PIMCO

Bond Basics
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Bond Basics: What Are Interest Rate Swaps and How Do They Work?

Interest-rate swaps have become an integral part of the fixed-income market. These derivative contracts, which typically exchange – or swap – fixed-rate interest payments for floating-rate interest payments, are an essential tool for investors who use them to hedge, speculate, and manage risk.

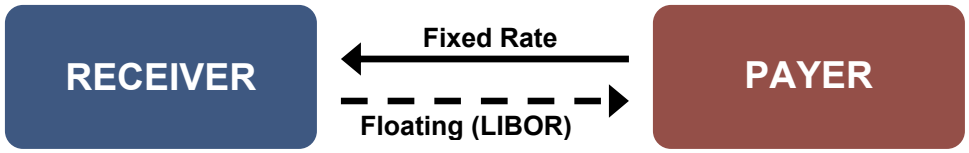
This article aims to explain why swaps have become so important to the bond market. It begins with a basic **definition of interest-rate swaps**, outlines their **characteristics** and compares them with more familiar instruments, such as loans. Later, we examine **the swap curve**, some of the **uses of swaps**, and **the risks** associated with them.

What is a Swap?

An interest rate swap is an agreement between two parties to exchange one stream of interest payments for another, over a set period of time. Swaps are derivative contracts and trade over-the-counter.

The most commonly traded and most liquid interest rate swaps are known as "vanilla" swaps, which exchange fixed-rate payments for floating-rate payments based on LIBOR, the interest rate high-credit quality banks (AA-rated or above) charge one another for short-term financing. LIBOR, "The London Inter-Bank Offered Rate," is the benchmark for floating short-term interest rates and is set daily.) Although there are other types of interest rate swaps, such as those that trade one floating rate for another, plain vanilla swaps comprise the vast majority of the market.

By convention, each participant in a vanilla swap transaction is known by its relation to the fixed rate stream of payments. The party that elects to receive a fixed rate and pay floating is the "receiver," and the party that receives floating in exchange for fixed is the "payer." Both the receiver and the payer are known as "counterparties" in the swap transaction.



Investment and commercial banks with strong credit ratings are swap market-makers, offering both fixed and floating-rate cash flows to their clients. The counterparties in a typical swap transaction are a corporation, a bank or an investor on one side (the bank client) and an investment or commercial bank on the other side. After a bank executes a swap, it usually offsets the swap through an interdealer broker and retains a fee for setting up the original swap. If a swap transaction is large, the interdealer broker may arrange to sell it to a number of counterparties, and the risk of the swap becomes more widely dispersed. This is how banks that provide swaps routinely shed the risk, or interest-rate exposure, associated with them.

Initially, interest rate swaps helped corporations manage their floating-rate debt liabilities by allowing them to pay fixed rates, and receive floating-rate payments. In this way, corporations

could lock into paying the prevailing fixed rate and receive payments that matched their floating-rate debt. (Some corporations did the opposite – paid floating and received fixed – to match their assets or liabilities.) However, because swaps reflect the market's expectations for interest rates in the future**,** swaps also became an attractive tool for other fixed-income market participants, including speculators, investors and banks.

As a result, the swap market has grown immensely in the past 20 years or so; the notional dollar value of outstanding interest rate swaps globally was $230 trillion at the end of 2006, according to the Bank for International Settlements. Swap volume is termed "notional" because principal amounts, although included in total swap volume, are never actually exchanged. Only interest payments change hands in a swap, as described below.

Characteristics of Interest Rate Swaps

The "swap rate" is the fixed interest rate that the receiver demands in exchange for the uncertainty of having to pay the short-term LIBOR (floating) rate over time. At any given time, the market's forecast of what LIBOR will be in the future is reflected in the forward LIBOR curve.

At the time of the swap agreement, the total value of the swap's fixed rate flows will be equal to the value of expected floating rate payments implied by the forward LIBOR curve. As forward expectations for LIBOR change, so will the fixed rate that investors demand to enter into new swaps. Swaps are typically quoted in this fixed rate, or alternatively in the "swap spread," which is the difference between the swap rate and the U.S. Treasury bond yield (or equivalent local government bond yield for non-U.S. swaps) for the same maturity. Swap spreads are discussed in more detail in the next section.

In many ways, interest rate swaps resemble other familiar forms of financial transactions, and it is helpful to think of swaps in these terms:

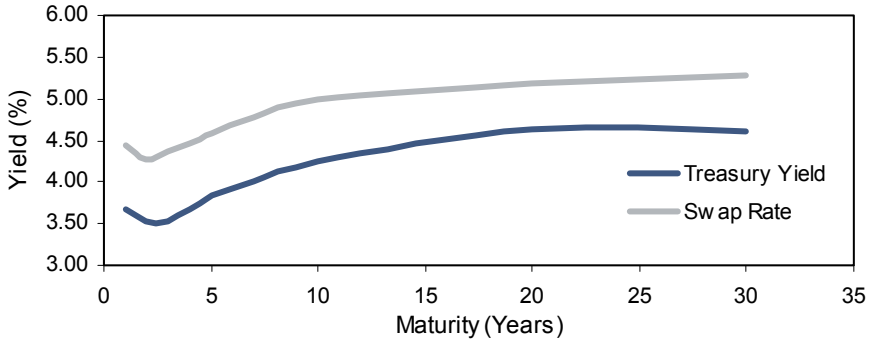
- **Exchanging Loans.** Early interest rate swaps were literally an exchange of loans, and this model still provides an intuitive way to think about swaps. Consider two parties that have taken out loans of equal value, but one has borrowed at the prevailing fixed rate and the other at a floating rate tied to LIBOR. The two agree to exchange their loans, or swap interest rates. Since the principal is the same, there is no need to exchange it, leaving only the quarterly cash flows to be exchanged. The party that switches to paying a floating rate might demand a premium or cede a discount on the original fixed borrower's rate, depending on how interest rate expectations have changed since the original loans were taken out. The original fixed rate, plus the premium or minus the discount, would be the equivalent of a swap rate.

- **The Financed Treasury Note.** Receiving fixed rate payments in a swap is similar to borrowing cash at LIBOR and using the proceeds to buy a U.S. Treasury note. The buyer of the Treasury will receive fixed payments, or the "coupon" on the note, and be liable for floating LIBOR payments on the loan. The concept of a "financed Treasury" illustrates an important characteristic that swaps share with Treasuries: both have a discrete duration, or interest rate sensitivity, that depends on the maturity of the bond or contract.

The Swap Curve

The plot of swap rates across all available maturities is known as the swap curve, as shown in the chart below. Because swap rates incorporate a snapshot of the forward expectations for LIBOR and also reflect the market's perception of credit quality of these AA-rated banks, the swap curve is an extremely important interest rate benchmark.

The Swap Curve and Treasury Yield Curve: November 13, 2007



Source: Federal Reserve

Although the swap curve is typically similar in shape to the Treasury yield curve, outright swap rates are generally higher than Treasury yields with corresponding maturities, as the chart above illustrates. This premium, or "swap spread" at any given maturity, mostly reflects the incremental credit risk associated with the banks that provide swaps compared to Treasuries, which are viewed as risk-free. While the swap spread can be also be driven by short-term supply and demand fundamentals and other factors within the swap market, the overall level of swap spreads across maturities can also offer a broad reading of the creditworthiness of the major banks that provide swaps.

Because the swap curve reflects both LIBOR expectations and bank credit, then, it is a powerful indicator of conditions in the fixed income markets. In certain cases, the swap curve has supplanted the Treasury curve as the primary benchmark for pricing and trading corporate bonds, loans and mortgages.

Uses for Swaps

Interest rate swaps became an essential tool for many types of investors, as well as corporate treasurers, risk managers and banks, because they have so many potential uses. These include:

- **Portfolio management.** Interest rate swaps allow portfolio managers to add or subtract duration, adjust interest rate exposure, and offset the risks posed by interest rate volatility. By increasing or decreasing interest rate exposure in various parts of the yield curve using swaps, managers can either ramp-up or neutralise their exposure to changes in the shape of the curve, and can also express views on credit spreads. Swaps can also act as substitutes for other, less liquid fixed income instruments. Moreover, long-dated interest rate swaps can increase the duration of a portfolio, making them an effective tool in Liability Driven Investing, where managers aim to match the duration of assets with that of long-term liabilities.

- **Speculation.** Because swaps require little capital up front, they give fixed-income traders a way to speculate on movements in interest rates while potentially avoiding the cost of long and short positions in Treasuries. For example, to speculate that five-year rates will fall using cash in the Treasury market, a trader must invest cash or borrowed capital to buy a five-year Treasury note. Instead, the trader could "receive" fixed in a five-year swap transaction, which offers a similar speculative bet on falling rates, but does not require significant capital up front.

- **Corporate finance.** Firms with floating rate liabilities, such as loans linked to LIBOR, can enter into swaps where they pay fixed and receive floating, as noted earlier. Companies might also set up swaps to pay floating and receive fixed as a hedge against falling interest rates, or if floating rates more closely match their assets or income stream.

- **Risk management.** Banks and other financial institutions are involved in a huge number of transactions involving loans, derivatives contracts and other investments. The bulk of fixed and floating interest rate exposures typically cancel each other out, but any remaining interest rate risk can be offset with interest rate swaps.

- **Rate-locks on bond issuance.** When corporations decide to issue fixed-rate bonds, they usually lock in the current interest rate by entering into swap contracts. That gives them time to go out and find investors for the bonds. Once they actually sell the bonds, they exit the swap contracts. If rates have gone up since the decision to sell bonds, the swap contracts will be worth more, offsetting the increased financing cost.

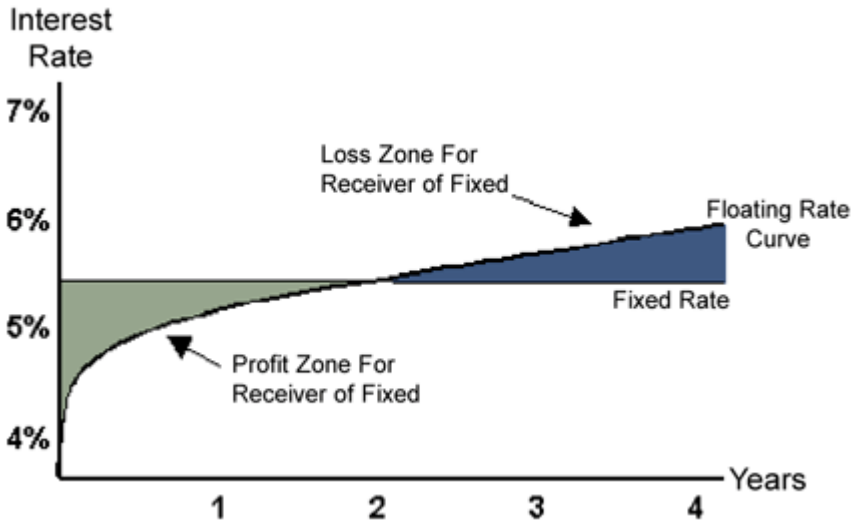
Risks Associated with Interest Rate Swaps

Like most non-government fixed income investments, interest-rate swaps involve two primary risks: **interest rate risk** and **credit risk**, which is known in the swaps market as **counterparty risk**.

Because actual interest rate movements do not always match expectations, swaps entail interest-rate risk. Put simply, a receiver (the counterparty receiving a fixed-rate payment stream) profits if interest rates fall and loses if interest rates rise. Conversely, the payer (the counterparty paying fixed) profits if rates rise and loses if rates fall.

At the time a swap contract is put into place, it is typically considered "at the money," meaning that the total value of fixed interest-rate cash flows over the life of the swap is exactly equal to the expected value of floating interest-rate cash flows. In the example shown in the graph below, an investor has elected to receive fixed in a swap contract. If the forward LIBOR curve, or floating-rate curve, is correct, the 5.5% he receives will initially be better than the current floating 4% LIBOR rate, but after some time, his fixed 5.5% will be lower than the floating rate. At the inception of the swap, the "net present value," or sum of expected profits and losses, should add up to zero.

A Typical Swap Transaction At Inception



When an investor enters into a swap, the difference between the fixed rate payments and the expected future floating rate payments should be zero (the blue zone equals the gray zone.)

Source: PIMCO

However, the forward LIBOR curve changes constantly. Over time, as interest rates implied by the curve change and as credit spreads fluctuate, the balance between the gray zone and the blue zone will shift. If interest rates fall or stay lower than expected, the "receiver" of fixed will profit (gray area will expand relative to blue). If rates rise and hold higher than expected, the "receiver" will lose (blue expands relative to gray).

If a swap becomes unprofitable or if a counterparty wishes to shed the interest rate risk of the swap, that counterparty can set up a countervailing swap – essentially a mirror image of the original swap – with a different counterparty to "cancel out" the impact of the original swap. For example, a receiver could set up a countervailing swap in which he pays the fixed rate.

Swaps are also subject to the counterparty's credit risk: the chance that the other party in the contract will default on its responsibility. Although this risk is very low – banks that deal in LIBOR and interest rate swaps generally have very high credit ratings of double-A or above – it is still higher than that of a risk-free U.S. Treasury bond.

Conclusion

The interest rate swaps market started decades ago as a way for corporations to manage their debt and has since grown into one of the most useful and liquid derivatives markets in the world. Vanilla swaps, which are most common and involve the exchange of floating-rate LIBOR for a fixed interest rate, are used across the fixed-income markets to manage risks, speculate, manage duration and lock in interest rates.

Because swaps are highly liquid and have built-in forward rate expectations as well as a credit component, the swap rate curve has become an important interest-rate benchmark for credit markets that in some cases has supplanted the U.S. Treasury yield curve.

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Swaps are a type of derivative in which a privately negotiated agreement between two parties takes place to exchange or swap investment cash flows or assets at specified intervals in the future. There is no central exchange or market for swap transactions and therefore they are less liquid than exchange-traded instruments.

LIBOR (London Interbank Offering Rate) is the rate banks charge each other for short-term Eurodollar loans.