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Morningstar.com's Interactive Classroom

Course 102

Bond Duration

Introduction

When you read reports on bonds and bond mutual funds, you will likely come across two apparently similar terms: bond maturity and bond duration. Though related, they refer to two different concepts. In this course, we will discuss these concepts, with the focus on duration. Let's begin with a brief discussion of basic bond features and concepts.

Bond Basics

A bond is issued with a stated value, known as the par, or face, value. This is the value at which the bond will be bought back by the issuer upon its maturity. Though there are exceptions to the rule, most bonds are issued with a \$1,000 par value. While a bond's current value can and usually does fluctuate during its lifetime, this par value remains fixed. At issue, most bonds also offer a fixed interest rate, or coupon rate. This is the annual rate of interest, calculated as a percentage of par, that the holder of the bond will earn. For example, if a \$1,000 par value bond has a 5% coupon rate, each year the holder of that bond will earn 5% of \$1,000, or \$50 ($0.05 \times \$1,000 = \50).

There are several yields with which bond investors must be familiar, but the most important is the yield to maturity, or YTM. This is the total return an investor receives from a bond, based on the annual interest rate and any profit or loss realized on the sale of the bond. Simply put, YTM is the yield calculation used to compare the value of bonds with different issue and maturity dates, coupon rates, and par values.

Another important bond concept is present value--the assumption that, due to inflation, a specified sum of money received today will be worth more than the same amount received at some point in the future. Because bonds are based on the foundation of "payments over time," investors should be aware of this relationship between the values of money received today and the same amount received later.

Now that we have looked at some bond basics, let's begin to focus on duration and its importance to bond investing.

Duration Defined

Bond investors are faced with reinvestment risk--the threat that if interest rates fall, the interest payments and principal that investors receive will have to be reinvested at lower rates. This is important because the yield-to-maturity calculation we discussed earlier assumes that all payments received are reinvested at the exact same rate as the original bond's coupon rate. However, this is rarely the case. As a result, brokers and portfolio managers try to account for reinvestment risk by calculating a bond's duration--the number of years required to recover the true cost of a bond, considering the present value of all coupon and principal payments received in the future. Duration can be used to compare bonds with different issue and maturity dates, coupon rates, and yields to maturity. The duration of a bond is expressed as a number of years from its purchase date.

Let's now look at some of the properties of duration as they relate to coupon rates and maturities.

The Properties of Duration

By definition, duration measures the number of years required to recover the true cost of a bond, considering the present value of all coupon and principal payments received in the future. Thus, the higher the coupon rate of a particular bond, the shorter its duration will be. In other words, the more money coming in now (because of a higher rate), the faster the cost of the bond will be recovered. The same is true of higher yields. Again, the more a bond yields in today's dollars, the faster the bondholder will recover its cost.

Conversely, longer bond maturities mean longer durations, since the fixed interest payments will be spread over longer periods and will be more greatly affected by inflation. This is best illustrated by imagining a fixed amount of money, for example \$1,000, being mailed to you in small payments over time. If these payments are spread over a one-year period, you will "recover" your money faster than if the same dollar amount were spread over a five-year period.

In order to complete the duration picture, we need to review the effects of changing interest rates on bond values.

The Effect of Changing Interest Rates on Bond Values

Another risk that bond investors face is interest-rate risk--the risk that rising interest rates will make their fixed-interest-rate bonds less valuable. To illustrate this, let's suppose you bought a \$1,000 par value bond with a 10-year maturity and a 6% coupon rate. You will earn 6% of \$1,000, or \$60, each year that you own the bond. Let's further assume that after one year, you decide to sell it, and at that time, new bonds are being issued with 7% coupons. Investors can

choose between your 6% bond and a new 7% bond. To entice someone to buy your bond, you will have to discount its price so that the new owner will earn the same \$60, but will have paid less than \$1,000 to buy it, thus raising his or her yield closer to 7%.

The reverse is also true of falling interest rates. Using the example above, let's assume that when you sell your bond, new bonds are being issued with 5% coupons. Investors can choose between your 6% bond and a new 5% bond. Comparatively, your bond is now much more attractive. An investor will be willing to pay more than \$1,000 to earn 6% rather than 5%.

Duration is the tool that helps investors gauge these price fluctuations that are due to interest-rate risk. As previously discussed, duration is expressed as a number of years from the purchase date. In simple terms, a bond's duration will determine how its price is affected by interest-rate changes. In other words, if rates move up by one percentage point--for example, from 6% to 7% -- the price of a bond with a duration of 5 years will move down by 5%, while a bond with a duration of 10 years will move down by about 10%. You will notice that all components of a bond are duration variables. That is, the bond's duration, coupon, and yield to maturity, as well as the extent of the change in interest rates, are all significant variables that ultimately determine how much a bond's price moves.

As you can see, duration is a powerful tool for any bond investor looking to make the most of his or her buying, selling, and holding decisions. Let's recap what we have learned.

Duration Is a Guide to Selecting Bonds

Duration determines the economic life of a bond. It is not expected that you as an individual investor have to necessarily know how to calculate a bond's duration. Rather, your broker, financial advisor, or other financial professional can provide this information. However, once armed with all the right numbers, it is your responsibility to understand that a bond's duration is a clear indication of its interest-rate risk (i.e., how much it will move in response to changing interest rates.) You can then buy, sell, or hold bonds according to how you think they will perform.

To learn more about bonds and bond basics, check out our other courses in this series.

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Quiz 102

There is only one correct answer to each question.

- 1 In which of the following ways is duration expressed?
 - a. As a percentage
 - b. As a number of years
 - c. As a dollar amount

- 2 Reinvestment risk is the threat that _____.
 - a. An investment will lose value over time
 - b. If interest rates fall, the interest payments and principal the investor receives will be lost
 - c. If interest rates fall, the interest payments and principal the investor receives will have to be reinvested at lower rates

- 3 Which of the following best describes the correlation between duration and coupon rates?
 - a. The higher the coupon rate, the shorter the duration
 - b. The higher the coupon rate, the longer the duration
 - c. The lower the coupon rate, the shorter the duration

- 4 How will the market price of a 5% coupon bond most likely respond if newer bonds are issued at 7%?
 - a. It will fall
 - b. It will rise
 - c. It will remain fixed

- 5 A bond's duration is the number of years required to recover what?
 - a. The true cost of the bond
 - b. The interest rate
 - c. The principal

To take the quiz and win credits toward Morningstar Rewards go to <http://news.morningstar.com/classroom/quiz/0,3268,5323,00.html>

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