

Why Are So Few Financial Assets Indexed to Inflation?

By *Stuart E. Weiner*

Highly volatile inflation over the past ten years has likely heightened uncertainty about inflation. This uncertainty should have presumably led to a growing number of inflation-indexed financial assets. By insulating real earnings from unexpected changes in the price level, such indexation would have guaranteed real rates of return to investors. Although financial assets have become increasingly flexible over the period, surprisingly few inflation-indexed assets have emerged.

This article addresses the near-absence of inflation-indexed financial assets in the United States. The article surveys the growing flexibility of financial assets in the inflationary 1973-82 period, and examines possible reasons why this flexibility has so seldom taken the form of inflation indexation.

The first section describes the mechanics of inflation indexation and illustrates how such indexation could have prevented the negative real rates of return earned over much of the 1973-82 period. The mechanics of an alternative indexing arrangement, market interest rate indexation, are also discussed. The two types of index-

ation are compared and their potential performance evaluated.

The second section surveys the increasing flexibility of financial assets in recent years. The analysis focuses on the major liabilities of three broad groups: corporations, households, and financial intermediaries. Among the instruments discussed are floating rate corporate notes, deep-discount and zero-coupon corporate bonds, variable rate business loans, adjustable rate mortgages, and ceiling-free time deposits. With few exceptions, inflation indexation has been missing from recent innovations.

Possible explanations for the paucity of inflation-indexed financial assets are explored in the third section. The discussion is guided by consideration of the likely supply and demand motives of corporations, households, and financial intermediaries. The final section offers a summary and concluding remarks.

INDEXATION AND INFLATION

Inflation-indexed financial assets

Financial contracts written in nominal terms expose both parties to an inflation risk. As an example, consider a debt obligation such as a loan or bond. If inflation over the length of the contract is higher than expected, the lender will earn an unexpectedly low real rate of return on

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the asset. The borrower, on the other hand, will gain from this unexpected inflation because fewer real dollars will be required to repay the debt. Conversely, if inflation over the period is lower than expected, the borrower will be paying a higher real interest rate than intended. In this case, the lender benefits. In a highly volatile inflationary environment, realized real rates of return rarely coincide with expected rates.¹

Inflation indexation removes this inflation risk. With an inflation-indexed financial asset, deferred payments are indexed to changes in the general price level. As a result, asset holders are protected from unexpected price movements. Realized real rates of return necessarily equal expected rates.

Table 1 provides an example of nonindexed and inflation-indexed 1-year bonds, each paying an expected 2.0 percent real rate of interest. Consider first the nonindexed bond (lines 1-5). It is assumed that the lender and borrower both expect inflation over the year to be 6.0 percent. To achieve a real interest rate of 2.0 percent, the nominal interest rate is set at 8.12 percent.²

As indicated in line 5, if prices increase at the expected 6.0 percent rate, the realized real in-

terest rate will equal the 2.0 percent expected rate. In the example, the realized real interest rate of 2.0 percent is obtained by dividing the real payment at redemption (\$10,200) by the principal (\$10,000). If prices increase more rapidly, however, say, at a 10 percent rate, the realized real rate will be -1.7 percent. Alternatively, if prices increase at only a 2 percent rate, the realized real rate will be 6.0 percent. Unexpected price movements cause unexpected real interest rates.

The inflation-indexed bond provides protection from this uncertainty (lines 6-12). In negotiating an inflation-indexed bond, the lender and borrower agree on a contract rate. The contract rate is in effect a guaranteed real interest rate. In this example, the contract rate is 2.0 percent. When the bond comes due, the principal is adjusted for changes in the price level over the year, and then the contract rate is applied to this inflation-adjusted principal to determine interest.³ The total nominal redemption payment, consisting of the adjusted principal plus interest, necessarily yields a real rate of return equal to the contract rate. As indicated in line 12, the realized real interest rate on the inflation-indexed bond equals 2.0 percent for all values of actual inflation.⁴

¹ For a full discussion of the possible costs of inflation, see Dean W. Hughes, "The Costs of Inflation: An Analytical Overview," *Economic Review*, Federal Reserve Bank of Kansas City, November 1982.

² The nominal interest rate is calculated according to the formula

$$(1+r^e)P = \frac{(1+i)P}{1+p^e},$$

or, simplifying,

$$i = r^e + p^e + r^e p^e,$$

where i = nominal interest rate,
 r^e = expected real interest rate,
 p^e = expected inflation rate, and
 P = principal.

The interaction term, $r^e p^e$, compensates for the expected reduced purchasing power of accrued interest.

³ Alternatively, instead of adjusting the principal and then applying the contract rate, the nominal interest rate can be adjusted and then applied to the original principal. The former adjustment mechanism has been termed an *indexed principal bond*, while the latter has been termed an *indexed interest bond*. The two mechanisms yield identical nominal repayments and, consequently, identical realized real interest rates. The terms "indexed principal bond" and "indexed interest bond" were suggested by Stanley Fischer in "Corporate Supply of Index Bonds," NBER Working Paper No. 331, March 1979, p. 18.

⁴ This discussion ignores income tax considerations. If the income tax is nonindexed, after-tax real rates of return on inflation-indexed bonds will not be constant, but rather will be lower the higher is the actual rate of inflation. Higher inflation rates generate higher interest and/or principal payments, pushing investors into higher marginal tax brackets.

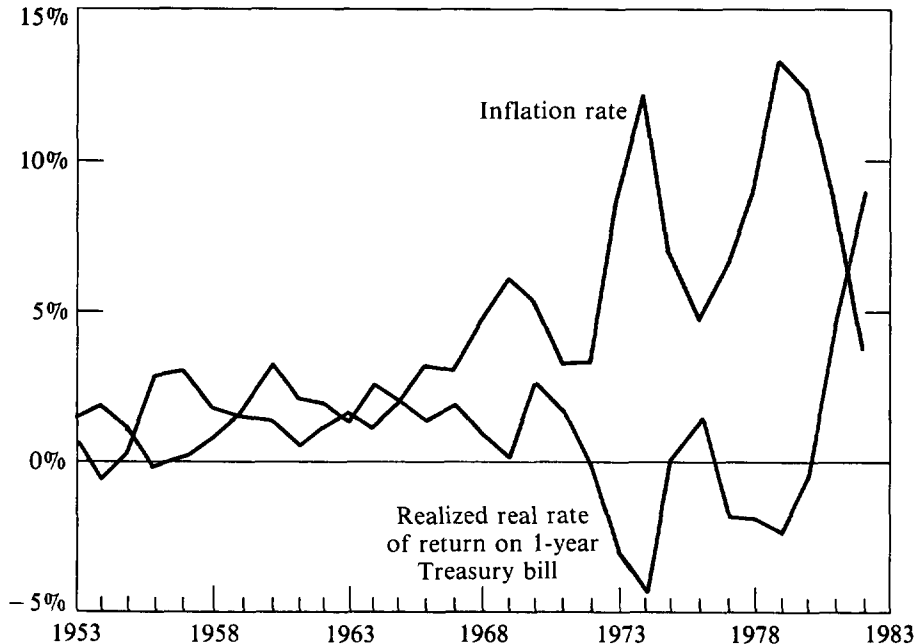
Table 1
REAL INTEREST RATES REALIZED ON HYPOTHETICAL NONINDEXED AND
INFLATION-INDEXED 1-YEAR BONDS WITH EXPECTED 2.0 PERCENT REAL RATE

	Actual Inflation Rate (p)		
	2 Percent	6 Percent	10 Percent
Nonindexed Bond			
$\left[\begin{array}{l} \text{expected inflation rate } (p^e) = 6.00\% \\ \text{nominal interest rate } (i) = 8.12\% \\ \text{expected real interest rate } (r^e) = 2.00\% \end{array} \right]$			
1. Principal [P]	\$10,000	\$10,000	\$10,000
2. Interest [iP]	\$ 812	\$ 812	\$ 812
3. Nominal Payment at Redemption [P + iP]	\$10,812	\$10,812	\$10,812
4. Real Payment at Redemption $\frac{P + iP}{1 + p}$	\$10,600	\$10,200	\$ 9,829
5. Realized Real Interest Rate $\frac{P + iP}{1 + p} / P$	6.00%	2.00%	-1.71%
Inflation-Indexed Bond			
[contract rate (c) = 2.00%]			
6. Principal [P]	\$10,000	\$10,000	\$10,000
7. Inflation-Adjusted Principal [(1 + p)P]	\$10,200	\$10,600	\$11,000
8. Interest on Inflation-Adjusted Principal [c(1 + p)P]	\$ 204	\$ 212	\$ 220
9. Nominal Payment at Redemption [(1 + c)(1 + p)P]	\$10,404	\$10,812	\$11,220
10. Realized Nominal Interest Rate $\frac{(1 + c)(1 + p)P}{P}$	4.04%	8.12%	12.20%
11. Real Payment at Redemption $\frac{(1 + c)(1 + p)P}{1 + p}$	\$10,200	\$10,200	\$10,200
12. Realized Real Interest Rate $\frac{(1 + c)(1 + p)P}{1 + p} / P$	2.00%	2.00%	2.00%

In retrospect, investing in inflation-indexed bonds would have been a wise strategy over the 1973-82 period, had such bonds existed. As shown in Chart 1 and column 1 of Table 2, these years were marked by high and highly volatile inflation. During the 20 years preceding

1973, inflation (as measured by the CPI) averaged 2.4 percent with a standard deviation of 1.7. Over the 1973-82 period, inflation averaged 8.7 percent with a standard deviation of 3.2. Nominal yields on financial assets did not keep pace with the inflation of the latter

Chart 1
Inflation and Realized Real Rates of Return
1953-82



Note: Data from Table 2, Columns 1 and 3.

period and, consequently, real yields plummeted.⁵

Yields on 1-year Treasury bills are a case in point. As illustrated in Chart 1 and documented in column 3 of Table 2, the pre-tax realized real rate of return on 1-year Treasury bills averaged 1.5 percent over the 1953-72 period. Over the 1973-82 period, the average was only 0.1 percent. In six of the ten years, the real rate of

return was actually negative. Inflation indexation could have tempered this dismal performance.⁶ The near-absence of inflation-indexed assets over the period is puzzling, and is explored in later sections of the article.

Market interest rate-indexed financial assets

The discussion to this point has implicitly assumed that debt instruments are held until maturity. Negotiable instruments, of course, can be sold prior to maturity. Negotiability is an attractive feature because it facilitates rapid portfolio adjustment. However, selling existing assets can prove costly when market interest

⁵ It is possible, of course, that a portion of the decline in realized real yields was expected, that is, that *ex ante* real yields declined due to shifts in the supply of or demand for credit. James A. Wilcox presents such evidence in "Why Real Interest Rates Were So Low in the 1970s," *American Economic Review*, March 1983, pp. 44-53. It is unlikely, however, that *ex ante* rates would be negative. For a discussion of this point, see G. J. Santoni and Courtenay C. Stone, "Navigating Through the Interest Rate Morass: Some Basic Principles," *Review*, Federal Reserve Bank of St. Louis, March 1981, pp. 11-18.

⁶ The performance, of course, was dismal only from a lender's (investor's) point of view. From a borrower's point of view, it was exemplary. The situation was reversed in 1981 and 1982 when large realized real interest rates were no doubt gratifying to lenders but disappointing to borrowers.

Table 2
INFLATION AND REALIZED REAL RATES OF RETURN: 1953-82

Year	Realized Real Rate of Return with Investment Strategy of:			
	Rate of Inflation	Rolling Over 30-Day Treasury Bills	Holding 1-Year Treasury Bill Until Maturity	Purchasing 20-Year Treasury Bond at Beginning of Year and Selling at End of Year
	(1)	(2)	(3)	(4)
1953	0.62%	1.19%	1.48%	2.99%
1954	-0.50	1.37	1.84	7.73
1955	0.37	1.20	1.03	-1.66
1956	2.86	-0.39	-0.29	-8.22
1957	3.02	0.12	0.18	4.30
1958	1.76	-0.22	0.79	-7.72
1959	1.50	1.43	1.63	-3.70
1960	1.48	1.16	3.38	12.12
1961	0.67	1.45	2.01	0.30
1962	1.22	1.49	1.91	5.60
1963	1.65	1.45	1.38	-0.43
1964	1.19	2.32	2.58	2.29
1965	1.92	1.97	2.04	-1.19
1966	3.35	1.36	1.45	0.29
1967	3.04	1.14	1.84	-11.87
1968	4.72	0.47	0.92	-4.76
1969	6.11	0.44	0.20	-10.55
1970	5.49	0.99	2.61	6.27
1971	3.36	1.00	1.73	9.55
1972	3.41	0.42	0.91	2.20
1973	8.80	-1.72	-2.92	-9.11
1974	12.20	-3.74	-4.45	-7.00
1975	7.01	-1.13	0.06	2.04
1976	4.81	0.26	1.43	11.39
1977	6.77	-1.55	-1.83	-6.97
1978	9.03	-1.70	-1.93	-9.35
1979	13.31	-2.59	-2.44	-12.82
1980	12.40	-1.03	-0.45	-14.55
1981	8.94	5.30	4.62	-6.51
1982	3.87	6.42	9.09	35.12
Means:				
1953-72	2.36	1.02	1.48	0.18
1973-82	8.71	-0.15	0.12	-1.78
Standard Deviations:				
1953-72	1.73	0.69	0.89	6.59
1973-82	3.20	3.34	4.05	14.99

Notes and Sources:

1. The rate of inflation (column 1) is measured as the December-to-December percentage change in the seasonally unadjusted CPI. Data beginning in 1978 are for all urban consumers; earlier data are for urban wage earners and clerical workers.
2. The real rates of return reported in columns 2 and 4 are updated from Zvi Bodie, "Commodity Futures as a Hedge Against Inflation," *The Journal of Portfolio Management*, Spring 1983, Table 1, p. 13. Underlying nominal rates are from Roger G. Ibbotson and Rex A. Sinquefeld, *Stocks, Bonds, Bills and Inflation: The Past and the Future, 1982 Edition*, The Financial Analysts Research Foundation, University of Virginia, Exhibit 4, p. 17.
3. The real rates of return reported in column 3 are updated from Zvi Bodie, "An Innovation for Stable Real Retirement Income," *The Journal of Portfolio Management*, Fall 1980, Table 3, p. 10. Underlying nominal rates are from Salomon Brothers, *Analytical Record of Yields and Yield Spreads*.
4. Real rates of return are calculated according to the formula:

$$\text{Real rate of return} = 100 \times \left[\frac{1 + \text{nominal rate of return}}{1 + \text{rate of inflation}} - 1 \right]$$

All rates of return are pre-tax.

rates are rising. Because of the inverse relation between interest rates and asset prices, whenever market interest rates increase, prices of existing assets decline. These capital losses are manifestations of the so-called "interest rate risk" associated with holding longer term negotiable debt instruments.⁷

One way of limiting this interest rate risk is to hold debt instruments for which the interest rate is indexed to other market interest rates.⁸ When market rates rise, rates on these assets automatically follow. Consequently, the potential for capital losses is reduced. Of course, the potential for capital gains (in an environment of falling interest rates) is also reduced. Such assets may be termed "market interest rate-indexed" financial assets, or MIRI assets for short.

An example of a MIRI asset is a long-term bond with an interest rate indexed to a short-term Treasury bill rate. At periodic intervals, say, every six months, the interest rate on the bond is adjusted to bring it in line with the rate prevailing on Treasury bills. For instance, it may be set at one or two percentage points above the weekly average Treasury bill rate, computed over some recent period. In this way, the yield on the bond moves with market interest rates.

Because their yields follow general market rates, MIRI assets reduce the interest rate risk facing investors. However, MIRI assets do not guarantee a real rate of return. Unlike inflation-indexed assets, MIRI assets expose lenders and borrowers to an inflation risk. MIRI assets provide protection from general price movements only the extent that such

movements are anticipated and built into the interest rates to which the assets are indexed.⁹

Column 4 of Table 2 provides an example of the interest rate risk associated with holding longer term debt instruments in recent years. An investment strategy of purchasing 20-year Treasury bonds at the beginning of the year and selling them at the end of the year is assumed. Annual real rates of return are calculated, taking into account both interest paid and capital gains or losses.

Over the 1953-72 period, this strategy would have yielded an average real rate of return of 0.2 percent. Over the volatile 1973-82 period, the real rate would have averaged -1.8 percent, falling to as low as -12.8 percent in 1979 and -14.6 percent in 1980. Rising interest rates, reflecting in part rising inflationary expectation, generated large capital losses.

By indexing the nominal interest rate on the 20-year bond to, say, the rate on the 3-month or 1-year Treasury bill, these capital losses could have been reduced. However, judging from the earnings on the 3-month and 1-year bills (presented in columns 2 and 3), such market interest rate indexation would not have prevented real rates of return on the bond from falling below zero over much of the 1973-82 period. To repeat the point made above, MIRI assets do not guarantee a real rate of return. They do not insulate investors from unexpected increases in inflation.

CHANGING NATURE OF OF FINANCIAL ASSETS

Financial assets have become increasingly flexible throughout the 1970s and early 1980s. Several new debt instruments have emerged, in-

⁷ This risk is sometimes alternatively referred to as "capital risk" or "price risk."

⁸ Interest rate risk is completely eliminated by market interest rate indexation only if the term structure of interest rates remains unchanged over the life of the asset.

⁹ Inflation-indexed assets, of course, strictly guarantee a real rate of return only if held until maturity. Capital losses could conceivably be incurred if such assets were sold prior to maturity, implying a nonguaranteed total (interest paid plus capital loss) real rate of return.

cluding floating rate notes, adjustable rate mortgages, and zero-coupon corporate bonds. Several new time deposits have been introduced, including money market certificates, All-Savers certificates, and money market deposit accounts. A number of other investment vehicles have appeared, including money market mutual funds, pooled CD funds, and universal life insurance policies. A common feature of all these assets is a flexibility not previously available.

This section surveys the changing nature of financial assets in recent years. The discussion centers on the liabilities of three groups: corporations, households, and financial intermediaries. A principal finding is that, although financial assets have increased in flexibility, this flexibility has rarely taken the form of inflation indexation.

Corporate liabilities

Corporate debt has become shorter in maturity and more flexible in design in recent years. These developments probably reflect an increasing reluctance on the part of investors to make long-term commitments and of borrowers to lock in high-cost liabilities. This reluctance is understandable given the erratic behavior of prices and interest rates over the period. Movements in these measures have become increasingly difficult to predict.

The primary form of long-term corporate debt is bonds. Over the past ten years, a number of changes have occurred in bond financing. New types of instruments have appeared and existing instruments have been modified. Perhaps the most important development has been the emergence of floating rate notes.

Floating rate notes have interest rates indexed to other market rates, typically a short-term Treasury bill rate or the commercial paper rate. These instruments are examples of the

MIRI assets discussed in the preceding section. Floating rate notes were introduced by Citicorp in June 1974. Citicorp had intended to issue \$250 million of these notes, pegged to the 3-month Treasury bill rate, but because investor demand was so great it eventually sold \$650 million. The Citicorp note was soon followed by floating rate notes from Chase Manhattan, Mellon National Bank, Crocker National Bank, and Continental Illinois.¹⁰

Floating rate notes have become firmly entrenched in the financing strategies of many corporations. Aggregate statistics reflect their importance. In 1982, floating rate notes accounted for 9.0 percent of the gross issuance of publicly offered corporate bonds. Over the first quarter of 1983, the proportion was 20.2 percent. Although most floating rate notes are issued by financial corporations, such as bank holding companies and finance companies, a growing number of manufacturing and commercial firms have entered the market in recent years. In 1982, for example, manufacturing firms sold \$780 million of these notes, representing 11.4 percent of the total bonds they issued.^{11 12}

¹⁰ These early issues are discussed in "Floating Rate Notes: An Idea Whose Time Has Passed?" *Moody's Bond Survey*, October 10, 1977, pp. 741-42.

¹¹ Data are derived from Salomon Brothers Inc., "Corporate Bond Volume: Monthly Update—March 1983," Figure 5. The floating rate note category includes extendable bonds and other adjustable rate issues.

¹² Floating rate notes have been defined here as being indexed to general market interest rates. Two related types of assets that have recently surfaced are silver-indexed bonds and stock-indexed bonds. In 1980, the Sunshine Mining Corporation issued \$50 million of certificates with principals indexed to the price of silver. The effective principal for each \$1,000 face amount was taken to be the greater of \$1,000 or the market price of 50 ounces of silver. In 1981, Oppenheimer and Company issued \$25 million of notes indexed to the trading volume on the New York Stock Exchange. The notes stipulated that as market activity increased, the nominal interest rate would increase. For further discussion, see "New Offering—Sunshine Mining Cor-

Another development of recent years is the growing prevalence of zero-coupon and deep-discount corporate bonds. Zero-coupon bonds are priced below par and yield no coupon payments. Rather, all interest is paid when the bond is redeemed at par. Deep-discount bonds are also priced below par, but the discount is smaller and some interest is paid prior to maturity. The increased call protection provided by these instruments was a primary reason for their development. Some investors also find these instruments attractive because reinvestment risk on interest payments is reduced (deep-discount) or even eliminated (zero-coupon).¹³

Deep-discount and zero-coupon corporate bonds were nonexistent in 1979 but accounted for 14.5 percent of publicly issued corporate bonds in 1981. The proportion slipped to 9.9 percent in 1982 and 4.0 percent in the first three months of 1983.¹⁴ The recent decline has been attributed to changes in the corporate tax law making interest deductibility less generous.¹⁵

Besides the appearance of such new instruments as floating rate notes and zero-coupon bonds, the 1973-82 period has seen growing modification of existing instruments. For example, conventional bonds increasingly incorporate put options which allow the investor to sell the bond back to the corporation at a fixed

price, thus avoiding capital losses. Extendable bonds allow the investor to renegotiate the yield at periodic intervals, with the option of holding or redeeming the bond at those times. Bonds with warrants permit the investor to buy additional debt from the corporation at a fixed yield.¹⁶

Many of these innovations and modifications have served to shorten the effective maturity of corporate bonds. Original maturities have also declined. In 1979, 68.5 percent of all publicly issued bonds had maturities of 20 years or greater. By 1982, the proportion had fallen to 34.5 percent.¹⁷ A similar pattern has held for another type of corporate debt, business loans at commercial banks. Over the 1977-82 period, the proportion of long-term (one year or greater) commercial and industrial loans declined from 15.9 percent to 9.6 percent. At the same time, the proportion of long-term loans with a floating rate, tied to other market interest rates, increased from 48.6 percent to 69.7 percent.^{18 19}

Household liabilities

Like corporate liabilities, household liabilities have become increasingly flexible in recent years. Particularly sweeping changes have occurred in the home mortgage market. A

poration," *Moody's Bond Survey*, April 14, 1980, p. 1554, and Daniel Hertzberg, "Some Gimmicks Used to Sell Bonds Sour as Rates Fall, Inflation Slows," *Wall Street Journal*, December 14, 1982, p. 23.

¹³ For further discussion of deep-discount and zero-coupon bonds, see Patrick Davey, "Debt Financing: Techniques and Trends," Conference Board Research Bulletin No. 114.

¹⁴ Data are derived from Salomon Brothers Inc., "Corporate Bond Volume: Monthly Update—January 1983," Figure 5, and "Corporate Bond Volume: Monthly Update—March 1983," Figure 5.

¹⁵ See "Some Borrowers Still Don't Want 'Vanilla,'" *Business Week*, March 21, 1983, pp. 130-31.

¹⁶ For further discussion of some of these innovations, see Davey, "Debt Financing . . .," and William L. Silber, "The Process of Financial Innovation," *American Economic Review*, May 1983, pp. 89-95.

¹⁷ Data are derived from Salomon Brothers Inc., "Corporate Bond Volume: Monthly Update—January 1983," Figure 5.

¹⁸ Data are taken from Daniel J. Vrabac, "Banking Developments: 1979-82," unpublished paper, Economic Research Department, Federal Reserve Bank of Kansas City, February 23, 1983, Table 4, p. 20.

¹⁹ Karlyn Mitchell examines the declining maturity of corporate debt, as well as increasing debt-to-asset ratios and declining liquid asset ratios, in "Trends in Corporation Finance," *Economic Review*, Federal Reserve Bank of Kansas City, March 1983.

large number of alternative financing arrangements are now available to prospective home buyers, including adjustable rate mortgages, growing equity mortgages, shared appreciation mortgages, and balloon mortgages. So-called "creative financing" has become the rule rather than the exception.

As the name implies, adjustable rate mortgages are mortgages on which the interest rate is adjusted periodically. Lending institutions increasingly adopted these instruments following relaxation of regulatory restrictions in the spring of 1981.²⁰ In August 1981, 37.1 percent of a sample of 400 representative savings and loan associations were offering adjustable rate mortgages. By September 1982, the percentage had increased to 62.5 percent.²¹ Corresponding to this increased availability has been an increased usage. During the first six months of 1981, the estimated proportion of loans closed by all lenders (savings and loans, commercial banks, mutual savings banks, mortgage companies) that were adjustable rate averaged 1.7 percent. Since then, the proportion has averaged 34.6 percent (July 1981-March 1983).²²

²⁰ In April 1981, the Federal Home Loan Bank Board removed constraints on the amount of adjustment and on the indexes that could be used in adjustable rate mortgages offered by federal savings and loan associations.

²¹ Data are taken from *Survey of Savings and Loan Associations' Adjustable Mortgages*, American Mortgage Insurance Company, September 10, 1981, and *Survey Number 3—Adjustable Type Mortgages*, American Mortgage Insurance Company, October 8, 1982. Diane L. Cortes of the American Mortgage Insurance Company generously provided these data.

²² The prevalence of adjustable rate mortgages has been positively related to the interest rate on conventional mortgages. For example, over the March 1982-October 1982 period, when the contract rate on conventional first mortgages averaged 16.3 percent, the estimated proportion of loans closed that were adjustable rate averaged 43.1 percent. Over the more recent February 1983-March 1983 period, when the conventional mortgage rate averaged 12.9 percent, the proportion averaged 29.2 percent. Some borrowers may have been led away from conventional mort-

gages and into adjustable rate mortgages in the earlier period because they found the typically higher offering rates on conventional mortgages prohibitive. The mortgage prevalence data are derived from unpublished Federal Home Loan Bank Board survey results; Virginia K. Olin of the Federal Home Loan Bank Board generously provided these data. Conventional mortgage interest rate data are taken from various issues of "Selected Interest Rates," Federal Reserve Statistical Release G.13.

Most adjustable rate mortgages have interest rates indexed to other market interest rates, and, as such, are examples of MIRI assets. Survey data reveal that savings and loan associations usually index their adjustable rate mortgages to the Federal Home Loan Bank Board mortgage contract rate while other mortgage servicers, including mortgage banking companies and commercial banks, usually index to rates on Treasury securities.²³ Savings and loan associations most commonly adjust interest rates annually. The adjustment interval for other mortgage servicers tends to be somewhat longer.²⁴

Not all adjustable rate mortgages are indexed to market interest rates. A very small number are indexed to changes in the price level. These price level-adjusted mortgages, or PLAM's,

²³ The 1982 survey cited in footnote 21 reveals that, among savings and loan associations, 62.5 percent most often index to the Federal Home Loan Bank Board contract rate and 12.8 percent most often index to rates on Treasury securities. Among other mortgage servicers, the figures are 4.9 percent and 95.0 percent, respectively. The difference is likely explained by the Federal Home Loan Mortgage Corporation requirement that any adjustable rate mortgage it purchases must be tied to the Federal Home Loan Bank Board rate. The Federal Home Loan Mortgage Corporation is an important secondary market customer for savings and loan associations. Stephen T. Zabrenski and Virginia K. Olin make this point in "Characteristics of Adjustable Mortgage Loans by Large Associations," Federal Home Loan Bank Board *Journal*, August 1982, p. 22.

²⁴ The 1982 survey cited in footnote 21 reveals that, among savings and loan associations, 58.6 percent most often adjust interest rates every year, 12.2 percent every three years, and 10.4 percent every five years. Among other mortgage servicers, 48.8 percent most often adjust interest rates every five years, 22.0 percent every six months, and 19.5 percent every year.

provide true inflation indexation. By protecting borrowers and lenders from unexpected price movements, they effectively guarantee a real interest rate.

PLAM's have been introduced in only a handful of states, including Utah, Colorado, Louisiana, and Georgia. One of the earliest experiments was in Utah. In 1981, the Utah State Retirement Board began making available PLAM's with a real interest rate of 4.5 percent. The program is reported to have been well received. According to one mortgage-industry spokesman, the program provided "a good investment for pension funds and, at the same time, offer(ed) the advantages of . . . below-market interest rates to borrowers."²⁵ PLAM's initially offer below-market nominal interest rates because built-in inflation premiums are unnecessary. If inflation accelerates, nominal interest rates are automatically adjusted upward.²⁶

Consumer loans at banks and finance companies are another major household liability. Here, too, changes are underway. Variable rate consumer loans, with interest rates tied to other rates, are slowly being introduced. Although aggregate data are unavailable, anecdotal evidence suggests growing consumer interest. A bank in Roanoke, Va., for example, recently reported that its variable rate loan program had grown to account for nearly 65 percent of consumer loans since being introduced in April 1982. Banks in Indianapolis, Ind., and

Louisville, Ky., have also reported success with such loans.²⁷

Financial intermediary liabilities

Depository institutions have experienced rapid deregulation in the late 1970s and early 1980s. Fixed ceiling accounts have been joined by variable ceiling and ceiling-free accounts. Investors now face a diverse array of deposit possibilities.

Variable ceiling accounts have ceilings which are pegged to rates on various Treasury securities. The 6-month money market certificate was the first such account; commercial banks and thrift institutions were authorized to offer this instrument beginning in June 1978. The 6-month certificate was followed by variable ceiling 2½-year or longer small saver certificates in January 1980,²⁸ variable ceiling 12-month All-Savers certificates in October 1981, variable ceiling 91-day time deposits in May 1982, and variable ceiling 7- to 31-day time deposits in September 1982.

Offering more flexibility are time deposits completely free of interest rate ceilings. Jumbo CD's (\$10,000 minimum denomination) with maturities of 90 days or less have been ceiling free since 1970; longer term large CD's have been ceiling free since 1973. The first ceiling-free deposit accessible to small savers was the 18-month or longer individual retirement ac-

25 "ABMs May Unlock Pension Funds," *Realtor News*, December 7, 1981, p. 1.

26 For further discussion of PLAM's, see Arthur Sharplin, "The Real Dollar Payback Mortgage," *The Bankers Magazine*, January/February 1983, pp. 50-55; J. Huston McCulloch, "Price Level Adjusted Mortgage-Affordability and Inflation Protection," *Mortgage Banking*, September 1982, pp. 8-13; and Henry J. Cassidy, "Price-Level Adjusted Mortgages Versus Other Mortgage Instruments," *Federal Home Loan Bank Board Journal*, January 1981, pp. 3-11.

27 See "Virginia National Looking at Variable Rate Consumer Loans," *Bank Letter*, January 17, 1983, p. 6; Laura Gross, "A Reporter's Notes: Video Games and Variable Rates," *American Banker*, April 15, 1983, p. 2; and "Bank One Plans Variable Rate Consumer Loans," *Bank Letter*, January 24, 1983, p. 6.

28 This instrument actually was introduced in July 1979 as a 4-year or longer deposit, but in January 1980, the maturity was reduced to 2½ years or longer and its ceiling rate was increased. The maturity was changed to 2½ to 3½ years in May 1982 when the 3½-year or longer ceiling-free account was introduced. The maturity was changed again, to 1½ to 2½ years, in April 1983 when the 2½-year or longer ceiling-free account was introduced.

count, authorized in December 1981.²⁹ Ceiling-free 3½-year or longer time deposits were authorized in May 1982, followed by ceiling-free money market deposit accounts in December 1982, ceiling-free Super-NOW accounts in January 1983, and ceiling-free 2½-year or longer time deposits in April 1983.

Investors have moved quickly into these accounts. In 1977, all small time deposit funds were held in fixed-ceiling deposits. By 1982, 85.4 percent of such funds in commercial banks was held in variable-ceiling or ceiling-free accounts. Comparable figures were 91.4 percent for savings and loan associations and 82.7 percent for mutual savings banks.³⁰

Investors have also moved into the growing spectrum of instruments offered by non-depository institutions. These include, but are not limited to, money market mutual funds, municipal bond funds, pooled CD funds, and zero-coupon Treasury security funds introduced by brokerage firms and other financial concerns, and variable-life and universal-life insurance policies introduced by life insurance companies. Some of these instruments have experienced extraordinary growth in recent years.

This survey of the changing nature of financial assets has uncovered only one type of inflation-indexed financial asset, PLAM's, and

they were found to be quite limited in use. Otherwise, inflation-indexed financial assets appear not to exist. Corporations do not issue inflation-indexed bonds. Commercial banks and thrifts do not offer inflation-indexed time deposits. Nondepository intermediaries do not offer inflation-indexed instruments. With the exception of PLAM's, lending institutions do not make available inflation-indexed loans. Benjamin Friedman, a leading financial economist, has characterized the lack of indexation as "a striking shortcoming" of the U.S. financial system.^{31 32}

POSSIBLE EXPLANATIONS FOR THE LACK OF INFLATION INDEXATION

This section explores possible reasons for the near-absence of inflation-indexed financial assets. The discussion is guided by consideration of the likely supply and demand motives of households, corporations, and financial intermediaries. Specifically, the analysis focuses on: (1) household demand for inflation-indexed bonds, time deposits, and other intermediary instruments; (2) corporate supply of inflation-indexed bonds; and (3) financial intermediary supply of inflation-indexed time deposits and other instruments and their demand for inflation-indexed loans and bonds.

Household demand

There is no *a priori* reason for believing that households would not demand inflation-indexed financial assets if they were available. Theoretical and anecdotal evidence suggests that they would welcome such instruments.

²⁹ Ceilings were removed on small time deposits (\$1,000 minimum denomination) with maturities four years or longer for a brief period in 1973. This "wild card" experiment, extending from July 5 to October 31, was designed to permit depository institutions to compete for a larger share of funds. The experiment proved highly popular with the public. It was terminated because commercial banks marketed the accounts more aggressively than savings and loan associations, placing the latter at a disadvantage. For further discussion, see "Changes in Time and Savings Deposits at Commercial Banks: July-October 1973," *Federal Reserve Bulletin*, April 1974, pp. 252-57, and "Nixon Gets Measure that Bans CDs Free of Interest-Fee Lids," *Wall Street Journal*, October 3, 1973, p. 25.

³⁰ Data are taken from Vrabac, "Banking Developments . . .," Table 2, p. 14.

³¹ Benjamin M. Friedman, "Postwar Changes in the American Financial Markets," in *The American Economy in Transition*, edited by Martin Feldstein, University of Chicago Press, 1980, p. 58.

³² Inflation-indexed financial assets have appeared in other countries, including France, Finland, Denmark, Austria, Israel, Belgium, and Brazil. Surveys of foreign experience

Stanley Fischer has developed a model that studies household demand for indexed bonds.³³ Households are assumed to be infinitely lived, risk averse, and facing a stochastic rate of inflation. They can hold as assets indexed bonds, nominal (nonindexed) bonds, and equity. The model implies that, in the absence of wage income and relative price uncertainty, all lending and borrowing will take place through indexed bonds. In a more realistic setting with wage income, both nominal and indexed bonds would likely exist. In neither case are indexed bonds dominated by nominal bonds. These results presumably extend to other types of inflation-indexed assets.

Other evidence suggests that households would willingly hold inflation-indexed assets in their portfolios. Cost-of-living escalators have become increasingly prevalent in wage contracts, indicating that individuals are aware of the dangers of unexpected inflation.³⁴ The shift in recent years from financial assets to real assets (e.g., housing, gold, antiques) suggests that households have been seeking inflation hedging.³⁵ In addition, as documented in the

with inflation indexation include Michael J. Prell, "Index-Linked Loans: Part II," *Monthly Review*, Federal Reserve Bank of Kansas City, November 1971, pp. 9-20; Adolf Ahnefeld and K.-H. Frank, "Appendix—Scope and Forms of Escalator Clauses in Various Countries," in *Essays on Inflation and Indexation*, American Enterprise Institute, 1974, pp. 16-23; Albert Fishlow, "Indexing Brazilian Style: Inflation Without Tears?" *Brookings Papers on Economic Activity*, 1974:1, pp. 261-82; and David Finch, "Purchasing Power Guarantees for Deferred Payments," *IMF Staff Papers*, February 1956, pp. 1-22.

³³ Stanley Fischer, "The Demand for Index Bonds," *Journal of Political Economy*, June 1975, pp. 509-34.

³⁴ In January 1973, 39 percent of workers under major union contracts were covered by escalator clauses. In October 1982, 58 percent were covered. See William M. Davis, "Collective Bargaining in 1983: A Crowded Agenda," *Monthly Labor Review*, January 1983, p. 11.

³⁵ Milton Friedman makes this point in "The Changing Character of Financial Markets," in *The American Economy in Transition*, edited by Martin Feldstein, University of Chicago Press, 1980, p. 84.

preceding section, the financial assets that are held have become increasingly innovative and flexible. Such new instruments as money market mutual funds, deep-discount bonds, and more recently, money market deposit accounts have been well received by households. It is unlikely that households would completely shun new inflation-indexed instruments.³⁶

One possible hindrance to household demand of inflation-indexed financial assets is the existing indexation in Social Security. One might argue that the inflation protection provided by Social Security satiates household demand for inflation-indexed assets. This argument is unconvincing for two reasons. First, nonretired individuals are likely to want some inflation protection for their current assets, i.e., those that will mature before retirement. Second, for many retired individuals, Social Security payments represent only a small part of their total income. Presumably, such individuals would want to index a portion of their income emanating from other sources.³⁷

Similarly, one might argue that households would not be interested in inflation-indexed financial assets because home ownership provides an adequate tool for hedging against inflation. This too is unconvincing. Divisibility constraints and high transactions costs prevent housing from being traded as easily as financial assets. Households would probably prefer to make marginal adjustments to their inflation-indexed holdings by buying and selling financial assets rather than buying and selling housing units.

³⁶ Further support for this view is offered by Arthur Sharplin, who notes that inflation-indexed national savers certificates in Great Britain are so popular that they have to be rationed, even though they pay a real interest rate of less than 1 percent. See Sharplin, "The Real-Dollar . . .," p. 55.

³⁷ Zvi Bodie makes this point in "An Innovation for Stable Real Retirement Income," *The Journal of Portfolio Management*, Fall 1980, p. 5.

Finally, it might be argued that individuals regard inflation-indexed assets and MIRI assets as close substitutes and, as such, are satisfied holding only the latter. Although this may be true for some individuals, it is unlikely true for all. As documented in the first section of the article (Table 2, columns 2 and 3), market interest rate indexation would not have prevented negative real rates of return from being earned during much of the 1970s. It seems reasonable to believe that at least some investors are aware of the record and, consequently, do not regard MIRI assets and inflation-indexed assets as close substitutes.

In summary, it appears likely that households would respond favorably to inflation-indexed financial assets. The near-absence of such assets does not appear to be attributable solely to a lack of household demand.

Corporate supply

Several explanations have been advanced for the failure of corporations to issue inflation-indexed bonds. The most straightforward explanation involves possible legal obstacles.

J. Huston McCulloch has argued that the U.S. Joint Congressional Resolution of 1933 deterred issuance of inflation-indexed securities until it was revoked in 1977. This law, the so-called Gold Clause Resolution, prohibited gold clauses in financial contracts. Citing a 1974 Tennessee Supreme Court decision (*Aztec Properties vs. Union Planters National Bank*) in which an indexed bank loan was disallowed on the basis of the resolution, McCulloch states that the resolution "has worked silently yet very effectively by making index clauses unenforceable in court."³⁸

Keith S. Rosenn does not share this view. He

³⁸ J. Huston McCulloch, "The Ban on Indexed Bonds, 1933-77," *American Economic Review*, December 1980, p. 1019.

states that "for 42 years it had simply been assumed that there was no conflict between index clauses and the U.S. Joint Resolution of 1933." He adds, "There are no cases on point prior to *Aztec Properties vs. Union Planters National Bank* . . . for the assumption of validity was so widespread that no one bothered to litigate the point."³⁹ Supporting Rosenn's claim is the fact that at least two inflation-indexed bonds were issued after 1933, one from the Christiansen Corporation in 1952 and a similar one from the Utility Manufacturing Company some years later.

The true impact of the Gold Clause Resolution on the issuance of inflation-indexed bonds remains unresolved. It is clear that since 1977 such bonds have been explicitly legal.

Another legal consideration, addressed in some detail by Gordon McClintock, is the possible nonnegotiability of inflation-indexed corporate bonds. Under Article 8 of the Uniform Commercial Code, an indexed bond would be negotiable provided it was "commonly dealt in upon securities exchanges or markets" or "commonly recognized in any area in which it is issued or dealt in as a medium for investment." As McClintock notes, "commonly dealt in" and "commonly recognized" are not defined in the Code, and consequently, "the problem is in determining when an instrument becomes one 'commonly dealt in.'"⁴⁰ It is conceivable that inflation-indexed bonds could initially be nonnegotiable, and that this possibility has prevented their issuance. However, this is not likely the case. Floating rate notes, deep-discount bonds, and extend-

³⁹ Keith S. Rosenn, "Protecting Contracts from Inflation," *The Business Lawyer*, January 1978, pp. 740-41.

⁴⁰ Gordon E. McClintock, "The Probable Legal Consequences of Inserting Price-Index Clauses in Long-Term Corporate Obligations," *The Hastings Law Journal*, May 1967, p. 970.

able bonds are all currently trading on the New York Stock Exchange. Negotiability was not a problem for them.

A second possible explanation for the absence of inflation-indexed corporate bonds involves possible tax obstacles to the firm. Suppose a firm issues a 1-year indexed bond with principal \$10,000 and contract rate 2.0 percent. Further suppose that inflation over the year is 6.0 percent. At redemption, the lender receives the inflation-adjusted principal (\$10,000 + \$600) plus interest on the inflation-adjusted principal ($.02 \times \$10,600 = \212), for a total of \$10,812. If the adjustment to principal (\$600) is treated as deductible interest, the bond poses no disadvantages to the firm. If it is not treated as deductible interest, the firm might be less anxious to issue the bond.

This potential tax obstacle can be avoided, however, by altering the indexing mechanism. Instead of adjusting the principal and then applying the contract rate, the nominal interest rate can be adjusted, and then applied to the original principal. In the example above, the adjusted nominal interest rate would be 2.0 percent + 6.0 percent + (2.0 percent)(6.0 percent) = 8.12 percent. At redemption, the lender receives the original principal (\$10,000) plus interest on that principal ($.0812 \times \$10,000 = \812), again for a total of \$10,812. Presumably, all interest (\$812) would be treated as deductible interest, just as it is for conventional bonds and floating rate notes. Consequently, tax obstacles do not appear to explain the absence of inflation-indexed bonds.⁴¹

It has been suggested that firms have had little incentive to issue inflation-indexed bonds because they have been able to borrow at nega-

tive after-tax real rates of interest since the early 1960s.⁴² Although this argument appears reasonable, Stanley Fischer has noted that it requires firms to have had systematically higher inflationary expectations than lenders, and this is "difficult to confirm or refute."⁴³ On theoretical grounds, it is not clear why lenders would consistently underestimate inflation to a greater extent than borrowers.

Fischer has developed a formal model that studies the corporate supply of inflation-indexed bonds.⁴⁴ Firms can finance investment outlays by issuing indexed bonds, nominal bonds, or equity. They are assumed to want to maximize their stock market value. The model predicts that indexed bonds will be issued by firms whose real profits are positively correlated with the general price level. The incentive for such firms to issue indexed bonds increases as the variance of the price level increases.

In a preliminary test of the model, Fischer examined the profits of 16 large firms over the 1954-73 period. He found that some of these firms had profits which moved with aggregate prices. This led him to conclude that "the failure of indexed bonds to appear is *not* due to the fact that there are no firms whose profits are positively correlated with the price level."⁴⁵

In Fischer's opinion, such firms did not issue indexed bonds because they had little incentive to do so, given the low level of inflation variability and possible costs of innovation. Fischer offered this explanation in the mid-1970s, when the record revealed a low variability of inflation. (See Table 1.) Although his explanation may have some validity for the

⁴¹ This argument draws the distinction between indexed principal bonds and indexed interest bonds, defined in footnote 3. For further discussion, see Fischer, "Corporate Supply . . .," pp. 18-20.

⁴² See Milton Friedman, "The Changing Character . . .," p. 84.

⁴³ Stanley Fischer, "Corporate Supply . . .," p. 21.

⁴⁴ Stanley Fischer, "Corporate Supply . . ."

⁴⁵ Stanley Fischer, "Corporate Supply . . .," p. 16.

period prior to 1973, inflation since then has been far more volatile and, according to the model, should have led to a growing number of inflation-indexed bonds. An alternative explanation must be sought for the more recent absence of indexed bonds. A strong candidate may be termed the relative price/supply shock explanation.

Both Michael Prell and Alan Blinder have noted that a divergence in product price and general price movements can create cash flow and profit problems for firms with inflation-indexed debt obligations.⁴⁶ Firms incur a risk when they issue inflation-indexed bonds because they have no guarantee that their own prices (and profits) will increase at the same rate as general prices.⁴⁷ Consequently, firms that experience substantial relative price variability are probably less likely to issue inflation-indexed bonds than firms that experience little variability.⁴⁸

A growing number of firms have likely faced

⁴⁶ See Michael J. Prell, "Index-Linked Loans: Part I," *Monthly Review*, Federal Reserve Bank of Kansas City, September-October 1971, pp. 17-18, and Alan S. Blinder, "Indexing the Economy Through Financial Intermediation," in *Stabilization of the Domestic and International Economy*, Carnegie-Rochester Conference Series on Public Policy, Vol. 5, 1977, pp. 69-105.

⁴⁷ Blinder suggests that firms would prefer to issue bonds indexed to their own prices. See Blinder, "Indexing the Economy . . ." Firms in Austria, Israel, and France have issued such bonds. See Prell, "Index-Linked Loans: Part II," pp. 11-16; Finch, "Purchasing Power Guarantees . . .," pp. 3-4; and Fischer, "Corporate Supply . . .," pp. 19-20.

⁴⁸ A similar argument can be made with respect to wage indexation. Firms that experience substantial relative price variability are probably less anxious to have cost-of-living escalators in union wage contracts than those that do not. Of course, in this case the "holders" of the asset, i.e., workers, share the risk by facing a higher probability of layoff. David Esterman presents empirical evidence on the negative relation between relative price variability and cost-of-living escalator coverage in "Relative Price Variability and Indexed Labor Agreements," *Industrial Relations*, Winter 1981, pp. 71-84.

divergence in product and general price movements over the past ten years. The period has been marked by rising relative price variability, due in large part to food and energy supply shocks.⁴⁹ General prices have tended to rise more rapidly than firms' product prices, making indexation to general price indexes riskier for firms. This has likely impeded the issuance of inflation-indexed bonds.⁵⁰

The following is one possible scenario documenting the nonemergence of inflation-indexed bonds. Until 1973, firms with profits that were positively correlated with the general price level operated in an environment where inflation variability was insufficient to evoke much interest in inflation-indexed bonds. Perceived legal obstacles and the perceived ability to borrow at very low after-tax real interest rates also deterred indexed bond issuance. Since 1973, inflation variability has increased substantially, but the increase has come largely from supply sources. Supply shocks have augmented relative price variability and, in the process, often reversed positive correlations between profits and the general price level. As a result, few firms have an incentive to issue inflation-indexed bonds. Perceived legal obstacles and perceived low after-tax real interest rates have also continued to deter such issuance.

This scenario, of course, is speculative, and extensive empirical testing would be required to determine its validity. However, it appears to be a reasonable working hypothesis.

Financial intermediary supply and demand

Several authors have suggested that the primary reason for nonissuance of inflation-

⁴⁹ See Stanley Fischer, "Relative Shocks, Relative Price Variability, and Inflation," *Brookings Papers on Economic Activity*, 1981:2, pp. 381-431.

⁵⁰ Blinder addresses the possible role played by supply shocks in "Indexing the Economy . . .," p. 82.

indexed liabilities by financial intermediaries is the absence of matching inflation-indexed assets.⁵¹ The argument appears reasonable.

Consider first depository institutions such as commercial banks and savings and loan associations. Although such institutions could presumably have issued inflation-indexed time deposits as early as 1970 (as ceiling-free jumbo CD's), potential matching assets were either nonexistent or of questionable legality. Now that the legality of inflation-indexed loans no longer seems in doubt (with the repeal of the Gold Clause Resolution in 1977), and state usury laws are being eased, depository institutions can hold the matching assets with which to offer inflation-indexed liabilities. For example, savings and loan associations currently offering PLAM's could safely issue inflation-indexed deposits. Ceiling-free 3½-year time deposits, money market deposit accounts, or Super-NOW accounts could serve as inflation-indexed vehicles.

Nondepository intermediaries have faced a similar situation. They have likely been reluctant to issue inflation-indexed instruments because they would not have been able to support such instruments with matching assets. If inflation-indexed assets were to become widely available (e.g., inflation-indexed corporate bonds or PLAM's bought in secondary markets), some intermediaries might be expected to offer inflation-indexed liabilities of their own. One can easily conceive of an inflation-indexed mutual fund similar in design to present money market mutual funds.

⁵¹ See, for example, Milton Friedman, "The Changing Character . . .," p. 84, and Prell, "Index-Linked Loans: Part I," p. 17.

SUMMARY

Changing economic and financial conditions have characterized the past ten years. Inflation has risen to high levels and has become increasingly volatile. New types of financial assets have been introduced and existing assets have become more flexible. However, few inflation-indexed assets have emerged.

This article has surveyed the growing flexibility of financial assets and has examined possible reasons why this flexibility has so seldom taken the form of inflation indexation. The analysis suggests that investors would elect to hold inflation-indexed assets if they were available. Consequently, one seeks supply-side explanations for their absence.

Corporations may have been reluctant to issue inflation-indexed bonds in recent years because of a growing variability of relative prices. Other contributing factors have possibly been perceived legal obstacles and expectations of low after-tax real interest rates on conventional bonds. Financial intermediaries may have been reluctant to issue inflation-indexed liabilities because of the absence of matching assets.

Inflation-indexed financial assets will likely become more prevalent if inflationary conditions persist. Depository intermediaries would probably increase the availability of inflation-indexed loans, and subsequently offer inflation-indexed deposits. If supply shocks became less severe, firms with product prices that move closely with general prices could begin to issue inflation-indexed bonds. Nondepository intermediaries would be able to invest in inflation-indexed assets and in turn offer inflation-indexed liabilities of their own. In short, sweeping innovations could continue to characterize the U.S. financial system.