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Causes and Consequences of the 1989-92 Credit Slowdown: Overview and Perspective

by M. A. Akhtar

This article is the overview essay for a volume, Studies on Causes and Consequences of the 1989-92 Credit Slowdown, published by the Federal Reserve Bank of New York. In addition to the present essay, the volume contains twelve papers dealing with a broad range of issues concerning the credit slowdown, including the importance of credit demand relative to credit supply factors, the role of bank and nonbank credit sources, the impact of credit supply shifts on the economy, and the implications of those shifts for monetary policy.

The volume is available from the Public Information Department of the Federal Reserve Bank of New York. Purchase information appears on page 85 of this issue of the Quarterly Review.

Between early 1989 and late 1992, U.S. economic growth averaged less than 1 percent, well below the long-run trend growth of the economy. This sluggish pattern of growth persisted in the face of substantial easing in monetary policy. Indeed, the economy failed to recover significantly after the 1990-91 downturn. Apparently the favorable effects of monetary easing were not sufficient to overcome numerous factors depressing the economy: lower defense spending, commercial real estate depression, relatively tight fiscal policy, global competition, corporate restructuring, historically low levels of consumer confidence, and the overextended financial positions of households, businesses, and financial institutions.

The sluggish real growth was accompanied by an unprecedentedly sharp slowdown in credit growth over 1989-92. Many observers have identified high debt service burdens of the nonfinancial sectors and widespread balance sheet problems of borrowers and lenders as crucial elements underlying both the credit slowdown and the persistent weakness of the economy. Others have attributed the sluggish economic performance to supply-side factors underlying the credit slowdown, which resulted in a prolonged period of substantially reduced credit availability to businesses and households. More recently, concerns about credit availability appear to have eased as credit growth has shown some signs of recovery.

Against the background of these developments, this overview provides a broad perspective on the causes and consequences of the 1989-92 credit slowdown. It begins by presenting a general conceptual framework for the analysis and then reviews the evidence from the collection of studies on the credit slowdown. The article also discusses implications of the evidence for monetary policy and offers some tentative general observations on the recent credit slowdown experience.

Overall, studies reviewed here provide substantial evidence of credit supply problems, or a "credit crunch," during the 1989-92 period for both bank and nonbank credit sources. The evidence on the consequences of credit supply constraints is less compelling, but the studies do indicate, at least collectively, that credit constraints have played some role in weakening economic activity. The depressing effects of the credit crunch appear not to have been the primary or dominant cause of the economic slowdown, however. As for the implications for monetary policy, credit supply problems have clearly contributed to reducing the effectiveness of monetary policy, although it is difficult to isolate their effects from those of other factors disrupting or altering the channels of policy influence to the economy.

Credit slowdown vs. credit crunch: A general framework

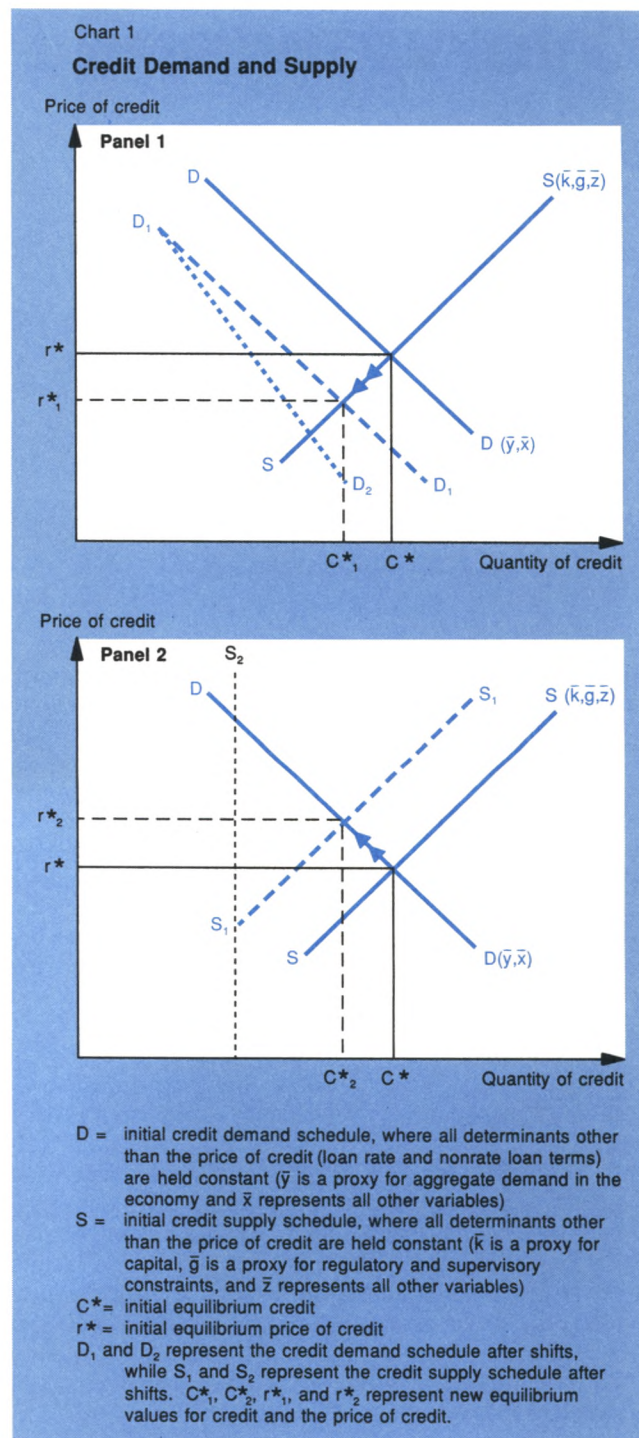
There is no generally accepted definition of the term "credit

crunch," but it is usually taken to mean a sharp reduction in the supply or availability of credit at any given level of interest rates. To clarify terminology and to provide a broad context for the issues involved in identifying a credit crunch, we begin with the more encompassing notion of credit slowdown or decline. At the broadest level, an observed slowdown or decline in credit may result from either the demand side or the supply side. At a given lending rate or price of credit, the demand for credit may fall because of other (nonprice) determinants of credit demand. In the usual graphical supply-demand framework, the demand schedule for credit may shift down and to the left. This is shown in Chart 1, panel 1, under very simplistic market conditions, where the price of credit includes both the loan rate and nonrate loan terms, such as collateral, maturity, and covenants. From a macroeconomic perspective, this type of shift may occur because of lower credit demand stemming from either cyclical weakness in economic activity or structural factors—such as changes in the tax code, inventory techniques, or the borrowers' desired debt-to-income ratio—that reduce the perceived need for credit permanently. In general, shifts in credit demand induced by cyclical weakness in economic activity are relatively commonplace while credit demand shifts due to structural changes are somewhat less frequent but not unusual.

A downward shift in credit demand tends to put downward pressures on loan rates and other loan terms and, given an unchanged supply schedule, leads to easier loan terms at the new credit market equilibrium. Moreover, if a downward credit demand shift is caused by structural factors, it may also be accompanied by a steepening (flattening) of the demand schedule; the demand for credit may become less (more) responsive to changes in the price of credit (Chart 1, panel 1, D_2 schedule).

On the supply side, a credit slowdown or decline may reflect reduced willingness to lend at prevailing interest rates and demand conditions. Factors that can cause reduced willingness to lend include, among others, balance sheet difficulties of lenders (poor quality assets, high loan losses, and so forth), higher capital requirements and regulatory constraints on lenders, and increases in actual or perceived riskiness of borrowers' credit quality. The last factor is intended to capture credit supply shifts resulting from changes in a borrower's balance sheet conditions. Specifically, a deterioration in the quality of a borrower's balance sheet reflecting, for example, a drop in asset prices, weakens his ability to repay existing debts or to borrow new funds.¹ The decline in creditworthiness of the borrower, in turn, may reduce the lender's willingness to

extend a loan, causing a decline in the supply of credit. In this situation, the supply shift reflects reduced credit availability to borrowers whose credit quality has been impaired,



¹ More generally, the deterioration in the quality of the borrower's balance sheet (and the associated decline in creditworthiness) may result either from a cyclical decline or from noncyclical shocks (economy-wide or partial) such as an asset price drop in one or more sectors. As explained below, it is very difficult to separate credit supply effects from demand effects of general cyclical shocks to the economy.

but there is no change in the lender's desire to lend to those borrowers whose creditworthiness has remained unchanged. Note that the drop in borrowers' creditworthiness could be treated, in principle, as a drop in credit demand by borrowers of given risk characteristics (unchanged creditworthiness) in that there are fewer such borrowers. Nonetheless, at a practical level, it is more convenient to look at the effect of changes in borrowers' credit quality—especially those resulting from noncyclical shocks—on the willingness of lenders to supply credit.

In any event, the reduced willingness to lend may show up as a leftward shift in the credit supply schedule (Chart 1, panel 2). In this case, borrowing is rationed by price as loan rates and nonrate loan terms tend to tighten and the new credit market equilibrium is attained at higher interest rates and generally more restrictive loan terms, other things equal.

The reduced willingness to lend may not show up as a simple leftward shift of credit supply envisaged in the context of a market-clearing environment, however. Instead, lenders may resort to increased nonprice credit rationing; that is, loans are rationed by quantity rather than by variations in prices (interest rates and nonrate loan terms). In this case, lenders do not feel that they can protect themselves against risk by charging higher credit prices. Put another way, the credit supply schedule is not fully operative; in the extreme case, the schedule shifts leftward and becomes vertical, with the supply of credit becoming completely insensitive to interest rates (Chart 1, panel 2, S_2 schedule). In practice, the existence of nonprice credit rationing does not preclude the role of interest rates and other loan terms; some borrowings may be rationed by price and others by quantity or by both. Nonprice credit rationing may take many different forms: some borrowers obtain loans while other borrowers with identical creditworthiness do not; loans for certain types of borrowing or to certain classes of borrowers are unavailable; some apparently creditworthy borrowers are denied loans at prevailing interest rates because lenders do not perceive them to be creditworthy.²

The papers in this volume deal with both demand and supply factors in the credit slowdown since 1989, but the emphasis is on sorting out the role of supply-side factors and their implications for nonfinancial economic activity. Accordingly, the term credit crunch as used here refers to a slowdown or decline in the *supply* of credit, whether rationed by price or nonprice mechanisms, or simply to credit supply problems. This definition is clearly much broader than the narrow use of that term to describe situations of nonprice credit rationing. It is also broader than another frequently mentioned definition of credit crunch: "a widespread, sudden, sharp, indiscriminate, and rather brief

credit shutdown" (Wojnilower 1993).³

In a macroeconomic context, the existence of credit supply problems implies that the observed credit slowdown or reduction cannot be fully explained by cyclical developments in aggregate demand, except insofar as cyclical developments may have significant adverse effects on borrowers' creditworthiness as perceived by lenders. There are, of course, numerous identification problems in sorting out supply from demand factors in the credit slowdown. For example, a sharp reduction in the willingness to lend may lead to a decline in output, inducing a reduction in the demand for credit. In these circumstances, the credit slowdown will be reported as reflecting lower demand for credit even though it was, in fact, caused by an initial shock to the supply of credit (Friedman 1993a, 1993b).

More generally, with demand and supply factors operating simultaneously and interacting with each other, it is very difficult to distinguish shifts in the supply schedule from developments on the demand side. Lenders usually tend to tighten credit standards and terms for lending when the overall economy slips into a recession because, on average, business and household loans entail higher risks than before. But the extent of lenders' response depends not only on the degree of perceived economic weakness and its effects on borrowers' credit quality but also on the state of their own balance sheets. From the perspective of borrowers, this situation would look like a contraction in credit supply, while lenders may believe this to be a response to developments in aggregate demand. Strictly speaking, there is no change in the lenders' willingness to extend credit to borrowers of given circumstances (that is, unchanged creditworthiness). At the same time, the reduced supply is not a response to lower demand for credit. The constriction in the supply of credit has clearly been caused by a decline in the willingness of lenders, albeit one that reflects the adverse effect of the weaker economy on the creditworthiness of borrowers and balance sheets of banks. Any sorting out of the demand and supply aspects in this case would be further complicated by the fact that the recession itself would reduce the demand for credit.

Identifying demand and supply factors in the recent credit slowdown is particularly difficult because of the conjunction of the prolonged cyclical weakness in the economy with a correction of earlier credit excesses. Those credit excesses, as noted below, reflected the unusually rapid increases in debt in the mid-1980s and became unsustainable over time as both borrowers and lenders experienced balance sheet and other difficulties, with cyclical develop-

² See Jaffee and Stiglitz (1990) for a detailed survey of various aspects of credit rationing.

³ For other perspectives on defining a credit crunch, see Peek and Rosengren (1992), Owens and Schreft (1992), and Wojnilower (1992a). For other perspectives on the current credit crunch, see Bernanke and Lown (1991), Cantor and Wenninger (1993), Jones (1993), Jordan (1992), Kaufman (1991), Kliesen and Tatom (1992), Peek and Rosengren (1992), Sinai (1993), Syron (1991), and Wojnilower (1993). For detailed analysis of earlier crunches, see Wojnilower (1980) and Wolfson (1986).

ments reinforcing pressures for correction. In this highly "endogenous" process, the demand for credit is believed to have fallen simultaneously with reductions in banks' capacity and willingness to lend.

Notwithstanding these difficulties, the twelve studies in this volume examine a broad range of issues concerning the 1989-92 credit slowdown. Five of these studies (Lown/Wenninger, Cantor/Rodrigues, Johnson/Lee, Demsetz, Seth) look at various aspects of the role of bank and non-bank credit sources in the slowdown of private nonfinancial debt, focusing on the importance of credit demand relative to credit supply factors. One study (Hamdani/Rodrigues/Varvatsoulis) reviews survey data on credit tightening from lenders and borrowers, and another study (Mosser/Steindel) explores the role of economic activity and other "fundamentals" in explaining the recent credit slowdown. Three studies (Harris/Boldin/Flaherty, Mosser, Steindel/Brauer) investigate the effects of credit supply problems on various aspects of nonfinancial economic activity. Finally, two studies (Hilton/Lown, Hickok/Osler) consider some special aspects of the credit slowdown: one attempts to assess the impact of credit supply shifts on the broadly defined money stock, M2, and the other provides a broad overview of the nature and extent of the credit slowdown abroad, largely based on the experience in France, Japan, and the United Kingdom.

The remainder of this article reviews evidence from the twelve studies under four broad headings: the extent of the credit slowdown; factors behind the credit slowdown; consequences of the credit crunch for nonfinancial economic activity; and implications of the credit crunch for monetary policy. The last section offers a few tentative concluding observations on the recent credit crunch experience.

Extent of the recent credit slowdown

Collectively, the studies in this volume show that the U.S. economy has experienced a broadly based and sharp credit slowdown in recent years. In documenting and describing the credit slowdown from the viewpoint of various types of borrowers (business, household, real estate, small business) or lenders (banks, other depositories, finance companies, insurance companies, foreign banks, bond markets), most of the studies begin by examining the extent of credit slowdown in the recent period. Since the timing of the slowdown is not uniform across all borrowers and lenders, however, these studies do not target a common time period for the recent credit slowdown. Nor do they judge the recent credit slowdown against a common historical benchmark. Instead, each study provides a comprehensive look at relevant credit developments from its particular vantage point using whatever time periods make most sense.

Nevertheless, it may be useful to provide a common time frame for summarizing the extent of the slowdown in private

nonfinancial debt and its main components on both the lending and the borrowing sides. I use the flow of funds data to highlight the breadth and depth of credit slowdown over the three years from 1989-IV to 1992-IV, taken as a whole, relative to long-term trends in the periods 1960-82 and 1982-89. Because inflation was greater in the earlier periods than in the most recent period, comparisons of nominal credit growth rates may be misleading. I have, therefore, presented data in both nominal and real terms in many cases. For simplicity and convenience, however, I have used the GDP deflator to convert nominal dollars into real dollars rather than search for specific sectoral deflators. (Sectoral deflators might change precise real dollar values but they are unlikely to alter the broader contours of constant dollar data obtained on the basis of the GDP deflator.) The points made here provide a broad overview of the extent of the credit slowdown to nonfinancial borrowers from both bank and nonbank sources, and may be viewed as a summary of details in various studies.

Private nonfinancial debt

Using data on nominal and real debt and ratios of debt to GDP, I begin by looking at the extent of the slowdown in private nonfinancial debt in terms of its three broad decompositions: business versus household debt, mortgage versus nonmortgage debt, and corporate versus noncorporate debt. As shown in Table 1, private nonfinancial debt growth declined sharply to about 3 percent, at an annual rate, over 1989-92 from long-term trend rates of 9 1/2 to 10 1/2 percent. Both businesses and households experienced large debt slowdowns, but the rate of decline was much greater for the business sector. Nonfinancial business sector debt growth averaged less than 1 percent in the recent period, compared with a long-term trend rate of 10 percent, while household debt growth averaged 5.6 percent in the recent period, about one-half the average growth rate over 1982-89.

In real terms, private nonfinancial debt actually declined somewhat over 1989-92 compared with trend rates of nearly 7 percent and 4 1/4 percent over 1982-89 and 1960-82, respectively. For both the business and household sectors, real debt trend growth rates were significantly higher in the 1982-89 period than in the earlier period. Credit to the nonfinancial business sector declined by nearly 3 percent, on average, in real terms over 1989-92, following more than 6 percent average growth over 1982-89. The sharp declines in private and business debt growth in recent years have reversed the rising trends of ratios of private and business sector debt to GDP (Chart 2 and Table 1) despite a sustained period of weak growth of nominal GDP.

With nonmortgage debt of both businesses and households slowing to about 2 percent at an annual rate over 1989-92, the greater decline in total business debt growth relative to household debt growth in recent years appears to be largely the result of differences in home and business

mortgage debt developments (Table 2). Home mortgage debt advanced at a hefty 7 percent annual rate in the 1989-92 period, although its rate of growth decelerated substantially from the historically high average growth rate over 1982-89. By contrast, business debt for real estate development declined at an average annual rate of about 2 percent during 1989-92, down from an average annual growth rate of close to 10 percent in the earlier period.

In real terms, both mortgage and nonmortgage components of business debt declined significantly in the 1989-92 period. But businesses have experienced a much sharper decline in credit flows for mortgages than for other activity in recent years.

Recent business debt developments have also differed significantly by the size of borrowers. As a group, large or corporate business borrowers fared better than small or noncorporate borrowers in the recent credit slowdown. Credit to corporate borrowers increased at an annual average rate of nearly 2 percent during the last three years, down from an 11.3 percent average increase over 1982-89 (Table 3). By contrast, noncorporate borrowers experienced an outright credit decline of 1.3 percent, at an annual rate, in the 1989-92 period, compared with growth rates of about 11 percent in 1982-89. It is interesting to note that noncorporate borrowing is the only category among those reported here that showed significantly lower *real* debt growth in the 1982-89 period than in the earlier period.

Bank and nonbank credit sources

The slowdown in private nonfinancial debt growth was

Table 1

Nonfinancial Debt

Fourth Quarter-over-Fourth Quarter Percent Change, Annual Rate

	Total Nonfinancial	Private Nonfinancial	Nonfinancial Business	Households
Current Dollars				
1960-82	8.6	9.6	10.0	9.2
1982-89	11.0	10.6	10.1	11.1
1989-92	5.2	3.1	0.7	5.6
Constant 1987 Dollars[†]				
1960-82	3.1	4.2	4.5	3.8
1982-89	7.2	6.8	6.3	7.3
1989-92	1.7	-0.4	-2.8	2.0
Ratio of Debt to GDP				
1960-82	0.2	1.2	1.6	0.8
1982-89	3.5	3.1	2.6	3.6
1989-92	0.3	-1.8	-4.2	0.6

Memo: 1992-IV 100.0 65.3 31.4 33.9
current dollar
share of total
nonfinancial debt

[†] GDP deflator was used to construct constant dollar series.

broadly spread across depository (banks and thrifts) and nondepository credit sources (Table 4). Banks and thrifts, however, experienced a sharper decline in credit growth over 1989-92 than did *overall* nondepository credit growth. Total depository credit actually declined at an annual rate of about 2 percent over 1989-92 following 9.3 percent aver-

Chart 2

Ratios of Debt to GDP



Sources: Board of Governors of the Federal Reserve System, Flow of Funds Accounts; U.S. Department of Commerce.

Table 2

Private Nonfinancial Debt

Fourth Quarter-over-Fourth Quarter Percent Change, Annual Rate

		Mortgage			Nonmortgage		
	Private Nonfinancial	Total	Business	Home Mortgage	Total	Business	Household
Current Dollars							
1960-82	9.6	9.6	10.3	9.3	9.6	9.9	9.1
1982-89	10.6	10.9	9.7	11.5	10.3	10.3	10.3
1989-92	3.1	4.2	-1.9	7.1	2.0	1.9	2.3
Constant 1987 Dollars[†]							
1960-82	4.2	4.2	4.8	3.8	4.2	4.4	3.7
1982-89	6.8	7.1	5.9	7.8	6.5	6.5	6.5
1989-92	-0.4	0.7	-5.4	3.6	-1.4	-1.6	-1.1
Memo: 1992-IV current dollar share of private nonfinancial debt	100.0	50.2	14.3	35.9	49.8	33.8	16.0

[†] Based on GDP deflator.

age growth over 1982-89, while total nondepository credit growth slowed to a 7 percent average rate in the recent period from about 12 percent in the preceding period. Both depository and nondepository credit growth rates are, of course, much lower on a constant dollar basis. At this level of aggregation, the bulk of the deceleration in private nonfinancial credit growth over 1989-92 relative to the 1982-89

average rate is accounted for by depository sources, with both banks and thrifts making substantial contributions to the slowdown.

The outright decline in total depository credit over 1989-92 reflects, to a considerable extent, the collapse of the savings and loan industry. In fact, the commercial bank credit component—which represents about 70 percent of total depository credit—advanced at a 2 percent average annual rate over the 1989-92 period, compared with a long-

Table 3

Nonfinancial Business Debt

Fourth Quarter-over-Fourth Quarter Percent Change, Annual Rate

	By Size of Borrower			By Type of Borrowing	
	Total [†]	Large [‡]	Small [§]	Mortgage	Other
Current dollars					
1960-82	10.0	8.7	14.1	10.3	9.9
1982-89	10.1	11.3	10.9	9.7	10.3
1989-92	0.7	1.8	-1.3	-1.9	1.9
Constant 1987 dollars[†]					
1960-82	4.5	3.3	8.5	4.8	4.4
1982-89	6.3	7.5	7.1	5.9	6.5
1989-92	-2.8	-1.7	-4.8	-5.4	-1.6
Memo: 1992-IV current dollar share of private nonfinancial debt	48.1	31.4	15.0	14.3	33.8

[†] All corporate and noncorporate debt.[‡] Corporate sector, excluding farm debt.[§] Nonfarm, noncorporate debt.[†] Based on GDP deflator.

Table 4

Nonfinancial Private Credit Growth

Fourth Quarter-over-Fourth Quarter Percent Change, Annual Rate

	Depository Credit	Nondepository Credit	Bank Credit	Depository Loans	Bank Loans
Current dollars					
1960-82	9.7	9.6	10.1	9.7	10.3
1982-89	9.3	11.8	10.1	9.0	9.9
1989-92	-2.0	7.0	2.0	-2.7	1.1
Constant 1987 dollars[†]					
1960-82	4.2	4.1	4.7	4.3	4.8
1982-89	5.5	8.0	6.3	5.3	6.1
1989-92	-5.4	3.5	-1.5	-6.1	-2.4
Memo: 1992-IV current dollar share of private nonfinancial debt	39.9	60.1	28.1	36.3	25.5

[†] GDP deflator was used to construct constant dollar series.

term trend rate of around 10 percent. This modest bank credit growth was more than fully offset, however, by a 45 percent (13 1/3 percent at an annual rate) decline in credit by savings and loan associations.

While overall nondepository credit growth has held up better than overall depository or bank credit growth, many components of nondepository credit did not fare much better than bank credit. As explained in the Cantor/Rodrigues study, credit growth to businesses experienced roughly similar slowdowns in commercial paper, finance company lending, and bank loans in recent years relative to earlier trends.

Comparing the contribution of depository and nondepository sources to business credit developments reveals that banks and thrifts accounted for about four-fifths of the fall in business mortgage debt growth in 1989-92 relative to 1982-89 (Table 5). The slowdown in nonmortgage business debt in the recent period relative to the earlier period was somewhat more evenly divided between depository and nondepository sources. For the nonfinancial business sector as a whole, most of the deceleration in the average credit growth from the 1982-89 period to the 1989-90 period reflected the slowdown in depository credit; banks accounted for somewhat more than one-half of the depository contribution.

On the household side, the collapse of the savings and loan industry and the lending slowdown by other thrifts were responsible for most of the slowdown in home mortgage debt growth in 1989-92 relative to 1982-89. The pace of commercial bank credit flows for home mortgages actually picked up somewhat during the 1989-92 period. Banks, however, made the largest contribution to the slowdown in nonmortgage household credit, accounting for more than

half of the total slowdown in that component.

Selected aspects of bank business loans

Data reported above clearly indicate that commercial banks have played a major role in the 1989-92 credit slowdown for both business mortgages and nonmortgage business loans. For the nonfinancial business sector as a whole, the slowdown in bank loans accounted for more than one-third of the deceleration in average credit growth from 1982-89 to 1989-92.

Both large (corporate) and small (noncorporate) business borrowers from banks experienced outright declines in bank loans over 1989-92, but the rate of decline was considerably greater for noncorporate borrowers (Table 6). Specifically, over the 1989-92 period, nonmortgage bank loans to noncorporate borrowers declined at a 4 1/2 percent annual rate, more than twice the pace of decline for corporate borrowers.

In the absence of bank loan sales, bank credit flows to businesses would probably have been even weaker in recent years. The study by Demsetz indicates, however, that adjustments for bank business loan sales to nonbanks and nonfinancial institutions over the 1986-92 period actually increase the severity of the recent slowdown in commercial and industrial loans on banks' books because business loan sales have decreased in recent years. (Note that the flow of funds data for nonfinancial borrowers reported here already incorporate loan sale adjustments.) Even so, the liquidity provided by loan sales and securitization has most likely enabled banks to maintain higher levels of total loan origination than would have been the case otherwise. Cantor and Rodrigues point out in their study for this volume that mortgage-backed securities have grown about 70

Table 5

Contributions to the Credit Slowdown

From 1982-89 to 1989-92

	Business			Household		
	Mortgage	Other	Total	Mortgage	Other	Total
Decline in credit growth rate [†]	11.6	8.4	9.4	4.4	8.0	5.6
Percent of total decline contributed by:						
Depository sources	82.8	58.3	69.1	84.1	67.5	78.6
Banks	38.8	21.4	37.2	-6.8	55.0	23.2
Thrifts	44.0	36.9	31.9	90.9	12.5	55.4
Nondepository sources	17.2	41.7	30.9	15.9	32.5	21.4

[†] Annual average credit growth rate over 1982-89 minus annual average growth rate over 1989-92.

percent since 1988 and that securitization of business and consumer credit has proceeded even more rapidly over that period.⁴ Clearly, recent sharp advances in securitization have, to some extent, cushioned the credit slowdown.

As described in detail in the study by Lown and Wenninger, the bank credit slowdown was spread fairly broadly across various regions of the country, but Northeast (New England and Mid-Atlantic) and Pacific regions experienced very large outright declines in total and business bank loans over 1989-92. Other regions also experienced contractions in commercial and industrial loans, although in some cases the rates of decline were relatively modest.

Within the banking system, the bulk of the recent bank credit slowdown is attributable to domestic banks as opposed to foreign banking offices in the United States (Chart 3). Total loans of U.S.-chartered banks showed less than 1 percent annual average growth over 1989-92, and business loans actually declined outright at a 4.5 percent annual rate. By contrast, total U.S. loans of foreign banking offices in the United States advanced at an annual rate of about 14 percent over the recent three-year period, only slightly below the average increase over the 1982-89 period. Business loans by foreign banking offices did register a significant slowdown in the recent period,

but they continued to increase at a hefty annual pace of about 9 percent.

These trends in foreign bank loans to U.S. borrowers are analyzed in more detail by Rama Seth in her study for this collection. She finds that as a group, foreign banks supported total U.S. credit growth during the recession, although many foreign banks, especially those from Japan, Italy, and the United Kingdom, cut back on loans over that period. While Seth is unable to provide a full accounting of the continued strong loan growth at foreign banks, she notes that their desire to increase market share and their capital strength may have been important in maintaining the relative strength of foreign bank lending.

The differing patterns of loan developments for foreign relative to domestic banks have substantially reduced the domestic bank shares of total and business loans (Chart 3). Moreover, the flow of funds data used here understate the extent of foreign bank loans to U.S. residents because offshore foreign banks' U.S. lending is excluded (McCauley and Seth 1992). Adjusted for offshore data, the true shares of U.S.-chartered banks are considerably smaller than shown in Chart 3.

Factors behind the credit slowdown

Studies in this volume investigate demand and supply factors underlying the slowdown in private nonfinancial debt for both bank and nonbank sources of credit. The evidence includes descriptive and econometric analysis and is based on hard data as well as survey materials for borrowers and lenders. On the demand side, the studies look for both cyclical effects—the credit slowdown viewed as a by-product of the economic slowdown—and noncyclical demand influences. On the supply side, the evidence for both price and nonprice rationing of credit is considered.

Cyclical and noncyclical demand influences

At an impressionistic level, the recent credit slowdown cannot be fully explained by the 1990-91 recession and the slow growth period surrounding the recession. Several studies in our collection—especially those by Cantor/Rodrigues, Lown/Wenninger, and Mosser/Steindel—provide noneconometric data analysis of cyclical effects on various debt or credit components. The general thrust of the authors' analysis of cyclical effects is captured by data in Table 7, although collectively these studies cover a much broader range of issues and detail. Briefly, the growth rate of private nonfinancial debt in nominal and real terms has been substantially lower in the period surrounding the recent recession than over comparable periods for the four earlier major recessions, on average, or considered individually. Broadly, this pattern holds for major aggregate borrowing components and for both bank and nonbank credit. The only significant exception is the flow of home mortgage debt from both bank and nonbank sources, which has been

⁴ Cantor and Demsetz (1993) show that over the two years to the second quarter of 1992, the growth in loans for home mortgages, consumers, and businesses inclusive of off-balance-sheet lending (securitization and loan sales) exceeded the growth in loans on the books of banks, thrifts, mortgage companies, and finance companies as a group.

Table 6

Nonfinancial Business Loans by Banks

Fourth Quarter-over-Fourth Quarter Percent Change, Annual Rate

	Nonmortgage Business Loans				
	Total	Total [†]	Large Business [‡]	Small Business [§]	Mortgages
Current dollars					
1960-82	10.6	10.3	10.0	14.0	12.0
1982-89	9.9	7.2	8.0	7.1	16.5
1989-92	-1.7	-2.3	-2.2	-4.5	-0.7
Constant 1987 dollars[¶]					
1960-82	5.2	4.9	4.5	8.5	6.5
1982-89	6.1	3.5	4.3	3.3	12.7
1989-92	-5.2	-5.7	-5.6	-7.9	-4.2
Memo: 1992-IV	13.7	8.7	6.9	1.4	5.0
current dollar share of private nonfinancial debt					

[†] All corporate and noncorporate business.

[‡] Nonfarm corporate business.

[§] Nonfarm, noncorporate business.

[¶] Based on GDP deflator.

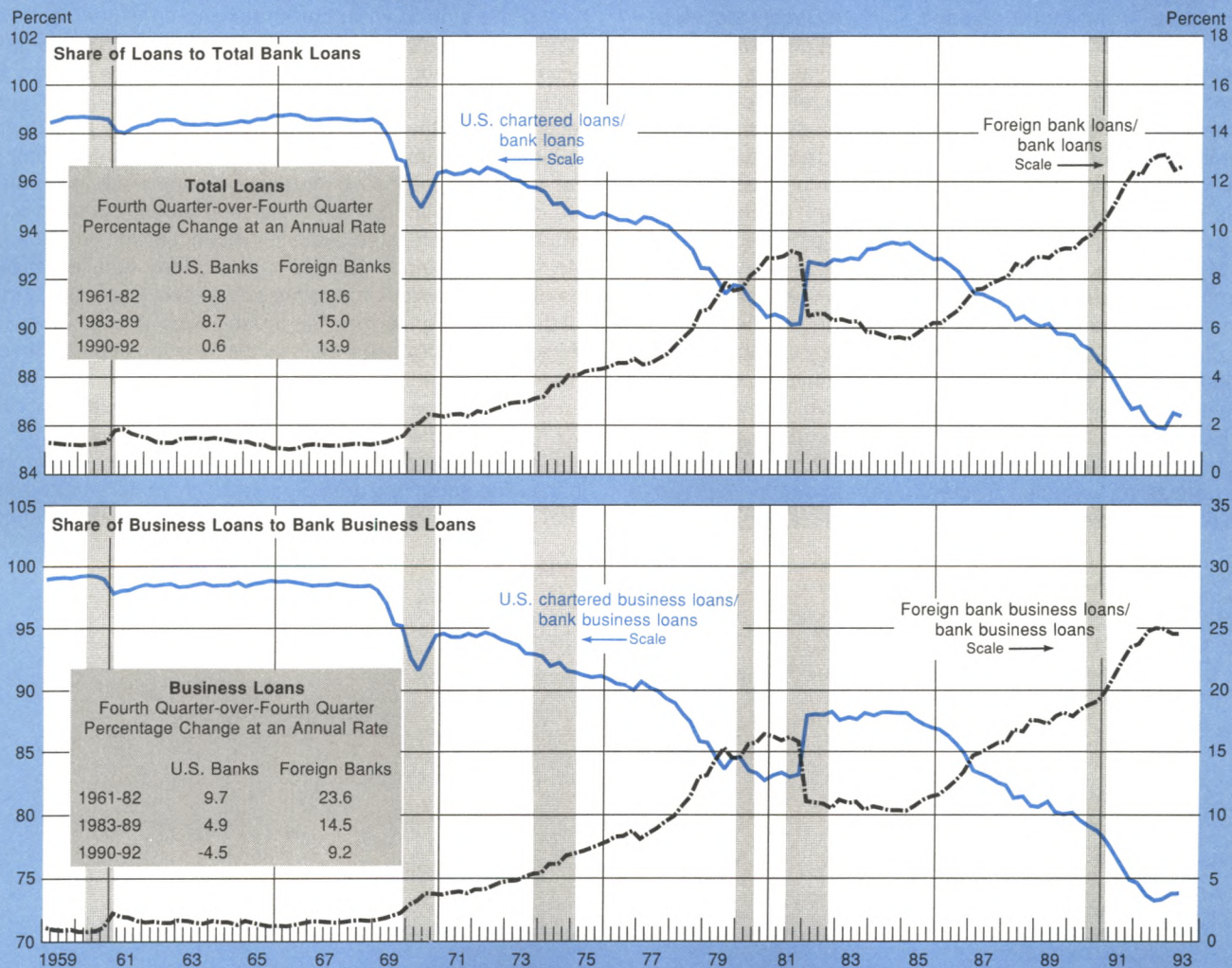
significantly stronger in real terms over the period surrounding the latest recession than around the last three major recessions since 1970.

The comparison of credit flows reported in Table 7 probably understates, to some extent, the contribution of cyclical developments to the private credit slowdown around the current recession relative to the earlier episodes. As shown in Chart 4, the pace of economic activity, nominal and real, was weaker in the current cycle than it had been on aver-

age in the earlier cycles. Nevertheless, as pointed out by Lown/Wenninger and others, the differences in the pace of activity do not fully explain the sharp credit slowdown in the current episode relative to the earlier episodes. Moreover, the credit weakness itself may be responsible, in part, for the slower pace of economic activity in the current cycle. With changing relationships between credit flows and economic activity, it is very difficult to assess the contribution of weaker than average growth in the current cycle to the

Chart 3

Comparison of Domestic and Foreign Bank Loan Shares



Source: Board of Governors of the Federal Reserve System, Flow of Funds Accounts.

Note: Shaded areas indicate periods designated recessions by the National Bureau of Economic Research.

severity of the credit slowdown. But one simple way to get a very rough sense of this contribution is to use the average relationship between real credit flows and economic growth for the earlier cycles as a benchmark to calculate the implied credit flows associated with recent growth performance. This type of exercise suggests that the weaker than average pace of economic activity accounts for only about 35 percent of the gap between the private credit growth in the current cycle and the average private credit growth in the past four cycles.

Some noncyclical or structural demand shifts may also have contributed to reducing the demand for credit in recent years. Such shifts are "permanent," by definition, but their influence on demand may be difficult to separate from that of cyclical forces. Some studies in this volume note the relevance of structural demand shifts in recent developments in credit flows. In particular, the Lown/Wenninger and Mosser/Steindel papers discuss the influence of a possible downward shift in inventory demand relative to sales, especially in the manufacturing sector, on the demand for commercial and industrial loans. Because of just-in-time and other management techniques, the amount of inventories needed for a given level of sales and, therefore, the financing requirements for those inventories have declined in recent years. Even though such a shift is likely to have been gradual and to have started before the recent credit slowdown, a considerable portion of the unusual weakness in commercial and industrial bank loans over the recent period may be explained. Lown and Wenninger argue, by the need to finance a lower than normal level of inventories.

Econometric analysis yields results that are broadly consistent with the less formal data analysis, namely, demand influences as reflected in standard macroeconomic variables are unable, by themselves, to explain adequately the

recent credit slowdown. At the outset, it is worth noting that the estimates discussed here generally do not distinguish between cyclical and noncyclical demand influences. The estimated equations simply attempt to explain particular credit flows using aggregate demand components and other appropriate macroeconomic factors as explanatory variables. Movements of explanatory variables, in this context, capture all relevant normal or long-run influences on credit flows.

Using cash flow and income or aggregate demand components as explanatory variables, Mosser and Steindel estimate total loan equations for nonfinancial corporations, consumers, home mortgages, and business mortgages. They find that swings in economic activity-related fundamentals seem to account for only about one-quarter to one-half of the slowdown in corporate and consumer borrowings. In the case of consumer credit, the authors reestimate equations by adding home equity lines to take account of shifts between consumer credit and home equity loans resulting from the Tax Reform Act of 1986; the results are roughly similar to those without the home equity variable. For business and home mortgage components, estimates are unstable, although for home mortgages, the estimated equations are able to explain the recent slowdown in loans. Mosser and Steindel provide a particularly detailed analysis of corporate and consumer loans, and argue that most of the prediction errors for those loans do not seem to reflect any exogenous shift in the relationships between credit demand and explanatory variables.

For bank loans, Lown and Wenninger estimate four sets of equations, one each for commercial and industrial loans, business mortgages, home mortgages, and consumer loans. The equations are estimated with vector autoregression methodology to approximate reduced-form relation-

Table 7

Credit Growth over Various Business Cycles

Percent Change, Annual Rate

	Private Nonfinancial	Business Nonfinancial	Household	Mortgage		Nonmortgage
				Business	Home Mortgage	
Current dollars						
Average, current cycle	3.1	0.7	5.6	-1.9	7.1	2.0
Average, earlier cycles(A) [†]	8.8	9.2	8.5	10.2	8.5	8.6
Average, earlier cycles(B) [‡]	9.0	9.7	8.3	10.6	8.2	9.0
Constant 1987 dollars[§]						
Average, current cycle	-0.4	-2.8	2.0	-5.4	3.6	-1.4
Average, earlier cycles(A) [†]	3.9	4.2	3.5	5.2	3.6	3.7
Average, earlier cycles(B) [‡]	3.2	3.9	2.5	4.7	2.4	3.2

Note: Business cycle periods cover four quarters before trough, trough quarter, and seven quarters after trough.

[†] Average of the 1958, 1970, 1975, and 1982 cycles.

[‡] Average of the 1970, 1975, and 1982 cycles.

[§] Based on GDP deflator.

ships, using a range of economic activity and interest rate variables. Broadly, the estimated equations for business mortgages and consumer loans underpredict the credit slowdown, while those for home mortgages more than fully account for the extent of the slowdown. For commercial and industrial loans, Lown and Wenninger are unable to reach any firm conclusions because of unstable regressions.

Cantor and Rodrigues estimate equations for total bank business loans and for nonbank business credit using GDP, investment, and inventories as explanatory variables. The prediction errors from both the bank and nonbank equations are large, indicating that macroeconomic activity

variables do not provide an adequate explanation for the slowdown in either bank business lending or nonbank business credit.

In summary, aggregate demand influences are unable to explain a substantial part of the recent slowdown or decline in nonfinancial business borrowings from bank and non-bank sources; this is true for both mortgage and nonmortgage business borrowings. Demand factors also fail to account for the recent slowdown in consumer credit, and taking account of shifts between consumer credit and home equity loans does not significantly alter this result. Recent developments in total home mortgage debt and home mortgage bank loans, however, appear to be adequately explained by the evolution of aggregate demand influences.

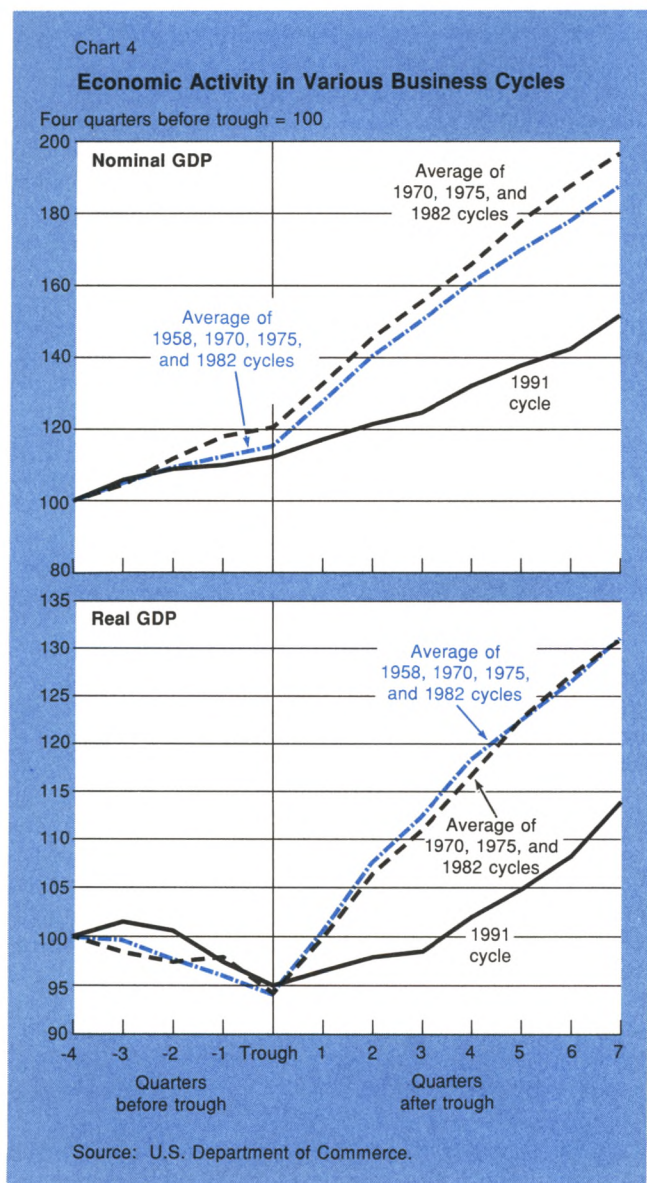
Supply-side factors

With a significant fraction of the credit slowdown left unexplained by standard aggregate demand variables, one must turn to the supply side. Indeed, the prediction errors or residuals from equations estimated with demand variables may be viewed as representing one measure of the supply-side influence on the credit slowdown. Of course, even if we could account for all of the recent credit slowdown with the help of demand variables, that result by itself would not necessarily imply that supply-side factors did not contribute importantly to the credit slowdown. Such a result might simply reflect, for example, the fact that demand influences overwhelm supply-side factors. More generally, with both credit demand and supply falling, if the drop in credit demand is larger, actual credit developments will tend to be dominated by demand influences, making it difficult to estimate the net contribution of supply-side factors.

Four studies in this collection—Lown/Wenninger, Cantor/Rodrigues, Johnson/Lee, and Hamdani/Rodrigues/Varvatsoulis—have devoted considerable attention to the role of supply-side factors in the credit slowdown. Their analysis covers bank and nonbank sources of credit and survey data. Overall, the evidence points to significant credit supply problems for both bank and nonbank sources of credit.

On the bank side, Lown and Wenninger look at a number of supply-side factors and provide both descriptive and econometric evidence on the role of those factors. They find that in the 1989-92 period, spreads between bank lending rates and bank funding costs for both corporate and consumer loans were at or above their previous record levels. They also note that the percentages of short- and long-term loans requiring collateral increased sharply over 1989-92. Both indicators are consistent with a leftward shift in the bank loan supply schedule.

Other noneconometric evidence discussed by Lown/Wenninger and others suggests that banks engaged in nonprice credit rationing or, more generally, experienced reduced ability or willingness to lend. Banks sharply increased their holdings of securities relative to loans, and



some of the increase appeared to be noncyclical.⁵ Survey data from banks indicate significant tightening in credit standards on mortgages and other business loans during 1989-92.

Weakening bank capital positions—reflecting, in part, deteriorating bank loan quality and increasing charge-off rates—seem to have played a significant role in credit supply problems over 1989-92. Lown and Wenninger argue that poorly capitalized banks reduced their lending more sharply than well-capitalized banks during 1990-91. Drawing on a more comprehensive examination of the relationship between bank capital positions and bank credit, Johnson and Lee reach a somewhat stronger conclusion along the same lines. Specifically, the results indicate that banks with weak capital positions did less lending than banks with strong capital positions during the 1990-92 period.

Lown and Wenninger also argue that the increased emphasis by the regulators on bank capital and the riskiness of bank loan portfolios may have contributed to the bank loan slowdown, although the role of the regulators and examiners is difficult to separate from other factors. While Lown/Wenninger and Johnson/Lee explore the effects of capital positions on bank lending, none of the studies in this volume explicitly investigate the role of regulators and regulatory changes in the credit slowdown process.⁶

Using state-level data, Lown and Wenninger estimate cross-sectional regressions for bank loan growth with employment, capital, and loan-loss reserves as independent variables; the latter two variables are intended to capture the effect of banking conditions (that is, supply-side factors) on loan growth. The results suggest that capital and/or loan-loss reserves contributed significantly to weak bank lending in 1990 and 1991 and that the effects of these supply-side factors were greatest for the New England region, followed by the Mid-Atlantic and the West South Central regions. By applying the cross-sectional regression coefficients to changes in the explanatory variables by region, Lown and Wenninger provide a quantitative sense of the contribution of supply-side factors to the overall bank credit slowdown. Specifically, they suggest that supply-side problems accounted for roughly 15 to 40 percent of the slowdown in bank lending from 1989 to 1990.

Also using cross-sectional data, Demsetz estimated equations for bank loan sales with expected economic activity, assets, capital ratios, nonperforming loan ratios, and other bank characteristics as explanatory variables.

⁵ More formally, Rodrigues (1993) shows that weak economic activity cannot explain all of the recent run-up in securities holdings and that the sustained steepness in the term structure of interest rates and risk-based capital standards may have contributed to that run-up.

⁶ For various perspectives on the role of regulators/examiners and capital standards, see Greenspan (1992), Syron and Randall (1992), Peek and Rosengren (1992), LaWare (1992), and Wojnilower (1992b, 1993).

She finds that both capital ratios and nonperforming loan ratios are significant in explaining loan sales but their contribution to predictions of loan sales declines is modest and swamped by that of economic activity.

Turning to nonbank credit sources, the Cantor/Rodrigues study offers evidence that supply-side forces were at work here as well. The authors' econometric estimates for nonbank business credit using GDP and its components as explanatory variables yield large prediction errors that suggest a significant role for supply-side factors. The results also indicate that the timing of the credit slowdown for nonbank sources was parallel to that for bank sources, with no evidence of a shift from bank to nonbank sources of funds.

Cantor and Rodrigues also provide considerable descriptive evidence on the role of supply-side factors in the slowdown of credit from nonbank sources such as finance companies, life insurance companies, and the commercial paper market. Business credit extended by finance companies advanced at a significantly slower pace starting in late 1989, when many finance companies were downgraded by the credit rating agencies because of major losses in commercial lending and, more generally, weak balance sheet positions. With more credit downgrades during the recession and large amounts put up for loan loss provisions and net charge-offs, total finance company business credit became roughly flat over 1990-92. Cantor and Rodrigues note that credit downgrades probably had a significant effect on lending because finance companies raise most of their funds in short-term public credit markets. The authors also suggest that credit stringency at banks may have had adverse feedback effects on finance company credit availability as many finance companies, faced with problems in raising funds in the commercial paper market, increased their borrowings from bank backup credit lines, presumably at higher costs.

Most of the problems of the life insurance industry, Cantor and Rodrigues argue, stemmed from commercial real estate lending, junk bond portfolios, and high rates on guaranteed investment contracts. Against the background of weak economic activity, these difficulties led to numerous credit downgrades, sharp declines in stock prices, and some outright failures in the life insurance industry. Life insurers became generally preoccupied with preserving liquidity and avoiding a collapse. In this environment, the National Association of Insurance Commissioners in mid-1990 adopted new rules establishing more stringent reserve and capital requirements for below-investment-grade bonds and private placements. These developments, Cantor and Rodrigues believe, have reduced the willingness of insurance companies to invest in below-investment-grade bonds and, more generally, have induced a shift toward low-risk assets.

Nonfinancial business borrowers did not increase the rate of commercial paper issuance during the latest credit

crunch, as they had done in earlier credit crunches. Because of numerous credit rating downgrades and fifteen defaults since 1989 (compared with only two defaults in the entire earlier history of the market), perceived credit risk in the commercial paper market increased greatly, leading investors, especially mutual fund investors, to lose confidence. Meanwhile, to protect small investors and sustain confidence in the money market mutual fund industry, the Securities and Exchange Commission in July 1990 imposed strict limits on the amount of "second-tier" (low-quality) commercial paper that mutual funds could hold. As a result of these developments, both the amount of second-tier commercial paper issued and the mutual fund holdings of that paper dropped precipitously over 1990-92. Cantor and Rodrigues believe that the credit quality concerns are not fully reflected in the rate spread between the top-tier and second-tier paper because the second-tier issuers are often "rationed" out of the market before they drive up rates.

Cantor and Rodrigues also discuss the public bond market. The market for below-investment-grade public bonds ("junk bonds") showed virtually no activity during 1990 and 1991 but recovered significantly in 1992. By contrast, the market for publicly placed investment-grade bonds remained quite strong, cushioning weakness in other credit markets to some extent.⁷

Survey evidence on supply-side factors

Hamdani, Rodrigues, and Varvatsoulis examine survey data from bank lenders and nonfinancial borrowers on credit tightening in recent years. Using both the narrative approach and econometric estimates, they find evidence of significant credit tightening by lenders because of supply-side factors. By purging the NFIB (National Federation of Independent Business) Survey data of aggregate demand influences, they uncover particularly strong and consistent evidence of a credit crunch for small business borrowers that depend primarily on banks for their financing (about 90 percent of small business debt consists of bank loans).⁸ The results indicate that for small borrowers, the recent credit crunch was more severe than earlier crunches. A significant part of this credit crunch appears to have taken the form of nonprice credit rationing or tightening of nonrate loan terms.

Hamdani, Rodrigues, and Varvatsoulis also find considerable evidence of credit supply constriction for large borrowers. They conclude that overall, the extent of bank

credit tightening for large businesses appears to have been greater than what can be explained by the general economic slowdown. Using the SLO (Senior Loan Officer) survey data from banks, again purged of aggregate demand influences, the authors argue that the degree of credit stringency during 1990-91 seems to have been similar to that in the 1974-75 episode.

Finally, Hamdani, Rodrigues, and Varvatsoulis estimate loan growth models using standard demand variables and survey variables on loan availability for both the SLO and NFIB surveys. The results suggest that restrictive loan supply conditions as proxied by the survey supply variables have had a significant impact on commercial and industrial bank loan growth over 1989-92.

Correction for the debt overhang of the 1980s

As noted earlier, disentangling the supply and demand factors underlying the recent credit slowdown is particularly difficult because the economic downturn was superimposed on a process of balance-sheet corrections for debt excesses of the mid-1980s. This process of correction for earlier debt excesses is widely believed to have contributed significantly to the credit slowdown over 1989-92.

During the last decade, a broad range of forces—including financial deregulation and innovation, developments in information and data processing technology, commercial real estate development, and mergers, acquisitions, and leveraged buyouts—combined to increase greatly both the supply of and the demand for credit, resulting in enormous increases in the amount of debt.⁹ The upward march of debt was supported, in part, by speculative asset price increases, especially for real estate.

Over time, the process of rapid debt increases led, perhaps inevitably, to problems for both borrowers and lenders. By 1989 and 1990, households and businesses faced historically unprecedented and unsustainable debt and debt service burdens (Chart 5). With weakening economic activity and declining real estate and other asset values, high debt burdens resulted in balance sheet difficulties for borrowers and loan quality problems for lenders. Not surprisingly, therefore, bank and nonbank lenders alike experienced a weakening of capital positions and increasingly higher loan loss reserves, charge-offs, and delinquency rates. All these factors together, so the argument runs, explain the sharp credit slowdown in recent years.

This account of the correction process is consistent with the view that the credit slowdown contained important supply-side elements although it was perhaps driven by demand forces. In particular, in the down-phase, balance sheet changes induced by declining real estate and other asset values led to weaker capital positions for banks and,

⁷ The severity of credit supply reductions, as noted earlier, has also been moderated somewhat by rapid increases in off-balance-sheet lending (securitization and loan sales) in recent years.

⁸ In fact, the authors' credit supply proxies, purged of aggregate demand influences, may understate the extent of credit supply shifts because they exclude supply shifts associated with movements of lending spreads and at least some of the effect of changes in borrowers' quality on the willingness to lend.

⁹ For a review of developments leading up to the credit crunch period, see Cantor and Wenninger (1993). For a broad perspective on the debt overhang of the 1980s, see Fryd (1991).

consequently, lower capacity and willingness to lend over 1989-92, just as on the up-side, balance sheet changes had increased capacity and willingness to lend in the earlier period. The lenders' reduced willingness to lend, in this case, reflected not only changes in their own balance sheets but also a shift in their attitude associated with the deterioration, actual or perceived, in the quality of borrowers' balance sheets and creditworthiness.

Perhaps even more important, according to this story, the correction process seems to have been dominated by market forces (both demand and supply) as opposed to policy factors. In fact, monetary policy had been easing since early 1989, and as a result, unlike earlier credit crunches, interest rates had declined significantly before serious credit supply problems emerged. To be sure, tighter capital requirements and regulatory pressures, stemming from both legislative changes and more intensive supervisory oversight, contributed to the credit slowdown, in part by reinforcing and highlighting prudential concerns. Such policy factors, however, appear not to have been the primary cause of the credit slowdown. In any event, any contribution of policy factors to the credit slowdown is likely to have been much smaller than the role played by market forces; these forces, particularly evident in a reduced desire to borrow and hold or extend debt, caused a decline in both credit demand and credit supply.¹⁰

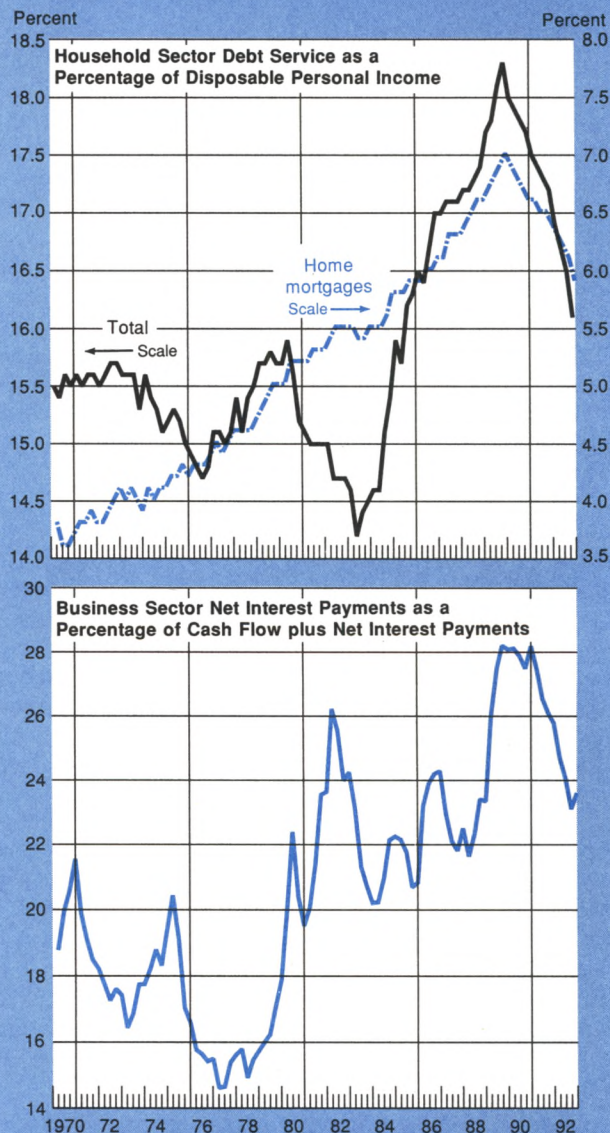
Research work in this volume does not provide any estimates of the extent to which the credit slowdown is attributable to the correction process for the debt overhang of the 1980s. While several studies discuss developments leading up to the credit slowdown, quantitative assessments are generally aimed at sorting out demand from supply (or cyclical from noncyclical) factors using historical trends. The study by Johnson and Lee does address the related question of the linkage between the earlier credit excesses by banks and the recent bank credit slowdown. It finds that banks that indulged in "high-risk" activities during the 1985-88 period were obliged to curtail their lending more sharply than other banks during the three years to end-1992. But the study does not estimate the extent of "excess debt" resulting from those earlier high-risk activities.

Nevertheless, it may be useful to get a rough sense of the impact of the correction for the debt overhang on the credit slowdown since 1989. Specifically, I address the following question: Was the actual cumulative expansion in private nonfinancial debt from end-1989 to end-1992 higher or lower than what is consistent with "normal" or long-run trend credit growth adjusted for cyclical developments and for the debt overhang of the 1980s? Using the simple rela-

tionship that the amount of credit expansion in any given time period is made up of the credit expansion consistent with the normal or long-run trend rate adjusted for cyclical

Chart 5

Debt Service Burdens



Source: U.S. Department of Commerce.

Notes: In the upper panel, debt service is an estimate of scheduled payments of principal and interest on home mortgage and consumer debt. In the lower panel, cash flow is defined as depreciation (book value) plus retained earnings (book value).

¹⁰ Incidentally, note that shifts in attitudes toward debt would normally be treated as "exogenous" in most macroeconomic models; the use of exogenous/endogenous in the current context, however, would appear to be inappropriate since such terms must be expressed relative to a specific model.

and other shifts away from that trend, I attempt to measure the gap between the actual credit expansion over the three-year period to the fourth quarter of 1992 and the amount of credit expansion implied by the adjusted long-run path under various assumptions for the relevant variables. If the actual credit expansion over 1989-92 falls short of the estimated credit expansion for that period, the recent credit slowdown has been greater than what could be reasonably attributed to the combination of cyclical effects and the correction for earlier debt excesses. In this case, the correction process itself might have produced overshooting or shifts unrelated to the earlier credit excesses, and cyclical developments might have further depressed credit flows. Of course, a significant positive gap between the actual and the estimated credit expansion has the opposite implications.

There is no obvious and definitive way to measure the "normal" or long-run credit expansion rate. The usual procedure is to use some measure of the historical trend rate. But with credit expansion rates much higher in the 1980s than in the preceding two decades, history does not offer a clear choice for the trend rate or the benchmark period. Perhaps more important, since long-run credit growth must be viewed in real terms, we need relevant prices. At an empirical level, however, the choice of the appropriate price measures needed to deflate various debt components is ambiguous. Similarly, the use of the debt-to-GDP ratio at the component level in figuring out the long-run or normal rate is quite problematical—the ratio of a particular debt component to GDP (or to broad sectoral income measures) need not be stable over time. Adjustment of the long-run trend to account for cyclical and noncyclical developments raises equally difficult questions: How should we measure cyclical effects? How much time should we allow for the correction of the debt overhang to be completed—as much time as it took to build up the problem, more time, or less?

Using various alternatives for the long-run or normal trend credit expansion rate and adjustment factors, I calculated the cumulative amount of excess debt over 1982-89 and several measures of the gap between the level of actual credit expansion over 1989-92 and the amount of trend credit expansion, adjusted for the debt overhang and cyclical developments, during that period. One such exercise is reported in Table 8. The long-run trend rates in this exercise are based on business and household data for mortgage and nonmortgage debt over the 1960-82 period, converted into constant 1987 dollars using the GDP deflator.¹¹ The cyclical effects are measured on the basis of differences between the 1960-82 trend rates and the com-

bined average growth rates for the periods surrounding the 1970, 1975, and 1982 recessions.

This exercise suggests that the decline in business credit over 1989-92 has gone far beyond what was necessary to correct the earlier debt excesses; only about 55 percent of the decline in business credit over 1989-92 relative to the long-run trend can be attributed to the need to correct the debt overhang. Combining the correction for the debt overhang with cyclical effects still accounts for only a part of the business credit slowdown. Even assuming complete adjustment over three years (1989-92) for the credit excesses that took place over seven years (1982-89), the actual business credit increase over 1989-92 fell short of the long-run trend expansion, adjusted for the debt overhang and cyclical effects, by about \$246 billion in 1987 prices; the shortfall represents nearly 7 percent of total business credit at end-1992. Under partial adjustment, with three-sevenths of the excess debt eliminated over 1989-92, the debt shortfall from the trend expansion level increases to \$461 billion, or about 12.5 percent of total business credit at end-1992. While both commercial mortgages and nonmortgage business debt declined more than implied by the estimated adjusted trend expansion levels under the two adjustment scenarios, the bulk of the shortfall reflects commercial mortgages.

For the household sector, the correction for the earlier debt excesses and cyclical effects together more than fully account for the credit slowdown. In fact, actual household credit expansion over 1989-92 exceeded the amount of credit expansion consistent with the adjusted long-run trend, assuming complete adjustment over three years, by \$665 billion in 1987 dollars; the excess is nearly 17 percent of total household debt at end-1992. About 90 percent of the excess debt is attributable to home mortgages. Under partial adjustment, the amount of household excess debt drops to less than half that under complete adjustment, but it is more than fully accounted for by home mortgages, with nonmortgage household debt actually showing a moderate shortfall relative to the estimated level. In sum, there has been no correction for the debt overhang for home mortgages. On the contrary, home mortgage debt over 1989-92 continued to advance at a faster rate than the long-run trend rate, apparently unaffected by cyclical developments and by the need to correct earlier debt excesses.

Alternative measures of the long-run trend rate yield, in some cases, significantly larger or smaller estimates of the debt excess over 1982-89 and of the gap between actual and estimated debt changes over 1989-92. Two general messages of the results in Table 8 hold up, however. First, although the correction process for the debt overhang played a major role in the credit slowdown, it is difficult to explain *all* of the business credit slowdown by appealing to the need for correction. Second, home mortgage debt in recent years has remained immune to the

¹¹ The use of a national price index instead of sectoral price indexes seems to be preferable for at least two reasons: appropriate component price measures are not always readily available, and even when they are available, their use would legitimize credit excesses of the 1980s by incorporating any speculative price increases for particular sectors such as real estate.

correction process for the earlier debt excesses. One implication of the first point is that some credit supply shifts largely or completely unrelated to the market correction process for the debt overhang may have played an important role in the credit slowdown. Such supply shifts were presumably caused by tighter capital standards and regulatory pressures.

The credit slowdown abroad

A number of foreign countries have also experienced credit slowdowns, to varying extents, during the last three years or so. The Hickok/Osler study in this volume examines the foreign experience, focusing on Japan, France, and the United Kingdom. Since a single study cannot be expected to deal with all aspects of the foreign experience, the authors consider only the broad contours of the recent credit experience abroad and the common forces that may have driven that experience.

Using both descriptive analysis and regression results, Hickok and Osler find that for all three countries, the waning of the credit surge of the 1980s contributed importantly to the credit slowdown during 1990-91. The broadly defined process of financial deregulation and innovation, working through expanded access to credit markets, asset valuations, and other changes, led to increases in both the demand for and the supply of credit during the mid- and late 1980s. Subsequently, as actual credit changes adjusted to "permanently" higher equilibrium levels, credit growth rates tended to return to more normal levels.

Hickok and Osler also find that for Japan and the United Kingdom, a reversal of the speculative factors played a considerable role in the credit slowdown. Developments in

economic activity helped reduce the pace of credit growth in all three countries, but their role appears to have been relatively modest in Japan and the United Kingdom. Finally, bank capital movements seem to be significant in explaining credit movements in Japan and to a lesser extent in the United Kingdom, but they appear not to have made any contribution to credit developments in France.

Credit supply problems and economic activity

To the extent that the credit slowdown reflects the slowdown in aggregate demand or economic activity, it is a symptom and not a direct cause of the weakness in the economy. Accordingly, any investigation of the consequences of the credit slowdown for nonfinancial economic activity must focus on credit supply problems. In this volume, three studies—Mosser, Steindel/Brauer, and Harris/Boldin/Flaherty—deal with this subject. *Overall*, the three studies indicate that credit supply problems have not been the primary or dominant cause of the recent weakness in economic activity. But collectively, the studies do suggest that credit constraints are likely to have made at least some contribution to the economic slowdown.

Aggregate demand

Mosser examines the effects of credit supply problems on aggregate demand components while attempting to control for changes in credit demand. She estimates reduced form equations for several demand components with and without variables representing credit supply restraints. Four different proxies, all based on other studies in this volume, are used for credit supply constraints: (1) regression residuals from various bank loan equations in Wenninger/Lown, representing part of the credit slowdown not attributable to

Table 8

Long-Run Trend and Actual Credit Expansion, 1989–92

Billions of 1987 Dollars, GDP Deflator Basis

	Business			Household			Total Private
	Total	Mortgage	Other	Total	Home Mortgage	Other	
Actual credit expansion	-261.5	-159.0	-102.5	191.6	227.6	-36.0	-69.9
Trend expansion	423.6	151.5	272.1	284.9	185.9	98.9	708.5
Cyclical adjustment	-62.9	-2.0	-60.9	-93.5	-67.8	-25.6	-156.4
Correction for excess expansion over 1982–89	-376.0	-75.1	-301.0	-665.1	-479.9	-185.2	-1041.1
Adjusted trend credit expansion	-15.3	74.4	-89.8	-473.7	-361.8	-111.9	-489.0
Excess/shortfall	-246.1	-233.4	-12.8	665.3	589.4	75.9	419.1
Partial adjustment	-461.0	-276.3	-184.7	285.2	315.2	-29.9	-175.8

Notes: Table reports changes in billions of 1987 dollars from 1989-IV to 1992-IV. Long-run trends are based on the 1960–82 growth rates of business and household components. Cyclical adjustments are based on the differences between the 1960–82 trend rates and the combined average growth rates for the periods surrounding the 1970, 1975, and 1982 recessions. Figures in the last row are estimated on the basis of partial correction (3/7) for the 1982–89 excess expansion over 1989–92. In current dollars, actual cumulative private credit expansion over 1989–92 was about \$680 billion (11.0 percent of 1992 GDP). Sums may not add up precisely because of rounding.

demand factors; (2) regression residuals from various sectoral loan equations in Mosser/Steindel, measuring the gap between actual credit flows and the estimates based on historical relationships between credit and aggregate demand variables; (3) residuals from regressions in Hamdani/Rodrigues/Varvatsoulis, capturing credit availability restraints for small business, purged of cyclical influences; and (4) interest rate spreads between market rates and loan rates on business and consumer lending.

Using data for the 1980-92 period, Mosser performs some Granger-Causality tests to determine whether credit aggregates or credit supply proxies are statistically more significant predictors of future economic activity. Her results tend to favor credit supply proxies. For the more recent period, Mosser finds significant effects of credit supply problems on commercial real estate activity and producers' durable equipment. In particular, the credit supply proxy for small business seems to account for a considerable part of the 1989-92 weakness in nonresidential construction and producers' durable equipment. Even so, Mosser argues that the weakness in these demand components relative to predictions based on normal historical relationships cannot be fully explained by credit supply problems. Doubtless, the widespread sluggishness of economic activity during 1989-92 reflected a broader set of factors than just credit supply problems.

Construction activity

Harris, Boldin, and Flaherty investigate the effects of credit supply problems on the real estate industry. Focusing on the three construction industry sectors—single family homes, multifamily housing, and nonresidential structures—they provide a comprehensive review of credit and noncredit factors underlying the recent decline in construction activity. Overall, their study finds that credit supply problems are likely to have played only a modest role in the real estate contraction.

For single family housing, the authors begin by examining predictions of housing activity from several standard models that use mortgage rates, income, and other fundamentals as explanatory variables. Since these models are not able to predict the recent weakness in housing, the authors search for an explanation by focusing on "special" factors or other variables that have been left out of the models. They argue that of the missing variables, demand-side factors such as a generalized effort to reduce debt and an adverse shift in investor psychology rather than narrowly defined credit supply problems explain the bulk of unusual weakness in housing. This view is consistent with the fact that because of the mortgage-backed securities market and other financial innovations, credit supply for home mortgages has not experienced any significant problems. The supply of loans to homebuilders has been constrained significantly, but this appears not to have caused a perva-

sive housing shortage. Even so, credit supply problems may explain part of the recent weakness in housing activity since without credit constraints, the housing supply would have been larger and prices lower. More generally, given the weakness of both credit demand and credit supply, the identification problems make it difficult to rule out a significant role for credit supply difficulties.

Multifamily and nonresidential construction have declined greatly since 1989 and have remained the two weakest sectors of the economy. According to the Harris/Boldin/Flaherty study, overbuilding in the 1980s (together with the resulting excess capacity) dominates the credit crunch as an explanation for the collapse of activity in both sectors. The study recognizes, however, that these sectors have experienced credit supply problems and that the simultaneous weakness in (and interaction between) credit demand and credit supply makes it difficult to isolate the effect of credit supply constraints. It is likely that in the absence of credit supply constraints, the decline in the nonresidential and multifamily sectors would have been more moderate. Put differently, the credit crunch does not appear to be the *dominant* cause of the collapse in construction activity, but it may well have played some role in the timing and process of decline.

Business activity excluding construction

The Steindel/Brauer study explores the consequences of credit supply problems for business activity excluding construction. Overall, this study provides only limited support for the view that credit supply problems impeded business activity over 1989-92.

Steindel and Brauer consider five different types of evidence. First, they review recent movements in corporate, noncorporate, and manufacturing activity, together with relevant credit flows. The review suggests that the sharp slowdown in credit flows may have been a significant contributing factor to weakness in small business activity and that such firms may have borne a disproportionate share of the shortfall in both output and debt.

Second, the authors look at survey evidence on lending to smaller firms and the connection between credit supply proxies from other studies in this volume and noncorporate business output. This survey evidence does point to a significant credit tightening which may have contributed to weakness in small business activity.

Third, using detailed industry- and firm-level data, the study compares activity for small and large businesses and attempts to *infer* the role of credit in the recent weakness of small business activity. The focus is on manufacturing businesses, but the analysis does include some nonmanufacturing establishments as well. In most cases, small business activity appears not to have shown any unusual weakness relative to large business activity, and so, by inference, Steindel and Brauer do not find any more support

for the effect of credit supply problems on small businesses than on large businesses. But with data on the relevant credit flows unavailable, this type of evidence is entirely indirect and does not necessarily contradict the view that credit supply problems may have contributed to the slowdown in business activity over 1989-92.

A fourth type of evidence considered by Steindel and Brauer focuses on indicators of financial strength. Again using industry- and firm-level data, the authors explore the role of financial factors in the recent weakness of business activity by examining various measures of real economic activity for financially "weak" and "strong" businesses. This evidence is also indirect and yields mixed results.

Finally, using firm-level data, Steindel and Brauer perform formal regression tests to look for the effect of size and debt- to-asset ratios on employment, inventories, capital spending, and spending on research and development for various periods. Once again, the results are mixed.

Implications for Monetary Policy

In reviewing the implications of the credit crunch or credit supply problems for monetary policy, this section focuses on two related issues: implications of the credit crunch for the impact of monetary policy actions on economic activity, and consequences of credit supply problems for monetary policy guides, M2, and other financial variables. The section begins with some background information on the main features of the recent credit crunch and on the channels of monetary policy influence on the economy.

Overview of credit supply problems

The evidence in this volume is consistent with the view that credit supply problems contributed importantly to the credit slowdown over 1989-92, although demand influences may have dominated overall credit movements. The nature and causes of the 1989-92 credit supply problems were significantly dissimilar to those of most earlier credit crunches. The distinctive features of the most recent episode are summarized below.

First, credit supply problems in the 1989-92 period were widely spread across both bank and nonbank sources of credit. As a result, unlike earlier credit crunches, nonfinancial borrowers were not able to substitute nonbank credit freely for bank credit. In fact, finance companies, life insurance companies, and commercial paper issuance seem to have experienced credit supply problems that were essentially similar to those of banks. Together with a broadly based retrenchment in credit demand, credit supply problems led to a sharp slowdown in all major components of private debt flows.

Second, credit restraints during 1989-92 took the form both of more stringent price terms—higher lending rates relative to funding costs and tighter nonrate loan terms—and of nonprice credit rationing. Although this phenomenon

is probably fairly typical of earlier credit crunches, the pervasiveness of nonprice rationing and tighter loan terms over an extended period of time in the recent credit crunch is unusual. Earlier credit crunches were generally short-lived; the 1989-92 crunch period was characterized by persistently high spreads between lending rates and funding costs, especially at depository institutions, increasingly tighter credit standards for applications through much of the credit crunch period, and continued stringent nonrate terms on loans. These persistent credit restraints were reflected, among other things, in large increases in holdings of government securities relative to loans at banks.

Third, significant evidence points to a capital crunch as one of the major causes of credit supply problems over 1989-92. None of the earlier credit crunches were characterized by a widespread weakening of the capital positions of banks and nonbank financial institutions. Broadly, the actual or perceived capital crunch seems to have reflected three underlying forces (in addition to the normal cyclical effects): (1) the need to correct balance sheet problems resulting from the lax lending standards that had prevailed through much of the 1980s and had left balance sheets badly exposed to asset prices and other shocks; (2) increased capital requirements induced by legislative and regulatory measures and by more intensive supervisory oversight; and (3) the weakening of capital positions reflecting declining real estate and other asset values starting about late 1988.

Fourth, market forces seem to have played a critical role in generating the latest credit crunch. To be sure, as noted above, regulatory measures and pressures contributed to the actual or perceived capital crunch but, unlike earlier credit crunches, the current episode emerged in an environment of accommodative monetary policy and declining interest rates.

More fundamental to the process of credit slowdown appears to have been the need to correct the debt excesses of the mid-1980s, which had become unsustainable over time. Faced with major balance sheet and other difficulties, borrowers and lenders alike responded to market forces, borrowers by lowering their credit demands and lenders by reducing credit availability. In particular, the so-called credit crumble phenomenon—the chain running from asset price declines to capital position weakness to lower capacity and willingness to lend—contributed importantly to the process of credit slowdown.¹² The role of market forces was reinforced and perhaps intensified by the regulatory pressures that highlighted prudential concerns about loan quality and capital positions and argued for the need to strengthen lenders' balance sheets. The capital crunch itself was at least partly a by-product of the correction process as weakening capital positions and mounting loan losses called

¹² See Johnson (1991) for a detailed description of this phenomenon.

increasingly greater attention to the need for correction of earlier debt excesses and for additional capital.

The accumulating loan losses, continuing balance sheet problems, and full realization of the debt overhang also led to more conservative lending attitudes—well beyond what could be attributed to the measurable weakness in capital positions—and to a complete reversal of the earlier lax lending standards. To a considerable extent, the pervasiveness of credit supply problems reflected the widespread nature of the correction process, with both bank and non-bank creditors experiencing the need to improve loan quality and repair their balance sheets.

Finally, the debt overhang correction process and its conjunction with a prolonged cyclical weakness in the economy made the already difficult task of distinguishing credit supply malfunctions from credit demand factors even more difficult. Both borrowers and lenders were deleveraging and restructuring their balance sheets in response to earlier debt excesses and cyclical weakness. In the process, credit demand and credit supply narrowed simultaneously, but the drop in demand is likely to have overwhelmed the fall in supply. As a consequence, it is very difficult, if not impossible, to detect empirically the contribution of supply-side factors net of demand influences.

Channels of monetary policy influence

Monetary policy influences the economy through at least four important channels: the money–interest rate channel (or the “money” channel, as it is commonly known); the credit channel; the asset valuations or balance sheet channel; and the exchange rate channel.¹³ The discussion here deals with only the first three, ignoring the exchange rate channel. In the money–interest rate channel, as enshrined in the standard IS-LM model, monetary policy affects aggregate spending by raising or lowering the cost of funds through changes in the supply of money relative to the demand for money. Specifically, monetary policy actions—open market operations and so forth—induce changes in bank reserves, money, short-term interest rates and, through substitution and expectational effects, long-term interest rates. Higher (lower) interest rates, in turn, raise (lower) the cost of funds, other things equal.

The credit channel, which may operate alongside the money–interest rate channel, affects aggregate demand through direct changes in the availability and terms of bank loans. A tightening of monetary policy may reduce the supply of bank loans through higher funding costs for banks or

through increases in the perceived riskiness of bank loans. Since the credit channel views bank loans as imperfect substitutes for other assets in bank portfolios (government securities, corporate bonds, commercial paper and the like), monetary policy actions that reduce bank reserves and, therefore, deposits will be matched by decreases in both securities and bank loans. As a consequence, borrowers with no access to other sources of credit will be obliged to reduce their spending, while others with nonbank sources of credit, though less affected, will not be immune to monetary policy influence as long as the alternative sources of credit are more expensive or less convenient.

The asset valuations channel of monetary policy influence on the economy works through changes in balance sheet positions. Monetary policy actions that lower interest rates, for example, tend to increase asset values and improve liquidity for firms by lowering interest-to-cash flow ratios. These balance sheet improvements, in turn, may increase business spending by raising the availability of internal funds and improving the access to and the terms on external funds. Lower interest rates may also work to improve household balance sheet positions through debt restructuring and higher asset values, thereby increasing the availability of funds for debt retirement and additional spending. Note that the argument of this channel is that interest rate changes may affect spending by weakening (strengthening) balance sheets or wealth holdings, quite apart from their effects on the cost of funds in the money–interest rate channel.

Effectiveness of monetary policy

Factors relating to the credit crunch seem to have created significant blockages for the workings of all three channels of monetary policy. Overall, the blockages are likely to have muted the impact of monetary policy actions on economic activity. The empirical size and significance of the blockages are far from clear, however. Whether any of these blockages will turn out to have permanent consequences for the conduct of monetary policy is also not clear at this time.

The credit channel of monetary policy was seriously disrupted over 1989–92. With the decline in the willingness and capacity of banks to lend, monetary policy actions increasing bank reserves were not translated into additional bank lending. Specifically, easing of monetary policy apparently had very little impact on the supply of bank loans over 1989–92. This view is clearly supported by increasingly tighter credit standards, higher (or at least continued high) lending rates relative to funding costs, and restrictive nonrate loan terms. With nonbank credit sources also experiencing supply disruptions, frustrated bank borrowers were not satisfied elsewhere. Much academic discussion of the credit channel assumes that nonbank credit alternatives are easily available to many (perhaps most) borrowers. This view clearly runs counter to the recent

¹³ A large number of theoretical and empirical studies on the transmission of monetary policy influence to the economy have appeared since the mid-1980s. For some recent discussions of various channels of monetary policy, see Akhtar and Harris (1987), Bennett (1990), Bernanke (1993), Bernanke and Blinder (1988, 1992), Bosworth (1989), Friedman (1989), Gertler (1988), Gertler and Gilchrist (1992), Gertler and Hubbard (1988), Mankiw (1992), Mosser (1992), and Romer and Romer (1993).

credit crunch experience. In fact, widespread nonbank credit supply disruptions appear to have added substantially to the severity of the blockage in the credit channel.

The money–interest rate channel of monetary policy also seems to have experienced some blockage during 1989–92. Policy-induced increases in bank reserves did translate into lower short-term open market rates and faster growth of narrow money, M1. But the response of long-term interest rates and broader monetary aggregates to policy actions was very sluggish and weak throughout 1989–92. The decline in credit supply, as shown in the Hilton/Lown study, contributed importantly to slowing the growth of M2. And presumably the shift in credit supply also played some role in maintaining high long-term interest rates by putting upward pressures on rates, other things equal. As a result, monetary policy actions were less effective in lowering the cost of capital, hampering the workings of the money–interest rate channel.

The process of correction for earlier debt excesses may also have weakened the asset valuations or balance sheet channel of monetary policy influence on the economy. Given the actual or perceived need to correct the large debt overhang, lower interest rates may not have induced much additional spending by businesses and households because the improvements in balance sheets and the underlying asset values materialized only slowly. Put differently, easier monetary policy as reflected in lower interest rates may have encouraged households and businesses to repair the perceived weakness in their balance sheets by deleveraging and debt restructuring, without increasing spending significantly.

While credit supply problems during 1989–92 may have been important in reducing the effectiveness of monetary policy, it is difficult to isolate their effects from those of a broad range of other fundamental developments that are likely to have disrupted, weakened, or changed the linkages between monetary policy and economic activity. Mosser discusses a number of these other fundamental developments. Of the factors not directly related to the credit crunch, the following appear to be particularly important:

- the response of long-term interest rates to short-term open market rates may have been weakened by inflation fears or by a high level of investor uncertainty stemming from large federal budget deficits;
- effects of lower interest rates may have been weakened by very high levels of real after-tax interest costs;
- looking from a longer term perspective, financial innovation and deregulation over the last two decades are widely believed to have caused significant changes in both the size and the speed of monetary policy effects on various sectors of the economy.

Economic growth in recent years has also been re-

strained by factors unrelated to both the credit crunch and monetary policy transmission—relatively tight fiscal policy, a military build-down, excess capacity in the construction industry, and low levels of consumer and business confidence. It is difficult to control for these nonmonetary influences in assessing the effectiveness of monetary policy.

Against this background, the quantitative significance of the 1989–92 credit supply problems for the transmission channels of monetary policy is far from clear. As reported by Mosser, econometric forecasting equations, both reduced-form and structural estimates from large models, significantly overpredict real spending from 1989 to 1992. This finding is consistent with the notion that monetary policy actions have been less effective in recent years than in the past. Presumably the overprediction reflects both the credit crunch and other factors, however. Indeed, Mosser is unable to account for all of the overpredictions by making use of credit supply proxies. Moreover, the overpredictions are not limited to sectors that are directly sensitive to monetary policy. Instead, they are widely spread across all sectors, suggesting a general malaise in aggregate demand not captured by economic fundamentals.

Notwithstanding these measurement difficulties, credit supply problems during 1989–92 are likely to have contributed to reducing the effectiveness of monetary policy. Clearly, the credit crunch weakened the credit channel and caused disruptions in credit flows, producing at least some adverse consequences for economic activity. The credit supply shifts are also likely to have hampered the workings of the standard money–interest rate channel and possibly to have weakened the balance sheet–related contribution of lower interest rates to aggregate spending.

The long-term implications of the credit crunch for the effectiveness of monetary policy are less clear. Recent credit supply problems may well cause durable changes in the workings of monetary policy transmission channels by altering, for example, the relationship between changes in monetary policy and bank loans, between bank loans and deposit flows, and/or between debt and income.¹⁴ But such an outcome is by no means certain. Moreover, with numerous other potential influences on the linkages between monetary policy and economic activity, it may not be possible to isolate any permanent traces of the recent credit crunch on those linkages.

Monetary policy guides

Disruptions in the linkages between monetary policy and the economy imply adverse consequences for the usefulness of financial variables as monetary policy guides, whether viewed as intermediate targets or simply as infor-

¹⁴ If, for example, the recent experience makes banks permanently more risk averse in their lending, monetary policy effects on bank lending would be smaller than before.

mation variables. The usefulness of any monetary policy guide depends primarily on two considerations: the strength and predictability of the relationship between the guiding variable(s) and the ultimate objectives of price stability and economic growth, and the ability of the Federal Reserve to define, interpret, and control the guiding variable(s).¹⁵ The recent credit crunch seems to have added to problems on both counts.

Credit supply problems since 1989 have almost certainly contributed to reducing the usefulness of M2 and M3 as policy guides. Hilton and Lown argue that the reduced willingness of depositories to lend was an important factor behind the weakness in deposits, although their work does not fully isolate the effect of credit supply problems from that of noncyclical credit demand factors. Specifically, the authors point out that relatively high lending rates and the pervasiveness of stringent nonrate loan terms and nonprice credit rationing reduced the supply of credit and, together with lower yields on deposits relative to alternative assets, led to weak depository flows. Controlling for cyclical effects, Hilton and Lown estimate that by the middle of 1992, the credit slowdown had lowered M2 growth by about 10 percent. Their regression results indicate that the breakdown of M2 demand equations is at least partially attributable to the exceptional weakness in credit formation; the predictive performance of M2 demand equations improves significantly when direct measures of credit or other factors capturing cutbacks in lending are included as explanatory variables.

Credit supply malfunctions have also affected the relationship between credit aggregates and the economy. None of the studies in this volume is able to account for developments in various credit measures—household, business, bank and nonbank, and so forth—over 1989-92 by using standard historical relations for macroeconomic variables. Of course, the underlying relationships of credit and monetary aggregates to prices and economic activity have not been particularly reliable during the last decade, even before the emergence of recent credit supply problems.

The usefulness of interest rates as information variables for monetary policy has also been adversely affected by the credit crunch. With the pervasiveness of nonprice credit rationing and stringent nonrate loan terms, changes in open market rates have had a smaller impact on credit conditions and economic activity than would otherwise have been the case. Put differently, disruptions in the credit market mechanisms have made past experience less pertinent as a reference point for understanding the effects of recent interest rate changes on credit conditions and the economy. Similarly, to the extent that credit supply problems influenced the yield curve and various interest rate spreads—such as that between lending rates and funding

costs or that between the (riskless) Treasury bill rate and the (risky) commercial paper rate—all these variables became less useful indicators, at least over 1989-92.

By reducing the information content of a broad range of financial variables, the credit crunch has compounded the problems of finding appropriate guides for steering monetary policy. More specifically, credit supply problems in recent years have made it more difficult to use M2 or the federal funds rate (or any other financial variable for that matter) for determining appropriate money and credit conditions relative to the needs of the economy. Even before the latest credit crunch, however, there was no significant agreement on the use of any one or two variables as monetary policy guides. Thus, the recent experience with financial sector developments seems to have moved us further away from a narrow focus on one or two intermediate targets toward the use of a broad set of financial indicators as information variables to steer monetary policy.

Some concluding observations

Collectively, studies in this volume offer evidence of a substantial, prolonged, and broad-based contraction in credit supply over 1989-92. This finding strongly contradicts the view that the recent credit slowdown originated solely on the demand side.¹⁶ Research work reported here conclusively demonstrates that demand influences are unable to explain a significant part of the recent credit slowdown or decline in nonfinancial borrowings from bank and nonbank sources. Moreover, the existence of credit weakness across a wide range of nonfinancial borrowings also challenges the notion that the recent credit slowdown was nothing more than the bursting of a speculative bubble in commercial real estate.¹⁷

The studies in this volume also indicate that the nature and causes of the recent credit supply problems were markedly different from those of earlier credit crunches. In particular, unlike earlier crunches, the credit supply problems during 1989-92 were broadly spread across both bank and nonbank sources of credit, with stringent loan terms and nonprice credit rationing persisting over a relatively long period. Also, unlike earlier episodes, the recent credit crunch was marked by a capital shortage and was driven to an important degree by market forces. Set in motion by the widespread balance sheet difficulties of both borrowers and lenders, these market forces led to the correction process for the debt overhang of the 1980s.

The sharp, prolonged, and widespread decline in credit supply over 1989-92 would be expected to have had significant adverse consequences for the economy. It is therefore not surprising that the credit crunch has sometimes

¹⁵ See Friedman (1993c) for a recent perspective on the role of financial variables in guiding monetary policy.

¹⁶ See Meltzer (1991) and Klieson and Tatom (1992) for particularly strong expressions of this view.

¹⁷ See, for example, Jordan (1992).

been blamed for much of the weakness in economic activity since 1989. Yet the studies in the volume do not support this conclusion. On the contrary, they clearly indicate that credit supply problems were not the primary or dominant cause of the weakness in economic activity over 1989-92. Nevertheless, the studies do suggest, at least collectively, that credit constraints almost surely made some contribution to that weakness, and probably played a significant role in slowing the economy before the recession and in impeding the recovery process.¹⁸

The apparent inconsistency between sharply reduced credit availability and its modest effects on economic activity is not hard to reconcile. The credit crunch has by no means been the only factor depressing the economy. Other factors that contributed significantly to the 1990-91 recession and the subsequent weak recovery include the Gulf War, the defense build-down, relatively tight fiscal policy throughout the period, generally high real long-term interest rates, low levels of consumer confidence, corporate restructuring, and the commercial real estate depression

that followed the great buildup of excess capacity during the 1980s. With so many powerful forces slowing economic activity in recent years, one can hardly expect the credit supply problems to dominate the picture. Moreover, the confluence of wide-ranging adverse influences on economic activity and the market-driven elements in the credit crunch make it difficult to isolate empirically the effects of credit constraints on the economy.

Finally, this collection of studies suggests that credit supply problems over 1989-92 contributed to weakening the influence of monetary policy actions on the economy and to reducing the usefulness of M2 and other financial variables as policy guides. Whether recent shifts in credit supply factors will have any long-term consequences for the conduct of monetary policy is far from clear, however. In the absence of further changes in the regulatory environment, the long-term effect will depend to a considerable extent on the durability of recent changes in attitudes toward debt on the part of lenders and borrowers—specifically, whether lenders will continue to follow the recent risk-averse approach to lending and whether the decline in the desired ratio of debt to income will turn out to be permanent. The new conservative attitude toward debt may persist, but such an outcome is by no means certain.

¹⁸ Perry and Schultz (1993) and Friedman (1993b) reach a roughly similar conclusion.

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International Interest Rate Convergence: A Survey of the Issues and Evidence

by Charles Pigott

The international integration of financial markets has increased dramatically over the last two decades. Technological advances and the progressive elimination of official barriers to capital flows have spurred an enormous increase in cross-border financial transactions and activities and rapid growth in the Eurocurrency and other international financial markets. As a result, linkages among national financial markets have been greatly strengthened, and financial conditions in individual countries have become increasingly sensitive to developments in the markets of their partners.

It was widely expected that international financial integration would also lead to convergence of interest rates across countries, or at least to greater synchronization of interest rate movements than in the past. In fact, however, considerable international interest divergences have persisted across a broad spectrum of assets, even very recently. Over the last two years, for example, domestic short-term rates in the United States have fallen sharply while those in Germany and other continental European countries have remained at considerably higher levels.

This article examines why interest rates have apparently failed to converge internationally. We first consider in conceptual terms what financial integration means for interest rate relations in an international context. We then examine the evidence on interest rate convergence and the circumstances under which it has or has not occurred.

As we will see, the key feature distinguishing the international economy from a single country is the presence of multiple currencies whose exchange rates are subject to change. Interest rate convergence has several meanings in this context. Where currency distinctions are absent, inte-

gration generally has led to interest rate convergence. But where assets differ in their currency denomination, as they typically do in comparisons of national interest rates, financial integration does not imply convergence unless the economic conditions determining the rates become more closely aligned and exchange rates are fixed, or nearly so. In fact, the evidence strongly suggests that for countries with flexible exchange rates, national interest rates have varied nearly as freely with financial integration as earlier, although with much greater repercussions on exchange rates. There appears to be no systematic tendency for cross-country disparities among either nominal or real interest rates to decline, much less disappear — despite a dramatic reduction in barriers to international capital flows.

The article examines one further concept of interest rate convergence particularly relevant to international investors. This is the extent to which national interest rate differentials tend to be systematically offset by currency movements, so that returns expressed in a common currency are equalized on average. This seemingly simple and intuitive presumption has raised a number of somewhat complex, and to this point largely unsettled, issues. Currency risks arising from uncertainty about future exchange rates as well as systematic errors made by investors in predicting currency movements can, and probably have, prevented full convergence in this sense. However, the evidence suggests that these considerations, at least as they are presently understood, do not seem to provide an adequate explanation for the large systematic return differentials among currencies that are observed in practice. These findings raise questions very similar to those long encountered in analyses of the behavior of stock and bond returns within a single country.

The meaning of international financial integration

Complete integration of an economy's financial markets basically means that all participants have equal access to all markets. Equal access implies that interest rate and other terms faced by participants depend only on objective indicators of creditworthiness such as financial position and credit history—not on residence or nationality. Integration allows portfolio diversification across markets and instruments; thus the tendency of investors to hold assets issued in their own locale when markets are isolated is likely to be substantially reduced, if not altogether eliminated, when markets become integrated.

Financial integration within a single country, where all assets are denominated in the same currency, affects the behavior of interest rates in several important ways. First, because integration allows arbitrage across markets, returns on instruments with identical characteristics are equalized regardless of where they are issued or traded. For example, within the United States, regional interest differentials among comparable assets are quite small or negligible in most cases. Second, and more generally, integration is likely to lead to much greater synchronization of interest rate movements across markets and to lower interest differentials among similar (though not necessarily identical) assets. The basic reason is that with integration, local differences in credit conditions tend to be largely eliminated by flows of funds among markets. Thus, regional fluctuations in real income, saving, or other determinants of credit demands and supplies do not themselves lead to significant interest rate divergences, as they would if markets were isolated. Instead, interest rates tend to vary with national credit conditions as determined by real growth, inflation, government fiscal positions, and other domestic macroeconomic conditions. Reinforcing this tendency is the fact that a single-currency economy sharply limits the degree to which certain key interest rate determinants, notably inflation, can differ among regions.

It follows that interest differentials within a single country largely reflect differences in instrument characteristics such as maturity, liquidity, and risks that are valued, or priced, in the common national market. For example, interest rates on ten-year corporate and U.S. government bonds move together quite closely over time, but the corporate rate is typically greater by an amount that largely reflects market perceptions about the risks of business defaults.

Integration in the international economy

While the implications of financial integration for the international economy are broadly similar to its implications for a single country, the specific consequences for interest rates are much less straightforward, for three reasons. First, impediments to financial flows among nations arising from overt restrictions on capital flows and from differing

tax laws, regulatory policies, and other institutional arrangements typically far exceed the barriers that exist among states, provinces, or regions of a single country. Second (and substantially as a result of the first), key instrument characteristics such as available maturities, minimum denominations, and liquidity generally vary much more across countries than within any single country.

Third, and most fundamentally, the international economy is distinguished by the existence of multiple currencies whose values are subject to change. Interest rate convergence in such an environment has two quite distinct, if closely related, meanings. The first, the convergence of national interest rates (as they are normally expressed), involves a comparison of returns denominated in different national monies: the quoted yields on U.S. and German government bonds, for example, refer to their yields in terms of dollars and German marks, respectively. Likewise, comparisons of real interest rates across countries usually involve returns expressed in terms of national commodity bundles whose composition typically varies across countries.¹ For investors deciding how to allocate funds among assets, however, it is the degree to which their prospective relative returns expressed in a common currency converge that matters. These relative returns are determined not only by the national interest rates themselves but also by the change in the relevant exchange rates over the investment horizon: the dollar return on, say, a three-month German mark-denominated asset depends upon the rate at which marks can be exchanged for dollars at maturity.

Even with multiple currencies, linkages among markets in a financially integrated international economy are no less strong than within a single country. The connections are more indirect, however, because the national markets are linked through the markets for foreign exchange. This fact would be of little practical consequence if exchange rates were completely and irrevocably fixed. In that case, integration would have virtually the same effects internationally as within a single economy: national interest rates would largely converge and their movements would be closely synchronized; remaining interest differentials would be determined by disparities in market and (noncurrency) instrument characteristics rather than by macroeconomic disparities among the countries.

In the actual world economy, however, exchange rates are very seldom completely fixed. The fact that national markets are linked through foreign exchange markets then has two important practical consequences. First, disparities in underlying determinants of national interest rates can be, and generally are, much greater than within a single country. In particular, inflation rates can diverge indefi-

¹ The U.S. real interest rate, typically defined as the nominal interest rate less some measure of anticipated domestic inflation, is effectively a return in terms of U.S. products, while German real interest rates measure returns in German goods.

nately provided that exchange rates can change to offset the differences.

Second, divergences in macroeconomic forces typically will lead to cross-country differences in national interest rates when exchange rates are free to vary. In the world economy, as in a single economy, a tightening of credit that pushes up interest rates in one country's markets tends to attract funds from abroad. This inflow, however, first places upward pressure on the home currency, raising its current value above the level expected to prevail in the future (and thus increasing the amount by which the currency is expected to fall subsequently). If the home government allows its exchange rate to float freely, this process will continue until the currency's prospective future decline is sufficient to eliminate the incentive for funds to flow in — leaving national interest rates both at home and abroad largely unaffected.

In a variable exchange rate environment, therefore, differentials among national interest rates stem not only from differences in their characteristics or imperfect integration of the markets, but also from divergences in macroeconomic and other determinants and their interactions with exchange rates. Disparities in economic conditions lead to national interest rate differentials, which in turn reflect perceptions about the magnitude of, and (as we will see shortly) the risk associated with, future currency movements.² Financial integration, even if complete, need not lead to interest rate convergence nor indeed to any increased synchronization of national rate movements across countries; interest differentials are likely to vary in magnitude as their underlying determinants become more or less aligned across countries. The main, and critically important, effect of financial integration in this context is to greatly increase the sensitivity of exchange rates to national interest rate fluctuations: as explained earlier, integration has meant that changes in a nation's interest rates relative to rates abroad lead to offsetting currency movements. The result is that financial developments in one country tend to affect conditions in others through their impact on foreign exchange markets.

Convergence in a common currency?

Although financial integration need not lead to equalization of national interest rates, it might seem that it should result in the convergence of returns expressed in a common currency. This is true in a narrow sense: yields on otherwise identical instruments whose returns are guaranteed by hedging ("covering") in forward foreign exchange markets must be equalized with complete integration. In the

Eurocurrency markets, for example (where the instruments are identical except for their currency), the dollar return on a three-month German mark deposit whose proceeds at maturity are covered through forward market sale (for dollars) is the same as that on a three-month dollar deposit. Note, however, that hedging the mark asset amounts to its redenomination in dollars (since the hedged instrument is a fixed claim to future dollars); currency distinctions among assets are effectively abolished in comparisons of their covered returns. The sources of covered interest differentials therefore are the same as those present within a single nation — barriers to financial flows across markets and differences in instrument characteristics.³

The broader and much more controversial question is whether returns that are not hedged (in other words, that are "uncovered" in the sense that they depend upon actual exchange rate movements that cannot be fully predicted) converge when expressed in a common currency. In practical terms, this question amounts to asking whether exchange rate movements tend on average to offset differences in national interest rates on otherwise similar assets. If so, investing in one currency as against another will produce no systematic difference in realized returns, and national interest rate differentials (apart from differences in asset characteristics) will simply reflect market expectations about future exchange rate movements. This principle is commonly referred to as "uncovered interest parity."

As explained further below, the degree to which uncovered interest parity holds in a practical sense depends primarily upon the importance of two factors. The first and, until recently, the predominant focus of debates in this area is the importance of the "currency risks" associated with investing in one currency as opposed to another. Currency risk in this context refers to the differential riskiness among assets that arises from their denomination. To understand what currency risk means, consider a U.S. investor who holds two government bonds, one denominated in dollars and the other in German marks. Both bonds are risky in that their prices, in dollars and German marks, respectively, are to some degree unpredictable; in addition, the return in dollars of the German mark bond depends upon future exchange rate changes — which are also unpredictable. The risks of the two bonds therefore are likely to differ,

² In effect, therefore, national interest differentials (aside from characteristic differences and imperfect financial integration) can be viewed as the proximate reflection of expected future exchange rate changes and currency risks that, at least in principle, are ultimately determined by divergences in countries' fundamental interest rate determinants.

³ Complete hedging is generally available only to fairly large market participants and for fairly widely used or traded instruments. Moreover, there are well-known factors other than unanticipated exchange rate movements that may impair the liquidity or solvency of an instrument and that tend to be currency-associated, including the possible default of a government or government-guaranteed borrower on its external foreign currency obligations ("sovereign" risk) and the potential inability of private domestic entities to obtain foreign exchange to meet their external obligations because of actual or prospective capital controls ("transfer" and "political" risks). These risks are currency-associated mainly because national authorities can regulate or otherwise impede the convertibility of their national money. In this discussion, however, these factors are treated as barriers to capital mobility or as sources of differences in asset (noncurrency) characteristics.

most obviously (although, as we will see later, not entirely) because of the uncertainty about exchange rates.

Currency risks are reflected (as "currency risk premia") in the uncovered returns that investors anticipate receiving in a common currency; the corresponding national interest differentials also incorporate these risks in addition to expectations about future currency changes. As with any other type of risk, the importance of currency risk depends not upon the volatility of any particular currency when viewed in isolation, but rather upon the extent to which holding an asset denominated in one money as against another contributes to the overall risk a typical investor faces; thus, uncovered interest parity is likely to hold exactly only if currency risks can be completely diversified, that is, offset by other sources of risk. From this perspective, the key question is not whether currency risk premia exist at all (the considerable volatility of exchange rates makes it very likely that they do) but how important they are in practice. If representative investors view these risks as comparatively large, there are likely to be significant average differences in dollar returns from investing in one currency relative to another.

Even if currency risks were quite small, however, common currency returns could still differ considerably and systematically for a second reason, namely biases in market forecasts. Suppose, for example, that investors consistently underpredicted increases in the value of the German mark versus the dollar during some period: mark-denominated instruments would tend to outperform their dollar-denominated counterparts even though the *ex ante* returns anticipated by investors would be the same. Economists have normally assumed that such biases are very small or sporadic but, as we will see later, growing evidence suggests that they may be sizable and pervasive.

Evidence on the convergence of national interest rates

There can be little doubt that the major financial markets of the industrial countries have become much more closely integrated over the last two decades. Official barriers to capital flows have largely been eliminated by the industrial countries and substantially reduced by many developing nations. Larger financial institutions and nonfinancial corporations now have access to an array of international financial markets with relatively low transactions costs, as well as to major domestic markets of the larger countries; portfolio diversification, particularly by banks and, in some countries, by institutional investors, has increased markedly since the late 1970s.⁴ International financial integration is certainly not complete (indeed barely begun for markets

catering to smaller businesses and individuals), nor is it as great as that found within the United States or most other countries, but it is still considerable in economic terms.

Nonetheless, despite the obvious interdependence among financial markets resulting from integration, national interest rates, whether nominal or real, do not seem to have converged in any very meaningful sense. Indeed, the recent record is quite consistent with the conclusion of an earlier study by Kasman and Pigott (1987) that the dispersion in national interest rates fluctuates considerably over time but without any systematic tendency to decline. At present, U.S. short-term interest rates are fairly close to those of Japan but substantially below those in Germany, the United Kingdom, and Canada; substantial gaps among the countries' long-term interest rates also remain. As Chart 1 shows, divergences among short-term interest rates are now actually somewhat above their average of the last twenty years, and while the dispersion in longer term rates has declined over the last decade, it is still noticeably higher than in the early 1970s.⁵

Although financial integration has led to no discernible convergence of national interest rates, its effects are dramatically manifest in covered interest differentials. As explained earlier, these differentials largely reflect barriers to capital flows and instrument characteristics rather than currency distinctions and so provide a direct indicator of the progress of integration. By this standard, the major short-term industrial country financial markets have become very highly integrated: as Chart 2 indicates, covered interest rate differentials among national money markets, which were at times quite large during the 1970s, have largely disappeared, as have gaps between the domestic money markets and the corresponding Eurocurrency markets.⁶ Analogous evidence suggests that integration has also increased in the markets for longer term instruments, although the

⁵ Despite this evidence, some observers have argued that integration has at least increased the synchronization of interest rate movements over the last decade. Several studies, in fact, have reported that by some measures, correlations between U.S. and foreign interest rates were somewhat greater during the 1980s as a whole than in the 1970s; see, for example, Frankel (1989) and the introduction to Bank for International Settlements (1989). But other, equally plausible measures do not show any consistent increase in this tendency (for example, see Kasman and Pigott 1988), and in many cases national interest rates appear to have been less synchronized during the latter 1980s than during much of the 1970s, when markets were presumably less integrated than now. Variations in these correlations are more likely a reflection of changing alignments among national economic conditions than a product of financial integration.

⁶ Numerous studies have documented the decline in short-term interest differentials resulting from the lowering of official capital controls, beginning with the major industrial nations in the 1970s and early 1980s and spreading to virtually all the industrial countries in the latter half of the decade. Among the more extensive studies are Caramazza et al. (1986) and Frankel (1988). In addition, Akhtar and Weiller (1987) and Frankel (1990) provide excellent discussions of conceptual issues concerning the definition and measurement of international capital mobility.

⁴ See Benzie (1992) for a detailed description and analysis of the remarkable development of the international bond market during the 1980s. For an excellent analysis of the international diversification by pension funds and insurance companies, see E. P. Davis (1988, 1991).

change has been more recent and less complete. In particular, as shown in Table 1, hedged (dollar) returns on government bonds are also now fairly closely aligned for at least the major currencies.⁷

Financial integration thus has significantly altered the relative importance of the factors underlying national interest rate differentials mentioned earlier. Institutional barriers along with noncurrency instrument characteristics are now a relatively minor source of the divergences; national inter-

est differentials reflect, nearly entirely, disparities in the macroeconomic determinants of interest rates and the corresponding exchange rate movements they induce.⁸

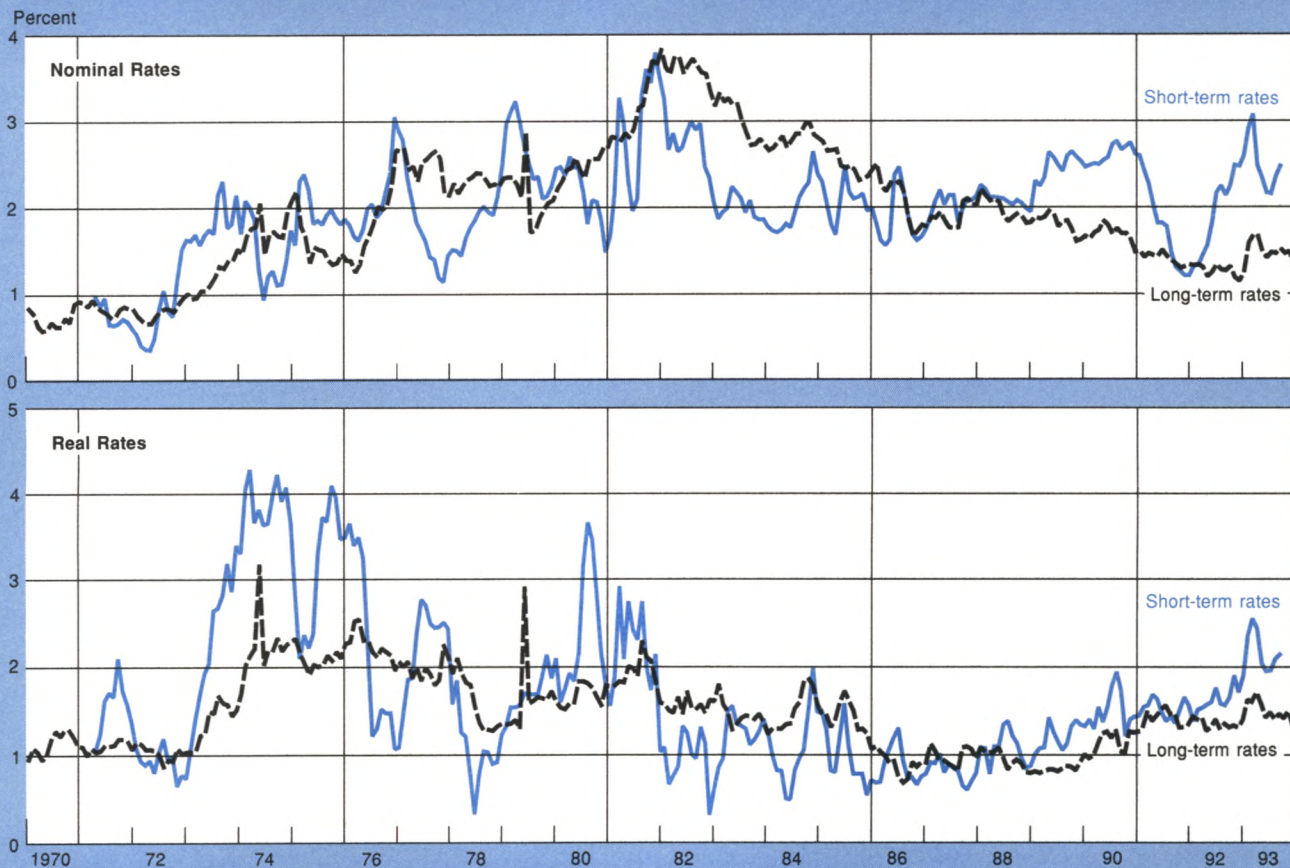
Indeed, at least the broad movements in national rate differentials in recent years can be fairly plausibly explained by fluctuations in real income, inflation, monetary and fiscal policies, and the changing alignment of these conditions across countries. For example, the largest divergences in nominal interest rates, particularly longer term rates, have tended to occur during periods of rising and relatively high inflation such as the mid- and late 1970s and the early

⁷ Long-term instruments can be hedged through currency and interest rate swaps. The development of these facilities beginning in the mid-1980s is itself a strong indication of the growing integration of major bond markets. Popper (1990) was the first to use this data to demonstrate the near-parity of hedged returns for such instruments.

⁸ Admittedly, heterogeneity of instrument characteristics is more important for mortgages and other assets that are less standardized than typical money market securities or government bonds.

Chart 1

Cross-Country Dispersion of National Interest Rates



Notes: Dispersion is calculated as the average absolute deviation from the country mean of each month. Short-term rates are the call money rate for Japan and three-month money market rates for the United States, Canada, Germany, France, and the United Kingdom. Long-term rates are long-term government bond yields for the above six countries plus Italy, Belgium, and Switzerland. The real short-term rate is the nominal rate less the inflation rate over the last year; the real long-term rate is the nominal rate less the inflation rate over the last three years.

1980s, largely because cross-country disparities in inflation, the stance of monetary policy, and business cycle positions have generally been greatest in these periods. Likewise, the decline in long-term interest rate divergences over much of the last decade can be attributed in large part to the general fall (and convergence) of national inflation rates during the same period.⁹

Furthermore, major shifts in the alignment of interest rates across countries have usually been associated with substantial movements in exchange rates. A dramatic illustration is the prolonged appreciation of the dollar accompanying the rise in U.S. interest rates relative to rates abroad during the first half of the 1980s.

The persistence of *real* interest rate differentials, while more surprising to many observers, is also understandable in these terms. As normally measured, the real interest rate on a given country's asset is effectively its return in terms of some aggregate of commodities produced or consumed in that country. The composition of these commodity aggre-

gates typically varies across countries because of the inclusion of nontraded goods and services and differences in production and consumption patterns. The belief that real interest rates should converge internationally is based on the presumption that returns to capital will ultimately be equalized and that purchasing power parity determines nominal exchange rates — conditions that are likely to hold, if at all, only in the very long run. Over the medium term,

⁹ These conclusions are also broadly consistent with more direct evidence about the forces shaping domestic interest rates. This evidence suggests on the whole that while the influence of international factors has risen in some cases, traditional domestic macroeconomic factors remain the most important determinants. For example, although international factors may now have some modest influence, short-term interest rates still appear to be largely determined by variations in the domestic supply and demand for liquidity. See, for example, Radecki and Reinhart (1988). There are reasons to believe that international factors may have somewhat greater influence on long-term interest rates, but the evidence is limited.

Table 1

Covered Interest Differentials for Government Bonds

(Foreign minus U.S. Yield to Maturity)

	Average	Standard Deviation
Germany	-70	15
Japan	-46	42
Switzerland	18	19

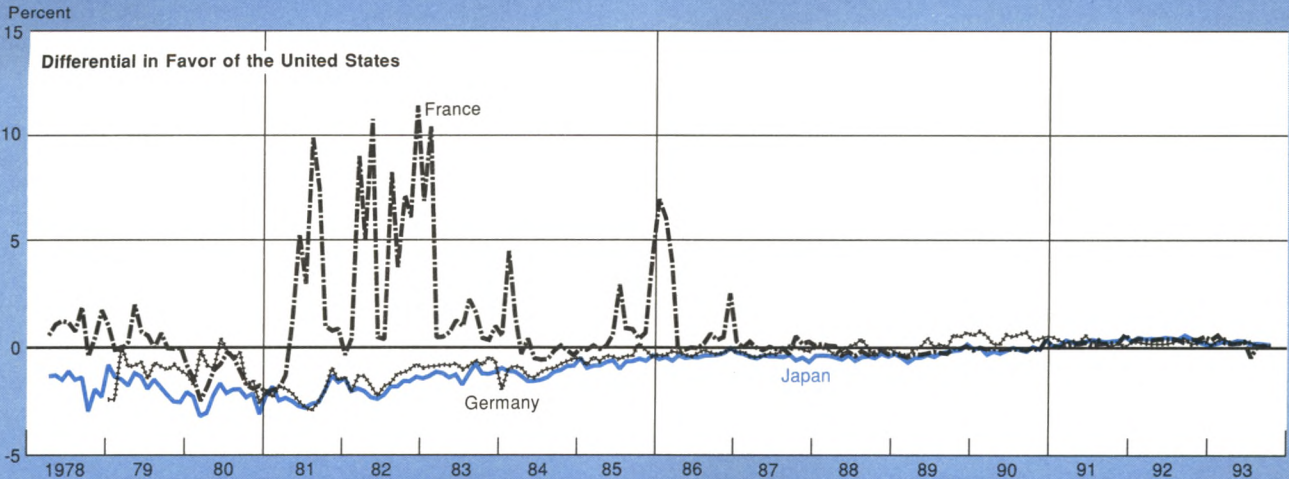
Notes: Table reports the difference between the domestic (ten-year) yield to maturity on the foreign bond and the yield in the same currency of a "swapped" U.S. ten-year Treasury bond. The differential combines the applicable interest rate swap rate for ten-year Treasuries (that is, from ten-year fixed payments into floating rate LIBOR payments in dollars) and the currency swap rate (from floating LIBOR payments in dollars into ten-year fixed payments in the relevant foreign currency).

All figures refer to averages for the period 1987-90.

Chart 2

Covered Interest Differentials

Domestic Three-Month Rates



Notes: Data are end-of-month. The three-month commercial paper rate is used for the United States. The foreign rates are three-month interbank rates whose dollar returns are covered in the three-month forward exchange rate.

real exchange rates have varied nearly as much as nominal exchange rates. Long, variable, and persistent fluctuations in real interest rates are quite consistent with this pattern, as is the corresponding tendency for domestic real interest rates to be the primary source of nominal interest rate movements over similar intervals.¹⁰

Overall, therefore, actual experience is quite consistent with the conceptual arguments presented earlier in this article. Integration has had clear and dramatic effects, most noticeably on covered interest rate differentials. Integration has not, however, led to any appreciable convergence of national interest rates, because of the combination of variable exchange rates and continued large disparities among nations' macroeconomic conditions that has characterized the world economy for over twenty years. Indeed, the experience of the European Monetary System, which is summarized in the box, strongly suggests that only when exchange rates are very nearly fixed and national macroeconomic policies are largely harmonized is integration likely to lead to any genuine convergence of national interest rates.

Uncovered interest parity?

While most investors and analysts have become quite accustomed to large and persistent divergences among national interest rates, there remains a very widespread belief that these differences tend to be offset by currency movements. Investing in one currency rather than another may yield higher or lower returns at certain times, but, according to this view, the returns should be equal on average over longer periods. Some tendency toward this "uncovered" interest parity is evident even when markets are isolated: countries with high inflation rates tend to have relatively high interest rates but also depreciating currencies. Moreover, as noted in the first section, currency-associated risks are likely to prevent uncovered returns from being fully equalized even with complete integration.

Nonetheless, it seems plausible to assume that uncovered returns would be more closely aligned now that markets are substantially more integrated and investors more diversified internationally than they were in the 1960s or 1970s. As we will see shortly, however, it is far from clear that this presumption is valid. Indeed, we will see that the

issues raised by empirical analyses in this area have proved to be (at least by comparison with those encountered in the last section) often complex and perplexing — as well as substantially unresolved.

Historical evidence on uncovered interest parity

The historical record of return differences across currencies provides one very rough indication of the degree to which uncovered yields have converged under financial integration. Table 2 lists average ex post differential returns, expressed in dollars, of foreign relative to U.S. assets over five-year intervals for three types of instruments, namely short-term (three-month) money market securities, longer term government bonds, and stocks.¹¹ In principle, these differentials reflect the returns anticipated (ex ante) by investors as well as any errors made in forecasting future exchange rates and the assets' prices. The differentials are often remarkably large. Indeed in certain periods they appear (even for short-term assets) to be of greater magnitude than the national interest rates themselves. The return disparities are also highly variable: in some periods, foreign assets strongly outperform their U.S. counterparts, while in other periods, they underperform them. (Partly as a consequence, average divergences over decade intervals, as well as the entire period, are generally smaller in magnitude than the five-year average.) And, of most relevance here, the differentials seem to show no tendency to decline over time.¹²

While unexpected changes in currency and asset prices are undoubtedly responsible for some portion of the recorded divergences, a large and growing body of evidence strongly suggests that they cannot be the only explanation. If return differentials on comparable instruments result simply from random and unbiased forecast errors, they ought to vary randomly and average out to zero. Most evidence, though, indicates that the divergences are larger than is explainable by pure chance (that is, they are statistically significant). Moreover, variations in return differentials appear to be systematic in the sense that they are at least partially predictable. Several studies have found, for example, that trading rules specifying when to invest or withdraw from one currency or another tend to yield significantly greater returns

¹⁰ In most empirical models of the U.S. and other economies, fluctuations in real income, inflation, and other macroeconomic determinants of credit market demands and supplies produce substantial variations in real interest rates. The corresponding international macroeconomic models — of the type first introduced by Dornbusch (1976) — view variations in real interest differentials across countries as a major, if not dominant, source of real exchange rate fluctuations. In an empirical analysis of several large industrial countries, Howe and Pigott (1992) develop evidence suggesting that long-term real interest rates vary substantially and are influenced both by persistent factors, such as aggregate debt and returns to physical capital, and, in the medium-term, by changes in macroeconomic policies. There is some evidence (see Mishkin 1984) of long-run real interest rate convergence, however.

¹¹ All data are computed from monthly holding period returns. The bond return estimates are taken directly from Ibbotson and Siegal (1991) and are based on long-term interest rate figures from the International Monetary Fund's International Financial Statistics. Note that the corresponding instruments are almost certainly not as comparable as those used for the data in Chart 1 and Table 1 (which generally are available only for a much shorter period). The stock returns are derived from aggregate stock price indexes and dividend-price ratios for the major exchanges in each country.

¹² Return differentials during the 1980s as a whole are smaller than during the 1970s in slightly more than half the cases. More often than not, however, the divergences in the three-month instruments and the bonds recorded in the first half of the 1980s are greater than during either half of the preceding decade.

Box: When exchange rate flexibility is limited

Because interest rates do diverge considerably when currencies are relatively free to vary, a natural question is, what happens when exchange rate flexibility is substantially limited? Some light is shed on this question by the experience of the members of the Exchange Rate Mechanism (ERM) of the European Monetary System (EMS).

Until last fall, about half of the members (Germany, France, Belgium, Denmark, Ireland, and the Netherlands) limited their exchange rate movements to a band of 2.25 percent around the central parity; the remainder (Italy, Spain, Portugal, Greece, and for most of its period of participation, the United Kingdom) adhered to 6 percent bands.[†] The central parities have been changed several times since the system's inception in the late 1970s, although with somewhat decreasing frequency up to the fall of 1992. Moreover, capital controls among the members have been removed gradually over a number of years—as early as the mid-1970s in Germany and the United Kingdom but not until the latter 1980s in several other countries.

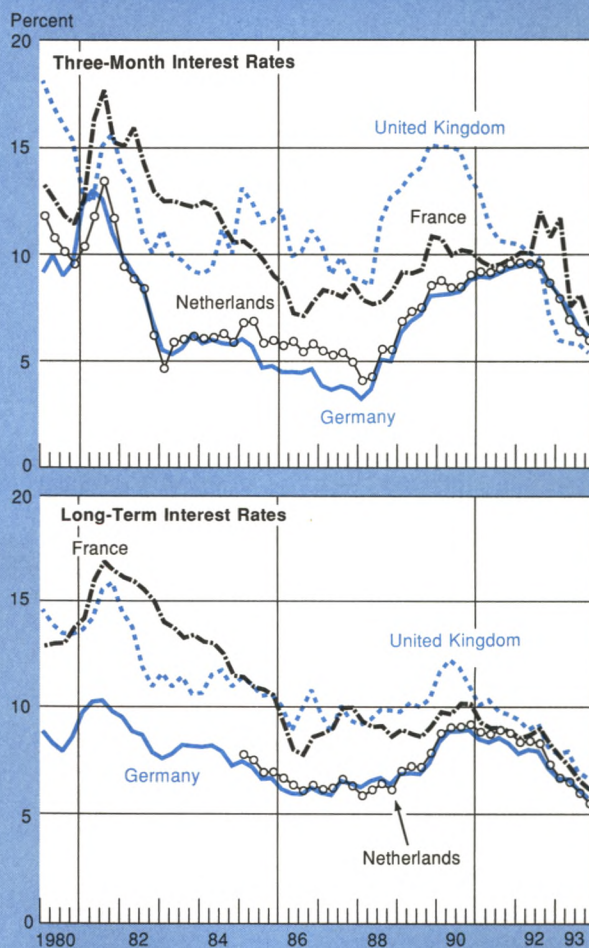
As Chart 3 shows, interest rates among the ERM countries have moved considerably closer, but only fairly recently. Except for the Netherlands, short-term interest rates did not achieve near-parity with Germany until about 1990. Most effective barriers to financial flows among these markets were removed some years earlier, as indicated by the fact that gaps between domestic money and Eurocurrency rates were largely closed by 1986 for France, and well before that for Belgium and the Netherlands. Moreover, it was not until 1991, at the earliest, that any genuine alignment of longer term rates occurred (again except for the Netherlands, whose long rates have followed those of Germany for much of the 1980s).

This sequence of developments suggests that it was not financial integration alone but rather the interaction of integration, the exchange rate regime, and the evolution of macroeconomic conditions that produced the gradual convergence of ERM interest rates. Given the margin for exchange rate fluctuations within the system, substantial divergences in shorter term interest rates are consistent even with complete integration. For example, under the narrower bands, three-month interest rates can differ by as much as 9 percentage points.[‡] Even the larger divergences among European rates in the mid-1980s were well within such limits. The marked narrowing of the differentials in recent years is substantially the result of changes in mon-

etary policy operating procedures: monetary authorities in France and several other countries have chosen to keep their official rates closely in line with those of Germany. This shift has been prompted by the planned European Monetary Union, but it is also reflective of the considerable convergence in macroeconomic conditions, particularly inflation, that has occurred.[§]

[§] For a useful recent analysis of interest rates in the ERM, see Mizrach (1993).

Chart 3
Evolution of European Interest Rates



Notes: The short-term rate is the three-month interbank rate; the long-term rate is the government bond rate.

[†] In addition, Austria, and more recently Sweden and Norway, have sought to closely tie their currencies to the German mark even though they are not formal members of the ERM.

[‡] This figure corresponds to the annualized movement of a currency across the full "width" of the permissible band. In practice, the maximum possible interest differentials depend upon a currency's position within the band.

Box: When exchange rate flexibility is limited (Continued)

Such macroeconomic harmonization has contributed even more to the convergence of longer term rates. In the ERM, gaps among long-term rates primarily reflect prospects that the central parities will be maintained over the longer term, a virtually impossible feat unless inflation rates remain equalized. Thus the near-equality of Dutch and German long-term rates for most of the 1980s essentially stemmed from the very close alignment of their inflation performances and policies. Also understandable in these terms is the relatively late convergence of French with German long-term interest rates: not until the end of the 1980s had France's underlying inflation rate clearly fallen into line with that of Germany.

The record of the ERM thus indicates that under financial integration, national interest rates probably would have converged had a completely fixed exchange rate system, *including* the harmonization of policies required to sustain it, been maintained. That same record also shows, however, that even modest departures from completely fixed rates can lead to very substantial interest rate divergences of a magnitude and variability barely distinguishable from those observed under floating exchange rates. The reason is that interest rates, particularly longer term rates, are very sensitive to prospective disparities in economic conditions and policies. Thus an option to depart from completely fixed rates, however improbable or distant its exercise, may sustain considerable interest rate divergence.

than simply holding a diversified portfolio of assets.¹³

Particularly remarkable in this respect is an apparent tendency, first pointed out by Fama but since supported by other studies, for returns on shorter term assets to rise when the corresponding national interest rate differential increases.¹⁴ Thus, for example, when German national interest rates rise relative to U.S. rates, realized dollar returns on mark-denominated assets typically increase also. This pattern is clearly inconsistent with uncovered interest parity, which implies that an increased German-U.S. interest rate gap should be fully offset (again on average) by greater mark depreciation (or less appreciation).

Overall, the evidence indicates that financial integration has not led to convergence of asset returns expressed in a common currency. Indeed it is even unclear whether integration has produced any closer alignment of uncovered returns. Instead we find apparently sizable systematic uncovered differentials whose magnitude and sign appear to vary over time. To most observers, the most plausible explanation of these patterns is currency risk. We will see, however, that this explanation seems to be incomplete in important respects.

A matter of risk?

We noted earlier that otherwise identical assets denominated in different currencies are inevitably subject to different risks unless their exchange rates are completely fixed. Typically when any asset has an uncertain return, its inter-

est rate must incorporate a risk premium as compensation. From this perspective, systematic uncovered return divergences are the natural result of risk factors specifically associated with currency denomination.

Currency risk is often viewed as simply reflective of uncertainty about future exchange rates and in this respect quite distinct from risks more normally encountered in domestic markets. This view is misleading for at least two reasons. First, as we have seen, when exchange rates are variable, the determinants of interest rates, and hence domestic asset prices, are likely to be only imperfectly correlated across currencies. As our earlier example of the U.S. and German bonds indicated, instruments denominated in different currencies thus are subject to differing risks from fluctuations in their domestic price (price risk) in addition to the risks arising directly from unexpected exchange rate movements.

Second, the factors underlying the risks associated with foreign currency assets are not fundamentally different from those determining risks on domestic instruments. Any investor holding U.S. bonds or Japanese bonds, for example, has to consider the outlook for inflation, real growth, and other factors in those countries that contribute to fluctuations in the bond's domestic currency price. Moreover, exchange rate movements, at least in principle, are determined by differences across countries in very much the same set of underlying conditions. From this perspective, the overall size of currency risk premia largely reflects the extent to which the importance of these standard determinants differs among currencies — whether, for example, uncertainties about U.S. inflation are more or less important to investors than uncertainties about inflation in other countries. Likewise, the risk premia are likely to change over time if and when the determinants change. Thus, assessing relative currency risks involves considerations fairly similar to those that have traditionally guided assess-

¹³ Prominent examples are Dooley and Shafer (1983), Sweeney (1986), and Levich and Thomas (1993). In general, the profits found under these rules easily exceed the transactions costs incurred (by a large investor) in their implementation.

¹⁴ See Fama (1985). Even more remarkable, the results suggest that a rise in national interest rates in favor of a country is associated with an appreciation of its currency (or a diminished rate of depreciation). More generally, Fama's findings and related results imply that variations in national interest rates predominantly reflect changing risk premia.

ments of domestic instruments.

Risk premia generally should decline with international financial integration because integration allows much greater risk diversification than is normally available from holding domestic assets only. The scope for such diversification is greatest when exchange rates vary simply to offset differences in national inflation rates. In that case the relative risks of assets denominated in different currencies would be the same for all investors regardless of their nationality (that is, whether returns are calculated in terms of U.S. or foreign consumption goods), and their portfolios would be very similar in composition. In reality, purchasing power parity does not hold, except perhaps in the very long run, and the variability of real exchange rates does reduce the possibilities for worthwhile diversification by giving domestic investors an effective habitat preference for assets denominated in their own currency. That is, to a German investor (one who assesses returns in terms of German goods), dollar instruments appear to be substantially more risky than a German mark asset, while the opposite is the case for a U.S. investor. Nonetheless, even though real exchange rates have often been quite volatile, much evidence suggests that investors can significantly improve their tradeoff between risk and return by devoting a

significant portion of their holdings to foreign assets.¹⁵

Most standard frameworks for assessing risk also suggest that currency-associated risk premia are likely to be fairly modest. In the most widely used approach, the risk premium of any asset is proportional to its contribution to the fluctuations in the value of the market portfolio as a whole.¹⁶ From this perspective, currency fluctuations account for only a small fraction of the total risk facing a typical investor; unforeseen fluctuations in domestic asset prices, for example, generally are a much more important

¹⁵ Recent studies include Levich and Thomas (1993) and Tesar and Warner (1992). Real exchange rate variability is probably one important reason why the portfolios of even the most internationalized financial institutions are far from fully diversified.

¹⁶ The framework is known as the "capital asset pricing model," first developed by Sharpe (1964) and Lintner (1965). An individual asset's risk premium in this framework is proximately determined not only by the asset's own return volatility but also by its correlation with fluctuations in the other asset prices. Both are determined by the fundamental economic conditions prevailing during a given period and are subject to change over time. Many extensions of this approach have been developed, the most common of which bases asset risk premia on their contribution to the variability of consumption rather than the market portfolio's value.

Table 2

Foreign-U.S. Return Differentials in Dollars

(Annual Average Percentage Rates)

	71-75	76-80	81-85	86-90	70-80	81-90
Short rates						
Canada	0.4	-2.4	-2.4	7.2	-1.0	2.4
Germany	7.2	0.2	-7.0	6.9	3.6	-0.2
France	5.4	-0.1	-9.6	8.7	2.5	-0.7
United Kingdom	-1.6	5.8	-11.7	10.3	2.1	-1.1
Italy	—	11.3	17.8	-5.0	—	5.7
Japan	4.4	6.2	-4.9	4.6	-0.2	-0.2
Equity†						
Canada	0.5	6.0	-8.1	-5.0	3.2	-6.6
Germany	—	—	6.6	1.9	-6.6	4.2
France	4.6	0	-1.5	9.0	2.8	3.6
United Kingdom	-1.2	9.8	-1.2	5.8	3.8	2.2
Italy	-11.8	-7.3	-1.1	-1.2	-10.9	-1.2
Japan	12.6	5.4	4.6	6.7	10.5	5.7
Bonds‡						
Canada	-1.8	1.0	-3.7	1.2	-0.4	-1.0
Germany	10.1	11.0	-9.7	3.2	10.6	-3.3
France	5.7	2.3	-10.0	7.9	4.0	-1.1
United Kingdom	-6.2	17.4	-10.3	4.6	5.6	-2.9
Italy	-3.4	-0.8	-6.8	12.6	-2.1	2.9
Japan	3.3	14.9	-4.8	0.6	9.1	-2.1

Note: Reported values represent the difference between foreign and U.S. average monthly returns, including reinvested earnings, expressed at an annual rate.

† The 1970s periods are 1970-75, 1976-80, and 1970-80.

‡ Figures are taken from Ibbotson and Siegal (1990).

source. This point is illustrated in Table 3, which lists estimates of the average (ex ante) differential between foreign currency and U.S. dollar-denominated bonds predicted for the period 1978-91 on this basis.¹⁷ The differential returns seem relatively modest in magnitude — between 1/4 and slightly more than 1/2 of 1 percentage point.¹⁸

Limitations of the risk explanation

These estimates suggest that currency-associated risk premia based on economic fundamentals provide a plausible explanation of why systematic return differentials exist and why they might vary over time. At the same time, however, empirical analyses based on risk considerations have not accounted satisfactorily for key aspects of observed return differentials. The main problem is that even after the influence of random forecast errors is taken into account,

¹⁷ The model for these estimates extends the standard capital asset pricing model to an international context and allows for the effects of real exchange rate variability and differing investor consumption preferences; see Lewis (1988). The estimates are derived from the variances and correlations of (real) bond returns and exchange rates for the period. Figures for different intervals will generally differ from those in the table because of the differences in the distribution of the asset returns. The framework used here is essentially the same as that used in Hung, Pigott, and Rodrigues (1989) to estimate the potential effects of the accumulation of U.S. debt to foreign countries.

¹⁸ By comparison, since the 1920s, the annual returns on U.S. common stocks have exceeded the yield on U.S. Treasury bills by an average of 6 percentage points, while government bond yields have averaged about 1 percentage point over the bill return (see Ibbotson 1992). Nevertheless, differential returns are highly variable, even across decades. The return differentials for short-term assets implied by this analysis are even smaller than those shown in Table 3 since short-term assets are largely free of price risk.

Table 3

Hypothetical Differential Currency Risk Premia for Bonds

(Ex ante Return Differential for Foreign Relative to U.S. Government Bonds)

	Basis Points
Canada	-24
Germany	-60
France	-24
United Kingdom	-24
Japan	24

Notes: Figures refer to the annualized differential ex ante yield of a representative foreign government bond over a U.S. counterpart. The estimates are averages for 1986-91 calculated from monthly realized returns on a portfolio of bonds from seven industrial countries (the above plus Belgium). The estimates are calibrated so that the ex ante return on the aggregate (world) bond portfolio corresponding to these figures is about 150 points above the U.S. Treasury bill yield. For details of the model used for these calculations, see Lewis (1988).

observed ex post return differentials (such as those shown in Table 1) seem to be too large as well as too variable to be explainable simply in terms of risk factors — at least as they are understood by standard risk assessment frameworks of the type used for the figures in Table 3.¹⁹ Furthermore, empirical studies generally have had little success in explaining observed uncovered return differences in terms of the fundamental economic factors thought to determine asset risks.²⁰

The shortcomings of such approaches have led a number of analysts to consider an alternative possibility, mentioned earlier: ex post return differentials among currencies may reflect systematic errors in market forecasts of exchange rates and domestic asset prices, and not simply (or even primarily) risk. Such errors could lead to systematic divergences in ex post returns even if the ex ante returns expected by investors were equalized (that is, risk premia were negligible). Although usually ruled out in formal economic analyses, which typically assume that expectations are rational and therefore unbiased, the view that expectations are biased is not implausible. Studies of survey data on the forecasts of market participants and analysts indicate that forecasts are generally biased, often substantially so.²¹

Market survey data do not, however, support the notion that expectations biases are the main reason for the large systematic return differentials observed across countries. If such biases were the reason, we would expect that anticipated (ex ante) returns on comparable assets calculated using survey data as a measure of expected exchange rate changes would be fairly small. In fact, as illustrated in Chart 3, this does not seem to be the case. The chart shows the expected return differential, expressed in dollars, between U.S. and foreign three-month Eurocurrency deposits. The differentials are calculated by subtracting the expected change in the relevant exchange rate, taken from a prominent survey of market forecasts, from the U.S.-foreign

¹⁹ Indeed, the Fama evidence cited earlier implies that risk premia, if viewed as the sole source of observed uncovered return differentials, are the dominant contributor to fluctuations in national short-term interest rates. This implication is both remarkable and implausible; it is hard to see why the normal determinants of domestic interest rates should be so strongly associated with risk.

²⁰ Generally, empirical applications of capital asset pricing models (including consumption-based versions) have not been able to explain observed return differentials either domestically or internationally, and their underlying assumptions are quite often statistically rejected. See, for example, Engle and Rodrigues (1989) and Lewis (1990). Moreover, research to identify the underlying economic determinants of asset price volatility, asset risks, and risk premia has barely begun.

²¹ Frankel and Froot (1989, 1990) and numerous subsequent papers have demonstrated considerable biases in market forecasts of exchange rates as measured by surveys. Forecasts over near-term horizons tend to draw heavily on recent experience. Earlier studies have shown a similar pattern in surveys of expected inflation.

interest rate differential.²² The return differences, which can be viewed as the risk premium between the dollar and foreign currency assets that market investors expect to receive, appear to be quite substantial, indeed comparable in magnitude and variability to the historical return differentials shown in Table 1. In short, the survey data (assuming they reasonably represent expectations) seem to confirm the impression from the ex post return data that investors believe that substantial currency-associated risk premia exist. But the question raised earlier remains: Why are these apparent risk premia so large compared with those predicted by standard theoretical frameworks?²³

Overall, therefore, uncertainties remain about differences in uncovered returns among assets denominated in alternative currencies as well as the effects that financial integration has had on these differences. Significant and variable common-currency return divergences apparently have persisted, but we cannot say to what degree currency risk factors or market expectations are responsible, individually or collectively, much less what the basic economic determinants of the divergences are.

Before closing, however, we note that these uncertainties are not peculiar to international comparisons or foreign exchange markets. Systematic divergences among returns on bonds, stocks, and indeed a wide range of assets have long been observed in domestic markets in the United States as well as abroad.²⁴ Attempts to attribute these divergences to risk or other factors have likewise met with only limited success. As here, these divergences have suggested to many analysts that the determination of asset risks and expectations may be much more complex, and financial markets much less "efficient," than was previously thought.

²² The premia shown are calculated as the difference between the three-month U.S. and foreign interest rates for the date of the survey, less the (consensus) expected dollar depreciation over the next three months. The survey data are from Consensus Forecasts, various issues.

²³ An alternative possibility is that deviations from uncovered interest parity reflect market expectations about discrete events, such as major policy shifts, that occur only infrequently but have large impacts on asset prices if they materialize. (See, for example, Evans and Lewis 1992.) The situation of the Mexican peso during the 1980s is often cited as an example. Mexican rates were substantially above those for some time in large part because of market perceptions that a devaluation was inevitable. Thus, for a substantial interval before the actual devaluation, dollar returns on peso-denominated instruments were consistently higher than the returns on comparable U.S. alternatives. Deviations from uncovered interest parity seem so pervasive, however, that such factors could only be responsible in fairly isolated instances.

²⁴ A provocative analysis by Cutler, Poterba, and Summers (1990) reveals several stylized facts common to a wide range of asset markets, including those for foreign exchange and those for art and other collectibles. These facts are 1) systematic persistence of excess returns over the near term, 2) some tendency for those returns to be reversed ("mean reversion") over longer periods, and 3) a tendency for actual asset prices and returns to converge over the long run with the values predicted by economic fundamentals (according to some model). The latter two tendencies, however, appear to be considerably weaker than the first.

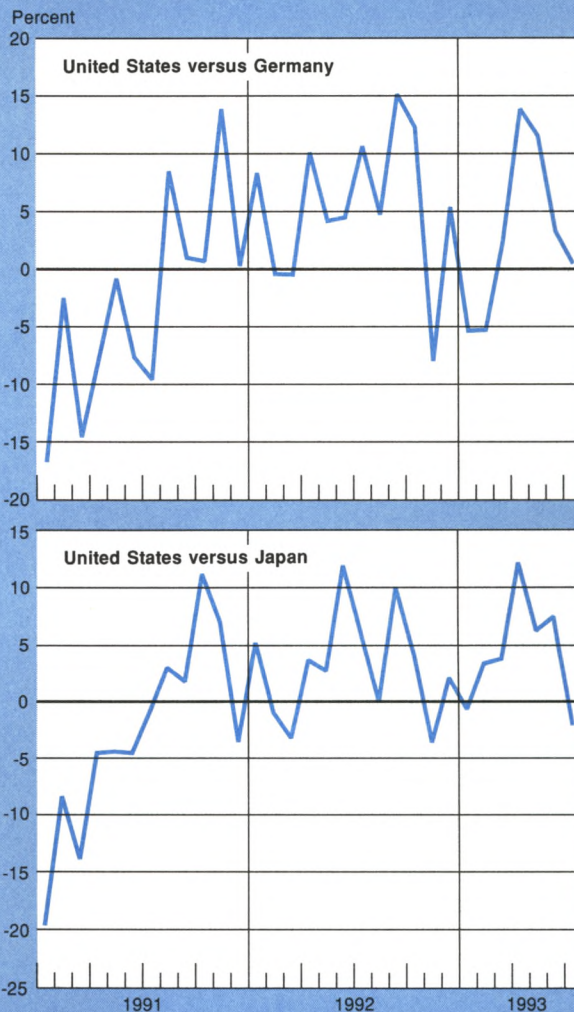
Quite possibly, complexities of this sort may be more important in international financial markets, given their shorter history and more limited experience relative to domestic financial markets, but they probably are not unique.

Conclusions

There can be little doubt that financial markets across the

Chart 4

Ex Ante Return Differentials in Dollars Implied by Surveys of Market Expectations



Notes: The ex ante dollar return difference is the U.S.-foreign interest differential less the survey's consensus forecast of the rate of dollar depreciation over the three months to maturity, expressed at an annual rate. Interest rates are returns on three-month Eurocurrency deposits. Market forecasts of currency movements are from *Consensus Forecasts*.

world have become highly interdependent. News about conditions in one country's markets typically has repercussions in foreign exchange markets and nearly as often in the domestic money, bond, and equity markets of the country's partners. So rapidly do these reactions among markets occur that an observer of their daily movements might easily conclude that domestic and foreign interest rates are directly and very closely linked.

We have seen that financial integration has indeed had important and tangible effects on international interest rate relations. Most obviously, integration has nearly eliminated covered interest differentials among the major markets of the industrial countries.

But we have also seen that, largely because of the existence of multiple currencies with changeable relative values, the effects of integration on the international economy are much less straightforward than they are within any single country. In the international environment, there are several distinct relations among interest rates that are jointly determined by the currency regime, market perceptions about currency fluctuations, and countries' macroeconomic conditions. Localized fluctuations in credit demands or supplies that would be transmitted directly across markets within a single country are, in the international economy, more often than not substantially absorbed in foreign

exchange markets. Thus in principle—and as the evidence reviewed here strongly suggests, in practice—financial integration need have little if any impact on divergences among national interest rates, except where exchange rates are fixed or very nearly so.

Financial integration has also led to considerable international diversification of financial holdings. It thus seems plausible to expect that national interest rate differentials would tend to be offset by exchange rate changes, so that average returns on comparable assets would be substantially if not completely equalized when expressed in a common currency. In fact, however, return differentials recorded over the last two decades appear to have been sizable and systematic. Little is yet known about the exact nature of these differentials or how they are determined: in particular, they seem to be too large and variable to be explainable purely in terms of risk considerations—at least as they are presently understood. These findings raise questions about the formation of investors' expectations and the assessment of risk quite similar to those encountered in analyses of the term structure of interest rates or the pricing of equities. Thus the issues posed by the international integration of financial markets, while new in certain respects, are in others quite familiar.

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Debt Reduction and Market Reentry under the Brady Plan

by John Clark

In March 1989, U.S. Treasury Secretary Brady proposed a new approach to resolving the developing country debt problem and restoring the creditworthiness of restructuring countries. From the outbreak of the debt crisis in mid-1982, financial packages for restructuring countries had emphasized new lending to give countries time to grow out of their debt-servicing difficulties. However, seven years later, few countries appeared close to returning to normal debt servicing and financing was becoming progressively harder to arrange. Drawing on banks' and countries' widening experience with agreements to convert and reduce debt, Secretary Brady urged a shift in emphasis toward permanent relief through market-based debt and debt service reduction for countries adopting strong economic reform programs. This article examines the impact of this new approach on participating countries and their creditors.¹

The agreements that followed the new approach provided for long-term net cash flows broadly comparable to the net flows previously achieved on a temporary basis through new money packages. Thus, countries were encouraged to embark on reform efforts by a new confidence that needed financial support would be available over time. Moreover, by marshaling this support through

market-based debt reduction, the new approach contained the growth in debt and fostered cooperation between debtors and creditors. Nonetheless, the immediate benefits to countries should not be exaggerated. The need to continue reform efforts was underscored by countries' ongoing debt burdens, which remained heavy notwithstanding the reductions in claims, and the persistence of deep discounts on the countries' external obligations immediately after the restructurings. Indeed, for countries that in recent years had unilaterally curtailed interest payments, such as Argentina and Brazil, restoring normal relations with creditors through Brady restructurings required significant increases in debt service payments.

The ultimate results of the change in approach have been impressive. In particular, several countries that mounted sustained reform efforts and reduced their debts have benefited from growing market access on improving terms. Although stronger economic performance by debtors has undoubtedly been the key to reopening market access, the Brady operations catalyzed and accelerated this process. Because the Brady agreements provided cash flow relief over a longer time horizon than conventional restructuring packages and insulated countries from possible future interest rate increases, the operations improved prospects for breaking the cycle of continual renegotiation that impeded capital flows under the previous approach. In the event, lower global interest rates have made the Brady operations more effective by giving countries additional cash flow relief and encouraging investors seeking alternatives to low-yielding industrial country investments to reevaluate restructuring countries' payment prospects.

The change in approach has also contributed to the recovery in the secondary market value of creditor claims,

¹ The analysis focuses on the experiences of eight middle-income countries—Argentina, Brazil, Costa Rica, Mexico, Nigeria, the Philippines, Uruguay, and Venezuela—that had obtained agreement to reduce their bank debts by end-1992. Some comparisons are also made to Chile, which significantly reduced its debt through market-based debt conversions. Bank claims have been substantially reduced in several other cases, but the affected claims accounted for a small portion of these countries' total indebtedness. For example, since 1988 five low-income countries—Bolivia, Guyana, Mozambique, Niger, and Uganda—have completed buybacks of their debts at steep discounts. These latter operations were largely financed out of grants and concessional loans from official creditors.

enhanced the claims' liquidity, and helped create expanded income opportunities in the secondary market trading of restructured bank claims and the underwriting of securities flows to restructuring countries. From mid-1988 until February 1989, as the market's confidence in the existing new money approach waned, the price of claims in what remained a fairly thin secondary market declined sharply. In fact, the amount of debt reduced in relation to cash outlays in the early Brady deals was broadly consistent with what could have been achieved through a cash purchase at these lower market prices. The subsequent substantial appreciation of prices, which came with a lag, reflected the market's reassessment of the reinforced strategy's overall prospects for success in an environment of improved macroeconomic performance by several countries as well as lower global interest rates.

The Brady Plan and the evolving debt strategy

While reaffirming the basic tenets of the existing debt strategy—a case-by-case approach stressing reform by debtor countries and financial support from private and official creditors—the Brady Plan introduced important innovations. Tactically, the new approach emphasized using financial incentives such as collateralized partial guarantees to encourage banks to provide financial relief. At the strategic level, the new initiative completed an evolution toward longer term horizons in bank debt restructuring packages by emphasizing permanent relief through principal write-downs and interest reductions.

The pre-Brady new money approach

When the debt crisis erupted, the international community—debtors, creditors, governments, central banks, and international financial institutions—moved swiftly to avert a systemic disruption of international trade and finance.² The strategy emphasized cooperation among debtors and creditors and timely financing to allow countries to reorient their economies while remaining current on interest payments. Banks rescheduled amortization payments falling due and in arrears, maintained short-term credit lines, and in effect partially refinanced interest obligations by extending new loans. Multilateral creditors—initially the International Monetary Fund (IMF) and later the World Bank—increased their lending. Countries tightened their belts by cutting public investment and noninterest current expenditures and by

devaluing their currencies and slashing imports.³

As restoring creditworthiness proved a time-consuming process, the strategy adopted a progressively longer horizon. Debt packages became more comprehensive, often restructuring the entire stock of medium-term bank debt rather than just the obligations falling due in a one- to two-year period. Repayment periods lengthened from around eight years out to as much as twenty years, and interest rate spreads narrowed to 13/16 of a percent over bank funding costs.⁴ On the policy side, the emphasis broadened under the “Baker Plan” to include structural reforms, such as trade liberalization and tax reform, that were designed to enhance countries' longer term growth prospects.⁵ To support faster growth, the Baker initiative also called for increased official and commercial bank lending.

By 1989, this basic case-by-case approach had achieved some measure of success. It had afforded banks the time to increase their capital, thereby containing systemic threats to the international financial system.⁶ In addition, after peaking at mid-decade, most restructuring countries' debt and debt service indicators had begun to decline (Chart 1).

Nonetheless, important strains had emerged, leading to deepening fatigue and frustration for both debtors and creditors. The net cash drain on debtors remained burdensome and the goal of countries' servicing their obligations without further extraordinary financing arrangements remained distant. While principal deferrals were longer, relief from interest payments continued to be of short duration because new loans covered a fraction of the interest falling due only during a two-year period. Debtor economies had grown disappointingly slowly and in many cases policy reform had not been adequate. Rates of capital formation had failed to recover from their sharp declines at the onset of the crisis, and domestic investors continued to express their lack of confidence by hoarding financial

² Worries about the international financial system grew out of the risks to the international banking system posed by the high exposure to developing country debt. For example, at the end of 1982, exposure to restructuring developing-country borrowers equaled 215 percent of the capital and 260 percent of the equity of the U.S. money center banks. Many of the large regional banks also were heavily exposed, as were leading banks of other industrial countries. For example, at the end of 1984 the less developed country exposures of the major banks of the United Kingdom and Canada were about 275 percent and 195 percent of equity, respectively; see David Mengle, “Update: Banks and LDC Debt,” Morgan Guarantee Trust Co., Economic Research Note, May 1992.

³ Nonetheless, as a result of transfers of external debt obligations from the private to the public sector and the public sector's greater reliance on more expensive internal financing following the cutoff of international bank lending, overall deficits declined by less than the improvements in the noninterest balances of the central governments. For a review of fiscal adjustment by several major debtors, see William Easterly, “Fiscal Adjustment and Deficit Financing during the Debt Crisis,” in Ishrac Husain and Ishac Diwan, eds., *Dealing with the Debt Crisis* (Washington D.C.: World Bank, 1989).

⁴ Reschedulings at the onset of the debt crisis typically entailed spreads over LIBOR ranging between 1% and 2½ percent.

⁵ This adaptation of the official strategy, emphasizing growth-oriented reform and new lending, was adopted along lines suggested by United States Treasury Secretary Baker during presentations at the October 1985 annual meetings of the World Bank and IMF, and hence was named the “Baker Plan.”

⁶ By end-1988, U.S. money center banks' exposure to restructuring countries in relation to capital had been cut by more than half, to about 95 percent.

assets abroad. The growing liabilities of international banks to depositors from restructuring countries partly indicate the extent of this capital flight (Chart 2).

At the same time, on the financing side, new money packages became increasingly difficult to arrange. The new money approach relied on banks to act in their collective interest even though, individually, banks might have preferred to "free ride"—that is, to benefit from the financial packages by receiving interest payments without providing new money. The approach was successful so long as the contradiction between collective and individual interests was not too severe. However, as the market's confidence in the prevailing strategy tumbled—as revealed by secondary market discounts that widened from one-third at end-1986 to an average of two-thirds by early 1989—disbursing cash in return for uncertain loan claims appeared ever more unattractive.⁷ The slide in secondary market prices in part reflected countries' uneven economic performances and the souring of the general atmosphere that followed some countries' impositions of unilateral payments moratoria. Moreover, the strengthening of bank balance sheets, including increased loan-loss provisioning by the major banks, reduced the adverse consequences of temporary

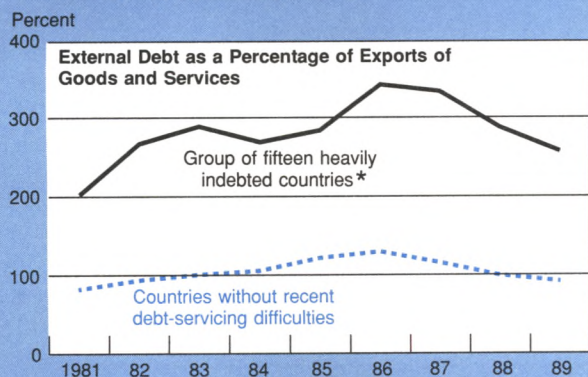
⁷ This concept of cost, based on the difference between the amount of new money disbursed and the expected future receipts associated with the new claim, did not necessarily accord with the "accounting cost" of providing new money. The regulatory authorities of some creditor countries required banks to establish reserves against their new money loans. Even where such provisioning requirements did not exist, however, new money could be perceived as lowering shareholder wealth if free riding presented a viable alternative.

payment interruptions and allowed banks to take a harder line in negotiations.⁸ This tension between stronger countervailing individual interests and weakened perceptions of collective interest produced a growing number of free riders and increasingly constrained the feasible financing that could be raised through new money.

While ever more banks resisted new lending, at least some banks were willing to sell their claims. By 1987 most major debtors had instituted conversion schemes under which foreign debt could be exchanged for local currency to make direct or portfolio investments. Some banks directly transformed their loan claims into equity stakes in local businesses; others sold their claims at a discount for cash to foreign or local investors who in turn undertook the conversion. Debt retirements under ongoing official debt conversion schemes rose from a total of \$3.7 billion in 1984-86

⁸ When exposure was high in relation to banks' capital, banks had stronger incentives to cooperate with the debtor to prevent the loan from lapsing into nonperforming status. Analyses of the rationale for and drawbacks of the new money process can be found in William Cline, *International Debt and the Stability of the World Economy* (Washington, D.C.: Institute for International Economics, 1983); and Paul Krugman, "Private Capital Flows to Problem Debtors," in Jeffrey Sachs, ed., *Developing Country Debt and Economic Performance* (Chicago: University of Chicago Press, 1989).

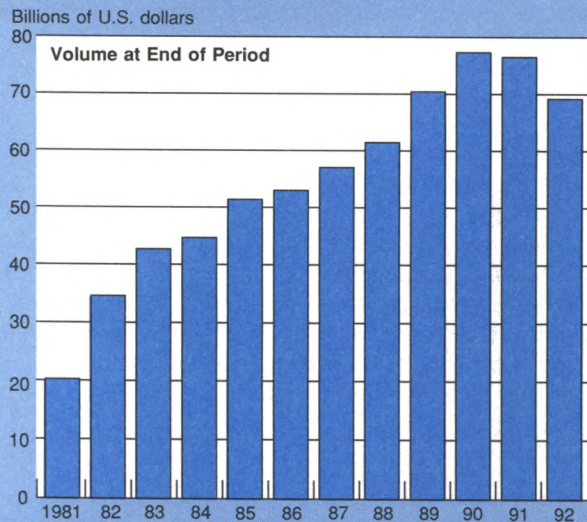
Chart 1
Evolution of the External Debt Burden of Selected Developing Countries, 1981-89



Source: International Monetary Fund, *World Economic Outlook*.

* Argentina, Brazil, Bolivia, Chile, Colombia, Cote d'Ivoire, Ecuador, Mexico, Morocco, Nigeria, Peru, the Philippines, Uruguay, Venezuela, and Yugoslavia.

Chart 2
Cross-Border Liabilities of International Banks to Nonbank Depositors from Selected Restructuring Countries



Source: International Monetary Fund, *International Financial Statistics*.

Note: The selected restructuring countries are Argentina, Brazil, Chile, Mexico, and Venezuela.

to \$4.7 billion in 1987 and \$8.8 billion in 1988.⁹ In one important transaction in 1988, Mexico used its reserves to finance a debt-for-debt exchange in which \$3.7 billion of bank loans were swapped for \$2.6 billion of partially collateralized twenty-year bonds.¹⁰ In addition, large amounts of cross-border debt were extinguished through unofficial conversions, particularly in Mexico and Brazil.¹¹ These latter transactions usually involved direct negotiations between corporations and their foreign bank creditors. Nonetheless, despite the demonstrated increased willingness of banks to sell, debtor countries became increasingly disenchanted.¹² The burden of essentially prepaying external debt at a discount proved difficult for fiscal and monetary authorities to manage. Concerns about possible adverse inflationary or balance-of-payments impacts led many countries to suspend or curtail their official programs by early 1989.

The Brady Plan

The need for a new, more comprehensive, and longer lasting approach was widely appreciated.¹³ Against this background, Secretary Brady proposed a shift in emphasis toward permanent relief through market-based debt and debt service reduction. Instead of providing new money,

banks would voluntarily reduce their claims on the debtor countries in return for credit enhancements on their remaining exposure, such as collateral accounts to guarantee the principal and/or interest in a bond exchange, or cash payments in the context of buybacks.

To support countries' economic reform programs and help debtors make the required up-front cash outlays for the debt operations, official creditors would provide financial assistance. Under the strategy, reforming countries would continue to benefit from loans from the IMF and World Bank, reschedulings from Paris Club creditors, and loans and loan guarantees from government agencies. However, a portion of the loans from the Fund and Bank would be set aside specifically to finance operations involving debt reduction. Additional Fund and Bank financing could also be made available to fund interest guarantees.¹⁴ To receive such support, countries would need to adopt strong policies to ensure that they would be able to service their reduced debt burdens. Measures to promote domestic savings and the repatriation of flight capital, such as removing interest rate controls, received particular emphasis. In addition, countries would be encouraged to maintain ongoing debt conversion schemes to provide additional relief.

By offering individual banks direct financial incentives, such as collateralized guarantees, to provide the targeted levels of financial relief, the new approach addressed the contradiction between individual and collective interests that had increasingly troubled its predecessor. Whereas high discounts and increased capital levels had worked against the new money strategy, they actually supported the new approach. High discounts allowed limited amounts of public moneys to "buy" a higher targeted level of cash flow relief, while strengthened capital and reserves allowed banks to take the hit on their balance sheets.

The new plan in action: the menu approach

In implementing the Brady approach, countries and bank steering committees negotiated comprehensive packages that offered "menus" of debt and debt service reduction options. These menus, which differed in their details from case to case, gave banks a range of choices that varied from as few as two to as many as six.

From the debtors' perspective, these packages were equivalent in impact to a combination of a partial debt buyback at market prices and a restructuring of the remainder.¹⁵ The restructurings usually securitized the claims—that is, converted the form of the claims from loans to

⁹ Charles Collyns and others, *Private Market Financing for Developing Countries* (Washington D.C.: International Monetary Fund, December 1992).

¹⁰ In some other notable experiments in 1988, Venezuela's bank creditors disbursed \$100 million in cash and swapped \$400 million of loans for \$500 million of new securities, and banks exchanged \$1.1 billion of loans for an equivalent amount of uncollateralized "exit" bonds carrying a 6 percent fixed interest rate as part of the financial package for Brazil. Most of the experiments of 1987-88 were less successful than countries had hoped. However, the lessons of these experiments were later applied to the Brady restructurings.

¹¹ Eli Remolona and Paul DiLeo estimate that \$11.4 billion of Brazilian and Mexican debts were canceled through informal conversions in 1987-88 ("Voluntary Conversions of LDC Debt," in Kate Phylaktis and Mahmood Pradhan, eds., *International Finance and the Less Developed Countries* [London: MacMillan, 1989], p. 75).

¹² Major U.S. banks initially remained on the sidelines. However, following the increases in reserves against developing country debt by money center banks in 1987, several U.S. money center banks became more active. For example, Citibank reported in 1989 that it had reduced cross-border exposure to developing countries by some \$2.4 billion at an average discount of about one-third. Regulatory changes that allowed U.S. banks to take larger equity shares in companies as a result of debt conversions also facilitated greater participation. See Mark Allen and others, *International Capital Markets: Developments and Prospects* (Washington D.C.: International Monetary Fund, April 1989).

¹³ By the eve of Secretary Brady's speech, many prominent individuals and politicians had made public proposals for new approaches involving elements of debt reduction. Included in this group were French President Mitterand and Japanese Finance Minister Miyazawa. Moreover, in 1988 the U.S. Congress had directed the Treasury to study the feasibility of creating an international debt management authority to purchase the bank debts of developing countries in the secondary market and to pass the discount along to the debtors.

¹⁴ The distinctions between the uses of "set-asides" and "additional financing" were relaxed in January 1994.

¹⁵ The first debt package for the Philippines, completed in 1990 and involving a buyback and new money, differed from other Brady packages in that it deferred the handling of the remaining exposure to a subsequent operation. The second stage was completed three years later.

bonds—and lengthened the repayment periods, sometimes to as much as thirty years. Much of the remaining exposure (about half in total) was converted from floating to fixed rate obligations.

For the banks, the Brady operations offered complex ranges of options designed to accommodate banks' diverse needs and expectations (Chart 3).¹⁶ At one extreme, some menus included buyback options—that is, outright sales of bank claims at a discount for cash—that enabled well-provisioned, pessimistic, or risk-averse banks to exit completely. At the other extreme, new money/debt conversion options permitted banks to exempt their existing exposure from debt and debt service reduction and usually to convert the exposure into a security, provided that they disbursed fresh money. Such financing in turn helped countries replenish reserves used to finance the up-front costs of debt reduction options chosen by other banks. Although the disbursement of new money for risky bonds was costly, some optimistic banks were attracted to the possibility of capital gains on their base exposure. Such gains might be anticipated because of securitization or because the debt reduction agreed to by others decreased competing claims. Banks valued securitization because it imparted greater liquidity to their claims. In addition, since securitized claims would be more widely held, a future restructuring would be more difficult to organize and hence less likely.¹⁷

Discount and par exchanges, which combined elements of both a buyback and a restructuring, proved the most popular options (Chart 3). Creditors swapped existing loans for new bonds with a lower principal amount (discount exchange) or with the same principal but submarket, fixed interest rates (par exchange). Instead of receiving cash as in a buyback, creditors benefited from the attachment of irrevocable collateral accounts to the securities. Most commonly, the principal would be fully secured by zero coupon U.S. Treasury bonds, and the next twelve to eighteen months of interest payments would be backed by escrowed

high-grade short-term securities.¹⁸ If the country remained current on interest, the interest guarantee would roll forward, covering the next twelve- to eighteen-month period, but usually the interest earnings from the escrow account would return to the debtor.¹⁹ Altogether, par and discount exchanges reduced banks' economic exposure by the present value of the outright interest or principal reduction plus the present value of any principal or interest guarantees.

For the debtor, the collateral accounts also effectively reduced the burden of the debt because expected rebates of interest and later principal from the accounts would eventually cover the cost of funding the collateral accounts.²⁰ By contrast, in the case of a simple buyback, there would be no prospect of future rebates; a country's debt would merely decline by the amount of debt purchased and increase by the borrowings to finance the operation.

Par and discount exchanges generally entailed lower cash outlays in relation to exposure reduction than did buybacks or secondary market sales.²¹ Many banks were nonetheless attracted to bond exchanges rather than outright sales because of the upside potential on the remaining exposure—again owing to securitization and the reduction in claims. Relative to new money/debt conversion options, bond exchanges held the additional attraction for banks of concentrating remaining unsecured exposure into interest claims, which were less commonly rescheduled than amortization obligations. Against this, par and discount exchanges required a longer maturity for the remaining exposure than debt conversion options and usually involved registered rather than bearer securities.

¹⁸ The amounts deposited in the interest guarantee accounts varied from 7 to 13 percent of the expected present value of the interest streams on the bonds, depending on the number of months covered and the interest rates involved.

¹⁹ Temporary interest reduction bonds differed in that the interest would cumulate in the interest collateral account. When the temporary interest reduction expired after about six years, the collateral and accrued interest would be returned to the debtor.

²⁰ Usually with collateralized guarantees, as the country serviced its debt it would receive rebates of interest earned by the interest collateral account; at maturity the country would also receive the principal and accrued interest in the principal collateral account and the collateral deposited in the interest account. The rebates of course would be expected to equal in present value the money originally borrowed or drawn from reserves and deposited in the accounts. Hence, the gross debt reduction achieved through, say, a discount exchange would typically be equal to the discount times the exchanged debt plus the present value of the expected rebates, while the net debt reduction (which takes into account financing costs) would be equal to just the discount. For a further discussion of guarantee structures and the concepts of gross and net debt reduction, see John Clark, "Evaluation of Debt Exchanges," IMF Working Paper 90/9, 1990.

²¹ As shown in Collins and others, *Private Market Financing for Developing Countries*, pp. 12-13, the ratio of collateral costs to exposure reduction was generally slightly lower for par and discount exchanges than prevailing secondary market prices. In contrast, buybacks took place at the prevailing price.

¹⁶ The range of options has varied across packages from just two for Argentina (par and/or discount exchanges) and Costa Rica (buyback and/or par exchange) to as many as six (Brazil). All packages have included at least one bond exchange option. Buybacks were included in all packages except those for Argentina, Brazil, and Mexico. New money options were omitted in the Argentina, Costa Rica, Dominican Republic, and Jordan agreements. More information on the structure of individual agreements and bank choices may be found in World Bank, *World Debt Tables*, various issues, and Collins and others, *Private Market Financing for Developing Countries*, 1992 and 1993.

¹⁷ Against this view, it could be argued that the difficulty of rescheduling widely held bonds would make debtors' future cash flow problems more difficult to resolve and would increase the likelihood of default should difficulties arise. Some advocates for securitization pointed to restructuring countries' record of regularly servicing their bonds throughout the 1980s as evidence that the new securities would be serviced better than the previous loans. However, this argument ignores the likelihood that the privileged servicing record of bonds has owed more to their small share of total debt than to their actual form.

Uniformity and diversity in terms

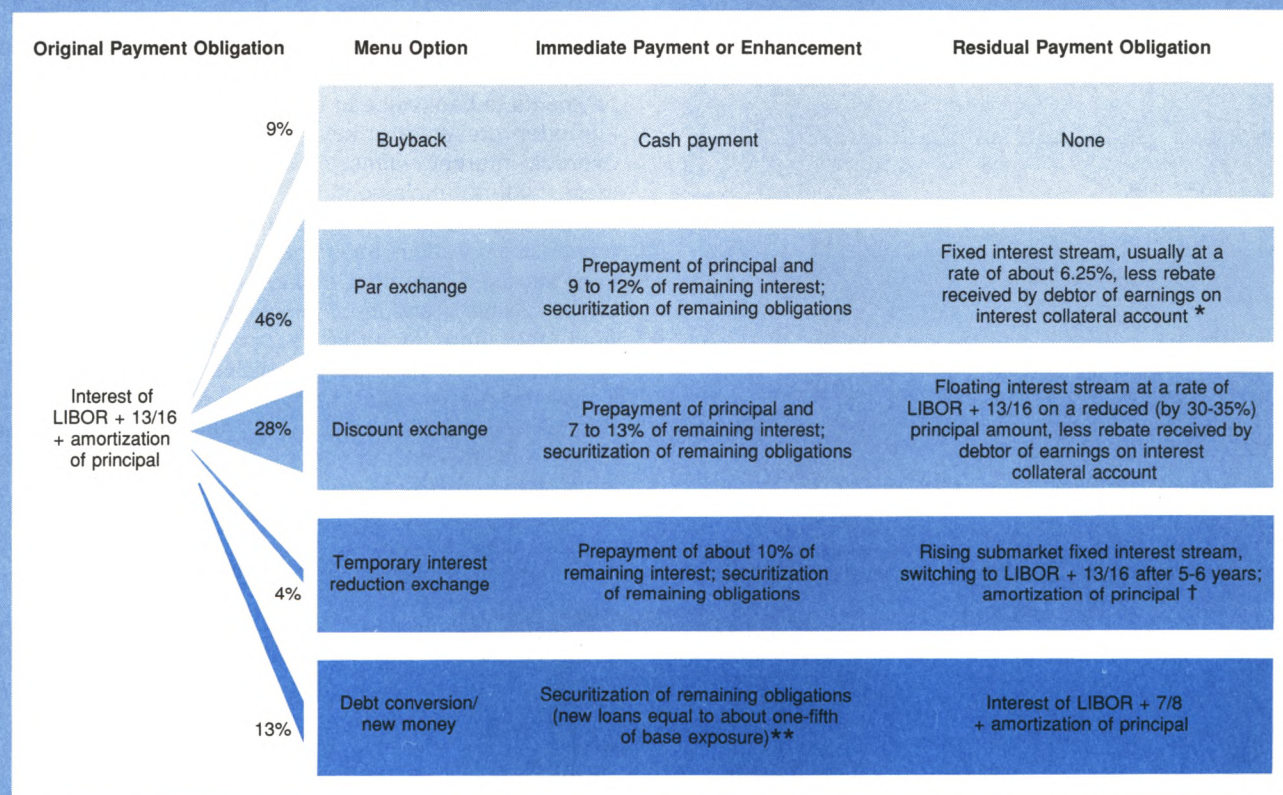
Brady packages have shown tendencies toward both uniformity in the design of some aspects of individual options and a tailoring to countries' individual needs. On the one hand, the discount and par exchanges, the primary debt reduction vehicles for the packages of the four largest debtors, generally kept the extent of principal or interest rate reductions at about one-third because banks were unwilling to grant terms more favorable than those

accorded Mexico.²² The lone exception was the discount exchange for Bulgaria agreed upon in principle in November 1993; the agreed terms in this case specified a discount of one half. On the other hand, through differing degrees of

²² The par exchange for Mexico, whose terms were agreed to in July 1989 while LIBOR stood at 8.81 percent and thirty-year Treasury bonds were yielding 8.14 percent, specified a fixed interest rate of 6.25 percent. Reflecting subsequent movements in the yield curve, some later agreements have specified initial coupon rates as low as 4 percent, which gradually rise to levels similar to those negotiated with Mexico.

Chart 3

Principal Restructuring Options in a Brady Menu



Source: Federal Reserve Bank of New York staff estimates.

Notes: Most menus did not include the full range of options. Several packages provided for the refinancing of outstanding overdue interest at market rates following an initial cash down payment. Percentages show proportion of aggregate principal allocated to each menu option for agreements concluded by mid-1993. Countries also achieved debt relief through debt conversions. These conversions took place before and after the Brady operations but were not part of the menu in a Brady exchange.

* Initial interest rates were sometimes lower (for example, 4 percent for Argentina), reflecting the shape of the yield curve at the time of agreement in principle.

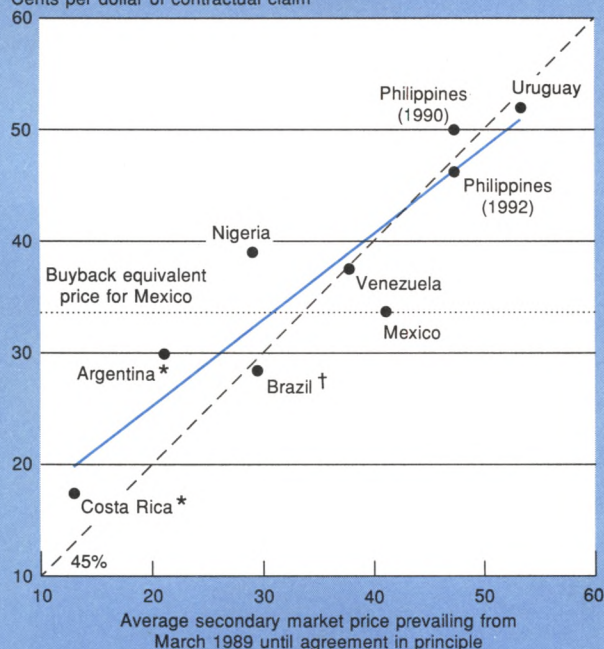
† Rates reflected term structure at the time of agreement in principle.

** The Mexican new money option did not entail securitization of the base. The Brazilian agreement provides for an interest capitalization option in addition to a debt conversion/new money option.

Chart 4

Buyback Equivalent Prices of Brady Packages

Cents per dollar of contractual claim



Sources: Salomon Brothers and Federal Reserve Bank of New York staff estimates.

Notes: The buyback equivalent price is the price at which the same amount of cash could have purchased an equivalent amount of debt reduction through a buyback. It is calculated as the ratio of the actual cost of the package to the amount of gross debt reduction achieved. The gross debt reduction comprises the outright principal reduction through buybacks and discount exchanges, the present value of interest reduction on par exchanges, and effective prepayments of principal and interest through collateral accounts.

The solid line plots the results of a cross-sectional regression of the buyback equivalent prices (BEP) on the price of the Mexican agreement (Mexican BEP) and the secondary market price for each country's debt during the period of negotiations (Avg Price). T-statistics are shown in parentheses:

$$\text{BEP} = 0.77 (\text{Avg Price}) + 0.29 (\text{Mexican BEP}) + u, \quad R^2 = 0.78$$

(6.06) (2.07)

This regression suggests that the price of a Brady deal can be expected to reflect a weighted average of the secondary market price prevailing during negotiations (3/4 weight) and the price established for Mexico (1/4 weight).

* The buyback equivalent prices for Argentina and Costa Rica do not reflect down payments made at closing against interest arrears. Inclusion of these costs would raise the Argentina price by around 5 cents and the Costa Rica price by about 2 cents.

† The estimated price for Brazil reflects bank choices among options and interest rates prevailing in July 1992, when the terms of the package were agreed upon in principle. The actual cost of the package may be higher because long-term interest rates have subsequently declined, raising the cost of thirty-year zero coupon bonds.

collateralization, effective pricing varied in a manner correlated with the differing secondary market discounts prevailing before the deals (Chart 4). For example, Argentina and Brazil collateralized only twelve months of interest while Mexico collateralized eighteen; likewise, Costa Rica did not guarantee the principal on its par bonds. In addition, the range of options included varied from package to package, reflecting the circumstances of particular cases. In particular, smaller debtors were able to achieve higher percentage reductions in claims payable to banks by securing a greater role for buybacks.²³

In many cases, countries were slow to implement and sustain policy changes that would provide the basis for needed official financial support. In addition, the richer menu of options made negotiations more complex, particularly when precedents did not yet exist or countries tried to vary from the precedents. In cases where significant interest arrears had accumulated, agreement on the level of payments to banks ahead of completion of the debt package often presented a key hurdle. Moreover, reconciling overdue interest claims proved arduous. As a result of these factors, implementing the new strategy has been time consuming. Still, progress has been steady and comprehensive packages have been completed for eight countries: Mexico, Costa Rica, and Venezuela in 1990; Uruguay in 1991; Nigeria and the Philippines in 1992; Argentina in April 1993; and Jordan in December 1993. Also in 1993 banks formally committed to participate in the package for Brazil and agreements in principle were reached for the Dominican Republic and Bulgaria. Altogether, the first ten of these middle-income countries account for about four-fifths of all bank claims on countries that had encountered debt-servicing difficulties at the start of the last decade. Discussions are in progress in a number of other cases, including Poland, Peru, Ecuador, and Panama.²⁴

Advantages and disadvantages of the menu approach

The menu approach encouraged nearly universal participation and helped countries maximize the debt reduction achieved with a given amount of collateral resources by allowing banks to choose options that best fit their particular tax, regulatory, and accounting situations, as well as

²³ Countries could encourage more banks to choose the buyback by offering a relatively attractive price. Costa Rica's Brady agreement was contingent on banks' offering at least 60 percent of their aggregate exposure to the buyback option. To encourage individual banks to tender at least 60 percent of their claims to the buyback option, Costa Rica offered more attractive terms, in the form of guarantees and shorter maturities, on the remaining exposure of banks that met that threshold.

²⁴ Not all countries with recent bank debt-servicing difficulties have sought Brady-type restructurings. Among the countries targeted for special attention under the Baker initiative, Chile has achieved a more manageable debt profile through debt conversions that canceled much of the country's medium-term debt, while Colombia and Morocco have refinanced principal without reducing debt.

their views on interest rates and the countries' prospects. Nonetheless, for countries, the approach introduced uncertainty as to the overall cost and impact of the packages. For example, if banks allocated too much exposure to the debt reduction options, the cost might exceed available financing, whereas if banks opted excessively for new money, the country might not achieve its debt reduction objectives. In this context, par and discount exchanges were often attractive to countries because they embodied in one option an outcome close to the overall desired mix, and thereby reduced uncertainty surrounding the overall impact of the package.

In addition to the above uncertainties, allowing banks to choose among options proved costly to countries when the external environment changed between the time of agreement on a menu and the actual selection of options. This complication reflected the convention, still observed, of fixing the interest rates and guarantees at the time of agreement in principle rather than indexing them to movements in market rates before the completion of the deal. As a result, movements in rates could shift the overall pricing and also favor some options over others. This problem did not arise with the early bank packages but emerged as an important issue for Argentina and Brazil, which saw a fall in long-term interest rates following agreement in principle with banks on a restructuring menu. These declines, to the extent they were unhedged, increased the cost of the Treasury zero coupon bonds used to secure the Brady bonds' principal, raising collateral costs for both the par and discount bonds. The cost increase was more pronounced for the par bonds because they had a larger principal amount to be secured. In addition, when the gap narrowed between market rates and the agreed fixed rates for the par bonds, banks strongly preferred the par option, which became more costly for the debtors. In both cases the countries sought a "rebalancing" or reallocation of choices away from the unexpectedly less concessional par exchange.

Financing

The debt operations entailed large up-front cash outlays for buybacks, collateral purchases for the bond exchanges, and in some cases down payments on arrears. Official sources provided the bulk of the financing of these costs for the seven operations that have been completed.²⁵ In particular, three-fifths of the overall financing came from official sources, although in every case the debtor also made a significant contribution (Table 1). However, for Mexico, the Philippines, and Venezuela, new money committed by banks effectively covered a substantial portion of the debtors' share of the financing burden. Interpretation of the financing of the Argentine package is more complex.

²⁵ Most of the operations involving middle-income countries were directly or indirectly financed with loans or reserves; grants have more commonly been used to finance operations for low-income countries.

Although Argentina did not receive new money, banks refinanced accumulated interest arrears. Hence, to a large extent the resources that Argentina is expected to contribute are the counterpart of earlier unpaid interest. To date, only the financing for Nigeria's debt operation breaks with the prevailing pattern. Nigeria received neither new money nor direct official financial support.²⁶

Debt conversions

As noted above, the revised official strategy encouraged the maintenance of debt conversion schemes.²⁷ In negotiating their debt packages, most countries agreed to maintain or reestablish debt conversion schemes and to carry out an agreed minimum level of conversions. In contrast with the Brady packages, which were concerted operations that dealt with all the debt at one go on preset terms, these conversions were usually smaller scale, ongoing operations that involved auction mechanisms. Overall, the pace of conversions did accelerate after 1989, with some \$28 billion in claims converted under official schemes from 1989 through 1992. For most countries, however, these debt conversions played a smaller, complementary role to the Brady packages in reducing countries' debt

²⁶ Under the Nigeria agreement, since all debt service arrears were to be eliminated before the closing, no effective financing was achieved through arrears.

²⁷ The IMF and World Bank guidelines on support for debt and debt service reduction explicitly endorsed the existence of debt equity swap programs as a useful step in encouraging investment. Banks pressed strongly for debt conversion schemes, reflecting beliefs that such programs enhanced the value and liquidity of their claims.

Table 1

Financing for Debt Reduction Packages

Billions of Dollars

	Total Cost of Operation	Sources of Funding		Memorandum: New Money from Commercial Banks
		Official Support [†]	Own Reserves	
Mexico	7.12	5.33	1.79	1.09
Costa Rica [‡]	0.22	0.18	0.04	—
Venezuela	2.38	1.46	0.92	1.20
Uruguay	0.46	0.06	0.40	0.09
Nigeria	1.70	0.00	1.70	—
Philippines	1.80	0.88	0.92	0.85
Argentina [‡]	3.64	2.53	1.12	—
Total	17.32	10.44	6.89	3.23
(as a percentage of total cost) (100.0)		(60.3)	(39.8)	(18.7)

[†]Includes disbursements of parallel financing from Japan Eximbank. Although not directly tied to debt reduction, this financing supported the programs of several countries that completed debt packages.

[‡]Includes down payments made at closing against interest arrears.

service burdens (Table 2).

The principal exceptions to this rule have been Chile and Argentina, which account for about three-fifths of the debt converted under official schemes since 1989. For Chile, debt-equity conversions constituted the primary means of reducing debt owed to banks, although some debt was reduced through buybacks in 1988 and 1989. For Argentina, debt conversions ahead of its Brady operation were an integral part of the country's overall debt reduction strategy. From 1990 onward these conversions consisted entirely of exchanges of debt for equity in privatized firms. The reduction in bank claims through such operations exceeded that achieved through the debt package and more than offset the \$8 billion accumulation of bank debt from 1988-92 stemming from interest arrears.

Impact on countries' debt and debt service burdens

The Brady operations gave countries a leg up in their efforts to surmount their debt-servicing difficulties. Essentially the operations provided permanent cash flow relief on a scale comparable to the temporary relief previously achieved through new money packages. Nonetheless, significant debt service obligations remained, to other creditors as well as to banks, so that debtors had to continue to pursue sound economic policies to service the remaining debt and maintain growth.

Reduction in debt service obligations

The seven Brady Plan operations completed to date are expected to cancel debt service obligations with an expected present value of roughly \$50 billion, or about one-third of the eligible bank debt (Table 2). The expected percentage reductions in the present value of gross claims payable to banks have differed across cases, from a low of about three-tenths for Venezuela and Argentina to about four-fifths for Costa Rica and Nigeria.²⁸ With the completion of the Brazil package, the present value of obligations canceled is expected to rise to about \$65 billion.

Comparison of changes in debt stock and debt service obligations

The stock of debt to banks, however, will decrease by a much smaller amount. Roughly three-fifths of the gross reduction in debt service burdens is expected through interest rate reductions on par exchanges and effective prepay-

²⁸ The gross reduction in claims payable to banks might alternatively be called the gross reduction in bank exposure. It measures the partial effect of those features of the packages that reduce debt and debt service; it does not include the increases in debt to banks through new money. It is the sum of the reduction in principal through discount exchanges and buybacks, the present value of debt service reduction on the reduced interest par bonds, and the prepayment of principal and interest through collateral accounts. The present value of the interest reduction is an ex ante calculation based on the long-term interest rates prevailing when agreement in principle was reached.

Table 2

Debt Reduction through Concerted Bank Packages

	Gross Reduction in Claims Payable to Banks ¹		Net Debt Reduction ² as a Percentage of:			Memorandum: Debt Retired under Official Debt Conversion Schemes ³ (Billions of Dollars)	
	Billions of Dollars	Percent of Eligible Bank Debt ⁴	GDP (1991)	Exports (1991)	Total External Debt (1989)	1984-92	1989-92
Mexico	21.1	43.5	5.1	30.8	14.6	7.3	3.1
Costa Rica	1.2	75.0	13.5	43.0	25.2	0.3	0.2
Venezuela	6.4	32.1	7.5	21.6	12.2	1.7	1.6
Uruguay	0.9	55.3	4.7	18.1	10.3	0.2	0.1
Nigeria	4.3	79.6	8.2	19.4	8.1	0.8	0.8
Philippines	3.7	57.8	4.2	13.0	6.8	3.2	2.6
Argentina	10.5	36.7	5.3	46.3	10.5	12.9	11.3
Brazil ⁵	16.0	27.1	2.8	32.1	10.1	5.2	1.3
Chile	N.A.	N.A.	N.A.	N.A.	N.A.	11.4	5.2
Total/(average)⁶	64.0	(38.2)	(4.8)	(30.6)	(11.8)	43.0	26.1

Sources: International Monetary Fund; World Bank; Federal Reserve Bank of New York staff estimates.

¹Principal reduction through discount exchanges and buybacks, present value of reduction in interest rates on interest reduction bonds, and prepayments of principal and interest through collateral accounts.

²Gross reduction in claims payable to banks less the cost of financing the operation.

³Includes the 1988 Mexican collateralized bond exchange but excludes estimates of unofficial debt conversions.

⁴As a percentage of public sector medium-term bank debt, including interest arrears, at the time of the operation.

⁵Author's estimate, based on banks' latest allocation among eligible options.

⁶Averages are weighted by shares in total bank debt as of end-1986.

ments of principal and interest through collateral accounts, that is, operations that reduce the present value of debt service but not the stock of debt (Chart 5). The impact on total debt stocks is even smaller than the direct reduction in bank debt because of new borrowing to finance the operations.²⁹ For example, because they involve loans to finance the collateral accounts, par exchanges actually increase the stock of debt even though they fix interest rates below prevailing market rates.

Cash flow impacts

Although the Brady operations canceled a significant amount of claims, they did not necessarily directly provide countries with more cash to finance growth and investment than did the previous approach. Recall that under the new money approach, banks often effectively refinanced a portion of the interest due by extending new loans. Moreover, some countries forced an even greater degree of cash flow relief by instituting unilateral partial or complete moratoria on interest payments.

In fact, the Brady operations on average tended to leave net transfers largely unchanged. This observation is borne out by a comparison of the absolute levels of net financial flows (debt service actually paid less disbursements from banks) during the Baker plan period and before and after the Brady operations (Table 3).³⁰ These calculations also reflect the complementary impact of debt cancellations under debt conversion schemes as well as the level and structure of interest rates at the time of each agreement.

Net cash flow impacts have varied, however, for the different countries. Countries that were paying full interest before their Brady deals, that is, countries not benefiting from new money loans nor incurring arrears, achieved the largest expected savings in cash outflows. In contrast, for Argentina and Brazil, restoring normal relations with creditors through Brady restructurings required significant increases in debt service payments. The agreements provided for net payments that were expected to rise over time to levels comparable to those of the earlier Baker plan period.³¹ For Mexico, which had benefited from large new

money packages in 1983, 1984, and 1987, projected debt service payments after the Brady operation were slightly higher than the average net payments made in 1986-88 but lower than those made in the years immediately following the onset of the crisis.

The Brady operations departed more strikingly from the previous new money approach by greatly extending the time horizon of contractual relief. A comparison of Mexico's net debt service obligations on restructured principal resulting from the financial packages of 1983, 1986, and 1989 shows the lowering and flattening of contractual obligations (Chart 6). Compared with the earlier agreements, the Brady packages substantially reduced the likelihood of further rescheduling or new money requests. Thus they enhanced countries' access to the international capital markets, further improving their net cash flow.

Implications of declining U.S. interest rates

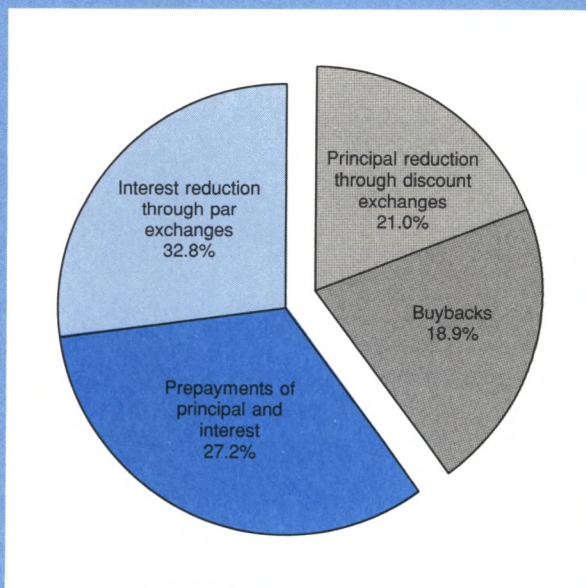
The central goal of the Brady operations was to reduce

Footnote 31 continued

accruals. In addition, full interest has been paid on 1989-90 interest arrears refinanced in 1992.

Chart 5

Reduction in Claims Payable to Banks through Concerted Bank Packages, by Modality of Debt Service Reduction



Source: Federal Reserve Bank of New York staff estimates.

Notes: Chart does not show claim reductions resulting from packages agreed upon but not yet finalized (as in the case of Brazil). Separated portion of pie represents outright reduction of principal (39.9%).

²⁹ On average, countries achieved net reductions in total debt service obligations of about one-eighth. The net debt reduction is defined as the gross reduction in claims payable to banks less the cost of financing the operation. The low reduction in net debt reflects the fact that the Brady restructurings to date have dealt only with medium- and long-term public sector debt to banks; these debts have generally accounted for between one-half and one-quarter of the total debt of the participating countries.

³⁰ For alternative calculations of debt service savings for packages completed through mid-1991 and a discussion of alternative counterfactual scenarios, see Eduardo Fernandez, "Cost and Benefits of Debt and Debt Service Reduction," World Bank Working Paper no. 1169, August 1993.

³¹ Brazil has already begun to step up its payments. After interest payments were suspended in 1989, a \$2 billion down payment on overdue interest was made in 1991 along with 30 percent of the current interest accruals on principal. The partial payment rate was stepped up to 50 percent of the accrued interest in 1993, with retroactive payments made on 1992

countries' debt service outflows to manageable levels on a permanent basis. To achieve this, countries prepaid a portion of their debt service obligations at a discount and locked in the interest rates on a significant portion of the remainder.³² These steps helped insulate them from future interest rate changes, up or down.

This locking in of interest rates may have resulted in additional ex ante costs which are not reflected in the calculations above if long-term rates generally exceed an average of relevant short-term rates. The calculations of the present value of countries' expected debt service savings are based on long-term interest rates at the time of agreement in principle for each of the packages. Specifically, the interest rates on the par bonds are compared with the hypothetical fixed rate that would result from swapping a LIBOR plus 13/16 payment stream into a fixed payment stream.³³ In this way, the ex post costs or benefits from

unanticipated interest rate changes are separated from the ex ante relief negotiated with creditors. However, to the extent that long-term interest rates have an upward bias in predicting short-term rates, this measure overstates the expected savings resulting from the par exchanges.³⁴

In the event, developments in dollar money markets since the launching of the Brady initiative have thus far turned out remarkably well for debtor countries. The LIBOR rate for U.S. dollar deposits, to which most loan contracts

³² The transformation of debt obligations from floating to fixed rates may be considered an extra benefit of the restructurings to the extent that the debtor country prefers fixing the rates on a portion of its liabilities but is prevented by its credit standing from achieving such rates through the swap market.

³³ The swap rate is taken as the market's expectation of the average level of future short-term rates.

³⁴ The literature on the predictive power of the term structure has cast strong doubts on the accuracy of the pure expectations theory of the term structure, particularly as the theory relates to the ability of short-term rates to predict movements in shorter maturities. However, some research suggests that at longer time intervals, medium- and long-term rates do tend to be useful predictors of medium-term movements in short rates: see, for example, Eugene Fama and Robert Bliss, "The Information in Long-Maturity Forward Rates," *American Economic Review*, vol. 77 (1987); Kenneth Froot, "New Hope for the Expectations Hypothesis of the Term Structure of Interest Rates," *Journal of Finance*, vol. 44 (1989); and John Campbell and Robert Shiller, "Yield Spreads and Interest Rate Movements: A Bird's Eye View," *Review of Economic Studies*, vol. 58 (1991). Studies have also found that when the yield curve slopes upward, the yields on longer bonds subsequently tend to decline, while short-term interest rates tend to rise. Although many theoretical models have been developed to explain the existence of a possible term premium, no consensus has emerged on the degree to which long-term rates overpredict future short-term rates.

Table 3

Annual Net Transfers to Banks before and after Completion of Debt Reduction Packages

Billions of Dollars

				Memorandum:		
	Before Conclusion of Bank Package [†]	After Conclusion of Bank Package [†]		Net Transfers		Cumulative New Money Disbursements
		Short-Run	Long-Run	1983-85	1986-88	1983-88
Mexico	3.24	3.59	3.59	3.95	3.22	14.27
Costa Rica	0.04	0.05	0.05	0.22	0.06	0.28
Venezuela	2.02	1.53	1.69	1.12	2.21	0.00
Uruguay	0.29	0.10	0.11	0.06	0.17	0.24
Nigeria	0.64	0.22	0.28	1.05	0.48	0.00
Philippines	1.04 [§]	0.28	0.49 [¶]	0.00	0.71	0.93
Argentina	0.59	1.19	2.09	0.68	1.33	6.50
Brazil	2.20 ^{††}	2.45	4.44	0.74	3.70	14.90
Total	10.05	9.42	12.73	7.82	11.88	37.11

Sources: World Bank, *World Debt Tables*; author's estimates.

Notes: Net transfers before debt reduction are defined as cash debt service payments less disbursements from banks. Transfers after debt reduction are defined as net interest payments due on new debt instruments issued plus interest on funds used to finance the transaction, including use of reserves and new money from commercial banks. Floating rate interest obligations are projected on the basis of swap rates prevailing at the time of agreement in principle. The calculations do not reflect additional expected savings due to downward shifts in the yield curve following the initial agreements.

[†]Average net transfer in the three years preceding the completion of the bank package.

^{††}The difference between short- and long-run projected net transfers reflects temporary interest reduction on par bonds and the expected path of floating rate interest rates based on the term structure of interest rates at the time of agreement in principle. For cases with rising interest payments, the long-run level of interest payments is generally expected to be reached in five to seven years.

[§]Average net transfers during 1987-89.

[¶]Includes interest but not principal on bank debt not eligible for debt reduction.

^{†††}Estimated average during 1991-93. Includes 1991 down payment against interest arrears and interest on refinanced interest arrears (so-called interest due and unpaid bonds).

were indexed before the Brady operations, declined by about 500 basis points between November 1990 and February 1993. For most debtors the interest savings implied by this decline are significantly larger than those resulting from the debt restructurings. For countries that had already agreed on debt packages (Mexico, Venezuela, Costa Rica), the declines did produce additional savings on the portion of their remaining medium-term bank debt that was left at floating rates (for example, discount and new money bonds). Moreover, savings accrued on other floating rate debts, such as short-term debt and debt to international

institutions. Nonetheless, for Mexico and Venezuela, countries that restructured early, near-term interest obligations on their medium-term debt to banks are currently about the same as if the restructurings had not taken place (Chart 7). Of course, the sharp upward slope of the yield curve indicates that the market expects an eventual recovery in short-term rates. Should this occur, these countries' interest obligations will rise, but by much less than if the debts had not been restructured.

Countries that restructured later, particularly Argentina and Brazil, benefited more from the decline in rates. The coupon profiles on their par bonds mimicked the slope of the U.S. yield curve at the time of their agreements.³⁵ Most of the countries that had not yet reached agreements by early 1991 were making at best only partial payments on accruing interest obligations. For these countries, a Brady package required a significant increase in cash outflows. The decline in short-term rates made for a more gradual step-up in payments, giving these countries time to grow into their long-term debt-servicing capacity (Chart 7).

Buying back into the market

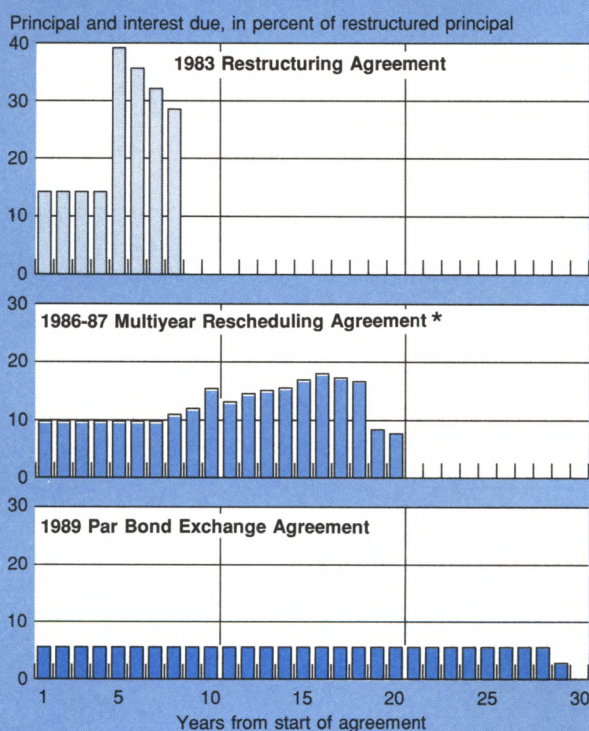
As argued above, the Brady operations did more to lock in a longer horizon of debt service relief than to change immediate net debt service outflows from their levels during the Baker Plan period. This locking in improved countries' prospects for breaking out of the cycle of continuous renegotiation that characterized the previous approach (Table 4). Of course, it was crucial that countries implement and sustain the policy reforms that would allow the servicing of the remaining reduced claims as well as any new borrowings. In this way, the Brady operations in concert with sound economic policies helped countries return to the international capital markets and played an indirect but catalytic role in helping countries achieve a positive net cash flow.³⁶

Breaking the cycle of continuous renegotiation

Under the new money approach that predated the Brady initiative, bank packages provided "front-loaded" cash flow

Chart 6

Mexico: Debt Service Due on Restructured Principal under Selected Restructuring Agreements



Source: Federal Reserve Bank of New York staff estimates, based on the terms of the respective agreements.

Notes: The 1983 and 1986 financial packages also provided for new loans that effectively covered a portion of the interest due in the initial years. In contrast, the 1989 agreement required outlays for principal and interest guarantees. Floating rate interest obligations on the 1983 and 1986-87 agreements are projected on the basis of long-term U.S. Treasury yields at the time the packages were finalized. Payments on par bonds exclude principal and interest payments prepaid through collateral accounts.

* The terms of the rescheduling agreement were agreed upon in principle in September 1986, and the package was finalized in April 1987.

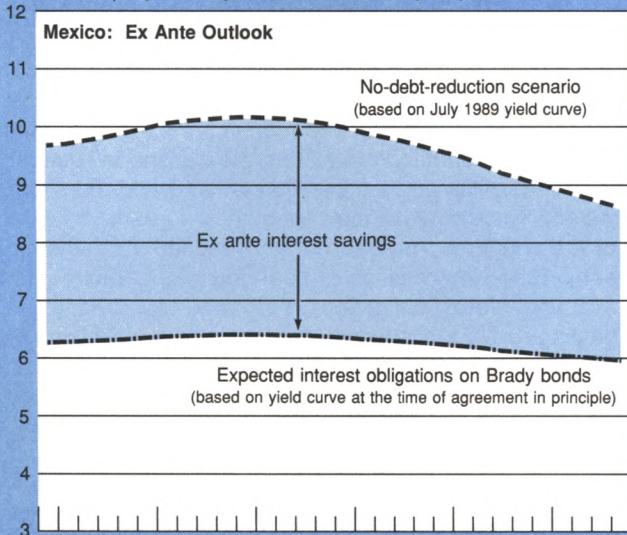
³⁵ For example, the Argentina and Brazil par exchange agreements provided for interest rates that rose gradually from 4 to 6 percent over a six-year period.

³⁶ Restoration of market access has always been a central goal of the debt strategy, and the shift toward debt reduction was presented as an important means toward this end. Secretary Brady, in his March 10, 1989, address to the Bretton Woods Committee, argued that "the path towards greater creditworthiness and a return to the markets needs to involve debt reduction" (reprinted in Edward Fried and Philip Trezise, eds., *Third World Debt: The Next Phase* [Washington D.C.: Brookings Institution, 1989]). The IMF guidelines on Fund support for debt and debt service reduction, approved in May 1989, stated that in considering requests for support, particular reference would be made to the strength of economic policies, "the scope for voluntary market-based debt operations that would help the country regain access to credit markets and attain external viability with growth," and the efficiency of resource use. See International Monetary Fund, *Selected Decisions and Selected Documents*, no. 16, 1991.

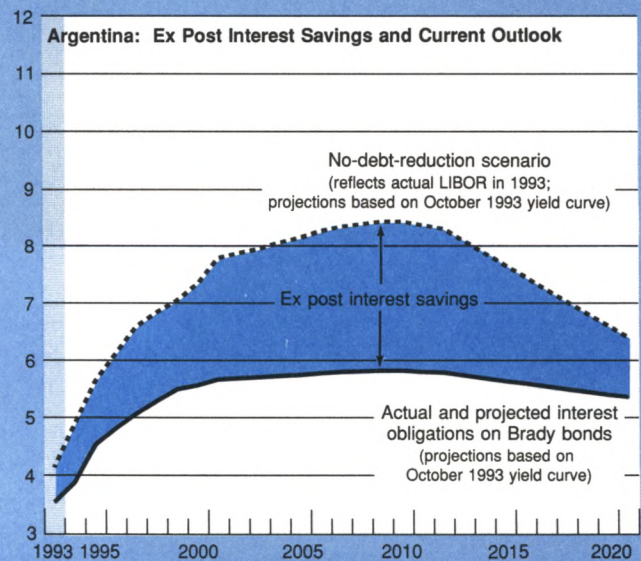
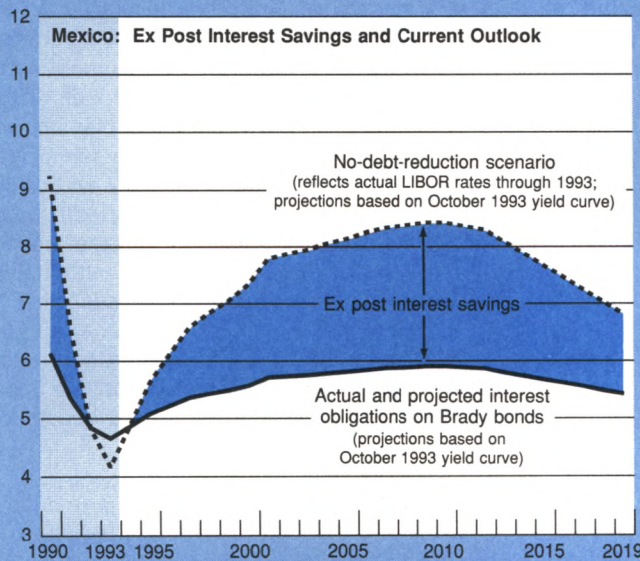
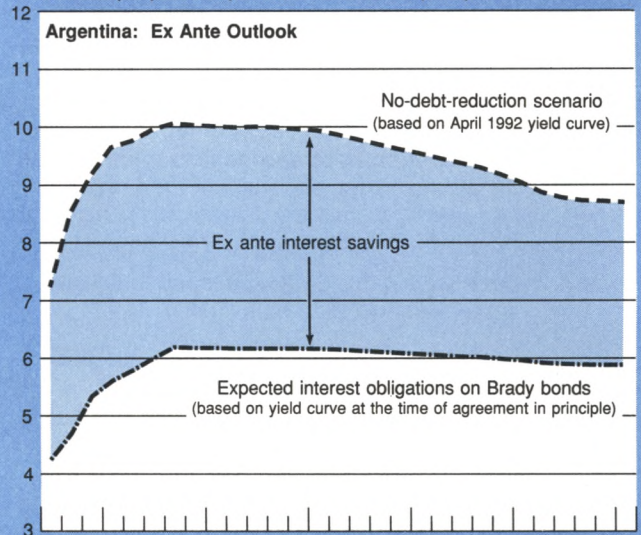
Chart 7

Mexico's and Argentina's Interest Savings on U.S. Dollar Brady Bonds

Interest due per period in percent of restructured principal



Interest due per period in percent of restructured principal



Notes: Mexico's and Argentina's annual interest savings on their par and discount bonds are shown as the shaded distances between the "no-debt-reduction scenario" lines and the lines showing the interest obligations on their Brady bonds. The no-debt-reduction line presents a counterfactual scenario under which interest accrues at a rate of LIBOR plus 13/16, and amortization is continually deferred. The Brady bond line shows the interest coupons expected on par and discount bonds weighted by their shares of restructured principal. The coupons are expressed as a percentage of the base exposure; hence, the market interest rates for discount bonds are reduced by the size of the discount.

In the ex ante panels, interest coupons (including those for the floating rate Brady discount bonds) are projected from forward interest rates implied by the yield curve prevailing when the Brady operation was agreed upon in principle (July 1989 for Mexico and April 1992 for Argentina). In the case of Argentina, the rising projected interest obligations on the Brady bonds reflect the step-up in coupon rates on the fixed rate par bonds as well as the expected rise in interest rates on the discount bonds. The ex post panels reflect the actual path of short-term rates through 1993 and the future path of short-term rates implied by the October 1993 yield curve.

relief. Since new money loans would generally cover a fraction of the interest due only over the next year or two, further packages would be necessary unless debt-servicing prospects improved sharply.

On the face of it, this approach served the interests of banks by maintaining a contingent claim on future improvements in debt-servicing capacity. If a country's debt-servicing prospects improved in the years following a new money package, then continuing with the current agreement (which usually provided for rising amortization payments and no further new money) would ensure that banks would benefit.³⁷

³⁷ A formal model exploring how bank packages would be expected to address only the debtor's near-term need for debt service relief is presented in Jeremy Bulow and Kenneth Rogoff, "A Constant Recontracting Model of Sovereign Debt," *Journal of Political Economy*, vol. 97 (1989). To encourage creditors to agree to contractual relief over a longer time horizon, a number of countries agreed to "recapture clauses" in their Brady packages that provided for increased debt

However, as indicated earlier, this approach was becoming harder to implement over time. Renegotiation was time consuming and distracting for decision makers. Moreover, such arrangements increased the already high stock of debt and blunted the perceived incentives for restructuring countries to improve their debt-servicing capacity. Finally, this approach impeded the resumption of voluntary lending. Potential new creditors were wary of being caught up in this cycle of continuous renegotiation. Given the unclear rules of the game, in which contracts were continually reopened, they feared that cash flow relief might be required from

Footnote 37 continued

service payments in the event of certain largely exogenous improvements in debt-servicing capacity; these clauses were usually linked to higher export proceeds (oil for Mexico, Venezuela, and Nigeria and agricultural commodities for Uruguay), although the Costa Rica clause was linked to GDP growth. The more recent agreements for Argentina, Brazil, and the Philippines have not included such clauses.

Table 4
Chronology of Restructuring Agreements, 1983-92

Country	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Brady Countries										
Mexico	N	N	R		N		B			
Costa Rica	N		N	p	p	p	B p			
Venezuela				R				B		
Uruguay	N			R				B		
Nigeria	R				N p		N	p	B p	
Philippines			N		R		B			B
Argentina	N	p	N		N	m	m	p	p	B p
Brazil	N	N		R	p	N	m	m	p	B p
Dominican Republic	R			R			m	m	m	m
Jordan							R	m	p	p
Bulgaria								d	d	p
Selected middle-income countries currently negotiating debt reduction packages										
Ecuador	N		N		N p	m	p	p	p	m
Panama	N		N		m	m	m	m	m	m
Peru	N	R p	m	m	m	m	m	m	m	m
Poland	N	N		N		R		m	p	m
Other selected middle-income countries with recent debt servicing difficulties										
Chile	N	R	N		R	R		R		
Colombia			R f			R f			R f	
Cote d'Ivoire			N	R	m	N m	m	m	m	m
Morocco				R	R			R		
Yugoslavia [†]	N	R	R			N				m

Sources: International Monetary Fund, *International Capital Markets: Developments and Prospects*; World Bank, *World Debt Tables*; Federal Reserve Bank of New York.

Notes: Brady countries are those that have completed or reached agreement in principle on operations to substantially reduce their commercial bank debt. Brady countries are ordered by the date of agreement in principle.

N: Agreement includes provisions for new financing.

R: Agreement provides for principal rescheduling only.

B: Agreement in principle on a Brady Plan debt restructuring.

d: Rolling agreement to defer all payments of principal and interest.

Rf: Principal refinancing agreement.

m: Indicates that at year-end country had suspended interest payments to banks. Excludes moratoria of less than twelve months.

p: Indicates that the country was making partial interest payments to banks; bold indicates that the level of payments was consistent with an agreement in principle with the bank steering committee.

[†]Serbia and Montenegro in 1992.

them as well or that new inflows from them would be used to justify a cut in debt relief by existing creditors.³⁸ Then, instead of improving debtor countries' capacity for growth, the new creditors would in effect be buying out the old creditors' heavily discounted debt at par. In contrast, debt reduction and longer maturities capped existing creditors' claims on current cash flows, allowing new flows to finance new growth and investment.

Lowering the profile of contractual obligations would not, by itself, be expected to lead to renewed market access. To be successful on its own, the Brady operation would need to convince the market that enough reduction had taken place so that the debtor, without further changes, would have sufficient capacity to service the remaining claims. Here market-based debt reduction faced an inherent limitation: to the extent that the reduction in the stock of claims was expected to raise the probability that the remainder would be more fully serviced, creditors would only be willing to sell at higher prices. With prices being bid up and financing limited, less debt reduction would be achieved and the overhang would persist, deterring new flows.³⁹ In the event, despite the reductions in claims owed to banks, discounts on unsecured restructured obligations generally remained steep, albeit somewhat lower, immediately after the Brady operations. In part, this discount reflected the longer maturities arranged under the restructurings. Hence, in order to gain significant market access, countries have had to show evidence of improved debt-servicing capacity as reflected in declining yield spreads.

³⁸ *Pari passu* clauses in the contracts on the existing debt specified that the old debt would be treated equally with all other debts of the borrower. Charging a higher interest rate on new credits to cover the possibility of a debt consolidation could lead to an explosion of debt; moreover, new creditors might not be able to maintain their interest premia if their claims were consolidated under a restructuring exercise. The debt overhang deterred nonbank flows as well as new bank loans. For example, while most rescheduling countries exempted their external bonds from refinancing during the 1980s—a move reflecting both the bonds' small share of total indebtedness and difficulties in organizing debt relief—discounts on bonds still tended to be high. These discounts reflected fears that de facto seniority was not absolute, and access to new flows appeared to be ruled out. Portfolio and direct investment equity flows could also be reduced because of concerns that debt-servicing difficulties could lead to restrictions on repatriations of profits and capital and/or costly confrontations with creditors that could adversely affect the return on capital. Similar fears of cost shifting could induce domestic investors to engage in capital flight.

³⁹ Countries did try to circumvent the problem of capital gains for nonexisting banks through a combination of novation (converting the remaining claims of participating creditors into bonds that might be treated more favorably than the claims of free-riding creditors) and requirements that nonexisting banks provide new money. In theory these efforts could have led to a complete elimination of the discount at little cost; however, in practice the Brady operations generally entailed upfront resource costs (that is, buyback equivalent prices) broadly similar to those prevailing in the period of negotiations. Discussions of the limitations of market-based debt reduction can be found in Stijn Claessens, Ishac Diwan, Kenneth Froot, and Paul Krugman, "Market-Based Debt Reduction for Developing Countries: Principles and Prospects," World Bank Policy and Research Series no. 16 (1990); and Jeremy Bulow and Kenneth Rogoff, "The Buyback Boondoggle," *Brookings Papers on Economic Activity*, 1988:2, pp. 675-703.

Mexico as prototype

The experience of Mexico, the first and most successful of the Brady countries to return to the international capital markets, illustrates the interactions between debt reduction, improved debt-servicing capacity, and market reentry (Chart 8). Mexico's implementation of a broad-based macroeconomic stabilization and structural reform program was already well advanced before the Brady initiative was announced.⁴⁰ Even as the Brady operation was being negotiated, Mexican borrowers began returning to the international bond markets. However, initial yield spreads were very steep (although lower than those on the old bank debt), overall volumes were not high compared with later levels, and most of the initial placements were enhanced by the attachment of receivables accounts or favorable equity conversion rights.⁴¹ Later, as perceptions of improving economic performance and rising payments capacity led to lower yield spreads on the restructured long-term (Brady) debt, yield spreads on new unenhanced issues decreased, the volume rose significantly, and the composition shifted toward unenhanced issues. Maturities were initially short because creditors were not sure that the improvements in debt-servicing capacity would last. By lending over the short term, creditors could monitor whether the improvement in capacity was being sustained; if not, they could then try to reduce their exposure as it matured. More recently, most Mexican Eurobond issues, particularly by public sector borrowers, have carried maturities of at least five years, and the maturity of several issues has exceeded ten years. In fact, in November 1993, Pemex, the state oil company, was able to place a thirty-year issue.

Market reentry: broad based but not universal

Certainly one of the more remarkable recent developments in the international financial arena has been the explosion of private capital flows to borrowers, especially Brady countries, that were once credit constrained. Most of the new flows have been in the form of direct and portfolio investment, both through equity and securities markets, and repatriation of flight capital. Syndicated lending from commercial banks has not resumed on a significant scale.

Not all Brady countries, however, have been able to

⁴⁰ See Claudio Loser and Eliot Kalter, eds., *Mexico: The Strategy to Achieve Sustained Economic Growth*, International Monetary Fund, Occasional Paper no. 99, September 1992.

⁴¹ The fact that new issues carried lower spreads than the Brady bonds may have reflected perceived de facto seniority owing to the new issues' shorter maturity and small share of total indebtedness. Receivables-backed borrowings eliminated convertibility risk by directing an entity outside of Mexico to pay funds owed to the Mexican borrower into a special purpose vehicle (a specially created trust, partnership, or corporation) that would then issue securities on behalf of the Mexican borrower. For example, Telmex, the Mexican telephone company, directed AT&T to deposit long-distance payments owed to Telmex into a trust located in the United States. See Andrew Quale, "Securing the Future," *LatinFinance*, May 1991.

regain access to the international capital markets (Table 5, Chart 9).⁴² As reflected in secondary market prices, the market did not perceive an improvement in Nigeria's prospects for growth and reform following the completion of its package, and the country has not returned to the international capital markets. In addition, the Philippines, which experienced a decline in secondary market prices following its 1990 buyback, was largely absent from the capital

⁴² Observed credit flows are of course only partial indicators of credit availability. Some countries, such as Chile, have taken active measures to limit the extent of capital inflows, while other countries have not been willing to borrow unless the terms were sufficiently attractive.

markets until the completion of the second stage of its Brady restructuring further reduced its debt and lengthened the maturity of the remaining exposure.

Argentina and Brazil

The success of Argentina and Brazil in regaining access to the international capital market when their debt packages were not yet completed and they were still incurring interest arrears raises questions about the relative importance of the debt operations. This is particularly the case for Brazil, where high levels of inflation persist and uncertainties continue regarding when the package will be completed.

Support for the view that the debt operations were a catalyst for reentry can be found in the timing of the countries' entries into the market in the third quarter of 1991. For both countries, market reentry followed developments indicating that the probability of a "Brady package" in the near future was increasing sharply. Brazil had just recently reached a preliminary agreement with the banks on the treatment of accumulated interest arrears that cleared the way for negotiations on a debt reduction package.⁴³ While Argentina's negotiations were not as advanced as Brazil's (although partial payments of interest had resumed sooner), the

⁴³ Brazil initiated partial interest payments on its medium- and long-term public debt in early 1991 after an eighteen-month moratorium. Agreement with the banks on the treatment of interest arrears accumulated during 1989-90 was reached in April 1991. Moreover, earlier in the year, in an effort to restore market access for Brazilian corporations, all private sector borrowers as well as several leading publicly owned corporations were given permission to negotiate directly with their bank creditors. Concerted interbank and short-term trade facilities were allowed to expire in April 1991 and were replaced with voluntary facilities.

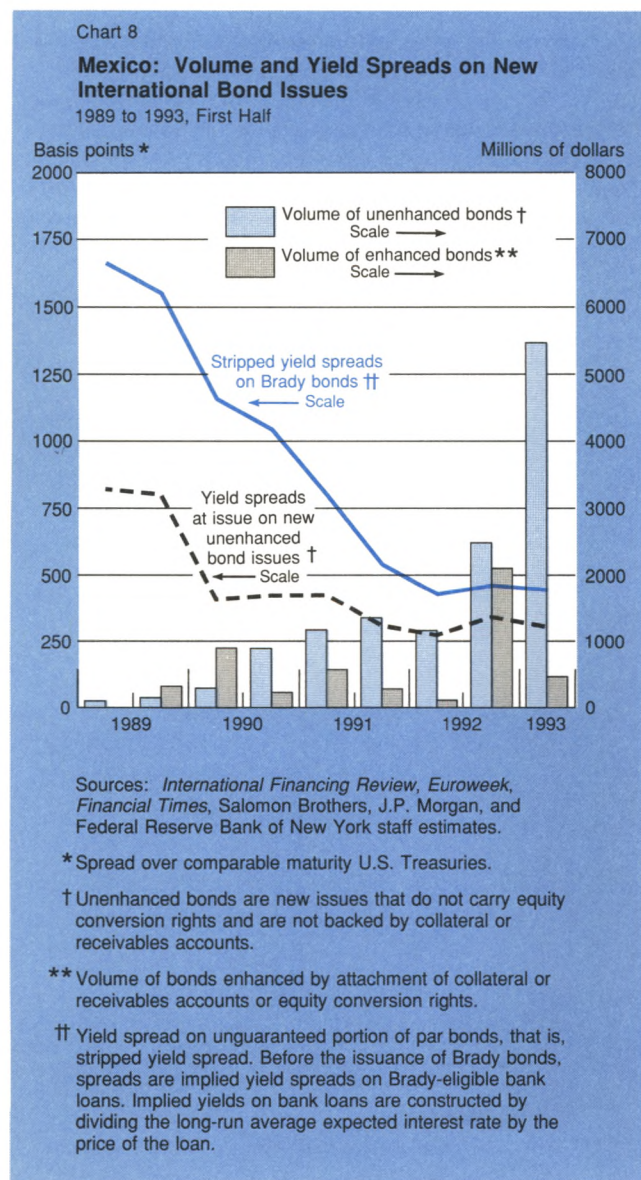


Table 5

Net Capital Inflows to Restructuring Countries

Billions of Dollars

	1989	1990	1991	1992	1993e
Mexico	4.5	10.4	21.9	24.0	23.9
Costa Rica	0.6	0.3	0.5	0.5	0.7
Venezuela	-1.1	-3.4	0.7	2.2	1.3
Uruguay	-0.1	-0.1	0.1	0.2	0.3
Nigeria	0.1	-2.5	-0.6	-6.0	1.3
Philippines	1.9	2.3	3.0	2.7	3.7
Argentina	-0.5	1.2	4.9	12.8	12.7
Brazil	-0.1	4.3	1.0	8.4	8.7
Chile	1.3	2.7	0.9	2.9	2.8
Total	6.5	15.2	32.5	47.7	55.4

Sources: International Monetary Fund, *International Financial Statistics*; Federal Reserve Bank of New York staff estimates.

Notes: Net capital inflows are defined as the current account deficit plus the increase in gross reserves. The inflows include errors and omissions and exceptional financing.

country was making important progress in controlling inflation and restructuring the economy. As a result, Argentina's prospects for receiving official financial support for a future Brady restructuring appeared to be on the rise.⁴⁴ In addition, the precedents established through the debt operations with Mexico, Venezuela, and other countries tended to make the timing of an agreement less crucial because potential new creditors were able to project reasonably well how existing bank claims would be treated under a debt package. The likely future structures were further clarified once the April 1991 Brazilian arrears agreement established a pattern for the treatment of such claims. The notion that terms for the treatment of old debt were already broadly defined apparently contributed to a presumption, reinforced by the countries' policies, that pending a restructuring of the old debt, new obligations would be given a de facto senior status. Hence the new flows were priced more on the basis of expected post-deal creditworthiness.

⁴⁴ Since mid-1989 Argentina had been implementing sweeping measures to encourage competitiveness, including liberalizing the trade regime and privatizing several major public enterprises. Argentina's reentry into the international capital markets in August 1991 followed the adoption of a new stabilization program in March 1991. The program, which involved a tightening of public finances, further structural measures, and a fixed exchange rate, was showing success in sharply curbing inflation and formed the basis for a stand-by arrangement with the IMF approved that same month.

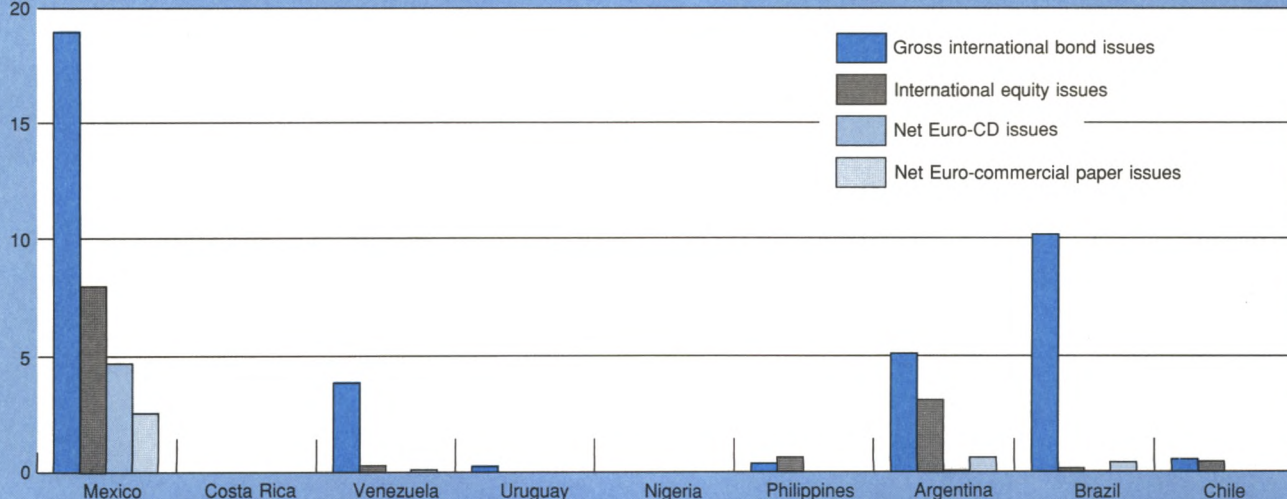
For both Argentina and Brazil, access to new capital flows followed changes in the market's perception of their capacity to service existing debts. In both cases, the yield spreads on their long-term debt sharply improved ahead of their reemergence in the international bond markets. In the case of Brazil, it is notable that bond issues peaked in the first half of 1992; this development coincided with a low point in yield spreads on the long-term debt as the country approached an agreement in principle, announced in July 1992, on a debt reduction package (Chart 10). Afterwards, in the face of political uncertainties culminating in the resignation of President Collor and continued high inflation, prospects for a deal dimmed, the yield spread on the long-term debt widened, and the flow of new issues slowed markedly.⁴⁵ Argentina made an initial foray into the Eurobond market in the third quarter of 1991, but it was not until after agreement on a term sheet for the bank operation in June 1992 that further significant bond issues took place (Chart 11). Moreover, the completion of the par and discount exchanges in April 1993 and the deepening success of the country's stabilization and reform effort, reflected in further declines in yield spreads in 1993, led to an explosion of new issues in the second and third quarters of 1993.

⁴⁵ Net foreign purchases of Brazilian equities followed a similar pattern: they fell to \$0.3 billion in the second half of 1992 after rising to \$1.4 billion in the first half of 1992 from \$0.6 billion in all of 1991.

Chart 9

International Capital Market Financing Received by Restructuring Countries, 1990-93

Billions of dollars
20



Sources: For bonds and equities, *Financial Times*, *International Financing Review*, and *Euroweek*; for Euro-CDs, Euroclear; for Euro-commercial paper, Bank for International Settlements, *International Banking and Financial Market Developments*.

Note: Data include issues through September 1993, except for Euro-commercial paper issues, which are through June 1993.

Brazil's access to capital market inflows still appears somewhat tentative in comparison with that achieved by Mexico. Argentina, which in 1993 saw growing interest from institutional investors, occupies a somewhat intermediate position. Through 1992, almost all of the unsecured Eurobond issues by Brazilian borrowers carried maturities of two to three years, whereas most recent Mexican issues have had maturities of five years or more. Argentina has been relatively more successful in placing longer term borrowings; notably, all of the five-year issues came after agreement on a term sheet for the debt exchange (Chart 12). While institutional and retail investors from developed countries are reportedly showing substantial interest in Mexico, Brazil has not captured institutional investors' interest to nearly the same degree. Market participants reported in mid-1993 that flight capital still accounted for the bulk of the demand for Brazilian Eurobond issues, particularly for private sector borrowers; in contrast, industrial country investors, particularly from the United States,

accounted for most of the demand for recent bond issues by Mexican corporations.⁴⁶ These differences suggest that if Brazil is to emulate some other countries' success in broadening the investor base, achieving a longer maturity structure, and narrowing yield spreads, investor concerns about cross-border risk must be addressed through improvements in debt-servicing capacity and completion of the debt package.

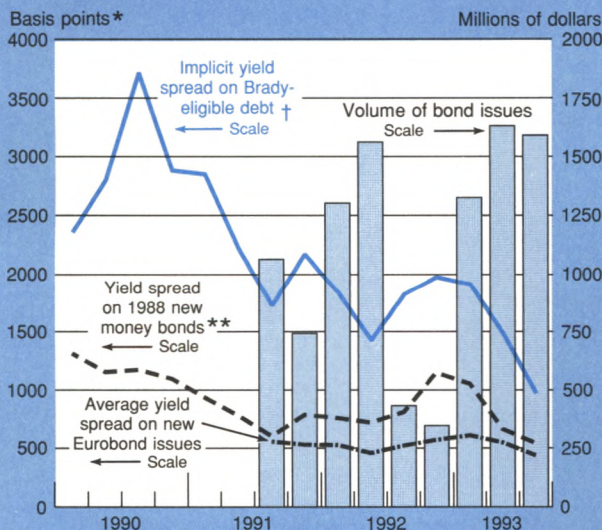
Overall, the pattern of sharply increased capital inflows received by many Brady restructuring countries since 1990 confirms that the debt operations, when accompanied by

⁴⁶ Information on final holders of Eurobonds is sketchy at best. However, evidence of the interest of developed country investors in Mexico can be found in the strong growth of foreign holdings of domestically issued Mexican government bonds, which increased by about \$20 billion between end-1990 and mid-1993.

Chart 10

Brazil: Volume and Yield Spreads on New International Bond Issues

1990 to 1993, Third Quarter



Sources: *International Financing Review*, *Euroweek*, *Financial Times*, *LatinFinance*, Salomon Brothers, J.P. Morgan, and Federal Reserve Bank of New York staff estimates.

* Spread over comparable maturity U.S. Treasuries.

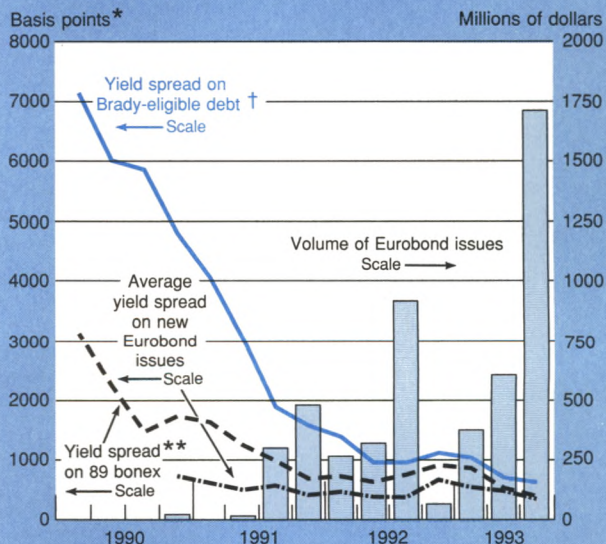
† Implied yields on medium-term bank loans are constructed by dividing the long-term expected interest rate by the price of the debt.

** The 1988 new money bonds were issued as part of Brazil's 1988 financing package. They are amortizing bonds with a final maturity in 1999.

Chart 11

Argentina: Volume and Yield Spreads on New International Bond Issues

1990 to 1993, Third Quarter



Sources: *International Financing Review*, *Euroweek*, *Financial Times*, *LatinFinance*, Salomon Brothers, J.P. Morgan, and Federal Reserve Bank of New York staff estimates.

* Spread over comparable maturity U.S. Treasuries.

† Implied yields on medium-term bank loans are constructed by dividing the long-term expected interest rate by the price of the debt. From April 1993, yield spreads are based on the stripped yields on par bonds. Stripped yields measure the yield to maturity on the uncollateralized or risky portion of a Brady bond.

** Bonex 89 are sovereign bonds issued in 1989 that fully mature in 1999.

improved policy performance, have played a catalytic role. Countries that have boosted their debt-servicing capacity and reduced their debts have been rewarded with growing market access on improving terms. However, the pattern of inflows suggests that other factors are at work as well. Most important, lower global interest rates, particularly the medium- and long-term declines in 1993, have encouraged yield-sensitive investors to reconsider the prospects of restructuring countries. The generally more favorable environment for capital flows helps account for the magnitude

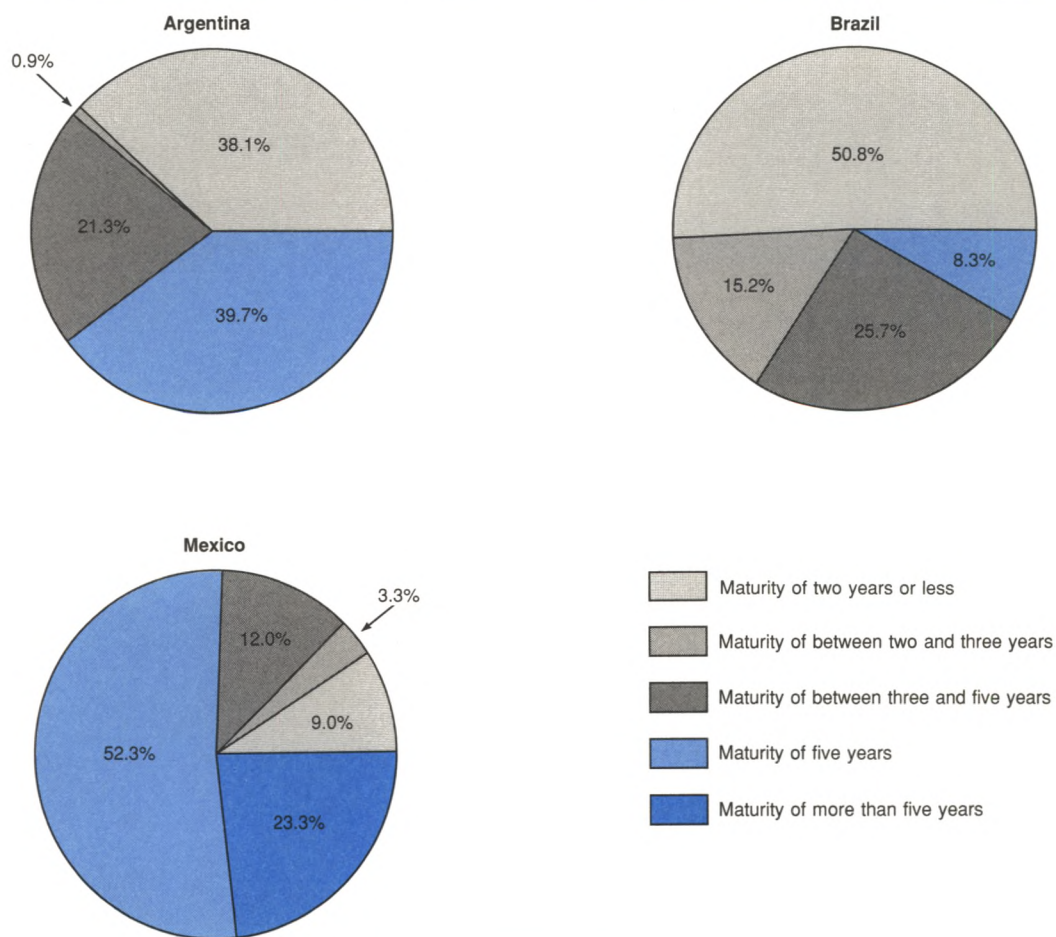
of net capital flows to Mexico, which greatly exceed the debt reduction achieved through the Brady operation, and the 1993 rebound in flows to Brazil despite uncertain fundamentals. In the current environment, some investors seem more willing to lend on the promise of reform, provided the contractual yield is sufficiently attractive.

Impact on investment performance

Many advocates for debt reduction argued that lowering countries' debt and debt service burdens would lead to

Chart 12

Maturity Structure of Unsecured International Bond Issues, 1990-92



Sources: *International Financing Review*, *Euroweek*, and *Financial Times*.

Note: In cases where put options are incorporated, time to put is used.

higher rates of capital formation. In fact, for most Brady countries, investment rates have been increasing in recent years (Table 6). Nonetheless, although in some cases capital inflows now rival those observed before the debt crisis and secondary market discounts have narrowed, in most Brady countries investment still accounts for a substantially smaller share of GDP than in the pre-debt crisis period.

The "debt overhang" hypothesis, advanced by a number of analysts of the developing country debt crisis, had suggested the possibility of a stronger investment response, at least in some cases. According to this hypothesis, elimination through debt reduction of the substantial discounts on countries' external debts would encourage investment, thereby producing important efficiency gains.⁴⁷ The "overhang," or excess of what debtors owed over what they could pay (as indicated by the market value of the debt), was thought to dissuade countries from improving their debt-servicing capacity: any improvements were expected to be largely "taxed away" through reduced debt relief in the future. This disincentive was seen to act both at the level of governments reluctant to adopt unpopular austerity measures and on the microeconomic level of investors who feared confiscatory tax policies. A variant of the overhang hypothesis argued that the discounts constrained investment by restricting the availability of financing. Absent credible seniority for new flows, potential creditors refused

to finance new investments for fear that their loans, like the old loans, would not be fully serviced.⁴⁸

To be fair, overhang proponents were skeptical about market-based debt reduction, as opposed to mandatory writedowns of excess claims, arguing that the former would not make much of a dent in the prevailing discounts. Indeed, discounts often remained high immediately following the implementation of the Brady packages. Nonetheless, even in those countries experiencing the largest ex post reductions in discounts—for example, Mexico—or the greatest restoration of capital flows, the improvements in investment rates have not generally been striking compared with the deterioration at the outset of the debt crisis.⁴⁹

Impact on banks

The secondary market value of claims on restructuring countries has recovered significantly in the period following the change in strategy. Some banks have also gained from

⁴⁷ Amongst the most widely cited expositions of this view are the theoretical arguments of Jeffrey Sachs, "The Debt Overhang of Developing Countries," in Jorge de Macedo and Ronald Findlay, eds., *Developing Country Debt and the World Economy* (Helsinki: WIDER Institute, 1988), and Paul Krugman, "Market Based Debt Reduction Schemes," in Jacob Frankel, Michael Dooley, and Peter Wickham, eds., *Analytical Issues in Debt* (Washington, D.C.: International Monetary Fund, 1989). The overhang hypothesis was by no means universally endorsed. For example, Jonathan Eaton in "Debt Relief and the International Enforcement of Loan Contracts," *Journal of Economic Perspectives*, vol. 4 (1990), and Jeremy Bulow and Kenneth Rogoff in "Cleaning up Third World Debt Without Getting Taken to the Cleaners," *Journal of Economic Perspectives*, vol. 4 (1990), strongly questioned the empirical significance of the overhang effect.

⁴⁸ Ishac Diwan and Dani Rodrik developed an argument broadly along these lines in "Debt Reduction, Adjustment Lending, and Burden Sharing," World Bank, mimeo, September 1991. Eduardo Borensztein presented numerical simulations suggesting that credit rationing associated with excess indebtedness may be more important in restraining investment than negative incentive effects; see "Debt Overhang, Credit Rationing and Investment," International Monetary Fund, Working Paper no. 89/74, 1989. Daniel Cohen presented empirical evidence of a negative linkage between net debt service outflows and investment in "Low Investment and Large LDC Debt in the Eighties," CEPREMAP Working Paper no. 9002, 1989. Cohen's results implied that a restoration of capital inflows should lead to increased investment.

⁴⁹ Adherents of the debt overhang hypothesis did not specify how rapidly investment would recover. However, the comparisons that some made with the collapse in investment at the start of the debt crisis appeared to imply that a rapid rebound would be possible. The weak association observed to date between debt reduction and investment may reflect in part countries' monetary and fiscal policies. In the aggregate, about half of the increased capital inflows in recent years have been channeled into increased holdings of official reserve assets. Public sector investment has declined relative to the period immediately preceding the debt crisis, a change that reflects both public sector austerity and reductions in the size of the state sector through privatization.

Table 6

Investment Performance in Restructuring Countries

Nominal Gross Fixed Capital Formation, Percent of GDP

	1978-82	1983-89	1990-92	1989	1990	1991	1992
Mexico	24.4	19.3	19.9	18.2	18.6	19.4	21.6
Costa Rica	23.5	19.3	21.1	20.5	22.4	19.7	21.2
Venezuela	29.6	19.4	17.6	17.2	14.1	18.2	20.6
Uruguay	15.9	11.3	11.4	11.6	10.8	11.3	12.1
Nigeria	22.7	8.7	13.1	8.2	11.9	12.7	14.6
Philippines	26.4	20.6	22.3	20.9	24.1	20.6	22.3
Argentina	23.7	18.5	15.1	15.5	14.0	14.6	16.7
Brazil	22.7	20.2	19.9	24.8	21.6	19.0	19.1
Chile	19.1	18.0	23.3	23.1	24.6	21.7	23.7

Sources: International Monetary Fund, *International Financial Statistics*; Federal Reserve Bank of New York staff estimates.

expanding income opportunities in the secondary market trading of restructured debts and the underwriting of new securities flows to restructuring countries. Although in the early cases the prices paid to banks in the form of collateral and cash for their forgone claims were close to the historical lows that had prevailed in the secondary market, banks have regained ground through subsequent price appreciations on their remaining exposure. This price rebound, which came with a lag, reflects growing optimism about the effectiveness of the new strategy. Moreover, the dramatic increase in secondary market liquidity, thanks in large measure to the securitization of claims through the Brady restructurings, has given banks new flexibility in managing their developing country exposure.

Sorting through the aftermath of the debt crisis has been a painful and costly process for the banks. From 1987 to 1992, the leading U.S. money center and regional banks charged off more than \$25 billion of their loans to restructuring country borrowers, or about one-third of their aggregate exposure at the end of 1987.⁵⁰ For the largest banks, these losses equaled two-thirds of these banks' capital at the start of the debt crisis.⁵¹

It is difficult to determine the extent to which the change in the debt strategy caused or contained these losses. Different views reflect largely unconfirmable hypotheses about what would have happened had another course been followed. In one view, shifting of the rules of the game to recognize that the loans were no longer fully collectible weakened the position of banks and created losses. This perspective imputes a strong role to the official community in arbitrating between countries and their creditors. By contrast, others maintain that banks were bound to incur losses anyway; providing official financing to help countries buy back their debts benefited banks by driving up prices and shifting risk to the official sector.⁵² One could also argue that the strategy helped all parties by encouraging greater economic efficiency.

A Brady bounce or a Brady dip?

One kind of evidence that bears on this problem is the reaction of secondary market debt prices to the Brady

initiative.⁵³ Secondary market prices have generally been on an upward trend since the launching of the Brady initiative; in particular, prices rose just after the proposal was announced (Chart 13). Some critics have pointed to such price behavior even against a background of continued steep discounts to suggest that the new plan was beneficial for banks, in some arguments to the exclusion of other parties.⁵⁴ However, any focus on the short-term movement immediately after the announcement needs to be tempered by awareness that the market anticipated the possibility of a tilt toward debt reduction well before Secretary Brady's March 1989 speech. Once this is taken into account, the initial reaction of the market to the change in approach appears on balance to be unfavorable. In particular, the free fall in secondary market prices from mid-1988 to the eve of Secretary Brady's speech must be regarded as at least partly reflecting fears that a change in strategy would adversely affect banks.⁵⁵ In the debate leading to the change in strategy, banks expressed concerns that any new approach be voluntary and that the Baker Plan's emphasis on policy reform continue. Secondary market prices did rise in the two months following Secretary Brady's speech as the official community worked out the details of the new approach, but this rebound offset the declines that had taken place only since December 1988, when President-elect Bush announced that the debt strategy was under review, and was still much smaller than the fall from mid-1988.

Buyback equivalent prices and post-deal price improvements
Brady deals can also be examined on a country-by-country basis to determine the effects on banks. The financial impact of Brady restructurings can be separated into two aspects: (1) the effective purchase price in the form of collateral and

⁵³ Because of the thinness of the secondary market before the launching of the Brady initiative, prices from this period might be regarded as unreliable. However, even after secondary market volumes increased in 1989 and 1990, trading stayed broadly in the ranges reached at end-1988, with prices rising somewhat in cases where economic performance was improving and falling where it did not.

⁵⁴ Conclusions about the implications of price movements for other parties, such as the borrowing countries, are generally based on strong assumptions that usually rule out the very efficiency gains that the reinforced strategy was seeking.

⁵⁵ In March 1989, the U.S. Treasury cited "heightened publicity on establishing debt facilities in the latter part of 1988" as one of the factors contributing to downward pressure on secondary market prices in the second half of 1988 (Department of the Treasury, "Interim Report to the Congress Concerning International Discussions on an International Debt Management Authority," in *Third World Debt—Reports and the Brady Plan*, Hearings before the Subcommittee on International Development, Finance, Trade and Monetary Policy of the House Committee on Banking, Finance and Urban Affairs, 101st Cong., 1st sess. [Washington, D.C.: GPO, 1989], p. 64). Clearly the decline reflected pessimism about the pre-Brady strategy. However, neither anticipation of a new approach nor clarification of how the strategy would change fully reversed the downward adjustment.

⁵⁰ Some charge-offs and provisions were made before 1987, but these were relatively insignificant compared with the post-1986 actions. Although some of these charge-offs are potentially recoverable because the banks have retained their legal claims, many are not because they reflect losses through swaps and sales.

⁵¹ In contrast, leading U.S. banks' net earnings on foreign operations, which include many activities unrelated to developing country lending, were on the order of \$1.1 billion per year in 1981-82.

⁵² See, for example, Bulow and Rogoff, "Cleaning up Third World Debt." Why creditors might or might not be better off is also discussed in W. Max Corden, "An International Debt Facility?" in *Analytical Issues in Debt*; and Michael Dooley, "Buy-Backs, Debt-Equity Swaps, Asset Exchanges, and Market Prices of External Debt," in *Analytical Issues in Debt*.

cash paid to compensate banks for forgone claims and (2) the returns on remaining exposure. Banks realize a benefit on market accounting when the effective purchase price is high compared with the prevailing secondary market price. However, even when it is low, they may be better off because of an induced capital gain on their remaining exposure due to a reduction in the amount of debt outstanding.⁵⁶

The effective pricing of the early deals was consistent with the low levels to which prices had fallen (Table 7). In the case of Mexico, the buyback equivalent price—that is, the price at which the same amount of cash could have purchased an equivalent amount of debt reduction through a buyback—was below the secondary market prices prevailing during the period of negotiations.⁵⁷ Despite a rise in

prices just before the agreement with Venezuela was reached, the buyback equivalent price was in line with the average price prevailing during the negotiation period.

Still, despite the relatively low compensation received by creditors for their reductions in nominal claims, they have benefited as their remaining exposure has appreciated in value. This recovery in prices was not immediate and it reflects a variety of factors, including some unrelated to the change in strategy. Undoubtedly the most important influence has been the increase in debt-servicing capacity. Since 1988, most Brady countries have increased their exports, lowered their fiscal deficits, curtailed inflation, and strengthened their balance of payments positions (Table 8).⁵⁸ The shift in strategy may well have encouraged such changes by making needed policy reforms more politically acceptable. The reduced debt burden magnified the effects of improvements in debt-servicing capacity on perceived creditworthiness, helping speed the return to market access. In addition, the securitization of remaining

⁵⁶ In fact, some have argued that banks could have been paid less in anticipation of a post-deal price rise. However, this would give rise to free rider problems because any single bank selling off its exposure would be worse off than those that did not.

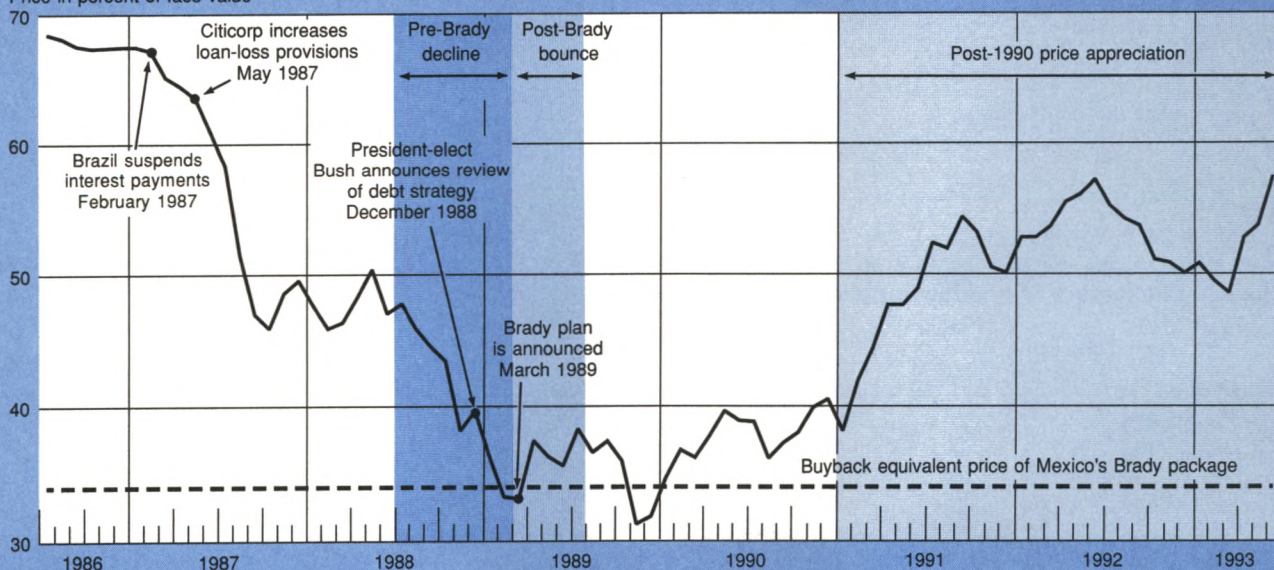
⁵⁷ The buyback equivalent price for a Brady package is the ratio of total up-front cash outlays for buybacks and collateral purchases to the present value of the exposure reduction by exiting banks. For a further discussion of buyback equivalent prices, see John Clark, "Evaluation of Debt Exchanges," International Monetary Fund, Working Paper no. 90/9, February 1990.

⁵⁸ The country that made the least progress in some of these areas, Brazil, is also the country that showed the weakest price performance.

Chart 13

Average Secondary Market Prices for Medium-Term Bank Debt

Price in percent of face value



Sources: Salomon Brothers; Federal Reserve Bank of New York staff estimates.

Notes: Index weights countries' debt prices by their share in total debt at the start of the period. The countries included are Argentina, Bolivia, Brazil, Chile, Colombia, Cote d'Ivoire, Ecuador, Mexico, Morocco, Nigeria, Peru, the Philippines, Uruguay, Venezuela, and Yugoslavia. Index reflects stripped prices (that is, prices adjusted to remove the effects of partial collateralization and interest reduction) following Brady restructurings.

claims greatly expanded liquidity (some Brady bonds are among the most actively traded instruments in the Euro-markets) and facilitated the entry of new investors into the market.

An important factor in the price rises not linked to the change in strategy has been the recent decline in global interest rates, particularly at medium- and long-term maturities. Lower rates raise the present value of future expected

Table 7

Evolution of Secondary Market Prices of Bank Claims on Selected Restructuring Countries

Cents per Dollar of Contractual Claim

Country	Secondary Market Prices					Memorandum Item: Buyback Equivalent Price of Brady Package
	Mid-1988	February 1989	Average during Negotiations [†]	Following Agreement in Principle	December 1992 [‡]	
Weighted Average[§] (excluding Chile)	48.3	31.9	34.3/38.3	41.8	46.8	33.6
Mexico	51.3	36.5	41.1	44.5	59.4	33.7
Costa Rica [¶]	14.7	13.5	13.0	16.0	34.1	17.4 [¶]
Venezuela	55.6	35.0	37.8	42.8	53.9	37.5
Uruguay	61.3	60.5	53.4	56.3	65.4	51.0
Nigeria	29.5	22.0	29.1/36.1	44.6	39.5	39.0
Philippines (1990)	54.8	42.8	47.4	51.5	54.7	50.0
Philippines (1992)				53.3		46.2
Argentina	26.5	19.0	21.1/39.3	44.8	48.0	29.9 [¶]
Brazil	52.1	30.0	29.5/34.2	35.9	29.5	28.5 ^{††}
Chile	61.6	59.5	N.A.	N.A.	93.0	N.A.

Sources: Salomon Brothers; Federal Reserve Bank of New York staff estimates.

[†]Average price from March 1989 until agreement in principle. In cases where formal negotiations did not begin in 1989, the second price is the average during the period of formal negotiations.

[¶]Reflects weighted average price of new instruments issued under debt exchanges. In cases where buybacks were included, the price includes the buyback price weighted by the share of debt allocated to the buyback option.

[§]Prices are weighted by shares in total debt to commercial banks as of end-1986.

[¶]The buyback equivalent prices for Argentina and Costa Rica do not reflect down payments made at closing against interest arrears. Inclusion of these costs would raise the Argentina price by around 5 cents and the Costa Rica price by about 2 cents.

^{††}The estimated price for Brazil reflects bank choices among options and interest rates prevailing in July 1992, when the terms of the package were agreed upon in principle. The actual cost of the package may be higher because of subsequent declines in long-term interest rates that have raised the cost of thirty-year zero coupon bonds.

Table 8

Selected Indicators of Economic Policy Performance

	Inflation (Annual Percent Change in Consumer Price Index)			Primary Fiscal Balance [†] (Percent of GDP)			Cumulative Export Growth [‡] (1988-92)
	1988	1989-91	1992	1988	1989-91	1992	
Mexico	51.7	22.8	11.9	8.0	7.1	5.6	47.5
Costa Rica	25.3	20.8	17.0	2.5	1.5	4.3	60.6
Venezuela	35.5	49.5	31.9	-6.1	3.5	-1.2	33.2
Uruguay	69.0	99.9	58.9	-0.4	1.3	3.4	36.5
Nigeria	64.7	23.8	48.8	-2.9	6.5	1.8	78.0
Philippines	9.0	15.0	8.1	2.7	3.6	4.6	62.4
Argentina	387.5	2,119.0	17.7	-0.6	0.3	1.4	33.0
Brazil	1,006.5	1,302.9	1,156.4	-0.4	1.5	2.0	11.7
Chile	12.2	22.5	12.8	5.0	5.5	4.6	53.4

Sources: International Monetary Fund, *International Financial Statistics*; Federal Reserve Bank of New York staff estimates.

[†]Excludes privatization receipts.

[‡]Exports of goods and services.

net debt service payments.⁵⁹ In addition, lower global rates raise the prospects for productive new inflows as yield-sensitive investors seek alternatives to industrial country investments. These new inflows in turn can raise debt-servicing capacity, increasing the value of existing debt.⁶⁰

The emerging markets fixed income business

Finally, the Brady operations have helped create a new industry focused on investments in countries that have restructured their debts. The operations catalyzed a restoration of market access and encouraged the emergence of a vibrant secondary market for restructured claims. Secondary market trading rose more than sevenfold from 1988 to 1992, reaching about \$0.7 trillion during the latter year.⁶¹ On the fixed income side, the main lines of business include investing and trading in Brady bonds and Brady-eligible medium-term bank claims, and underwriting and investing in new international bond, commercial paper, and certificate of deposit issues.⁶² In addition, derivatives underwriting has expanded in recent years. In some cases, the increased investor interest has spilled over into domestically issued debt instruments as well, principally those of Mexico and Argentina.

Most of the income earned in these markets accrues directly in the form of yield spreads and capital gains to investors willing to put their capital at risk. However, ancillary noninterest income opportunities have arisen as well from market making and underwriting. Although banks have captured a large, although shrinking, share of the noninterest income, they generally have been reluctant to expand their exposure significantly. Most of the growth in claims has been taken up by an expanding pool of nonbank investors.

The experience of late-restructuring countries

The early Brady deals (Mexico, Venezuela, Costa Rica) were priced at levels that reflected skepticism about the effectiveness of the new approach. However, as the early

reformers, particularly Mexico and Chile, demonstrated how policy reform and debt reduction could lead to restored market access and sustainable growth, and as the interest rate outlook improved, a reassessment took place.

For late-restructuring countries, including those yet to negotiate a Brady deal, this reappraisal represents a mixed blessing. These countries have been helped by the enhanced credibility given to needed structural reforms, which makes their adoption more likely, and by the acceleration of their return to the market. Hence, their debt-servicing capacity has improved. However, this reappraisal has also tended to push up the price at which banks are willing to reduce their claims.⁶³ For example, market participants cited this demonstration effect to explain market bullishness in third-quarter 1991 for claims on countries in the earlier stages of policy reform and debt restructuring.

Late restructuring countries also face more of an uphill debt-servicing path because of their past interest arrears. Banks have taken a harder line on the treatment of interest arrears relative to principal, as part of their strategy of discouraging forced relief through such arrears. For example, in the bank packages for Brazil and Argentina, refinanced interest arrears were excluded from principal or interest reduction and carried maturities of ten to twelve years in contrast to maturities of as long as thirty years for restructured principal. As a consequence of not granting as flat a repayment profile as that accorded Mexico, the banks have effectively maintained a claim on these countries' expected increases in market access over the medium term.⁶⁴

Conclusion

Since the emergence of the developing country debt crisis in 1982, policymakers have sought to avert systemic threats to the international financial system, to gain time for debtor

⁵⁹ The value of a country's external debt may be viewed as a function of the portion of export receipts or national income that the country is presumably willing to devote to the debt's servicing in the future. When the discount rate is lowered, the present value of any future path of service payments rises.

⁶⁰ Of course, this outcome requires that the inflows be channeled into activities with appropriate returns.

⁶¹ For estimates of the growth in trading volumes based on periodic surveys of market participants, see Richard Voorhees, "A Trillion Dollar Market," *LatinFinance*, no. 45, pp. 49-62. The 1992 estimate is taken from the Emerging Markets Traders Association's (EMTA) survey of market participants. The EMTA estimate does not adjust for double counting; see "EMTA Volume Study: Brazil, Mexico Grab Top Spots in \$734 Billion Debt Market," *LDC Debt Report*, October 4, 1993, p. 7.

⁶² For a discussion of recent developments in equity flows, see John Mullin, "Emerging Equity Markets in the Global Economy," Federal Reserve Bank of New York *Quarterly Review*, Summer 1993.

⁶³ In many cases, before recovering, the prices of claims on the late-restructuring countries fell well below the buyback equivalent price of the Mexican Brady package. Note that fears that countries might drive down the price of their debt so as to purchase it subsequently on the cheap do not appear to have been borne out. Banks have used arguments of precedence to resist offering more generous terms to late-restructuring countries; the power of precedent has pushed buyback equivalent prices of debt exchanges to conform more closely to those offered Mexico. Countries that did not adopt strong adjustment programs generally lacked the resources to complete comprehensive restructuring operations because direct support from official creditors was not available. When countries that had been incurring interest arrears showed signs of moving toward a debt operation, debt prices tended to recover sharply. As a result, the effective prices of the bank packages reflected precedent, expected future debt-servicing capacity, and up-front enhancements rather than past debt-servicing history.

⁶⁴ Although capturing the benefits of the improved outlook for capital inflows might not have directly informed banks' negotiating positions on the treatment of interest arrears, countries surely considered the outlook for future flows in deciding whether to agree to the banks' terms. Moreover, it seems reasonable to expect that banks as negotiators attempted to anticipate countries' positions. Hence, in this way, the outcomes on the arrears restructurings reflected the more optimistic outlook.

countries to build up their debt-servicing capacity and get back on a sustainable growth path, and to restore countries' access to the international capital markets. Advances toward these goals were uneven under the new money strategy, and the process proved less and less workable over time. Designed to address these shortcomings, the Brady approach has achieved impressive results. The Brady restructurings did not achieve significantly more near-term cash flow relief for debtors than the previous approach. But they did provide a more stable long-run

financial framework that, in combination with structural reforms by debtors and a favorable environment of lower global interest rates, helped to restore market access.

Although there has been a remarkable turnaround in the market's assessment of restructuring countries, significant risks remain. Debt service obligations remain heavy for the Brady countries. While the restoration of market access is helpful, the key to sustained growth and creditworthiness continues to be sound macroeconomic policies complemented where needed with further structural reforms.

Index Amortizing Rate Swaps

by Lisa N. Galaif

As short-term interest rates have declined over the past several years, investors have increasingly sought higher yielding investment vehicles. The index amortizing rate (IAR) swap is one of several new instruments that have been developed in response to this investor demand for yield enhancement. An IAR swap is an interest rate swap based on a notional principal amount that may decrease over time in accordance with the path of future interest rates.¹

The IAR swap market has grown rapidly since its inception in 1990, achieving a market size in late 1993 estimated at \$100 billion to \$150 billion notional principal. IAR swaps should continue to be popular because they can be an attractive investment under certain interest rate scenarios and a good hedging vehicle for dealers' written options exposures.

This article explains the structure and pricing of IAR swaps, the risks associated with the product, and the uses as well as the growth prospects for the market. We find that while the product has advantages for dealers and investors, its complexity may be a drawback. To price and hedge IAR swaps, dealers must use highly technical models with parameters whose values are difficult to forecast. Investors may have trouble comparing the risk-return tradeoffs of an IAR swap with those of more liquid and traditional instruments.

The structure of IAR swaps

An IAR swap is an over-the-counter contract between two parties to exchange interest payments—one based on a fixed rate and the other on a floating rate—on an amortizing notional principal amount. Like the so-called plain vanilla

interest rate swap, the IAR swap involves no exchange of principal. But unlike the plain vanilla swap, whose net interest payments are made on a fixed notional amount, the IAR swap calls for net interest payments made on a notional principal balance that may decrease over the life of the swap. The rate at which the notional principal amount decreases will vary with a specified short-term interest rate according to a schedule predetermined by the two parties. In general, however, notional principal amortizes more quickly when short rates fall and more slowly when short rates rise.²

In a typical IAR swap, an end-user³ (or fixed rate receiver) receives interest payments based on the fixed rate while paying the dealer (or fixed rate payer) floating interest indexed to three-month LIBOR. The amortizing notional amount on which both interest payments are based is typically \$100 million at origination. Net interest payments are most often made quarterly throughout the life of the swap, just as they are in a plain vanilla swap.

The standard contractual maturity for an IAR swap is five years with a two-year "lockout" period, meaning that the swap does not start amortizing until the beginning of the third year. The amortization schedule is usually designed so that if short-term interest rates remain unchanged, the IAR swap will have a life of about three years. However, if the floating rate index falls sufficiently, the swap could fully amortize at the end of the lockout period. Alternatively, if rates rise, the swap would amortize at a slower rate and

¹ The IAR swap is also known as an index principal swap (IPS) or an index amortizing swap (IAS).

² Despite the use of the term "amortization" by market participants, the amortization of notional principal does not imply payment of principal; it refers to the declining notional principal amount on which interest payments are based.

³ An end-user or customer is typically an institutional investor such as an insurance company, bank, or mutual fund.

have a longer than expected maturity, perhaps reaching its five-year maximum life. The variable maturity of an IAR swap is another feature distinguishing it from a plain vanilla swap, which has a fixed maturity date.

Table 1 presents a typical IAR swap amortization schedule. If LIBOR remains at 4.50 percent, the swap amortizes by 80 percent per year after the lockout period; if LIBOR rises to 5.50 percent, the swap amortizes at 30 percent per year. Alternatively, if LIBOR drops to 3.50 percent, the swap amortizes at 100 percent in year 3. This particular schedule assumes yearly amortization, although quarterly amortization is also common in IAR swap schedules.

Changes in future short-term interest rates affect the

swap in three ways: they 1) directly affect future net interest payments, 2) indirectly affect future net interest payments by changing the principal amount on which interest calculations are based, and 3) alter the maturity of the swap.

The interest rate scenarios presented in Table 2 illustrate how the notional principal of an IAR swap amortizes given the schedule set forth in Table 1. If future interest rates follow LIBOR path 2 (case 2), then, in year 3, \$800 of the notional principal amortizes, reducing the remaining notional principal to \$200.⁴

An IAR swap's maturity is usually described in terms of a weighted average life because the instrument's maturity and notional principal may vary. First, the date of the swap's last payment will vary with the path followed by short-term interest rates. Second, the date of the last payment can be a misleading representation of the swap's maturity because the remaining notional principal is also variable. Consider, for example, two IAR swaps that originate with the same notional principal of \$100. While both may end after three years, one may end with a notional principal amount of \$60 while the other may end with a notional amount of \$30. The weighted average life of an IAR swap is calculated by summing the percentage of the remaining notional principal amounts over each interest rate path. These amounts are then averaged across the possible paths. Note that the weighted average life is simply used to describe the instrument's maturity. It is not used for pricing and hedging because it does not describe the actual cash flows with sufficient precision.

Table 1

Amortization Schedule of Typical IAR Swap

LIBOR* (Percent)	Change in Basis Points	Amortization Rate (Percent)
3.50	-100	100
4.50	0	80
5.50	+100	30
6.50	+200	10

Notes: The amortization rate in the table is based on annual changes in LIBOR. The terms and conditions of the IAR swap illustrated here are as follows:

Notional amount: \$1,000
Fixed rate: 4.745 percent
Lockout period: 2 years
Final maturity: 5 years
Payment frequency: Annual
Amortization: After the lockout period, yearly amortization of remaining notional principal balance based on changes of yearly LIBOR.

* The initial spot rate is 4.50 percent.

⁴ Given an interest rate of 4.50 in year 3 (case 2), the amortization schedule specifies that \$800 of the notional principal will amortize. This amortization leaves \$200 in remaining notional principal at the end of year 3. In this example, the amortization rate applies to the current outstanding notional principal.

Table 2

IAR Swap Notional Principal Balance

Notional Principal Given Various LIBOR Paths

Paths	Year:	0-1†	1-2†	2-3	3-4	4-5
Case 1: declining rates						
LIBOR		4.50	4.00	3.50	3.25	3.00
Notional principal		1,000	1,000	0	0	0
Case 2: stable rates						
LIBOR		4.50	4.50	4.50	4.50	4.50
Notional principal		1,000	1,000	200	40	8
Case 3: rising rates						
LIBOR		4.50	5.01	5.53	5.82	6.13
Notional principal		1,000	1,000	705	539	445

Notes: Amortization is applied to the remaining notional principal balance of the previous period and is based on the schedule in Table 1. Amortization for rates not given in Table 1 is computed through linear interpolation.

† No notional principal amortization during two-year lockout period.

Optionality of an IAR swap

The amortizing feature of an IAR swap is an implicit call option that essentially gives the fixed rate payer the right to “call” or cancel a portion of the swap (according to the pre-determined schedule) if interest rates decline substantially. The fixed rate payer in an IAR swap thus owns an implicit option analogous (but not identical) to the prepayment option in a callable bond or mortgage security. For this right, the fixed rate payer pays a yield premium for the implicit option. However, in contrast to the embedded options on long-term rates in callable bonds and mortgage securities, the implicit options in an IAR swap are usually options on short-term interest rates.⁵

Because an IAR swap’s behavior is dependent on the path of interest rates, the exact set of interest rate options embedded in an IAR swap are difficult to determine directly from the amortization schedule. Instead, these implicit options must be determined indirectly from interest rate models that estimate the IAR swap’s exposure profile in different interest rate scenarios. For example, in Table 2, the amount of notional principal remaining in case 2, year 4, depends not only on the short-term rate that will prevail in year 4, but also on the rate that will prevail in year 3. Hence, it is not always possible to purchase the correct number of options or futures contracts in year 1 to hedge the cash flow risk in year 4, since the exposure in year 4 depends on the intermediate path of future interest rates. Specifically, dynamic hedging is required as the exposures to be hedged change with each period.

Behavior of IAR swaps when interest rates change

Like a plain vanilla interest rate swap, an IAR swap has a present value for the fixed rate receiver that will fall when interest rates rise and increase when interest rates fall. However, the magnitude of these changes for an IAR swap and a plain vanilla swap differs because of the option-like behavior of the IAR swap. Specifically, when rates fall, the gain in an IAR swap’s value is smaller than the gain in a plain vanilla swap’s value; when rates rise, the loss in value of an IAR swap exceeds that of a plain vanilla swap.

The chart illustrates the performance difference between an IAR swap and a plain vanilla interest rate swap (of the same maturity as the expected maturity of the IAR swap) from the perspective of the fixed rate receiver. When long and short rates move together (producing parallel shifts of the yield curve), the IAR swap outperforms the plain vanilla interest rate swap in a stable interest rate environment and underperforms it in a volatile environment. In other words, if interest rates do not change by a large amount, an IAR swap offers the investor a more favorable fixed rate of return than the plain vanilla swap because of the option premium embedded in the IAR swap’s fixed rate.

⁵ Thus, IAR swaps are not ideal hedges for mortgage securities unless perfect correlation exists between long-term and short-term rates.

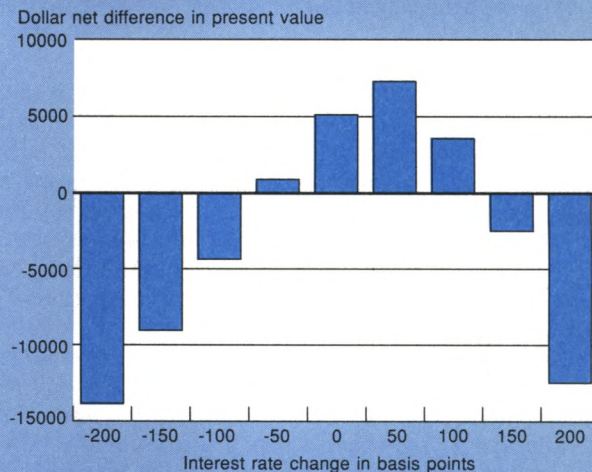
However, for large parallel shifts in the yield curve, the IAR swap will provide a lower return than the plain vanilla swap. If both short and long rates fall, the IAR swap will amortize rapidly after the lockout period, subjecting the IAR swap’s fixed receiver to reinvestment losses at the lower rates. If both short and long rates rise, the amortization rate will slow, lengthening the maturity. In this scenario the fixed rate receiver is paid a below-market fixed rate for a longer period than would be the case in the plain vanilla swap.

As the chart shows, if the net present value of the plain vanilla swap is subtracted from the net present value of the IAR swap, the difference is similar, but not identical, to the exposure profile of a short straddle.⁶ In other words, an IAR swap can be thought of as a plain vanilla swap (of the same maturity as the expected maturity of the IAR swap) combined with a collection of interest rate options written by the fixed rate receiver that replicate the “straddle-like” exposure in the chart. For the fixed rate receiver, the option premium

⁶ A short straddle is a collection of written interest rate options. Some pay off when rates rise, while others pay off when rates fall.

Our chart is modeled loosely on a chart that appeared in *Derivatives Week*, vol. 2, no. 3 (January 25, 1993).

Net Difference between an Index Amortizing Rate Swap and an Interest Rate Swap from the Perspective of a Fixed Rate Receiver



Notes: The net difference equals the present value of the cash flows of the IAR swap along the given interest rate path minus the present value of the cash flows of the interest rate swap along the same interest rate path. The interest rate changes are based on parallel shifts in the yield curve. The weighted average life for the IAR swap is three years, with a contractual maturity of five years and a two-year lockout period. The maturity of the interest rate swap is three years. The original notional principal for both the IAR swap and the interest rate swap is \$1,000,000. The fixed rate on the IAR swap is 4.745 percent and the fixed rate on the interest rate swap is 4.50 percent.

embedded in the fixed rate of the IAR swap causes the IAR swap returns to exceed the plain vanilla swap returns when interest rates stay within a narrow range (because the option is not exercised). But when rates either fall or rise by a large amount, some of the embedded options will be exercised against the fixed rate receiver, thus causing the returns from the IAR swap to fall short of the returns from the plain vanilla swap.

Nonparallel shifts in the yield curve

The embedded options in an IAR swap have complex features that become apparent as soon as nonparallel yield curve changes are considered. If long rates rise and short rates fall, an IAR swap outperforms a plain vanilla swap from the perspective of the fixed rate receiver.⁷ As short rates decline, an IAR swap amortizes faster, allowing the fixed rate receiver to enter into another swap at a higher long-term fixed rate, whereas the owner of a plain vanilla swap will continue to hold an instrument that now pays a below-market fixed rate.

Similarly, if long rates fall and short rates rise, the IAR swap will also outperform the plain vanilla swap for the fixed rate receiver. As short rates rise, the IAR swap amortizes at a slower pace, enabling the fixed rate receiver to continue receiving an above-market fixed rate for a longer period. In contrast, the owner of a plain vanilla swap experiences reinvestment losses at the now lower long-term fixed rate when the plain vanilla swap matures.

Pricing of IAR swaps

In principle, the fixed rate of an IAR swap is set at the level that gives the swap an expected net present value of zero at origination. That is, the IAR swap is priced by taking the swap's net cash flows over each of the possible paths of LIBOR rates (in Table 3, three equally likely paths) and solving for the fixed rate that makes the average present value of the net cash flows equal to zero. In practice, all pricing models apply weights to the possible paths. To maintain the internal consistency of the pricing model, these paths and their weights are chosen so that arbitrage possibilities are eliminated.

Table 3 illustrates the difference in pricing between an IAR swap and a plain vanilla swap. Consider an IAR swap with a \$1,000 initial notional principal and the amortization schedule presented in Table 1. The cash flows calculated in the example are from the perspective of the fixed rate receiver. For simplicity, assume that the possible future paths of LIBOR rates are the three paths indicated by cases 1, 2, and 3. Case 2 is the path of LIBOR rates implied by forward rates derived from the initial yield curve, and the other two paths are possible alternative interest rate paths.

The price (or the fixed rate) of the plain vanilla swap is the fixed rate that causes the present value of the fixed payments to equal the present value of floating payments as forecast by the initial forward rates.⁸ The fixed rate of the IAR swap is 4.745 percent, while the fixed rate of the plain vanilla interest rate swap is 4.50 percent. In effect, the 24.5 basis point difference between the two rates represents the value of the implicit options in the IAR swap.

The complexity of the IAR swap's valuation process is itself a source of uncertainty. Market participants will use different assumptions about volatilities, future interest rate paths, and the correlations between long and short rates in their IAR swap interest rate models. These different assumptions can create larger price variations between different market participants' pricing models for IAR swaps than is the case with plain vanilla interest rate instruments, which are priced using the observable yield curve.

Risk issues

Price risk

The greatest risk for an investor (that is, fixed rate receiver) in an IAR swap is the opportunity cost of holding an IAR swap in the event of a significant interest rate move up or down. If short rates rise sufficiently, the net payout for the fixed rate receiver (end-user) can become negative if the amount of the floating rate payment exceeds the amount of the fixed rate receipt. This interest rate risk is amplified in an IAR swap because as rates rise, the swap's amortization slows and the fixed rate receiver may have a negative cash flow for a longer period.

Since the birth of the IAR swap market in 1990, short-term rates have declined. Thus, most IAR swaps initiated to date have ended immediately after the lockout period, and the behavior of IAR swaps in a rising rate environment has not yet been tested.⁹

Many end-users may find it difficult to determine precisely the risk-return tradeoff provided by IAR swaps. The exact set of interest rate options embedded in an IAR swap is not easily identified because of the IAR swap's path-dependent nature. Hence, buyers cannot go to an exchange and price a specific set of options equivalent to those embedded in the IAR swap. As a result, fixed rate receivers will have a difficult time judging whether or not they have received the appropriate premium for the implicit options

⁸ Alternatively, the plain vanilla swap can be priced over the same set of possible interest rate paths used in pricing the IAR swap. If these interest rate paths satisfy a consistency condition known as the "arbitrage-free" condition—a requirement that profitable, riskless strategies be ruled out—then the two pricing methods for the plain vanilla swap will produce the same price.

⁹ Recently, barrier-type options called "knock-outs" have been offered on some IAR swap contracts. A knock-out clause typically states that if interest rates rise above a certain level (the knock-out rate), the swap will terminate automatically. This feature effectively eliminates the extension risk for the end-user. However, these contracts are expensive and thus tend to defeat the yield-enhancement feature of the IAR swap.

⁷ In reality, medium-term rates of under five years are relevant for IAR swaps because the contractual maturity in most IAR swaps is five years or less.

they have sold, because they lack readily apparent and equivalent market prices for the set of options embedded in an IAR swap.

Hedging risk

To hedge IAR swaps, dealers use interest rate term structure models that incorporate several assumptions about the volatility of rates and the correlation of movements in short and long rates. As a first step, the dealers estimate the IAR swap's exposures with an interest rate model.¹⁰ Next, they take into account the offsetting exposures already in their portfolios to determine a residual exposure. These residual exposures (both to changes in interest rate levels and changes in interest rate volatilities) are then hedged, usually using Eurodollar futures and interest rate options.

An interest rate model is required for hedging because,

as mentioned previously, the exact structure of the interest rate options embedded in an IAR swap cannot be easily determined from the swap's amortization schedule. The path-dependent nature of the IAR swap requires dealers to use interest rate models to "reveal" and then dynamically hedge the swap's embedded options because the path-dependency of these options cannot be replicated by any simple buy-and-hold options portfolio. Moreover, dealers must use sensitivity analysis or simulations of both the IAR swap and the rest of their portfolios to determine the degree to which the IAR swaps and other exposures in the portfolio offset each other. Hence, hedging the IAR swap's exposures depends on the reliability of the interest rate model used in the simulations.

Model risk

Estimating the true profitability over time of an IAR swap can be difficult. Because of the IAR swap's path-dependent behavior, the instrument cannot be easily broken down into

Table 3

Comparison of the Pricing of an IAR Swap and a Plain Vanilla Swap

Year	Forward Rate (Percent)	Notional Principal	Fixed Payment [†]	Floating Payment [‡]	Net [§]	Present Value of Net	
IAR swap pricing							
Case 1							
0-1	4.50	1,000	47.45	45.00	2.45	2.35	
1-2	4.00	1,000	47.45	40.00	7.45	6.85	
2-3	3.50	0	0.00	0.00	0.00	0.00	
3-4	3.25	0	0.00	0.00	0.00	0.00	
4-5	3.00	0	0.00	0.00	0.00	0.00	
						Sum 9.20	
Case 2							
0-1	4.500	1,000	47.45	45.00	2.45	2.35	
1-2	4.500	1,000	47.45	45.00	2.45	2.24	
2-3	4.500	200	9.49	9.00	0.49	0.43	
3-4	4.500	40	1.90	1.80	0.10	0.08	
4-5	4.500	8	0.38	0.36	0.02	0.02	
						Sum 5.12	
Case 3							
0-1	4.50	1,000	47.45	45.00	2.45	2.35	
1-2	5.01	1,000	47.45	50.10	-2.65	-2.41	
2-3	5.53	705	33.45	38.99	-5.54	-4.79	
3-4	5.82	539	25.58	31.37	-5.79	-4.73	
4-5	6.13	445	21.12	27.28	-6.16	-4.74	
						Sum -14.32	
Average [¶]	=	(9.20	+	5.12	+	-14.32)	÷3 = 0.00
Plain vanilla swap pricing ^{††}							
1	4.50	1,000	45.00	45.00	0.00	0.00	
2	4.50	1,000	45.00	45.00	0.00	0.00	
3	4.50	1,000	45.00	45.00	0.00	0.00	

[†] Fixed payments are calculated by multiplying notional principal by 4.745 percent.

[‡] Floating payments are calculated by multiplying notional principal by LIBOR.

[§] Net is the difference between the fixed and floating payments.

[¶] The average is calculated under the assumption that the three possible LIBOR paths are equally likely.

^{††} Since the average life of this IAR swap is approximately three years, the comparable swap is the three-year plain vanilla swap.

pieces that look exactly like other instruments whose prices are known. Hence, the product's valuation depends critically on interest rate models. This dependence on interest rate models and the possibility of mispricing is known as "model risk."

The set of possible interest rate paths over which an IAR swap is priced and valued is usually generated using one or two factor interest rate models. One factor interest rate models implicitly assume perfect correlation between changes in short and long rates. Two factor interest rate models, by contrast, can simulate imperfectly correlated short- and long-term rates. In this respect, two factor models would appear to provide better representations of the term structure than one factor models. Two factor models, however, require their users to make explicit assumptions about the correlation between separately varying short- and long-term rates. If inappropriate assumptions are made, then a two factor model's results can be less accurate.

The pricing models must also rely on assumptions about the volatility of short- and long-term rates. Assumptions about volatility, like those concerning the correlation of short and long rates, make IAR swaps difficult to "mark to market" and to hedge. The correlation of rates, however, is an especially difficult parameter to forecast, and problems can arise because pricing model results are particularly sensitive to the assumed magnitude of the correlation. For example, the assumptions about correlations can have a substantial impact on the level of the fixed rate determined by the model.

Closely related to model risk is "personnel risk." When the IAR swap market was first formed, finding personnel familiar with the instrument's pricing and hedging demands was difficult. In some cases, only one trader at an institution may have been familiar with IAR swap pricing models. If that trader left the firm, a knowledge gap could arise, making the risk management of outstanding IAR swap positions more difficult. Fortunately, personnel risk tends to diminish as a product matures and market participants become more familiar with the instrument's behavior in a variety of market conditions.

Liquidity risk

For end-users, significant illiquidity exists in the IAR swap market because of the difficulties of hedging and the customized nature of the instrument. Because only dealers with sizable interest rate option exposures can successfully compete in the IAR swap market, only a handful actively trade this product. Smaller dealers, who generally lack sizable interest rate options positions, find it more difficult to hedge IAR swaps in a cost-effective way and typically execute these swap deals only if they can earn a substantial margin up front. Without a sizable interest rate options book, small dealers would have to sell options in the market to offset their IAR swap positions.

Dealers have expressed their willingness to make a secondary market in this product for customers, but as of yet an active secondary market has not developed.¹¹ Normal industry practice is for the initiating dealer to make a bid to the customer who wants to liquidate an existing contract. But if the dealer chooses not to buy back the swap from an end-user and the end-user is unable to find another dealer to assume the swap, the end-user cannot easily liquidate or offset the position. Hedging, instead of unwinding, would be difficult for most end-users because the precise nature of the exposure to be hedged can be discovered only with an interest rate model, which IAR swap end-users normally do not possess.

Credit risk

Principal risk is not present in an IAR swap because there is no principal investment (as there is in mortgage securities). Hence, potential credit losses are limited to the net exchange of interest payments over the remaining life of the swap. Like plain vanilla interest rate swaps, IAR swaps are priced with a zero net present value at inception. As short-term interest rates change, the net interest payments will acquire a net positive or negative present value. This present value is the credit exposure between the two counterparties and is usually only a small fraction of the notional principal. Thus, IAR swaps pose no additional or fundamentally different credit or settlement risks than those already present in the plain vanilla interest rate swap.

The market for IAR swaps

The number of dealers currently active in the IAR swap market is small but growing. While major U.S. securities firms dominate the market, U.S. money center banks and foreign bank subsidiaries also participate in the market. New York is the market center for IAR swaps, and most IAR swaps are denominated in U.S. dollars. The low short-term interest rate environment in the United States has no doubt been more conducive to the development of the IAR swap market than have other countries' interest rate environments. If the yield curves of other countries begin to steepen, however, investors may begin to use IAR swaps pegged to non-U.S. rates.

Initially, regional banks were the primary end-users of IAR swaps. Much of the recent growth in demand, however, has come from mutual funds, insurance companies, and other institutional investors.

Uses of IAR swaps

For dealers with sophisticated risk management systems, IAR swaps provide offsets to the exposures arising from

¹¹ Secondary market liquidity has yet to be tested in the swaps initiated before or during 1991 because these swaps ended immediately after the lockout period owing to a dramatic drop in rates over the past two years.

their over-the-counter interest rate options business. As fixed rate payers, the dealers own the options embedded in the IAR swap. Hence they can use these options to hedge their written interest rate option positions as well as other exposures in their interest rate swap book.

From the viewpoint of investors such as mutual funds, insurance companies, and regional banks, IAR swaps provide enhanced yields in a low interest rate environment. These investors, as writers of the options embedded in IAR swaps, are essentially speculating that interest rate changes will be less volatile than buyers of the embedded options expect. In other words, these investors are betting that short- and medium-term rates will remain unchanged or will rise more slowly than predicted by the forward curve. If this scenario does in fact occur, investors will receive an above-market fixed return over the life of the swap from the premiums on the unexercised implicit options that they sold in the swap.

Investors also find IAR swaps to be a useful substitute for mortgage-related securities such as collateralized mortgage obligations (CMOs) and pass-throughs. IAR swaps offer mortgage-bond-type yields and a similar risk profile, but remove the idiosyncratic portion of prepayment risk associated with mortgage securities. Idiosyncratic prepayment risk refers to risk not directly related to changes in interest rates. For example, the need to relocate or a death in the family may prompt a homeowner to prepay a mortgage in what would otherwise seem to be an unfavorable interest rate environment. IAR swaps eliminate risks of this kind, leaving only the interest-rate-sensitive portion of prepayment risk.

For many end-users, the IAR swap combined with a position in Treasury securities provides additional advantages over owning CMOs and other types of cash mortgage instruments. IAR swaps offer a less uncertain absolute final maturity than do CMOs, and as a result, they have a more predictable weighted-average-life profile than CMOs and other mortgage assets. IAR swaps also have fewer operational complexities than mortgage securities. For example, the IAR swaps' typical quarterly pay structure is easier to track than the pay structure of mortgage-backed securities, whose principal and interest payments must be recalculated monthly as prepayment rates change.

By entering into an IAR swap while holding Treasury securities, a regional bank can increase its liquidity while receiving yields similar to those of a CMO and maintaining an interest rate exposure comparable to a mortgage product's. Dealers' marketing materials for IAR swaps also emphasize "capital efficiency," suggesting that some regional bank end-users use IAR swaps to reduce capital requirements. A position combining government securities and an IAR swap has low capital requirements that can offer advantages over the purchase of similar short-dated CMO securities. Note, however, that this difference in capi-

tal requirements is justified by the lack of any principal risk in the IAR swaps.

Size and growth prospects

The IAR swap market has been expanding rapidly for the past two years, showing particularly fast growth through the first half of 1993. An estimated \$100 billion to \$150 billion in notional principal has been originated since 1990. It is unlikely that this expansion will slow markedly unless the yield curve flattens dramatically.

The market for IAR swaps to date is almost completely one-way in nature. Dealers are almost exclusively the fixed rate payers (buyers of the embedded options), and end-users are almost exclusively the fixed rate receivers (writers of the embedded options). Recently, however, a small interdealer market has developed and a modest number of transactions have been completed through interdealer brokers.

Although the market seems to be expanding and maturing, growth could ultimately be limited by dealers' inability to sell the embedded options they have purchased by paying the fixed rate. Dealers must manage their options risk and thus do not want a large net long or net short options position. Dealers may be forced to cease writing IAR swaps if they cannot use the purchased options to hedge other written option risk or if they cannot resell the long options exposures. The cost of hedging the residual exposures created by unmatched positions can become prohibitive, especially as the IAR swap market becomes more competitive and the cost of the embedded options begins to increase.¹² In fact, some dealers have shown reluctance to originate new transactions because the difficulties of hedging and evaluating the prospective profitability of these instruments become more critical as spreads narrow.¹³

Conclusions

IAR swaps have proved useful to both investors and dealers. Investors in this instrument can acquire a position that pays off if rates rise more slowly than predicted by the forward curve. Investors in the swaps have also earned enhanced yields comparable to those on mortgage bond securities while remaining exempt from the idiosyncratic portion of the prepayment risk embedded in mortgage securities. Through IAR swaps, investors have been able to earn short-dated mortgage-type yields for at least two

¹² If dealers were able to sell all of the IAR swaps' embedded options, they would not be forced to go to the Eurodollar futures market to hedge residual risk not offset within their portfolio of other options. Alternatively, if a two-way market for IAR swaps existed, dealers would be able to receive the fixed rate and create a natural hedge for those existing IAR swap positions where they are the fixed rate payer.

¹³ The rating agencies have prohibited dealers from placing IAR swaps in their special-purpose AAA-rated swap subsidiaries. The agencies cite concerns that the one-way nature of the IAR swap market would make it more difficult to unwind such a swap book in a timely manner.

years, while many cash mortgage securities have prepaid. Dealers with large interest rate options books have found IAR swaps attractive as an alternative instrument for hedging the exposures arising from their over-the-counter options business. In other words, IAR swaps have created a natural offset for most dealers' net short positions in options, thereby helping dealers to meet the market's demand for interest rate options.

Most of the risks associated with IAR swaps are similar to those of other instruments. The IAR swap poses the same threat of negative cash flows as plain vanilla interest rate swaps or equity-index swaps, along with prepayment and reinvestment risks similar to those of mortgage securities. Nevertheless, while IAR swaps pose few unique risks for most market participants, significant problems may materialize in a portfolio with a high concentration of IAR swaps.

Certainly, model risk figures more prominently in IAR swaps than in other kinds of instruments. Pricing and hedging IAR swaps require highly technical interest rate models, and the absence of benchmark market prices and the instrument's relatively long life mean that pricing model inaccuracies may not become immediately apparent. A dealer who enters the market without strong technical expertise may encounter problems arising from mispricing and mishedging. Risk management systems in place for plain vanilla interest rate swaps and options may not be

sufficient to handle the complexity of IAR swaps. A firm's internal risk control unit must be capable of accurately monitoring the trading desk's pricing and hedging models for IAR swaps. In sum, dealers who are active in the IAR swap market need considerable technical knowledge as well as strong risk management systems.

The variable maturity feature of IAR swaps requires that an institution's risk management system take proper account of longer term exposures embodied in these instruments. For example, excessive emphasis by management on short-term trading results may create incentives to enter into IAR swaps strictly for short-term yield enhancement or trading gains, without consideration of the long-term performance results of the instrument. Note, however, that this problem exists for all instruments with medium- to long-term option-like exposure, not only IAR swaps.

This problem highlights potential weaknesses in current methods of recognizing trading gains in accounting systems. For example, the fixed rate return of an IAR swap contains an option premium for future option-like liabilities or exposures. This feature leads one to ask how much of an IAR swap's yield premium should be incorporated in current income. From a broader perspective, the proliferation of IAR swaps and similarly complex financial transactions underscores the need for accounting and disclosure practices suited to such instruments.

Appendix: Reverse Index Amortizing Rate Swaps

Instrument structure

Anticipating a possible rise in short-term interest rates, investors are seeking to limit potential losses on their floating rate exposures. In response to this demand, dealers are currently marketing a variation of the IAR swap called the reverse index amortizing rate swap or RIAR swap. Like an IAR swap, an RIAR swap is an interest rate swap whose notional principal amortizes at a rate that varies with the level of market interest rates according to a predetermined schedule. In a typical RIAR swap, as in an IAR swap, an end-user receives the fixed rate while paying the dealer a floating rate. An RIAR swap's amortization schedule differs from that of an IAR swap, however, in calling for the notional principal to amortize more quickly as market interest rates rise. For example, if the floating rate index rises sufficiently, the swap could fully amortize at the end of the lockout period. Alternatively, if rates decrease, the predetermined structure of the RIAR swap could cause the swap to amortize more slowly or, in some cases, not at all.

The amortizing feature of an RIAR swap can be viewed as an implicit put option, giving the floating rate payer the right to "put" or reduce a floating rate liability if rates increase. For this right, the floating rate payer receives a

somewhat lower fixed rate than would be paid on a plain vanilla interest rate swap.

At the present time a small number of U.S. securities firms and money center banks are developing this product. Only a handful of trades are believed to have taken place in the market to date.

RIAR swaps are being marketed to corporate end-users, banks, mutual funds, insurance companies, and other institutional investors.

Risks

The RIAR market is presently one-sided. To date, only dealers have written the embedded put option in the RIAR swap, and in their normal course of business, they are typically net sellers (writers) of options. Thus, for dealers with net short option positions, writing put options embedded in RIAR swaps may increase their overall portfolio's residual exposure and raise hedging costs.

Like IAR swaps, RIAR swaps involve no principal risk. The greatest risk to an investor would be the opportunity cost of holding an instrument paying a below-market rate of interest if rates were to remain stable.

The Pricing and Hedging of Index Amortizing Rate Swaps

by Julia D. Fernald

Index amortizing rate (IAR) swaps have been popular yield enhancement instruments over the past few years.¹ The enhanced yields associated with these instruments result from premiums earned on options embedded in the swaps. Because these options depend on the path of interest rates, the pricing of IAR swaps requires a model of interest rate movements.²

This article presents a simple example of an interest rate model, outlines IAR swap pricing derived from the model, and develops a hedging strategy to offset the uncertain cash flows from the swap. Finally, the article discusses the complications that arise in more realistic pricing and hedging situations.

Interest rate model

In this example, we assume that one-year interest rates are well represented by a model with the binomial tree structure illustrated in the figure.³ The tree is consistent with initial two- and three-year interest rates of 9.995 percent and 9.988 percent, respectively, if the probabilities of rates

rising or falling equal one-half.⁴

Description of the swap

Although the interest rate tree has only two periods of uncertainty, the IAR swap in our example has three cash flow payments. If we assume an IAR swap with a one-year lockout period, the first cash flow at time 0 is based on an original notional amount of \$100 and the current one-year rate. The two subsequent payments depend on the realization of the one-year rates at time 1 and time 2 and on the amortization schedule in Table 1.

⁴ The price of a two-period zero coupon bond with an interest rate of 9.995 percent equals the price of a two-year zero coupon bond derived from the tree:

$$\frac{1}{1.10} * \frac{1}{2} * \left(\frac{1}{1.09} + \frac{1}{1.11} \right) = .827.$$

In the pricing and hedging of IAR swaps, the relevant probabilities are those that make the binomial tree consistent with the current term structure of interest rates.

¹ See Lisa Galaif, "Index Amortizing Rate Swaps," in this issue of the *Quarterly Review*.

² Models used to value path-dependent interest rate options must be free from arbitrage in the sense that they price fixed-income instruments consistently with the current term structure of interest rates. The models can be represented by interest rate trees or lattices that give possible outcomes of future short-term interest rates. These representations are used to calculate both the initial price of the IAR swap and the dynamic hedges that swap dealers would enter over time.

³ Our example assumes that future short-term rates are determined by one factor. The example is consistent with one-year rates that are normally distributed with a constant annual volatility of 1.0 percentage point.

Figure: Binomial Distribution of One-Year Interest Rates

One-Year Interest Rates			
Time 0	Time 1	Time 2	Path
10%	11%	12%	1
		10%	2
	9%	10%	3
		8%	4

Because the swap's notional principal amortizes on the basis of the short rate, the swap cash flows at each period depend not only on the rate that period but also on the path of previous rates. Table 2 shows the four possible cash flow paths (from the perspective of the fixed rate payer) that arise from our interest rate model. In this example, F is the fixed rate paid on the IAR swap.

Pricing

As with any swap, the fixed rate on a IAR swap is determined such that the initial present value of the swap's cash flows is zero. The present value of the cash flows from an IAR swap is more difficult to calculate than the corresponding value for a plain vanilla swap, however, and depends on the assumed arbitrage-free interest rate model. In pricing our IAR swap, we find the fixed rate consistent with the predetermined amortization schedule, the assumed distribution of one-year interest rates, and our binomial representation of the model. The cash flows are functions of the fixed rate F , the current rate, and the path of previous rates. Because we have only four possible cash flow paths, we can solve explicitly for the fixed rate, F , that makes the average present value over these possible cash flow paths equal to zero. In this way, we obtain a fixed rate of 10.26 percent.⁵

In this example, with its virtually flat 10 percent term structure, the fixed rate on a plain vanilla swap is approximately 10 percent. The 26 basis point premium in the IAR swap fixed rate is the value of the embedded options that the fixed rate payer implicitly purchases.

Table 3 shows the fixed rate payer's cash flows over the four paths and the three time steps, given the 10.26 percent fixed rate. Notice that when the interest rate is 10 percent at time 2 (paths 2 and 3), the cash flows depend on the interest rate at time 1. This difference illustrates the path-dependent nature of the IAR swap.

⁵ Let $R_{p,t}$ be the one-year interest rates and let $CF_{p,t}$ be the cash flows for the four possible paths, p , and the three time periods, t . We solve for the fixed rate that sets the present value of the cash flows, or

$$\frac{1}{4} * \sum_{p=1}^4 \sum_{t=0}^2 \frac{CF_{p,t}}{\prod_{q=0}^t (1+R_{p,q})}$$

equal to zero.

Table 1
Amortization Schedule

Interest Rate (Percent)	Notional Amortization (Percent)
12	0
11	10
10	20
9	50
8	100

Hedging

Fixed rate payers (usually swap dealers) may wish to hedge their highly variable payments. For example, if rates rise in the first period, dealers receive \$.663, but if rates fall, the dealer pays \$.631. In the second period, dealers face a similarly variable outcome that depends on the path of interest rates. We show that if fixed rate payers hedge the uncertain cash flows every period, they will earn exactly the additional 26 basis points that they pay as option premium.

Although there are many ways to implement hedges, all methods involve calculating changes in the swap's value given small changes in the underlying interest rates. Because our interest rate model involves only one factor, we need only one instrument to hedge the swap. For simplicity of exposition, we choose to replicate the IAR swap's payoffs using forward contracts instead of the more typically used futures contracts. In our example, the forward rate implied by the initial term structure is 9.991 percent on one-year contracts maturing at time 1.

We choose the first hedge at time 0 to offset the two possible time 1 swap values. The time 1 swap values are composed of two elements: the actual cash flows paid or received on the swap and the expected value of the time 2 payments or receipts. The actual cash flows from the swap are the value of the time 0 payment (-\$.263) at time 1 plus the time 1 amount (+\$.663 in the up-state, or -\$.631 in the

Table 2
Fixed Rate Payer's Cash Flows from the IAR Swap

Path	Cash Flows		
	Time 0	Time 1	Time 2
1	$100*(10\%-F)$	$90*(11\%-F)$	$90*(12\%-F)$
2	$100*(10\%-F)$	$90*(11\%-F)$	$72*(10\%-F)$
3	$100*(10\%-F)$	$50*(9\%-F)$	$40*(10\%-F)$
4	$100*(10\%-F)$	$50*(9\%-F)$	$0*(8\%-F)$

Table 3
Fixed Rate Payer's Cash Flows from the IAR Swap with a Fixed Rate of 10.26 Percent

Path	Cash Flows		
	Time 0	Time 1	Time 2
1	-\$0.263	\$0.663	\$1.563
2	-.263	.663	-.189
3	-.263	-.631	-.105
4	-.263	-.631	0.0

down-state).⁶ The expected remaining value of the swap is \$.612 in the up-state, and -.048 in the down-state.

If the dealer combines the \$100 swap with -\$97.5 of the forward contract, the portfolio's value will be equal to zero at time 1 whether rates rise to 11 percent or fall to 9 percent.⁷ At time 1, the dealer follows the same type of calculation, keeping track of the time 2 values of the swap and the previous hedge. The new hedge amounts are -\$87.0 if we are in the up-state or +\$5.2 if we are in the down-state. The process of readjusting hedges through time is known as "dynamic hedging."

If we adopt these hedge amounts, the outcome from hedging the swap along each path offsets the payoffs from the swap along that path. Table 4 illustrates the calculations of the hedged swap's value along the first path. The hedged swap's value along the other three paths will also equal zero at time 2.

Another hedging method computes the change in the swap's value for changes in each forward rate. This "bucket" hedge method involves (1) the initial purchase of a series of forward contracts in amounts that offset the recomputed swap's value and (2) the dynamic adjustment of the hedge through purchases or sales of additional forward contracts in the future.⁸ Because bucket hedging

allows for nonparallel shifts in the yield curve, it implicitly assumes multiple sources of risk; it thus requires multiple hedging instruments. Bucket hedging is useful if interest rate dynamics are more complicated than the single factor model assumes.

Issues

In this example, the hedges perfectly offset the swap if any of the four modeled interest rate paths is realized. Although it is simplistic to assume that interest rates will follow one of these four paths, the example illustrates potential issues that can arise when valuing and hedging interest-rate-dependent derivatives. In particular, the pricing and hedging of any interest rate derivative security depend on decisions at several levels concerning:

- the interest rate model: How many factors are relevant? What type of process do they follow—for example, normal, lognormal?
- the parameters of the model: What are the volatilities? If the model includes more than one factor, what are the correlations?
- the implementation of the model: How small are the time steps? Is it a binomial or trinomial tree? How many simulations are used?

If assumptions about the model and the parameters of the model are incorrect, the hedging cannot offset realized gains and losses. In our example, hedging depends on the forward rates implied by our interest rate tree. If these rates are not realized, the cash flows from the hedges cannot perfectly offset the cash flows from the swap. These rates can be wrong because the short rate process is in fact not well represented by a single factor normal distribution with constant volatility. Valuing the swap using other interest rate models—for example, a two factor lognormal interest

⁶ The total cash flow from the swap in the up-state is therefore \$.372, which equals $-.263 \times (1.11) + .663$.

⁷ The hedge amounts are essentially (the negative of) the derivative of the swap's value with respect to interest rates. In our example, the first hedge amount, \$97.5, equals \$.983 (the swap's value in the up-state) less \$-.966 (the value in the down-state), divided by .02 (the difference in the interest rates).

⁸ In our example, we would initially sell \$80.1 of the forward contract maturing at time 1 and \$19.1 of the contract maturing at time 2. If rates rise to 11 percent, we would sell \$68.1 of the contracts maturing at time 2 at the new forward rate; if rates fall to 9 percent, we would buy \$24.5 of the time 2 forward contracts.

Table 4
Payment Stream for the First Path

	Cash Flows				Future Value
	Time 0	Time 1	Time 2		
Swap at time 0	-.263	-.263(1.11)	-.263(1.11)(1.12)	=	-.327
Swap at time 1		.663	.663(1.12)	=	-.743
Swap at time 2			1.563	=	1.563
Hedge entered at time 0		-97.5(.11-.0999)	-97.5(.11-.0999)(1.12)	=	-1.102
Hedge entered after up-jump at time 1			-87.0(.12-.1099)	=	-.878
Value of the hedged swap at the end of time 2					0.0

rate model—can give a different fixed rate and different hedges.

Different assumptions about the parameter values also affect the fixed rate. In our example, if the volatility is 1.5 percentage points instead of 1.0, the fixed rate will increase from 10.26 percent to 10.60 percent. The differences across models and parameter values can be considerable, and careful judgment should be used when testing the sensitivity of the results to different assumptions.

The fixed rate and the subsequent hedging also depend on how the model (with its assumptions) is implemented. The goal in implementing the model is to approximate numerically a stochastic process. If we shorten the time steps, we will find a different fixed rate than we find with annual time steps. The appropriate time step for valuation

is the one in which the fixed rates have converged on a value. In our example, the hedge ratios at time 1 are significantly different when the rates rise to 11 percent than they are when the rates fall to 9 percent. If we shorten the time steps and update the hedge ratios more often, the hedging will change more gradually than is illustrated by our example.

Actual models are more complex than our example at all levels: volatilities are not necessarily constant, the initial term structure is not conveniently flat, and models are implemented with higher frequencies. Adjustments need to be incorporated for nonparallel shifts in the yield curve because nonparallel shifts will affect the swap's value. Making errors at any of these levels will potentially result in a misvalued instrument.

Recent Trends in Commercial Bank Loan Sales

by Rebecca Demsetz

Loan sales represent an important departure from the traditional bank activity of originating credit to be held until maturity. The dollar volume of commercial and industrial (C&I) loan sales rose rapidly in the mid-1980s but has declined equally rapidly over the past few years. Previous studies have discussed these aggregate trends;¹ however, aggregate data mask some interesting differences between the loan sales activities of the largest sellers and those of all other banks. This article seeks to provide insight into recent loan sales declines by examining the sales activities of two distinct groups of institutions. The first group includes the top few sellers only and is referred to as the market's "first tier." All other institutions are labeled "second tier."

The article finds that recent declines in loan sales appear to reflect a drop-off in the origination of loans likely to be traded in the secondary market, rather than a disruption of the secondary market process. Diminished origination of salable loans reduces the volume of "inputs" available for secondary market transactions. This pattern seems to have characterized the sales activities of both first-tier and second-tier banks. Second-tier sales first fell during the 1990-91 recession and have continued to decline with the persistent weakness of C&I lending since the recession. First-tier trends also reflect recession-related origination declines and the ongoing weakness in C&I lending, but appear to be

driven mainly by a decrease in large credits related to corporate acquisitions, leveraged buyouts (LBOs), and recapitalization. The following three sections examine loan sales trends; the role of corporate acquisitions, LBOs, and recapitalization; and the importance of economic conditions.

Aggregate, first-tier, and second-tier sales trends

Chart 1 tracks the aggregate loan sales activity of all insured domestic commercial banks from the first quarter of 1986 through the first quarter of 1993. The data in Chart 1, drawn from banks' Reports of Income and Condition ("Call Reports"), measure the dollar volume of C&I loans originated and sold without recourse during each calendar quarter.² Quarterly loan sales flows attributable to insured domestic commercial banks peaked at \$285 billion in 1989. By 1993, these flows had dropped to \$89 billion, a decline of almost 70 percent.

The aggregate trends revealed in Chart 1 mask important differences in loan sales trends associated with first-tier and second-tier sellers. Chart 2 adds two additional series describing the loan sales activities of these subsets of the insured domestic commercial bank population. The first-tier subset includes the top five sellers in each quarter examined. All other banks belong to the second-tier subset. The size of the first-tier subset may seem arbitrarily small; however, loan sales attributable to the second five sellers are much smaller than those attributable to the top five sellers and follow trends similar to those experienced by the

¹ For example, see Joseph Haubrich and James Thomson, "The Evolving Loan Sales Market," Federal Reserve Bank of Cleveland *Economic Review*, July 1993; Richard Cantor and Rebecca Demsetz, "Securitization, Loan Sales, and the Credit Slowdown," Federal Reserve Bank of New York *Quarterly Review*, Summer 1993; and Allen Berger and Gregory Udell, "Securitization, Risk, and the Liquidity Problem in Banking," in Michael Klausner and Lawrence White, eds., *Structural Change in Banking* (Homewood, Ill.: Irwin Publishing, 1992), pp.227-91.

² The term "loans sold" refers to the sale of entire loans or portions of loans; "loans originated" refers to loans made directly by the reporting bank and does not include loans purchased from other institutions. When a loan is sold "without recourse," the risk of the loan is transferred to the buyer.

remainder of the loan sales market.³ Two first-tier sellers are especially important, accounting for an average of 42 percent of aggregate sales between first-quarter 1986 and first-quarter 1992.⁴

Chart 2 shows that first-tier banks, all very large institutions, account for a substantial fraction of both the level of aggregate sales and trends in aggregate sales. Sales by first-tier banks increased rapidly through 1988, fell sharply from the third quarter of 1989 through the first quarter of 1990, and then fell more gradually over subsequent years. These first-tier sales account for 81 percent of the aggregate loan sales increase between first-quarter 1986 and third-quarter 1989 and 80 percent of the subsequent loan sales decline. Second-tier sales trends differ from first-tier trends but also show a rise and subsequent decline over the 1986-93 period. Second-tier sales rose gradually in the mid-1980s, peaked in the first quarter of 1990 (after the peak in first-tier sales), and then fell at a rate similar to the rate of decline in loan sales by first-tier banks.

³ In addition, the composition of the first-tier subset is quite stable over time. A total of eight institutions appear in the seven first-tier subsets corresponding to the first quarters of 1986-92.

⁴ Berger and Udell first noted the importance of these two institutions, Security Pacific and Bankers Trust. See "Securitization, Risk, and the Liquidity Problem in Banking."

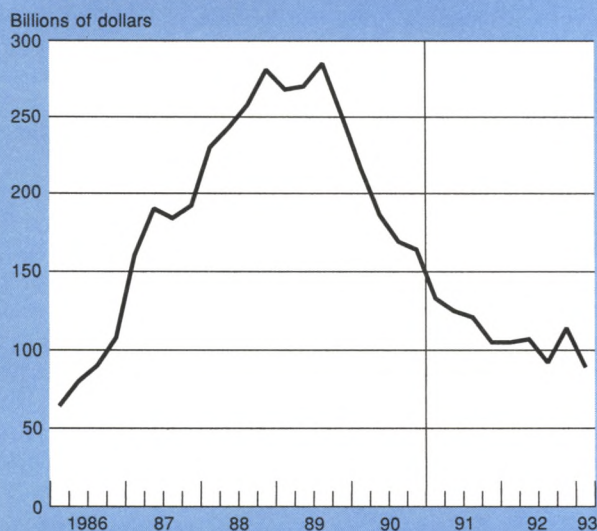
The role of corporate acquisitions, LBOs, and recapitalization

For first-tier banks, loan syndication activity provides insight into trends in the origination of salable loans. Syndications are large credits shared by a group of banks upon origination. Since syndications are commonly parceled into smaller credits that are sold in the secondary market, syndicated loan volume gives some indication of the strength of secondary market loan supply by large sellers. The table reports annual syndicated loan volume by purpose from 1987 through 1992. These data reflect lines of credit as well as actual loan originations, so they overestimate the volume of syndicated loans available for secondary market sale. Nevertheless, they do clarify the trends in the origination of salable loans by large banks.

The table shows that total syndicated loan volume increased between 1987 and 1989 and then fell abruptly. Furthermore, the sharp drop in total syndicated loan volume was driven by loans in the "leverage" category. Syndicated loans extended for leverage purposes finance corporate acquisitions, LBOs, and recapitalization. They are unlikely to represent lines of credit, because investment-grade borrowers generally use credit lines to support com-

Chart 1

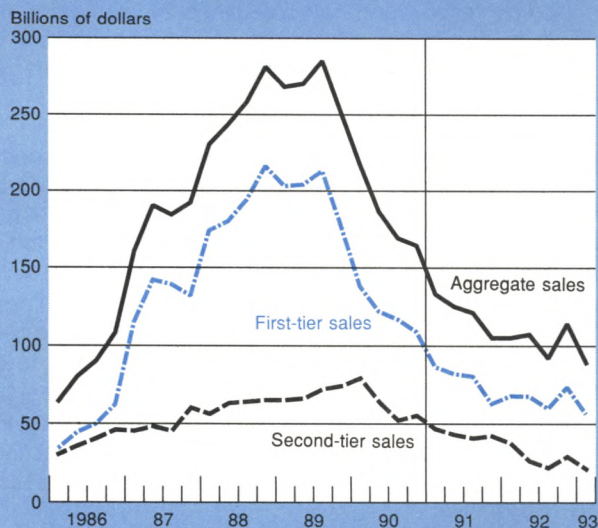
Quarterly Sales of Commercial and Industrial Loans by Insured Domestic Commercial Banks: Aggregate Trends



Source: Federal Financial Institutions Examination Council, Reports of Condition and Income.

Chart 2

Quarterly Sales of Commercial and Industrial Loans by Insured Domestic Commercial Banks: Subsample Trends



Source: Federal Financial Institutions Examination Council, Reports of Condition and Income.

Note: "First-tier" banks are defined as the top five sellers in each quarter. All other banks are defined as "second-tier."

mercial paper issuance. Data from the *Bank Loan Report*, a publication of *Investment Dealers Digest*, confirm a dramatic drop in syndications related to acquisitions, LBOs, and recapitalization between 1989 and 1990.

Chart 3 compares trends in loan sales by first-tier sellers with trends in the volume of syndicated loans in the leverage category. In the chart, loan sales are reported at quarterly intervals and syndicated loan volume is reported at annual intervals, so comparisons should be made with caution. It is clear, however, that trends displayed by the two series are similar. Several authors have noted a positive correlation between aggregate sales and corporate merger

Syndicated Loan Volume by Purpose

Billions of Dollars

Purpose	1987	1988	1989	1990	1991	1992
Leverage (acquisition, LBO, recapitalization)	66.1	162.7	186.5	57.9	20.9	39.9
Debt repayment	11.5	42.3	44.4	42.6	46.5	58.5
Specialty finance	17.0	8.6	7.1	17.4	16.6	23.0
General purpose	42.5	70.7	95.3	123.4	150.4	215.1
Total	137.1	284.4	333.2	241.3	234.4	336.5

Source: Loan Pricing Corporation.

activity.⁵ Chart 3 demonstrates a strong correlation between first-tier sales and *lending* related to acquisitions, LBOs, and recapitalization.⁶ Conversations with market participants confirm the importance of these activities in explaining aggregate trends in the secondary market volume of top loan sellers. In the future, the effect of such activities on the loan sales market will depend on the extent to which they involve bank financing.

The importance of economic conditions

Trends in lending related to corporate acquisitions, LBOs, and recapitalization appear to be less important in explaining loan sales by second-tier banks, which continued to rise through the first quarter of 1990. The timing of the second-tier sales decline suggests that the recession-related slowdown in C&I loan origination was a key underlying factor. As Chart 4 shows, a composite index of four coincident

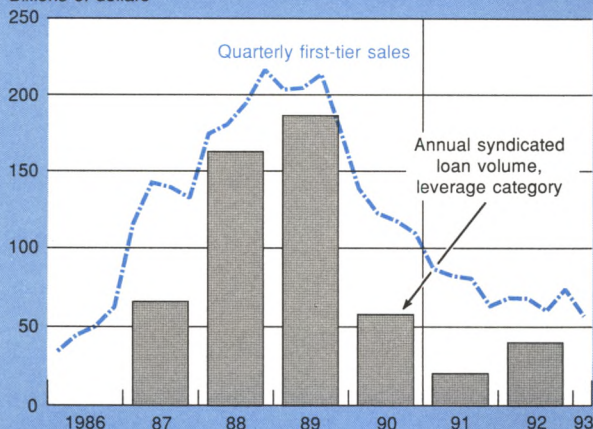
⁵ See, for example, Berger and Udell, "Securitization, Risk, and the Liquidity Problem in Banking," and Haubrich and Thomson, "The Evolving Loan Sales Market."

⁶ Other authors have attempted to explore the relationship between bank loan sales and merger-related lending using Call Report data on "highly leveraged transactions," or "HLT's." (See Joseph Haubrich and James Thomson, "Loan Sales, Implicit Contracts, and Bank Structure," in *Proceedings from a Conference on Bank Structure and Competition*, Federal Reserve Bank of Chicago, 1993.) The main drawback of these data is that they were introduced in the Call Report only after the dramatic declines in corporate merger activity and aggregate loan sales. Other important limitations are that the HLT data measure the existing stock of highly leveraged transactions rather than the flow of new HLT originations and that all credits extended to an HLT borrower are considered HLT transactions, regardless of their particular purpose.

Chart 3

First-Tier Sales and Volume of Syndicated Loans in the Leverage Category

Billions of dollars



Sources: Federal Financial Institutions Examination Council, Reports of Condition and Income; Loan Pricing Corporation.

Chart 4

Second-Tier Sales and Index of Coincident Indicators

Billions of dollars



Sources: Federal Financial Institutions Examination Council, Reports of Condition and Income; Survey of Current Business.

indicators of business conditions was highly correlated with second-tier sales from 1986 through the recent recession, peaking just one quarter after the peak in second-tier sales.⁷ The correlation between second-tier sales and the index of coincident indicators weakened after the recession. Economic conditions improved, but loan sales by both second-tier and first-tier banks continued their decline. This divergence of trends may be attributable to the persistent weakness in borrowing by large corporations after the recent recession.

An econometric analysis confirms the importance of economic conditions and lending opportunities in explaining cross-sectional variation in loan sales activity.⁸ This analysis divides the country into fourteen geographical regions and investigates the effects of regional economic conditions and a variety of bank characteristics on the loan sales activities of individual banks. Five of the geographical regions are identical to Census regions; the remaining four Census regions are divided into smaller geographical areas, with states that experienced similar economic circumstances over the relevant period grouped together. Variables used to measure economic conditions in each of the fourteen regions include the unemployment rate (a measure of current conditions) and consumer confidence (a measure of expected future conditions). Results of this empirical analysis suggest that regional economic conditions have been relatively important determinants of loan

sales activity in recent years. In addition, the positive effect of economic conditions can be attributed, at least in part, to the relationship between economic conditions and loan origination opportunities.

Declines in the dollar volume of loan sales are consistent with either a drop in secondary market supply or a drop in secondary market demand. Price data can help determine whether the recession-related reduction in sales was supply- or demand-driven. Data from the *Asset Sales Report* of the *American Banker* magazine reveal that secondary market yields on C&I loans to investment grade borrowers fell relative to commercial paper yields during 1990 and 1991.⁹ In conjunction with the decrease in loan sales volume over the same time period, this yield decline (price increase) suggests a drop in secondary market supply. Data from the Board of Governors' Senior Loan Officers Opinion Survey are consistent with this interpretation of secondary market dynamics in the early 1990s. The majority of banks included in the August 1992 and August 1993 surveys reported either increased demand or little change in demand by typical loan purchasers over the previous year.

In summary, while the initial decline in first-tier sales is associated with a sharp drop in lending to finance corporate acquisitions, LBOs, and recapitalization, the turning point for second-tier sales can be linked to recent cyclical slowdowns in C&I lending. The continued declines in both first-tier and second-tier sales since the recent recession have coincided with persistent weakness in C&I originations and the resulting reduction in secondary market supply. Together, these relationships suggest that recent drops in loan sales volume may be best explained by declines in the origination of salable loans.

⁷ The four coincident indicators included in the composite index measure employment on nonagricultural payrolls, personal income less transfer payments, the index of industrial production, and manufacturing and trade sales. The composite index is available on a monthly basis from the Survey of Current Business. Values reported are from March, June, September, and December.

⁸ See Rebecca Demsetz, "Economic Conditions, Lending Opportunities, and Loan Sales," Federal Reserve Bank of New York, working paper, 1994.

⁹ Reported yields are on loans and commercial paper to borrowers rated A1 (Standard and Poor's)/P1 (Moody's) and borrowers rated A2/P2.

Treasury and Federal Reserve Foreign Exchange Operations

August-October 1993

During the August-October period the dollar appreciated 3.7 percent against the Japanese yen, depreciated 3.2 percent against the German mark, and was little changed on a trade-weighted average basis,¹ declining 0.4 percent. On August 19, the U.S. monetary authorities purchased \$165 million against yen in the period's only intervention operation.

The yen appreciates, then reverses against the dollar

During early August, the yen strengthened against the currencies of all major industrialized countries, reaching record highs against the dollar, mark, Swiss franc, the pound sterling, and the Canadian and Australian dollars. On August 11, the release of data indicating a wider than expected 28 percent year-on-year expansion of Japan's merchandise trade surplus to \$11.84 billion triggered sharp yen appreciation, and the yen traded to a new high against the dollar of ¥103.50. Continuing weakness in domestic economic indicators was perceived as evidence that reduction of Japan's current account surplus was unlikely in the near term, and the yen moved to several new daily highs against the dollar, peaking at a postwar high against the dollar of ¥100.40 on August 17.

From August 16 to 18, conditions in the Japanese money

markets were eased. On August 19, the Japanese cabinet met and agreed to try to devise additional measures to stimulate domestic demand. The dollar was trading at ¥102.50 in early New York dealing on August 19, but then declined quickly to ¥101.35 following the release of the worse than expected \$12.1 billion U.S. merchandise trade deficit for June; at the same time, the dollar abruptly declined one pfennig against the mark. The U.S. monetary authorities intervened shortly after the release of the trade data. During the day they purchased a total of \$165 million against the yen, shared equally between the Federal Reserve and the Treasury's Exchange Stabilization Fund. This operation was coordinated with another monetary authority.

Initially, the operations surprised market participants, and the dollar promptly rose. During the morning, Treasury Under Secretary Summers released a statement welcoming the decline in Japanese money market rates and expressing concern that further yen appreciation could retard growth in the Japanese and world economies. Operations continued after Under Secretary Summers' statement but ceased before noon. Market participants subsequently continued to cover short positions throughout the afternoon, and the dollar reached a high of ¥106.75 before closing the day at ¥105.95.

In the month following the operation, the dollar-yen exchange rate largely traded between ¥103.00 and ¥106.00 as market participants increasingly focused on the apparent weakness of the Japanese economy. A series of Japanese data releases showed continued weak business sentiment, deteriorating corporate profits, and a 0.4 percent decline in second-quarter GDP. Consequently, when the Bank of Japan lowered the official discount rate (ODR)

This report, presented by Peter R. Fisher, Senior Vice President, Federal Reserve Bank of New York, and Manager for Foreign Operations, System Open Market Account, describes the foreign exchange operations of the U.S. Department of Treasury and the Federal Reserve System for the period from August 1993 through October 1993. Frank Keane was primarily responsible for preparation of the report.

¹ The dollar's movements on a trade-weighted basis are measured using an index developed by staff at the Board of Governors of the Federal Reserve System.

on September 21 by a greater than expected 75 basis points to 1.75 percent, the action was perceived as an appropriate supplement to the government's efforts to stimulate the economy, not as a device to avoid further yen appreciation. Favorable reactions by senior U.S. officials to the Bank of Japan's action led to a perception that tensions between the U.S. and Japan on trade issues had given way to greater cooperation, and the yen declined about 1.5 percent, closing on September 21 at ¥106.18.

The dollar firmed gradually over the latter half of the three-month period while expectations of near-term volatility in the dollar-yen exchange rate dwindled substantially. The implied one-month option volatility fell from about 14 percent in mid-September to around 10 percent in late October. The period closed with the dollar-yen exchange rate trading steadily above ¥108.00 in late October.

Mark appreciates against dollar in wake of ERM crisis

The European Community finance ministers and central bank governors agreed, effective Monday, August 2, to per-

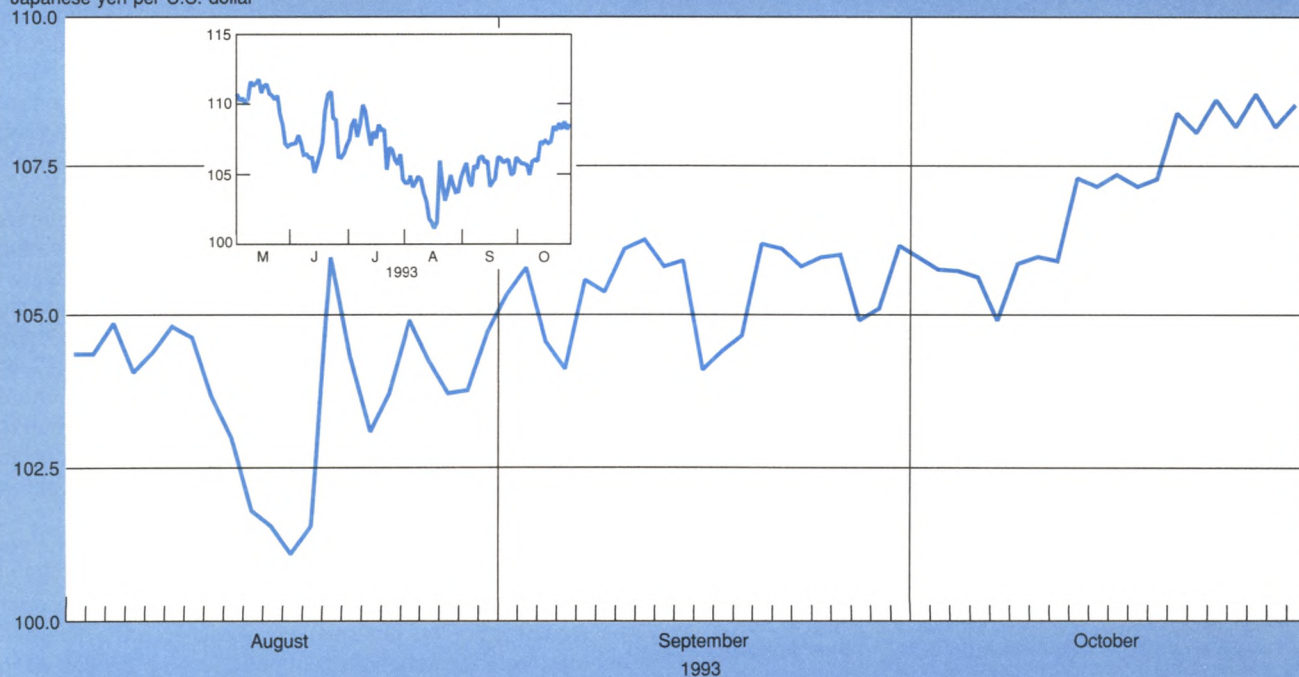
mit currencies participating in the Exchange Rate Mechanism (ERM) to fluctuate within 15 percent of their central parities. However, authorities from Germany and the Netherlands agreed to maintain their bilateral exchange rate within 2.25 percent of their central parity. During the uncertainty created by the currency turmoil in Europe, market participants had aggressively accumulated dollar positions in late July. When widely anticipated European interest rate reductions failed to materialize in the first few weeks of August, the mark began to appreciate against the dollar. The negative sentiment toward the dollar during this period was reinforced by market reports of dollar sales by European central banks to adjust reserve positions after July's currency turmoil, and by a widening of interest rate differentials in the mark's favor implied by Eurocurrency futures contracts.

The Bundesbank Council's decision on August 26 to leave official rates unchanged disappointed market expectations of an interest rate cut, and banks were caught short of funds at the end of a reserve period. When the Council

Chart 1

The Dollar against the Japanese Yen

Japanese yen per U.S. dollar

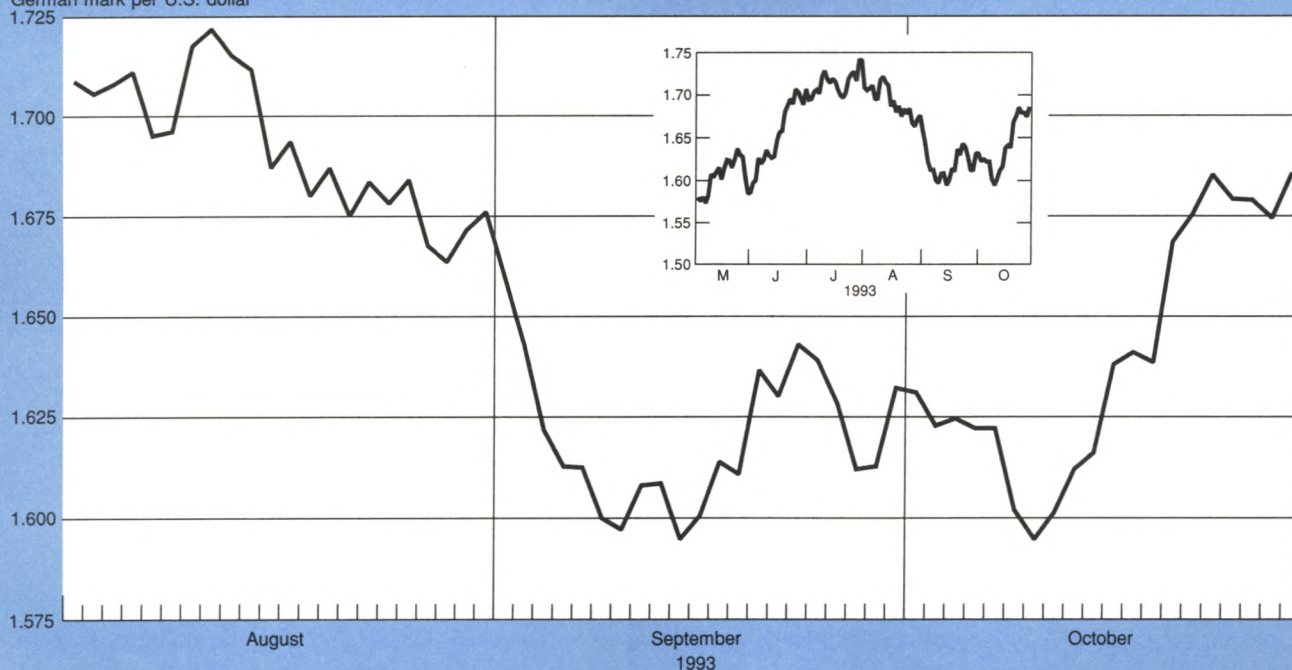


Note: Inset panel shows the six-month exchange rate movement.

Chart 2

The Dollar against the German Mark

German mark per U.S. dollar



Note: Inset panel shows the six-month exchange rate movement.

did lower the discount and Lombard rates by 50 basis points to 6.25 percent and 7.25 percent, respectively, on September 9, the concurrent smaller than expected 10 basis point reduction in the Bundesbank's money market repurchase rate, to 6.70 percent, led to continued tightness in short-term German money markets. These developments resulted in continued mark strength against the dollar. Although the mid-September political unrest in Russia caused the dollar to appreciate briefly against the mark, the dollar again drifted lower against the mark when the crisis was resolved, closing at DM 1.6013 on October 13.

On October 21, the Bundesbank Council surprised exchange markets by again reducing its discount and Lombard rates by 50 basis points to 5.75 percent and 6.75 percent, respectively. The Council also announced that it would conduct the following week's fourteen-day repurchase agreement at a fixed rate of 6.40 percent, a 27 basis point reduction from the prior day's variable rate repurchase agreement. The dollar, which had begun rising gradually against the mark

before the announcement, rose steadily over the remainder of the period, closing at DM 1.6857 on October 29.

Other operations

The Federal Reserve and the Treasury's Exchange Stabilization Fund (ESF) each realized profits of \$22.1 million from the sales of Japanese yen in the market. Cumulative valuation gains on outstanding foreign currency balances as of the end of October were \$3,368.5 million for the Federal Reserve and \$2,839.0 million for the ESF.

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 have a high degree of liquidity and credit quality. A portion of the balances is invested in securities issued by foreign governments. As of the end of October, the Federal Reserve and the ESF held either directly or under repurchase agreements \$10,004.3 million and \$10,276.6 million, respectively, in foreign government securities valued at end-of-period exchange rates.

Chart 3

Dollar-Yen Interest Rate Differential

Implied by the Three-Month Eurodeposit Futures (December Contract)

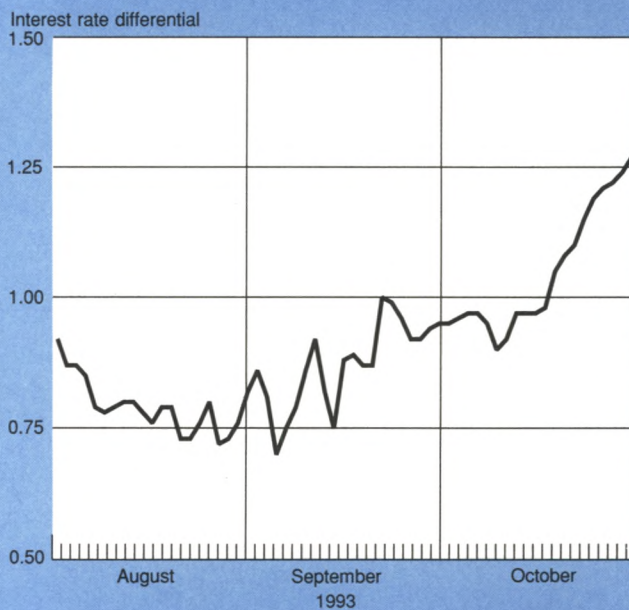
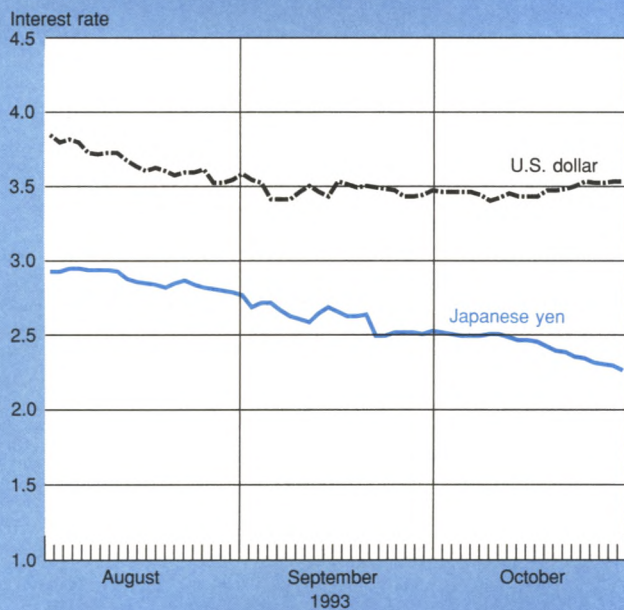


Chart 4

German Mark-Dollar Interest Rate Differential

Implied by the Three-Month Eurodeposit Futures (December Contract)

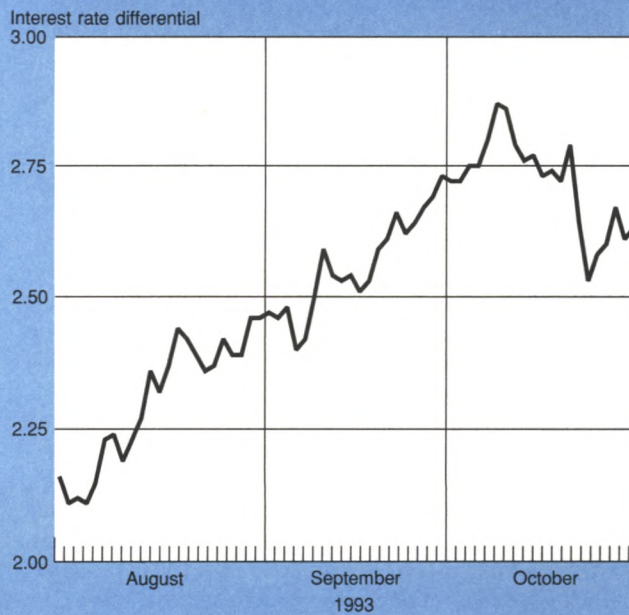
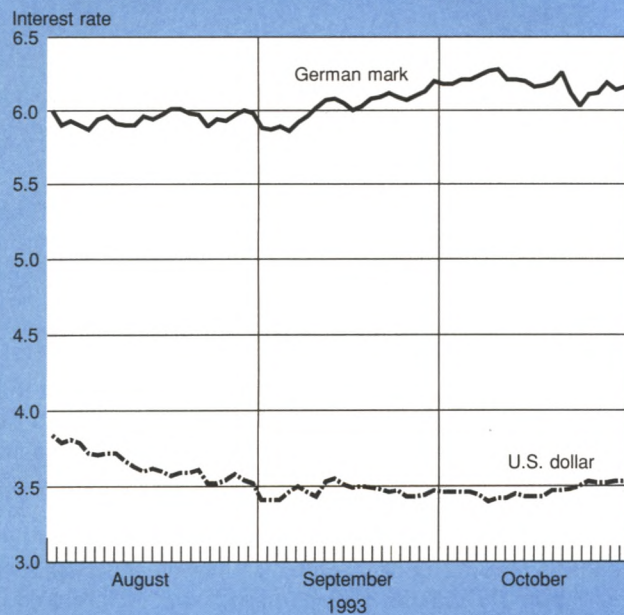


Table 1

**Federal Reserve
Reciprocal Currency Arrangements**
Millions of Dollars

Institution	Amount of Facility October 31, 1993
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 5

Short-Term Interest Rates for Selected Countries

Percent

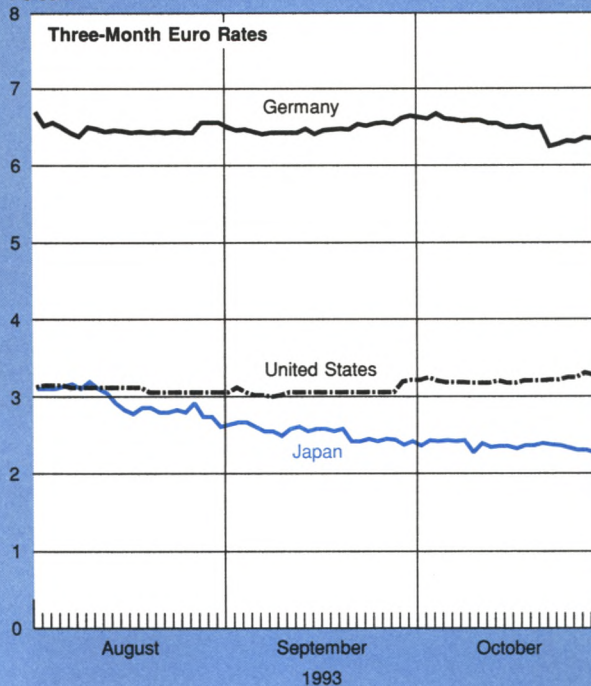


Table 2

**Net Profit (+) or Losses (-) on
United States Treasury and Federal Reserve
Foreign Exchange Operations**
Millions of Dollars

	Federal Reserve	U.S. Treasury Exchange Stabilization Fund
Valuation profits and losses on outstanding assets and liabilities as of July 31, 1993	+3,226.6	+3,005.5
Realized profits and losses August 1–October 31, 1993	+22.1	+22.1
Valuation profits and losses on outstanding assets and liabilities as of October 31, 1993	+3,368.5	+2,839.0

Note: Data are on a value-date basis.

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