

The Role of Stripped Securities In Portfolio Management

By Sean Beckett

A wave of new financial products has been generated in recent years by the combined pressures of increased financial market volatility, technological innovation and regulatory change. Many of these new products are valuable additions to the tools investors and financial intermediaries use in managing their portfolios. Such new products as financial futures, options and swaps provide better means of hedging interest rate risk while other products increase investment opportunities. But the novelty and complexity of some of these products raise regulatory concerns about their possible misuse, particularly by federally insured financial institutions.

One of the most interesting examples of financial product innovation is the development of stripped securities. These securities are created by separating (stripping) the principal and interest payments from an underlying debt security and selling the claims to the payment streams as new and separate securities. In recent years, stripped

securities have been created from Treasury bonds and from mortgage-backed securities.

The main reason for stripping is to create new securities with properties different from those of the underlying security. For example, the sensitivity of a stripped security's price to interest rate changes can be very different from the price sensitivity of the underlying security. This property can make the stripped security a useful hedging device. However, an investor who does not fully understand the behavior of stripped securities in different interest rate environments can be exposed to sizable losses. In fact, federal bank regulators recently issued guidelines noting the extreme price volatility of some of these stripped securities and warning banks to avoid adding stripped securities to their portfolios.

This article provides an introduction to stripped securities and their uses in investment and portfolio management strategies. Despite apparent similarities in the process of stripping Treasury and mortgage-backed securities, the resulting stripped securities have very different properties and usually appeal to different investors. The article first examines the conceptually simpler

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Treasury-backed stripped securities and then examines mortgage-backed stripped securities. Both discussions are organized into three parts: a description of the underlying Treasury or mortgage-backed securities used to create the stripped securities, a discussion of how stripped securities are created and their key properties, and a look at the evolution of the markets for stripped securities.

Treasury-backed stripped securities

Properties of Treasury securities

To understand the mechanics of Treasury strips and their appeal to investors, it is useful to look first at the main features of the underlying Treasury securities that are stripped. An investor purchasing a Treasury bond pays the Treasury the face value (principal) of the bond and receives in return semiannual payments of interest at a fixed coupon rate plus the return of the principal at maturity. For example, an investor buying a \$10,000 10-year Treasury bond at an 8 percent coupon rate pays the Treasury \$10,000 and receives 20 semiannual interest payments of \$400 each plus the \$10,000 principal at maturity.

From an investor's standpoint, Treasury securities have both advantages and disadvantages. One key advantage is the absence of credit (default) risk. A second advantage is the absence of interest rate risk if the security is held to maturity.

In contrast to these positive attributes, there are two potential drawbacks to an investment in Treasury securities. First, if the investor sells the security before its maturity, the price received for the security may be less than the par value, reducing the effective yield on the investment. This risk of capital loss would be eliminated if the investor could match the maturity of the Treasury security to the timing of his payment needs. A second potential disadvantage is that, if the interest earnings from the Treasury security

are reinvested at the current market rate, the rate of return on the reinvestment may be lower than the coupon rate of the Treasury security.

Creating stripped securities

Treasury-backed stripped securities are created by separating or stripping the principal and interest payments from a Treasury security and selling the claims to these payment streams as new and separate securities. A claim to the principal portion of the underlying Treasury security is called a PO (principal-only) security. A claim to an interest payment is called an IO (interest-only) security. Thus the 10-year Treasury security discussed above can be subdivided into 20 interest-only strips, each representing a \$400 interest payment and one principal-only strip representing payment of \$10,000 principal.

The properties of stripped securities can be very different from the properties of the underlying Treasury security. These properties can make stripped securities a valuable addition to an investment portfolio. In particular, Treasury strips allow an investor to avoid the reinvestment risk of regular Treasury securities and give the investor greater flexibility in matching the maturity of his investment to the timing of his payment needs.

Treasury strips avoid the reinvestment risk of regular Treasury securities because each IO strip and PO strip is, in effect, a zero-coupon bond. Such a bond is a discount security with no periodic interest payments and one lump sum repayment of the principal at maturity. Investors earn a return on a zero-coupon bond by purchasing the bond at discount, that is, by paying less than the face value of the bond. Since there are no periodic interest payments to reinvest, there is no reinvestment risk. The yield of a zero-coupon bond held to maturity is the yield quoted when the bond is sold.

Like a zero-coupon bond, each IO strip and PO

strip obtained from a Treasury security represents a promise to pay a fixed amount of money at a specific date in the future. An investor purchases a strip at a discount from its face value, the amount of the discount determining the effective yield of the strip. By buying one of the IO or PO strips, the investor can lock in a fixed yield for maturities starting at six months and extending to the maturity of the bond.

An investor also can better match the maturity of his investment to his need to make other payments by buying a combination of IO and PO strips. Treasury securities are issued in a limited number of different maturities. By buying an appropriate assortment of strips, the investor can pick investment maturities that more closely coincide with his need to make payments.

Another important property of stripped securities is the sensitivity of their price to interest rate changes. The interest sensitivity of stripped securities can be very different from the interest sensitivity of the underlying Treasury securities. This property can be advantageous to investors who want to change the overall interest sensitivity of their investment portfolios. This same property can potentially be dangerous to unwary investors who add stripped securities to their portfolios without examining their potential price behavior in different interest rate environments.

The relationship between the interest rate and the value of Treasury strips is straightforward. As with the underlying Treasury security, the prices of the strips and interest rates move inversely. As the interest rate rises, the prices both of the strips and of the underlying Treasury security fall. Similarly, as the interest rate falls, the prices of these securities rise.

While the prices of all these securities move in the same direction when the interest rate changes, the magnitude of the price change increases with the maturity of the Treasury strip. In other words, the prices of the strips with the longest maturities are most sensitive to interest

rate changes.¹ The PO strip of a Treasury security represents the payment with the longest maturity. Thus, the price of the PO strip is most sensitive to changes in market interest rates. In contrast, the individual IO strips or combinations of the IO strips have shorter effective average maturities so that the values of these strips are less sensitive to interest rate changes. The interest sensitivity of the underlying Treasury security is a weighted average of the sensitivities of all the strips.²

To see the practical importance of this relationship between the maturity of a strip and its interest sensitivity, consider an investor with a 10-year horizon who has the choice of buying a regular 10-year Treasury security or a PO strip with the same maturity. The investor might prefer the PO strip in order to avoid the reinvestment risk of the Treasury security. However, if the investor has to sell the security before maturity, he must recognize that changes in market rates will have a greater impact on the value of the PO than on the value of the underlying security.

Evolution of the market for Treasury strips

Like most financial innovations, stripped

¹ To see how a longer maturity increases interest rate sensitivity, consider a zero-coupon bond that pays F dollars K years from today. If the market interest rate is r , then the present value, P , of this bond is:

$$P = \frac{F}{(1+r)^K}$$

If the interest rate falls by one percentage point, the value of the zero-coupon bond will increase $K/(1+r)$ percent, a change that grows larger as the maturity, K , increases.

² Some of the IO strips that mature later will be more interest rate sensitive than the underlying Treasury security. However the PO strip and the latest IO strip will be more interest rate sensitive than either the underlying Treasury security or any of the other IO strips. (The latest IO strip represents the final coupon payment, which is made at the same time the principal is repaid.)

securities arose as a solution to specific financial problems. The organized market for Treasury strips originated in the early 1980s, partly in response to high interest rates and partly in response to loopholes in tax laws that made investments in stripped securities attractive.

Investors purchasing 20-year Treasury bonds in 1981 could earn record high coupon rates, close to 16 percent. However, as market rates fell from these elevated levels, the interest from the semiannual coupon payments would have to be reinvested at lower rates. With the creation of Treasury-backed stripped securities, investors could avoid reinvestment risk by locking in the high rates for the maturity of the investment.

Tax laws also stimulated the development of Treasury strips. Prior to 1982, investors did not have to report the implied interest accrual on a zero-coupon bond as current income. In addition, tax accounting rules tied the taxable value of a bond to its principal. Since the price of a PO strip is less than the price of an underlying Treasury security, institutions could buy Treasury securities, create PO strips, and sell the PO strips at a loss for tax purposes. These loopholes were eliminated in the Tax Equity and Fiscal Responsibility Act of 1982.

Treasury strips were originally developed by investment banks to meet the demand for zero-coupon Treasury securities. In 1982, Merrill Lynch created TIGRs (Treasury Investment Growth Receipts), the first zero-coupon derivative security based on Treasury securities.³ Merrill Lynch bought Treasury securities, deposited them as an irrevocable trust handled by a custodian

³ Prior to the development of TIGRs, a few dealers stripped Treasury securities for their customers. The customer received the stripped components of the Treasury security itself, that is, the actual pieces of paper that constitute the Treasury security. TIGRs were a *derivative* security that represented claims to portions of the receipts from a pool of Treasury securities.

bank, and sold zero-coupon TIGRs with maturities that matched the maturities of the interest and principal payments of the pool of Treasury securities. Other investment banks followed Merrill Lynch's approach and created their own proprietary, zero-coupon securities collateralized by pools of Treasury securities.

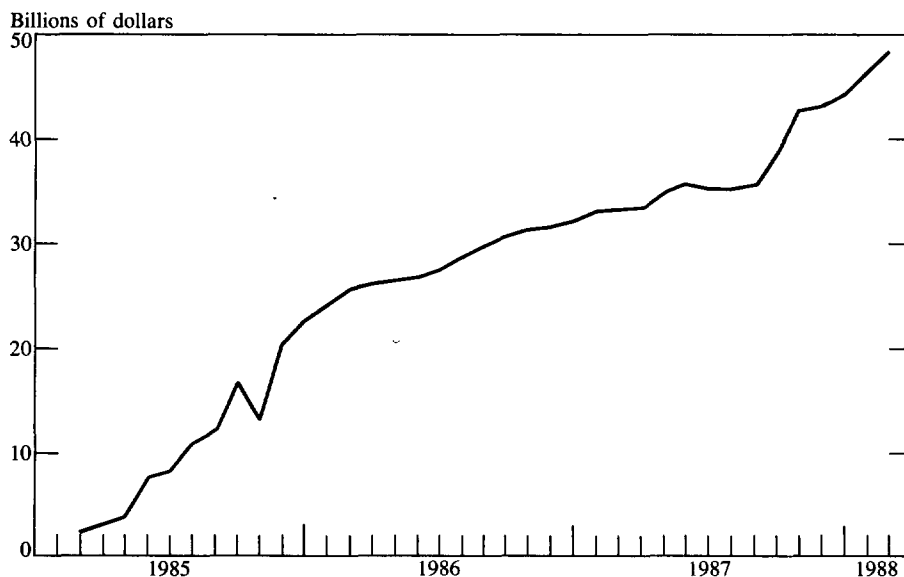
The market for Treasury strips changed dramatically in 1985 when the Treasury announced its own STRIPS (Separate Trading of Registered Interest and Principal of Securities). Prior to 1982, the Treasury had been opposed to Treasury strips because of their tax loopholes. Once the tax loopholes were closed, stripping became attractive to the Treasury because the demand for STRIPS increased the total demand for Treasury securities and, thus, lowered the cost of issuing government debt.

Under the STRIPS program, Treasury securities with maturities of ten years or more can be submitted to the Treasury for stripping. The Treasury provides PO and IO strips in book-entry form to the investors and stands ready to reconstitute the STRIPS by exchanging the underlying Treasury securities for the pieces of the STRIPS.⁴

The market for stripped securities has grown steadily. Privately issued zero-coupon securities dominated the Treasury-backed stripped securities market from August 1982 until the beginning of the Treasury's STRIPS program in February 1985. In these 31 months, investment bankers stripped \$33.7 billion (par value) of Treasury securities. Of this amount 91 percent was accounted for by three products—Salomon Brothers' CATS, the generic TR's (a product supported by a group of investment banks), and

⁴ Although the STRIPS program began in February 1985, the reconstitution program did not start until May 1987. Reconstitution is a desirable feature because it increases the liquidity of STRIPS.

CHART 1
Treasury STRIPS outstanding
 February 1985 to February 1988



Merrill Lynch's TIGRs.⁵

The growth of the Treasury's STRIPS program is displayed in Chart 1. The amount of STRIPS outstanding increased from \$2.4 billion in February 1985 to \$48.2 billion in February 1988. This latter amount represents 4 percent of all outstanding Treasury notes and bonds and 19 percent of all outstanding Treasury securities eligible for stripping. The increase from February 1985 to February 1988 represents an annual growth rate of 172 percent in the amount outstanding. The reconstitution feature of the STRIPS program is also actively used. Reconstitution increased from \$2.6 billion in August 1987 (7 per-

cent of outstanding STRIPS) to \$8.1 billion in February 1988 (17 percent of outstanding STRIPS).

Mortgage-backed stripped securities

The creation of new securities by stripping interest and principal payments from existing securities has been extended recently to the market for mortgage-backed securities. But just as mortgage-backed securities differ fundamentally from Treasury securities, so do the properties of mortgage-backed strips differ from those of Treasury strips. As a result, mortgage-backed stripped securities play a different role in the portfolios of investors and financial institutions.

Properties of mortgage-backed securities

Mortgage-backed securities (MBSs) are pass-

⁵ These figures are taken from Thomas J. Kluber and Thomas Stauffacher, "Zero Coupon Treasury Securities," in *The Handbook of Treasury Securities: Trading and Portfolio Strategies*, edited by Frank J. Fabozzi, Probus Publishing Co., 1987.

through securities, that is, securities representing an undivided interest in the principal and interest payments from an underlying pool of mortgages.⁶ MBSs are more attractive to some investors than whole mortgage loans because the securities are more liquid and are backed by federal or private insurance guarantees. Correspondingly, yields on MBSs are generally lower than on whole mortgage loans.

Mortgage securities and Treasury securities are similar in that they both have low default risk. There are, however, two important differences between MBSs and Treasury securities. First, mortgage principal is amortized over the life of the mortgage so that some principal is included in each mortgage payment. Moreover, the proportion of each payment that represents principal increases steadily while the proportion that represents interest declines. In contrast, a Treasury security has one principal payment at maturity and all other payments represent a constant amount of interest.

Second, and more important, mortgage borrowers have the option of prepaying their mortgages at any time. Prepayments affect the pattern of mortgage payments in two ways. First, prepayment accelerates the mortgage holder's receipt of principal. Second, because mortgage interest payments are calculated as a percentage of the remaining unpaid principal, interest payments cease when principal is repaid early. Thus, the cash flow from an MBS can be altered significantly by a change in prepayments.

Creating mortgage-backed stripped securities

Mortgage-backed stripped securities are created

⁶ The term "MBS" is used in this article as a generic term for a pass-through security backed by a pool of mortgages. For the purposes of this article, mortgage-backed bonds are not included in MBSs.

in much the same way as Treasury strips, by separating the principal and interest payments streams and selling them as separate securities. However, unlike Treasury securities, which are stripped into separate securities for each interest payment and the principal payment, mortgage securities are generally stripped into only two parts: a PO strip representing all principal payments and an IO strip representing all interest payments.⁷ Thus, mortgage strips do not have the zero-coupon feature of Treasury strips.⁸

Because of this difference in construction, mortgage-backed strips play a different role in portfolio management than Treasury strips. Indeed, the two primary functions of Treasury strips—reduction of reinvestment risk and maturity matching—cannot be performed by mortgage strips. Mortgage strips do not have the zero-coupon feature of Treasury strips and thus do not reduce reinvestment risk. Moreover, because of prepayments, the effective maturity of mortgage strips is uncertain so they cannot be used for maturity matching.

The feature that makes mortgage strips most useful in portfolio management is their interest rate sensitivity. In principle, mortgage strips can be very useful hedging devices for a variety of investors and portfolio managers. However determining the degree of interest sensitivity of mort-

⁷ This arrangement, that is, the separation of mortgage cash flows into a single PO security and a single IO security, describes the Federal National Mortgage Association's (Fannie Mae) current method of stripping MBSs. The Fannie Mae program represents the majority of stripped MBSs.

Other methods of separating mortgage cash flows were used early in the development of this market and continue to be used to create so-called strip classes of collateralized mortgage obligations (CMOs), which are multiclass mortgage-backed bonds. Other than noting these techniques here, this article restricts its attention to the simpler Fannie Mae method of stripping MBSs.

⁸ Because mortgage principal is amortized over the life of the mortgage, even the PO portion of an MBS represents a sequence of payments rather than a single zero-coupon type of payout.

gage strips in different interest rate environments is extremely complicated. Thus, they are potentially dangerous in the hands of unsophisticated or unwary investors.

The key factor determining the interest sensitivity of PO and IO mortgage strips is the rate of prepayment on the underlying mortgages. Prepayment rates depend primarily on interest rates. A fall in interest rates tends to increase home sales, causing existing mortgages to be retired. A drop in rates can also cause an increase in mortgage refinancing. Refinancing requires the payment of discount points and other fees. When interest rates fall far enough, though, as they did in the spring of 1986, refinancings and the rate of prepayments can skyrocket. In contrast, when interest rates rise, slower home sales and fewer refinancings cause prepayments to slow.

Prepayments make the price of PO mortgage strips extremely sensitive to interest rate changes—much more sensitive than the price of the underlying MBSs. To see this, it is helpful to divide the change in value of a PO strip into two parts: a discounting effect and a prepayment effect.⁹ Even with prepayment rates held constant, a fall in interest rates induces a rise in the value of a PO strip because the stream of principal payments is discounted at a lower interest rate. Since prepayments rise when interest rates fall, there is a further rise in the value of the PO strip because principal payments are received earlier than expected and thus have higher present value. Taken together, these two effects make the value of PO mortgage strips highly sensitive to interest rate changes.

Prepayments are also crucial in determining the

interest sensitivity of IO mortgage strips. Indeed, prepayments can cause the value of an IO strip to move in the opposite direction from the value of fixed-income securities, making the IO strip potentially useful as a hedging instrument. To see this, consider the effect of a fall in market interest rates with prepayments held constant. As rates drop, the discounting effect causes the value of the stream of interest payments to rise. Thus, the discounting effect causes the price of IO strips to rise, just like the prices of other fixed-income securities, when market rates fall. But if prepayments also increase as rates drop, the expected stream of future interest payments is cut short, reducing the value of the IO strip. If the prepayment effect is large enough, it can outweigh the discounting effect, causing the value of the IO strip to fall. That is, with a strong enough prepayment effect, the value of IO mortgage strips can move in the opposite direction of the prices of other fixed-income securities.

An example may be helpful in illustrating both the importance of the prepayment effect and the heightened interest rate sensitivity of the stripped securities. Consider the effect of a one-percent-age-point decrease in the interest rate, from 9 percent to 8 percent, on the value of a \$100,000 share in a pool of newly issued, 30-year mortgages.¹⁰ The drop in interest rates increases the value of the share to \$104,511, a 4.5 percent gain. This increase reflects the combined effect of the discounting and prepayment effects. The discounting effect alone—that is, the effect of holding

⁹ This division of the effect of interest rate changes into two parts is only a conceptual separation. When interest rates change, the discounting and prepayment effects simultaneously influence MBS values. Only the ultimate changes in values can be observed. Nonetheless it is helpful to analyze these influences separately.

¹⁰ The methods used to calculate the effects described in this example are explained in Edward A. Hjerpe III, "Stripped Mortgage-Backed Securities: An Economic Analysis and Valuation Simulation," Research Working Paper 130, Federal Home Loan Bank Board, June 1987. The prepayment assumptions used in the example are taken from the estimates in Frank J. Navratil, "The Estimation of Mortgage Prepayment Rates," Research Working Paper 112, Federal Home Loan Bank Board, April 1984.

prepayments constant and discounting future cash flows at 8 percent rather than 9 percent—raises the value of the share \$6,819, or 6.8 percent.¹¹ However, the drop in interest rates also increases prepayments. These prepayments raise the present value of the principal payments, but, by retiring principal early, they reduce the amount of the interest payments. The net result of this prepayment effect is to reduce the value of the share \$2,308, or 2.3 percent. The combined effect of the discounting and prepayment effects is the total increase of \$4,511 ($=\$6,819 - \$2,308$).¹² In this example the discounting effect is larger than the prepayment effect.

The values of both the PO and the IO components of this share in a pool of mortgages are more sensitive to interest rate changes than is the underlying share. In addition, the prepayment effect is more important than the discounting effect in determining the value of the PO and IO components. When rates drop from 9 to 8 percent, the value of the principal payments increases a whopping 51.4 percent, from \$42,210 to \$63,911. But only 15 percent of that increase (\$3,239) is due to the discounting effect. Fully 85 percent of the increase (\$18,462) reflects the early repayment of the principal.

The value of the IO component is also extremely sensitive to interest rate changes. When rates drop from 9 to 8 percent, the value of the interest payments decreases by 30.0 percent, from \$57,790 to \$40,600. For the IO component, the

discounting and prepayment effects work in opposite directions. The fall in interest rates gives future interest payments a higher present value. This discounting effect raises the value of the IO component 6.2 percent (\$3,580). However the early retirement of principal associated with the fall in rates reduces the amount of interest received. This prepayment effect lowers the value of the IO component 35.9 percent (\$20,770). The combination of these effects accounts for a \$17,190 ($=\$3,580 - \$20,770$) loss in the value of the IO component.

The precise sensitivity of MBSs and their associated stripped securities to interest rate changes depends on many factors. However this example does illustrate the three most important. First, the prepayment effect makes the interest rate sensitivity of MBSs different from the interest sensitivity of Treasury securities. Second, the prepayment effect makes the PO and IO mortgage-backed strips much more sensitive on average to interest rates than the underlying MBS. Third, the prepayment effect is sometimes so strong that an IO mortgage-backed strip will rise in value when interest rates rise and fall in value when rates fall—precisely the opposite relationship from other fixed income securities. This last feature of stripped mortgage-backed securities, the positive relationship between the value of some IO strips and interest rates, is particularly useful to investors who need to hedge a portfolio of other fixed-income securities.

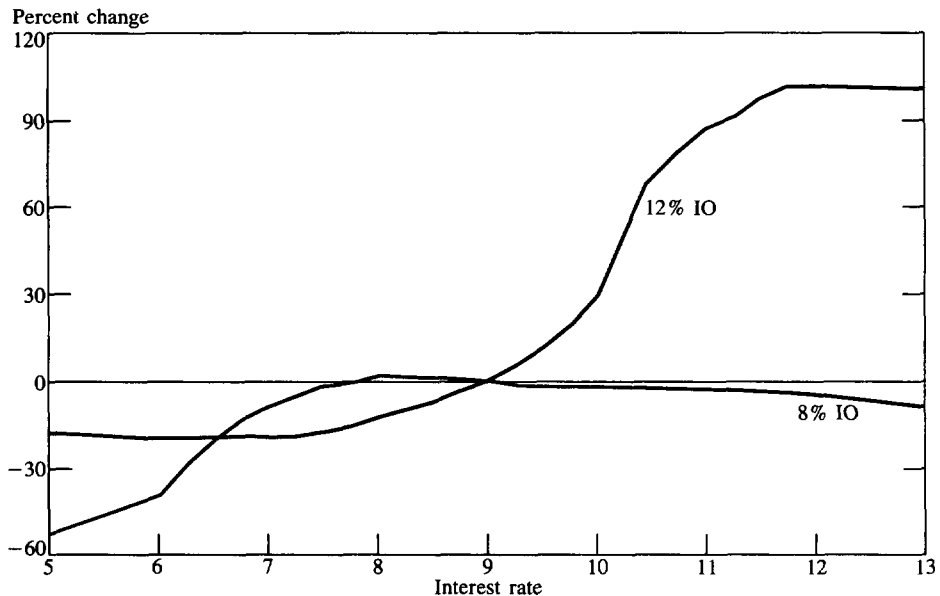
To see how IO strips can act as a hedge, consider the effect of interest rate changes on the value of a portfolio containing both IO strips and ordinary fixed-income securities. When interest rates rise, the increase in the value of the IOs tends to balance the decrease in the value of the other securities. When interest rates fall, the decrease in the value of the IOs tends to balance the increase in the value of the other securities. The right proportions of IO strips and other securities can insulate the value of the combined portfolio

¹¹ Since Treasury securities do not prepay, this is the same increase in value that would be enjoyed by a “comparable” Treasury security. The difference in the timing of principal and interest payments between mortgage and Treasury securities makes it difficult to decide what a comparable Treasury security might be. Nonetheless it is still true that the interest rate sensitivity of Treasury securities reflects only the discounting effect.

¹² Note that the share increases in value less than a Treasury security when interest rates fall. The share also decreases in value more than a Treasury security when interest rates rise.

CHART 2

The interest rate sensitivities of two mortgage-backed IOs



from interest rate changes.

The precise relationship between the value of stripped mortgage-backed securities and interest rates is complicated. The relationship can vary greatly, depending on the difference between the current interest rate and the coupon rate on the underlying MBS.

Chart 2 presents an example of how different these interest rate sensitivities can be. The chart displays the hypothetical change in the market values of two IO strips at different interest rates.¹³ One of the IO strips is based on an MBS with a coupon rate of 8 percent. The other IO strip is based on an MBS with a coupon rate of 12 per-

cent. The chart is drawn under the assumption that the market interest rate is initially 9 percent.

While both IO securities tend to increase in value as interest rates rise, their interest sensitivities are different in many respects. The value of the 12-percent IO, for example, benefits greatly from increases in interest rates above the initial 9 percent because these rate increases reduce the incentive to refinance the underlying 12-percent mortgages. As a result, interest rate increases reduce prepayments and increase interest receipts. The value of the 8-percent IO, in contrast, responds very little to interest rate increases, even large increases. At an initial interest rate of 9 percent, 8-percent mortgages are already prepaying slowly, and further interest rate increases have little additional effect. Interest rate declines initially lower the value of the 12-percent IO, but these losses level out after rates fall to 7 percent. However the 8-percent IO is very vulnerable to

¹³ The data for this chart are taken from Edward A. Hjerpe III, "Stripped Mortgage-Backed Securities: An Economic Analysis and Valuation Simulation," Research Working Paper 130, Federal Home Loan Bank Board, June 1987.

decreases in rates. Again, the differences derive from prepayment behavior. The 12-percent mortgages are already prepaying rapidly when the interest rate is 9 percent, and further interest declines have little additional effect. The 8-percent mortgages just begin to prepay as rates fall below 7 percent or so.

Chart 2 highlights the complexity of stripped MBSs. Investors who buy these stripped MBSs as hedging assets without fully understanding the properties of these securities may not achieve their investment goals. In addition, the potential for enormous swings in the value of the stripped MBSs magnifies the cost of small errors in portfolio management. Stripped mortgage-backed securities are for only the most sophisticated investors, and even these investors must constantly monitor the performance of these assets.

None of these cautions, however, erases the usefulness of stripped MBSs to certain classes of investors. As was noted above, the value of the IO strips may rise with interest rates, hence, they can be used to hedge other fixed-income assets. Such investors as thrifts and other institutional investors that hold portfolios of MBSs and other fixed-income securities may find IOs useful as a hedging asset.

PO strips may appeal to investors who wish to hedge fixed-income liabilities. Such investors include insurance companies and corporations that have issued long-term bonds. Since the values of fixed-income securities move inversely with interest rates, the debt burdens of investors that issue fixed income liabilities also move inversely with interest rates. If these investors hold PO strips as assets, then changes in the burden of their debt induced by changes in interest rates are balanced to some extent by changes in the value of their PO strip holdings.

Another group of investors that may wish to purchase PO strips are mortgage servicing corporations and issuers of collateralized mortgage obligations (CMOs). Mortgage servicing fees and

the residual payments that accrue to CMO issuers are similar to interest-only securities.¹⁴ As a result, these investors can purchase PO strips to balance their IO-like assets.

Evolution of the market for mortgage-backed strips

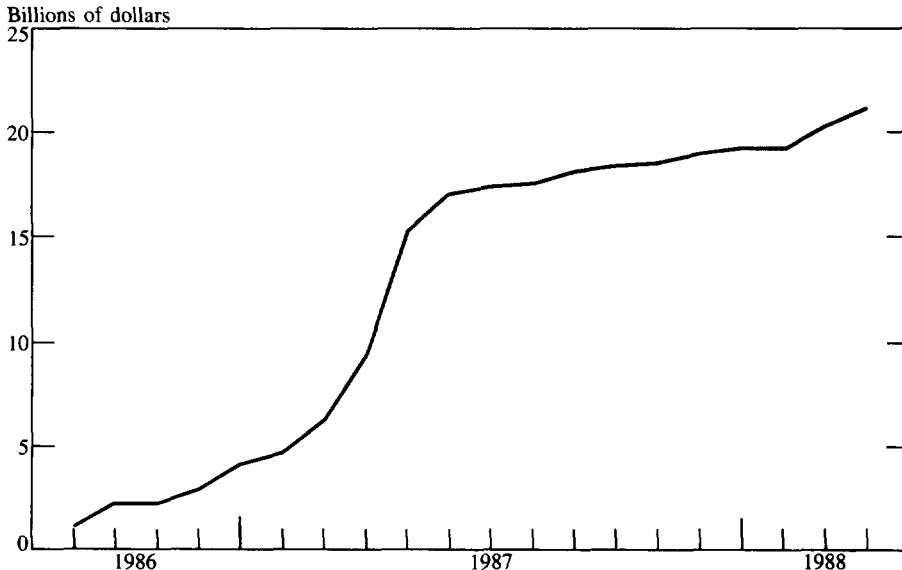
Like Treasury-backed strips, stripped MBSs arose as a solution to specific financial problems. The record-high interest rates of the early 1980s seriously hurt many depository institutions. Savings and loan associations (S&Ls), in particular, found themselves saddled with long-term mortgage loans with low, fixed interest rates while, at the same time, they were forced to pay higher market rates to obtain the deposits to fund these loans. When rates dropped from their peaks, S&Ls faced a new problem: mortgages made at peak interest rates began prepaying rapidly.

These experiences alerted depository institutions to the need to insulate their portfolios from unexpected swings in interest rates. Financial markets experimented with ways of restructuring traditional mortgage-backed securities to obtain new securities with properties that are helpful in portfolio management. One example of this experimentation was the appearance in 1983 of CMOs.

The market acceptance of CMOs led to the development of the market for stripped mortgage-backed securities. As noted earlier, the CMO residuals—the excess of mortgage receipts over

¹⁴ Mortgage servicing fees are paid as a thin slice of the mortgage interest payments. These fees account for much of the difference between the contract rate on the mortgages in a pool and the lower rate paid to holders of the mortgage-backed securities. CMOs are multiclass, mortgage-backed bonds. CMO residuals are the funds left after the bond obligations are met. These residuals reflect the overcollateralization of the bonds. The complicated structure of CMOs makes the CMO residuals, in effect, interest-only securities. Many market observers count CMO residuals as IO strips when they measure the amount of mortgage-backed stripped securities.

CHART 3
Stripped mortgage-backed securities outstanding
 August 1986 to March 1988



bond obligations—are similar to IO mortgage strips. In addition, some CMO bond classes are like PO mortgage strips. From these “near-stripped” CMO securities, it was a short step to an explicitly stripped mortgage-backed security.

The organized market for mortgage-backed stripped securities began in July 1986 when the Federal National Mortgage Association (Fannie Mae) issued its first stripped MBSs backed by \$200 million of FHA/VA mortgages. For technical reasons, Fannie Mae issued “almost principal-only” and “almost interest-only” securities.¹⁵ The “almost PO” security received 99 percent of the principal payments and 45 percent of the interest payments. The “almost IO” security

received 1 percent of the principal payments and 55 percent of the interest payments.

Fannie Mae issued 12 of these pairs of partially stripped mortgage-backed securities before it created its current SMBS (stripped MBS) Trust program. The SMBS Trusts issue “pure” PO and IO securities collateralized by pools of MBSs.¹⁶ Fannie Mae has formed 32 SMBS Trusts so far. Private investment banks have also issued some stripped mortgage-backed securities.

The growth of the market for mortgage-backed strips is shown in Chart 3.¹⁷ The amount of strips outstanding increased from \$1.02 billion in August 1986 to \$21.03 billion in March 1988. New issues of mortgage strips were halted briefly

¹⁵ For several reasons, it was not possible at that time to enter IO mortgage securities in the Federal Reserve Bank of New York’s book entry system or to transfer such securities by Fedwire, the Federal Reserve’s electronic system for transferring funds and securities. These problems have since been overcome.

¹⁶ SMBS Trust No. 25 is an exception to this rule.

¹⁷ The data in Chart 3 include the Fannie Mae issues and the stripped classes of CMOs. No attempt has been made to account for the partial retirement of these securities. Because most of these securities were issued very recently, this procedure should

after Merrill Lynch lost \$250 million on its portfolio of mortgage strips in April 1987. The market has recovered slowly from the shock of this loss. But investment bankers report recent increases in the trading of existing stripped securities. Some investment bankers estimate that as much as \$200 million of stripped mortgage-backed securities changes hands daily.

Summary and conclusion

Specific financial market problems led to the creation of both Treasury-backed and mortgage-backed stripped securities. Investors' desire to lock in record-high interest rates accounts for the initial interest in Treasury strips. Thrift institutions' need to insulate portfolios of mortgages and mortgage-backed securities from unpredictable shifts in interest rates stimulated experimentation that ultimately produced stripped MBSs.

Treasury and mortgage strips are very different securities, even though the mechanics of their creation are similar. The most important feature of Treasury strips is that they are zero-coupon bonds with the safety of Treasury securities. Treasury strips are useful to investors who wish to avoid reinvestment risk and who need to time their investment receipts to match their obligations to make payments. The most important feature of mortgage-backed strips is their heightened and varied sensitivities to interest rate changes. Mortgage strips are useful to investors who wish to hedge their portfolios against unexpected changes in rates.

Because their interest rate sensitivity is similar to that of the underlying Treasury securities, Treasury strips are easily understood. Although

Treasury POs are more sensitive to interest rate changes than the underlying Treasury securities, the general shape of their relationship to interest rates mimics that of the Treasury securities. Furthermore, investors, such as municipal bond issuers, who use Treasury strips simply to match future payments obligations need not worry about the interest rate sensitivity of Treasury strips. The zero-coupon character of Treasury strips eliminates the reinvestment risk such investors would otherwise face. However, as guidelines recently issued by federal bank regulators point out, few depository institutions require zero-coupon bonds in their portfolios, hence few depository institutions are likely to purchase these assets.

Because mortgage-backed stripped securities are so volatile and because their interest rate sensitivity is so complicated, only the most sophisticated investors should consider using them. Mortgage strips are unlike any other fixed-income securities in their interest rate sensitivity, including the underlying MBSs. Investors' experience with other securities will not prepare them to manage a portfolio containing stripped MBSs. However the extreme volatility of these stripped securities may make them a very effective hedging asset. Some of their properties may not be obtainable from other assets or combinations of assets.

Guidelines recently issued by federal bank regulators warn banks against incorporating mortgage-backed stripped securities in their portfolios. The riskiness of mortgage strips and the relatively short term of most bank assets suggests that mortgage strips are not suitable for bank portfolios. Savings and loan associations, in contrast, hold high proportions of their assets in long-term, interest-sensitive mortgages and mortgage-backed securities. For some sophisticated S&Ls, mortgage strips can be a useful hedging tool. However the extreme price volatility of mortgage strips may make other hedging assets a better choice for the majority of thrifts.

introduce relatively small errors. The data in Chart 3 do not include CMO residuals, which total approximately \$5.1 billion in February 1988. The author would like to thank R. Blaine Roberts, managing director of government bond research, Bear, Stearns & Co., Inc. for information on CMO issues and CMO strip classes.