

Why Bond Prices Go Up and Down

By Annette Thau

With bond investing, prices go up and down in response to two factors: changes in interest rates and changes in credit quality. Bond investors tend to worry a lot about the safety of their money. Generally, however, they tie safety to credit considerations. Many bond investors do not fully understand how changes in interest rates affect price. Since the late 1970s, changes in the interest rate environment have become the greatest single determinant of return on bond investments. Managing interest rate risk has become the most critical variable in the management of bond portfolios. In this article, we'll see why.

Interest Rate Risk

"Interest rate risk," also known as "market risk," refers to the propensity bonds have of fluctuating in price as a result of changes in interest rates.

All bonds are subject to interest rate risk.

If nothing else makes an impression, but you learn that all bonds are subject to interest rate risk, regardless of the issuer or the credit rating or whether the bond is "insured" or "guaranteed," then this article will have served a useful purpose.

The principle behind this fact is easy to explain.

Let us suppose you bought a 30-year bond when 30-year Treasuries were yielding 4%. Further suppose that you now wish to sell your bond and that interest rates for the same maturity are currently 10%. How can you convince someone to purchase your bond, with a coupon of 4%, when he can buy new issues with a 10% coupon?

Well, there is only one thing you can do: You mark down your bond. In fact, the price at which a buyer would buy your bond as readily as a new issue is that price at which your bond would now yield 10%. That would be approximately 30 cents on the dollar, or about \$300 per bond.

But, you will object, if I sell my \$1,000 bond for \$300, I have lost \$700 per bond!

That is precisely the point.

In the bond investing area, significant changes in the interest rate environment are not hypothetical. During the past decade, swings of 1% (100 basis points) have occurred on several occasions over periods of a few weeks or a few months. During the late 1970s and 1980s, rates moved up and down, in sharp spikes or drops, as much as 5% (500 basis points) within a few years. Between September of 1998 and January of 2000, interest rates on the Treasury's long bond moved from a low of 4.78% to a high of 6.75%, almost 200 basis points. If you held bonds during that period, you will remember it as a period when the returns on bond investments were dismal.

With bond investing, the basic principle is that interest rates and prices move in an inverse relationship. When interest rates went from 4.78% to 6.75%, that represented an increase in yield of over 40%. The price of the bond declined by a corresponding amount. On the other hand, when interest rates decline, then the price of the bond goes up.

Bond Investing: Managing Risk

What can you do to protect your money against interest rate fluctuations?

The best protection is to partake in a bond investing program that buy bonds with maturities that are either short (under one year) or short-intermediate (between two and seven years).

While all bonds are subject to interest rate risk, that risk is correlated to maturity length. As maturity length increases, so do potential price fluctuations. Conversely, the shorter the maturity of the bonds you invest in, the lower the risk of price fluctuations as a result of changes in interest rate levels.

To illustrate, let's look at [Table 1](#). This table shows what would happen to the price of a bond selling at par (\$1,000), with a 7% coupon, for several different maturities, under three different scenarios:

- Interest rates rise modestly by 50 basis points, to 7.5%;
- Interest rates rise by 100 basis points, to 8%;
- Interest rates rise steeply, by 200 basis points, to 9%.

[Table 1](#) shows that if interest rates rise modestly, by 50 basis points, the price of the two-year bond changes very little. But even that modest rise results in a decline of 3.5% (\$35) for the 10-year bond and 5.9% (\$59) for the 30-year bond. For the 30-year bond, the decline of 5.9% wipes out almost the total amount of interest income for the entire year. If a much sharper rise in interest rates occurs, from 7% to 9%, declines become correspondingly larger. Clearly, if interest rates go up, the holder of bonds with shorter maturities would be less unhappy than the holder of bonds with long maturities.

Table 1. Interest Rate Risk: Bond Price Changes if Interest Rates Rise (\$1,000 par value bond with a 7% coupon)			
Maturity	Change in Bond Price If Interest Rates Rise To:		
	7.50%	8.00%	9.00%
2 Years	-0.9%	-1.1%	-3.6%
5 Years	-2.1%	-3.5%	-4.7%
10 Years	-3.5%	-6.8%	-13.0%
30 Years	-5.9%	-11.3%	-20.6%

Source: Merrill Lynch (material supplied to author).

This phenomenon, happily, operates in reverse. As interest rates decline, bond prices rise. This is illustrated in [Table 2](#), which shows changes in price for various maturities under three declining interest rate scenarios. Once again, the change in price is much smaller for the two-year maturity, but it rises gradually through the maturity spectrum. In this instance, the holder of a bond would benefit from holding the longest maturities because the longer the maturity, the higher the gain. That is the reason that bond investors anticipating a decline in interest rates position themselves at the long end of the maturity spectrum, in order to realize the largest capital gains.

Table 2. Interest Rate Risk: Bond Price Changes If Interest Rates Fall (\$1,000 par value bond with a 7% coupon)	
Maturity	Change in Bond Price If Interest Rates Fall To:

	6.50%	6.00%	5.00%
2 Years	0.90%	1.90%	3.80%
5 Years	2.10%	4.30%	8.70%
10 Years	3.60%	7.40%	15.60%
30 Years	6.60%	13.80%	30.90%

Source: Merrill Lynch (material supplied to author).

Several qualifications need to be made concerning both of these tables. First, the exact price changes illustrated are assumed to have occurred as a result of instantaneous changes in yield. In practice, such changes may take weeks, months, or even years. Changes occurring over longer time periods would result in somewhat different numbers because, as noted earlier, the price of a bond moves toward par as it gets closer to maturity, and those price changes occur regardless of what happens to interest rates.

Secondly, the exact price changes illustrated apply only to bonds selling at par, with a 7% coupon. The numbers would be different for bond investments with coupons that are either higher or lower. Price changes would be somewhat larger, in both directions, if the coupons were lower than 7%, and the price changes would be lower if the coupons were somewhat higher than 7%.

Thirdly, if you look at the price changes that occur in both directions, you will note that these changes are not linear. If interest rates rise, the price of a bond declines as maturity length increases, but those increases occur at a declining rate. That decline in the rate of increase begins to be noticeable approximately after the 10-year mark. Similarly, if interest rates decline, the price of bonds increases as maturity length increases, but again, at a declining rate that begins to be noticeable at the approximate 10-year mark. Nonetheless, it remains the case that price changes are greatest at the highest maturity length.

Finally, note that the price changes that occur if interest rates move up or down are somewhat larger if interest rates decline than if they go up. For example, for the 30-year bond, if interest rates go up by 100 basis points, the price of the bond declines by 11.3%. But if interest rates decline by 100 basis points, the price of the same bond goes up by 13.8%. Similarly, if interest rates go up by 200 basis points, the price of the 30-year bond declines by 20.6%. But if interest rates decline, the price of the same bond goes up by 30.9%. That distinction is obviously a desirable characteristic for the bond investor: Your bond appreciates more in value if interest rates decline than it loses if interest rates rise. This characteristic has a somewhat formidable name: It is known as convexity.

In summary, while the numbers vary somewhat for different bonds, both [Table 1](#) and [Table 2](#) illustrate two basic principles applicable to bond investing. First, the prices of bonds and interest rates move in opposite directions. If interest rates decline, the price of a bond goes up, and if interest rates rise, the price of a bond declines. Second, bonds with longer maturities incur significantly higher interest rate risk than those with shorter maturities. That is a disadvantage if interest rates rise, but an advantage if interest rates decline.

So now we have the two faces of interest rate fluctuations: risk and opportunity. It may sound paradoxical, but a rising or strong bond market is one in which interest rates are declining because that causes bond prices to rise. You can sell a bond for more than you paid for it and make a profit. A weak bond market is one in which interest rates are rising and, as a result, prices are falling. If you have to sell your bonds, you have to do so at a loss. In either case, with bond investing, the changes in price are correlated to maturity length.

Here are some bond investing questions and answers that will help illustrate several other important aspects of managing interest rate risk:

Bond Investing Question #1: If long-term bonds are so risky, why would anyone invest in them?

One reason is that many investors believe that long-term bonds provide the highest yields (or maximum income). That, however, is not necessarily true. If all other factors are equal, long-term bonds have higher coupons than shorter-term bonds of the same credit quality. But intermediate bonds in the A to AA range often yield as much as AAA bonds with far longer maturities, and they are much less volatile. (Note that this relationship is considered normal. But there are times when interest rates on short maturities are higher than interest rates on longer maturities.)

You might, of course, want to invest in long-term bonds for other reasons. One would be to "lock in" an attractive interest rate for as long as possible, if you think you are not going to sell the bonds before they mature. Also, if you think interest rates are about to decline, bond investing at the long end positions you for maximum capital gains. That would imply that you consider potential capital gains as important (or more so) than interest yield, and in all likelihood that you intend to resell the bonds before they mature.

Bond Investing Question #2: How do interest rate fluctuations affect the price of a bond if I hold it to maturity?

If you hold bonds to maturity, you recover your principal in full (assuming there has not been a default). No matter what kind of roller coaster ride interest rates take during the life of a bond, its value will always be par when the bond is redeemed. Bond investments made above par (premium bonds) or below par (discount bonds) are also redeemed at par. The price of discounts gradually rises to par; the price of premiums falls to par. These changes occur very gradually, in minute annual increments and are reflected in the current price of any bond.

Bond Investing Question #3: I own bonds issued years ago, when coupon rates were 4%. Rates are now much higher. Can't I sell my old bonds and buy new ones with higher coupons in order to earn more income?

The swap by itself will not result in higher yields: If you buy a bond that is comparable in maturity length and credit quality, the transaction will be a wash, because you would have to sell at that price at which the buyer of your old bonds would be indifferent to buying your bond or one carrying a higher coupon, meaning at the exact price which would result in the prevailing yield. Therefore, your income from the bonds would not change.

For example, let us assume you own 10 bonds with a par value of \$10,000 and a coupon rate of 4%. That means that annually you receive interest (coupon) income of \$400. Assume further that over a period of several years, interest rates have risen to 8%. You sell your bonds for approximately \$500 per bond, for a total of \$5,000, which you now reinvest. You now own \$5,000 (par value) bonds, and you will now receive annual interest of 8%; that is, \$400. Therefore, even though you are now earning a coupon rate of 8%, you will be earning the same dollar amount as before the swap. Moreover, you would be out the transaction costs (commissions) incurred in selling the old bonds and buying the new bonds.

This does not mean that you should never consider swaps. There are other valid reasons for swapping. On the preceding transaction, you would generate a capital loss of approximately \$5,000 and that might be used for tax

purposes to offset capital gains on other transactions. Or you might swap to upgrade credit quality. You might increase yield by buying lower-quality bonds, or by buying different bonds.

Please note two caveats. In the preceding example, you would have taken an enormous hit to principal. Also, costing out a swap accurately is complex.

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