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Following up this year's success, the 2004 symposium will be held in Boston on November 8-9, with co-chairs Larry Rubin and Josee Deroy. You can contact them directly if you have suggestions for sessions or speakers, or just want to help out. The AFIR will join the SOA and CIA as hosts. As you can see, there is something for everyone. Make plans to attend in 2004!

Swaps and the Swaps Yield Curve

by Joseph G. Haubrich

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Interest rate swaps have become a popular financial derivative, and market watchers and economists are paying closer attention to them and their associated yield curves. This *Commentary* gives a brief introduction to swaps and their relation to other interest rates.

Anyone who reads the financial pages soon becomes acquainted with a variety of interest rates—long rates, short rates, rates on government bonds, bank accounts and corporate bonds. Those readers may have recently noticed a new rate getting more attention in the financial pages: swap rates. As the interest rate paid on an increasingly common financial derivative—the interest rate swap—these rates deserve attention in their own right. Spreads between swap rates and Treasury bonds are becoming a closely watched indicator of the market's view of macroeconomic risk. Furthermore, some analysts view swaps as the most likely replacement for Treasury bonds as a financial benchmark, should budget surpluses dry up the government bond market. They have already become the standard for pricing many corporate bonds.

Swap rates, like bond and mortgage rates, can provide information about current and future economic conditions. But swaps are not bonds or mortgages, so their interest rate measures something a bit different than the rates on those instruments. Extracting information about the economy from swap rates requires understanding the differences between them and other types of interest rates. This *Economic Commentary* describes the swaps market, explores the differences between swaps and other interest rates, and attempts to illustrate some of the information swap rates can provide.

• Swaps—An Overview

Unlike derivatives such as CATS, DOGS or Quantoes, the name "swap" actually describes the instrument.[1] In a swap, the two parties exchange, or swap, payment streams. For example, suppose one firm has invested in a bond that pays a coupon of 5 percent each year, and another firm has invested in a bond that pays an adjustable, or floating rate each year. The two firms can enter a swap agreement and pay each other their interest streams. The firm paying the fixed rate (or "fixed leg") is called the buyer and is said to be "long the swap." That paying the floating rate is called the seller and is "short the swap," though these terms are really just a market convention.

Just why firms enter swaps agreements is an open question. Swaps have grown exponen-

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tially since their introduction, so firms must perceive some value to them. Researchers suggest several possibilities.[2] Swaps may help firms protect their cash flow from frequent changes in interest rates on bank credit. They may reduce a firm's overall financing costs, either by giving the firm the flexibility to adjust the terms of its existing debt— maturities, cost or whether it's fixed or adjustable—or by enabling firms to effectively obtain lower credit-risk premiums from each other than they can from banks or by selling equity.

There are different kinds of swaps, but they have several common features. First, the swap payments are all based on what is called the notional amount. An annual coupon of 5 percent on a notional amount of $1 billion would mean a payment of $50 million each year. Swaps are often measured by their notional value, and it is common to see corporations reporting numbers such as "$2 billion notional value" or even reports saying things like "the total swaps market has become enormous, with notionals exceeding $3 trillion." Notionals are like the principal on a bond, with the extremely important difference that the notional amount never gets exchanged. Because the notional amount is not at risk—unlike a bond—a $1 billion swap has less credit risk than a $1 billion bond or loan. (One way to think of this is that two bonds are being swapped—a fixed bond for a floating bond, and the principal amounts cancel out.)

In a similar fashion, to avoid redundant payments, the two swap counterparties make only net payments to each other. On that $1 billion swap of a fixed 5 percent for a six-month floating rate currently at 2.5 percent, Megafirm does not pay $50 million to BigBank while getting $25 million back from BigBank. Rather, Megafirm makes the net payment of $25 million. This netting is one reason swaps are less risky than bonds. If BigBank fails, Megafirm is happy to be out of the contract because it owes money to BigBank. In a swap, you only lose when the failing party owes you money—so even if one firm fails, there's roughly a 50-50 chance no losses will occur.

Interest rate swaps, in which interest payments are exchanged, are one kind of swap and they come in two general types—coupon swaps, like the one above, where a fixed rate is exchanged for floating, and basis swaps, where two different floating rates are swapped, such as a six-month rate for a twelve-month.

Another basic type of swap is the currency swap, which exchanges payment streams in different currencies—say, dollars for yen. Simple sorts of swaps are often denoted as "plain vanilla"— nothing fancy. The more complex sort are exotics.

• The Importance of LIBOR

The floating rate used most often in the swaps market to reference a swap rate to is LIBOR, or the London interbank offered rate. This means swaps can be thought of as derivatives on the LIBOR rate. LIBOR has some special characteristics and it therefore imparts a special character to swaps and interest rates based on it.

First, LIBOR is an unsecured rate. It is the rate at which major international banks can borrow unsecured funds from each other, that is, without posting collateral. As such, it is similar to the federal funds rate, the rate at which banks in the United States borrow funds from each other. Second, LIBOR is a standardized rate. It is set by the British Banker's Association, which produces the actual reference rate itself each business day at noon. The association surveys a panel of banks at 11:00 a.m. about the interest rate each bank would pay if it borrowed funds right then.[3] The highest and lowest 25 percent of the responses are thrown out, and the mean of the remaining middle half is the LIBOR "fix" for that day. LIBOR is calculated for several currencies—the most popular being for the U.S. dollar, and LIBOR without a qualification means the U.S. dollar rate. So the US$ LIBOR gives the interest rate for borrowing Eurodollars, dollar deposits held in banks outside the United States.

LIBOR rates are short term—the maturities are one week and one, two, three, six, nine and twelve months. If we plot a yield curve for LIBOR, that is, a graph of yields (such as interest rates) against maturity, and compare it to the more familiar Treasury yield curve, we see the LIBOR curve is richer at the short end, because only a few Treasury securities

have an original maturity of one year or less. The LIBOR curve, of course, does not extend nearly as far as the Treasury curve, which goes out to 30 years. Figure 1 on page 18 compares the LIBOR yield curve with the U.S. Treasury yield curve for October 26, 2001. Since the banks behind the LIBOR rate are not as safe as the U.S. government, the riskier LIBOR curve is everywhere above the Treasury curve. Still, the LIBOR rates have become such a standard that the Financial Accounting Standards Board has accorded LIBOR special status as an acceptable benchmark, which in turn makes swaps based on it more attractive.

• The Interest Rate Swaps Market

Interest rate swaps, unlike stocks, futures or options, but like most bonds, are traded "over the counter," that is, not on an organized exchange. There is no set location where trade takes place and no clearinghouse to ensure the swap contracts are honored. This means firms need to be aware of who they are dealing with, but it also allows customized variations, both in terms of the amounts involved, the maturity and in the interest rates chosen. It is not uncommon for the floating rate to be some amount above the index, say LIBOR plus 5 percent.

Other variations extend far beyond the "plain vanilla" versions described above. Indeed, the many exotic flavors provide one measure of the swap market's success. For example, a collapsible swap gives a firm the option to cancel the swap if interest rates turn against it—as long as the floating rate is below the fixed rate, the firm gets the net payment, but if rates rise, the swap is cancelled and the firm pays nothing. Quanto swaps let firms get a floating payment in another currency—the firm may pay the fixed rate in dollars but get the floating rate in yen. A swaption is an option to enter into a swap. That is, the buyer of a swaption has the right, but not the obligation to enter into a swap before the option expires.

Because it is an over-the-counter market, some swap counterparties may get together on their own, but many use swap facilitators, who may be either brokers or dealers. The brokers bring people together, while dealers may trade and enter swaps for their own account. Often dealers are large banks, which use their extensive experience in lending and payments to work both sides of the market. This adds some needed anonymity to the market. For example, Ford and GM may both want to enter into an interest rate swap, but they might be reluctant to reveal that information to their rival— but a bank might act as go-between, say, by doing one swap with Ford, paying fixed and getting floating, and by doing another swap with GM, getting fixed and paying floating.

Despite, or perhaps because of the over-the-counter nature of the market, the interest rate swaps market has grown: Since the first interest rate swap in 1981, total outstanding swaps reached $682 billion in notional value in 1987, $6.2 trillion in 1993, $22.3 trillion in late 1997[4] and, by one measure, $46 trillion at the end of 1999.[5] This compares with total U.S. government debt outstanding of $5.7 trillion in June 2001 (of course, this figure is a nominal, not a notional amount.)[6]

• Yield Curves

The large volume of swaps outstanding has made yields on swaps of various maturities ("tenor," in market parlance) readily available, allowing us to plot a yield curve for the swap rate. The "swap rate" curve shows the fixed-rate leg of a plain vanilla swap against the floating leg of a six-month LIBOR.

The swap rate curve has become popular as a benchmark, and one reason is the dual nature of the risk involved. As discussed above, interest rate swaps are close to riskless—the "general swap rate" is only for highly rated counterparties, there is no principal to default on, and counterparties lose money only if they are a net receiver when the other partner defaults. In addition, many swap agreements require collateral—putting up bonds or other securities that the other side may take in case of default.[7] On the other hand, the swap is based on LIBOR, which is a risky rate. This combination means that although swaps themselves are not risky, they are tied to a risky rate, and therefore they make a nice asset to hedge other risky assets. In fact, this rather amphibious duality of safety and hedging ability has led regulators to give swaps a special status in portfolio accounting.[8]

The usefulness of swaps as a hedge became particularly apparent in 1998, during the Russian default and the Long Term Capital Management debacle, when spreads between risky bonds and safe Treasury securities increased dramatically. This hurt firms that had hedged their portfolios of corporate bonds and mortgage-backed securities using short positions in Treasury bonds; as the value of the risky bonds fell, and since the value of the Treasuries increased, the value of the short position fell as well. So rather than offsetting or mitigating the loss, the so-called hedge position in Treasuries increased losses, just the opposite of what a hedge should do. Swaps looked more like risky bonds, then, so a short position (paying floating) was a better hedge.[9]

Another advantage, though, is that, extreme incidents aside, the swaps curve behaves somewhat similarly to the Treasury yield curve. Figure 2 shows that over the past several years, the curves have moved together. The biggest difference is that the term spread for swaps (that is, the difference between rates on the longer maturity and the shorter maturity) did not invert—that is, go negative as short rates exceeded long rates—in the second half of 2000. While special factors (such as a riskier market) might explain the failure to invert, some people suspect a deeper reason: that risky yield spreads, more closely tied to firm behavior, invert less often. In an inverted market, private firms will issue a lot of longer-term debt in place of short-term debt, and the resultant supply will drive the yield curve slope upward again.

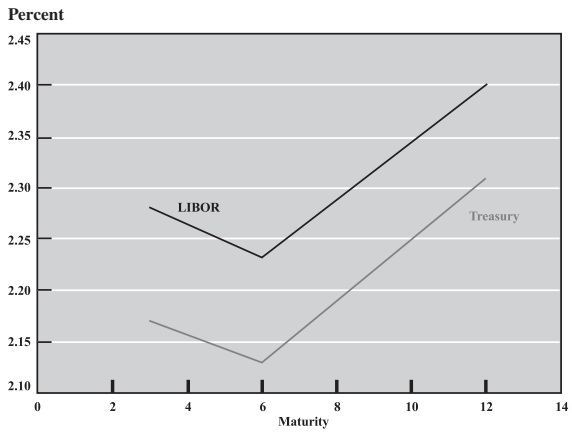
Even so, differences between the Treasury and the swaps yield curves can be very important. Yield curve inversions are often taken as a signal of recessions in the near future.[10] If the swaps curve rarely inverts, that signal may be missing. On the other hand, perhaps a new signal arises when there is a big spread between swap rates and Treasury rates.

• Conclusion

Judged either by the volume outstanding, the special status accorded by regulators, or the intense scrutiny of practitioner and academic alike, interest rate swaps and their associated yield curve occupy a key, if not yet central place in financial markets. The attractions of swaps that have fueled their growth, however, have also caused the swaps market to differ significantly from the markets for Treasury or corporate bonds, and some of the differences are reflected in the respective yield curves. Swaps are not bonds, but derivatives on a standardized interest rate (LIBOR). Though having very little credit risk of their own, they are based on an interest rate that does reflect credit risk.

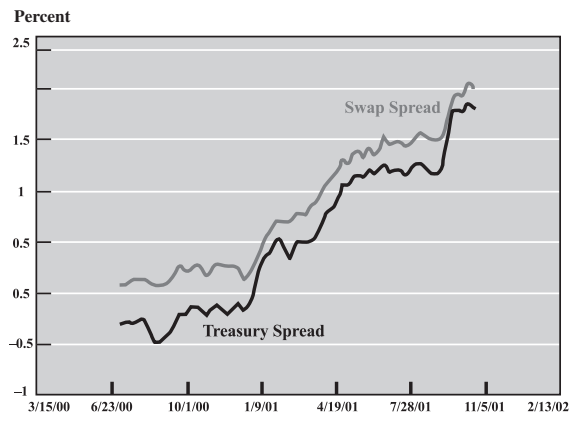
These differences account for much of the popularity of swaps, but they also mean that swap rates will differ in subtle but important ways from other interest rates. Some time-honored relationships —such as the tendency for the yield curve to invert before recessions—may not hold when the yield curve in

FIGURE 1 LIBOR AND TREASURY YIELDS, OCTOBER 26, 2001



SOURCE: Bloomberg Financial Services.

FIGURE 2 TERM SPREADS FOR TREASURY AND SWAPS MARKETS



SOURCE: Bloomberg Financial Services.

question measures swap rates. Thus, a clear view of the similarities and differences of this market is essential for nearly everyone concerned with financial markets.

• Footnotes

1. CATS are *certificates of accrual on Treasury securities*, an early attempt to separate the stream of interest rate payments on government bonds from the principal. DOGS are *dibs on government securities*, another attempt. Quantoes will be explained below.

2. For a good discussion of this and related issues, see Anatoli Kuprianov, "The Role of Interest Rate Swaps in Corporate Finance," Federal Reserve Bank of Richmond, *Economic Quarterly*, vol. 80, no. 3 (Summer 1994), pp. 49–68.

3. For the U.S. dollar, the 16 current (as of January 2, 2002) panel members are: Abbey National PLC, the Bank of Tokyo-Mitsubishi, Ltd., Bank of America NT & SA, Barclays Bank PLC, Citibank AG, Credit Suisse First Boston, Deutsche Bank AG, Fuji Bank, HSBC, JP Morgan Chase, Lloyds TSB Bank PLC, the Norinchukin Bank, Rabobank, the Royal Bank of Scotland Group, UBS AG, Westdeutsche Landesbank AG. For more details, see <www.bba.org.uk>.

4. These numbers are from the International Swaps and Derivatives Association, "Summary of OTC Derivative Market Data," <www.isda.org/statistics/qtcderiv.html>.

5. Charles Smithson, "Swaps Become the Benchmark," *Risk*, April 2001, pp. 78–79.

6. *Federal Reserve Bulletin*, September 2001, p. A27, table 1.40.

7. Some swaps also have market-to-market provisions for additional safety. For more information on this and a sophisticated view of what determines swap yields, consult Pierre Collin- Dufresne and Bruno Solnik, "On the Term Structure of Default Premia in the Swap and LIBOR Markets," *Journal of Finance*, vol. 56, no. 3 (June 2001), pp. 1095–1115.

8. See Andrew Osterland, "Good Morning Volatility," *CFO Magazine*, July 1, 2000.

9. See Robert N. McCauley, "Benchmark Tipping in the Money and Bond Markets," *BIS Quarterly Review*, March 2001, pp. 39–59.

10. My favorite reference for this is Joseph G. Haubrich and Ann M. Dombrosky, "Predicting Real Growth Using the Yield Curve," Federal Reserve Bank of Cleveland, Economic Review, vol. 32, no. 1 (Quarter 1, 1996), pp. 26–35. For more on why the swaps curve is generally steeper, see John Youngdahl, Brad Stone, and Hayley Boesky, "Implications of a Disappearing Treasury Debt Market," *Journal of Fixed Income*, March 2001, pp. 75–86.

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