**BOND FUNDAMENTALS**

**BOND PRINCIPLES:**

Special conventions are used to identify and to classify bonds.

**1. Identification of Bonds:**

We identify a bond by citing the issuer, the bond's coupon, and its maturity. The coupon rate is the fixed interest rate that is the basis for the quantity of dollars the bond pays. For instance, an investor might instruct a broker to buy 5 of the "Hertz sevens of 03." This order calls for a purchase of $5,000 face value of the Hertz bonds carrying a 7% stated interest rate and a maturity in the year 2003. The face value of a bond is also called its par value. The 7% coupon rate, coupled with the $5,000 par value, means an investor would receive $350 per year from this investment. In the financial press, this bond is listed as Hertz 7s03. The s does not stand for anything, but is pronounced when the bond is identified, Hertz might issue another bond paying 81/2% per year and maturing in 2010. These would be the "eight and one-halves of ten": Hertz 81/2s l0.

***Bonds are identified by issuer, coupon, and maturity.***

**2. Classification of Bonds:**

A legal document called the indenture contains the details of a bond issue. This pamphlet describes the terms of the loan, to include the issuer, security for the loan, and the term of repayment.

**Issuer:**

One method of classifying bonds is by the nature of the organization selling the bond. Corporations; federal, state, and local governments; government agencies; and foreign corporations and governments all issue bonds. (A bond sold by a state or local government is a municipal security.) These broader groups are divided into subcategories.

**Security:**

***The security of a bond refers to the collateral that backs the bond.***

*Unsecured Debt:*

All debt of the U.S. Treasury department is secured by the ability of the federal government to make principal and interest payments from general tax revenues. No specific assets are ever listed as collateral for federal debt.

State and local governments can also issue debt without specific assets pledged against it. These are full faith and credit issues or general obligation bonds. Like obligations of the federal government, these bonds are backed by the taxing power of the issuer.

Financially sound corporations frequently issue debentures, which are really just signature loans backed by the good name of the company. If a company subsequently issues a second unsecured bond, it would be a subordinated debenture. These bonds have a claim on the company's assets after those of the original debenture holders.

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| *Secured Debt:* |  |

There are a great many ways in which companies provide security for a risky debt issue. A municipal bond might be a revenue bond used to finance a turnpike or a bridge across a river, with user fees being the principal source of debt repayment. An assessment bond is typically used to pay for a project that benefits a specific group of people. The installation of streetlights in a residential area is an example. People who directly and routinely benefited from this improvement would be assessed a higher property tax.

Corporate secured debt comes in many forms. A mortgage is a well-known security using land and buildings as collateral. Mortgages are especially popular with public utilities. Their power lines, poles, and the land on which they sit frequently back a debt issue. Other securities such as investment assets or the stock of a subsidiary back a collateral trust bond. An equipment trust certificate provides physical assets such as a fleet of trucks as collateral for the loan. Airlines frequently use these to finance the purchase of new airplanes; railroads use them to finance boxcars. In each case the collateral may be easily transported to a new purchaser if the bondholder wishes to liquidate the collateral in the aftermath of a bankruptcy.

**Term:**

Another common debt classification is by term, or the original life of the security. Short-term securities are those with an initial life of less than one year. U.S. Treasury bills are a good example. Intermediate-term securities like U.S. Treasury notes have lives ranging from two years to ten years. A long-term security (such as a U.S. Treasury bond) has a maturity greater than ten years. Table 4-2 provides some details on the characteristics of Treasury securities.

Loan arrangements may also be open-ended, as with a corporate line of credit at a commercial bank or a private citizen's home equity loan. These loans, however, are seldom readily marketable and usually cannot be resold to another lender.

Some bonds are part of a larger debt obligation known as a serial bond. Such a bond issue has a series of maturity dates for specific portions of the debt rather than one single date for the entire issue.

**3. Terms of Repayment:**

A potential bond investor is interested in knowing the structure of the cash flows promised in the bond indenture. Several repayment patterns are common.

**Interest Only:**

Most marketable debt is structured such that the periodic payments are entirely interest. The principal amount of the loan is repaid in its entirety at maturity.

**Sinking Fund:**

In some circumstances lenders may require that the borrower provide for the eventual retirement of the debt by setting aside a portion of the debt principal each year. Such a fund is called a sinking fund. For instance, a $10 -million, 20-year debt issue might provide that after five years, the borrower must deposit $1 million into a special escrow account and another $1 million every third year to partially offset the eventual burden of debt repayment.

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Alternatively, the indenture might provide that after a period of time the borrower must retire a certain number of the bonds each year. This format means that a portion of the debt must be paid off early according to a schedule outlined in the bond indenture.

**Balloon Loan:**

A balloon loan may involve a partial amortization of the debt with each payment, but with the bulk of the principal due at the end of the loan term. Frequently all of the principal is due at the end of a balloon loan. These bonds are rarely found in marketable form; they are most often used in commercial banking.

**Income Bond:**

The key characteristic of an income bond is that the interest is payable only if it is earned. An income bond might be used to finance some type of income -producing property such as a parking garage. If the facility is unprofitable in the first few years, the interest does not have to be paid. It may or may not accumulate depending on the specifications of the bond indenture. Income bonds are a relic from a bygone age and are no longer common.

**4. Bond Cash Flows:**

Relative to other types of securities, bonds produce cash flows that an analyst can predict with a high degree of accuracy. The cash flow patterns fall into four categories: annuities, zero coupon bonds, variable rate bonds, and consols.

**Annuities:**

Most bonds are annuities plus an ultimate repayment of principal. An annuity promises payments of a fixed amount on a regular periodic schedule for a finite length of time. In the United States and Japan, virtually all bonds pay interest twice per year. In Europe, the tradition is to pay interest once annually.

**Zero Coupon:**

A zero coupon bond has a specific maturity date when it returns the bond principal, but it pays no periodic income. In other words, the bond has only a single cash inflow the par value returned at maturity. An investor might pay $450 for a bond that promises to return $1,000 in 7.5 years. The investor's return comes from the $550 increase in value over the seven-and-one-half years. These types of bonds are still relatively new in the United States. The retail department store JCPenney (JCP, NYSE) issued the first publicly offered zero coupon bond in 1982. Chase Manhattan Bank (CMB, NYSE) and McDonald's (MCD, NYSE) followed suit later that year.

**Variable Rate:**

Some securities do not carry a fixed interest rate, but allow the rate to fluctuate in ac-cordance with some market index. Such a bond is a variable rate bond, also called an adjustable rate bond. U.S. savings bonds are a good example. The interest paid on these is 90 percent of the prevailing rate on five-year Treasury securities, with a 4 percent minimum. If market rates move higher, the income earned on these bonds increases, and vice versa.

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A special type of variable rate bond is the step-up bond, one whose coupon increases according to a predetermined schedule. In February 1995 the Federal Home Loan Bank issued a three-year step-up bond10 with a coupon that began at 7.25%. Every six months thereafter the coupon increases, eventually settling at 9.25%.'

***Most bonds are composed of an annuity plus a single sum at maturity.***

**Consols:**

With a consol, a level rate of interest is paid perpetually; the bond never matures, and the interest is paid forever. Bonds of this type are traded in Europe and in Canada, but they are rare in the United States. Two examples are the Lehigh Valley Railroad 4'/2% and 6% issues. Issued in 1873, these bonds were "due only on default of interest." A mortgage on one of the company's main railroad lines secured them. Bondholders agreed to a modification of the indenture in 1949 giving the bonds a definite maturity of 1989. They are now gone and part of history.

U.S. companies do occasionally issue very long-term bonds, however. In fact, on January 1, 1937, of the 4,425 U.S. corporate bonds outstanding, 88 (2.7 percent of the total) had a maturity in excess of 99 years." Long-term bonds seem to be returning to favor with corporate issuers. Walt Disney Company issued $150 million par value of a 100-year, 7.5% coupon bond in July 1993. The offering was an enormous success, although one analyst predicted that the bond would become a "historic artifact, a curiosity."

Earlier in 1993 five other companies issued 50-year bonds. In 1992 there was only one 50-year bond issued, and prior to that none had been issued in decades. The last 100-year bond issued prior to the Disney bond was a Chicago & Eastern Illinois Railroad bond in 1954.

**Inflation-Indexed Treasury Bonds:**

Beginning the end of January, 1997, investors have been able to purchase Treasury Inflation Protected Securities (TIPS) from the U.S. Treasury department. The securities are obligations of the federal government with a maturity and coupon, but with an added feature to provide protection against inflation.

The bonds have a face value of $1,000 and a semiannual coupon that so far has ranged between 3% and 4% per year. Every six months the government adjusts the principal value of the bond according to changes in the Consumer Price Index. If, for instance, the CPI rises 4%, the par value of the bond rises to $1,040 and the coupon rate is applied to this higher rate.

**5. Convertible and Exchangeable Bonds:**

Some debt instruments have a valuable conversion option. The bondholder has the right, but not the obligation, to exchange the debt instrument fqr another security or for some physical asset. A convertible bond may be exchanged for common stock in the company that issued the bond. An exchangeable bond may be exchanged for shares in a different firm. At one time International Business Machines (IBM, NYSE) owned a substantial chunk of Intel (JNTC, NASDAQ). IBM issued a 63 /8% bond exchangeable into 26.143 shares of Intel. An investor in this bond had the security of IBM and the market potential of Intel.

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The conversion is a one-way street. Once conversion occurs, the security holder cannot elect to reconvert and regain the original debt security. Chapter Twelve of this book provides detailed coverage of convertible securities.

**6. Registration:**

Bond registration refers to how the ownership interest is recorded. There are three methods: bearer bonds, registered bonds, and book entry bonds.

**Bearer Bonds:**

A bearer bond is one that does not have the name of the bondholder printed on it, Like a hundred dollar bill, the bond belongs to whomever legally holds it. These bonds have actual coupons around the perimeter that must be physically clipped with scissors as interest payment dates arrive. Because of this characteristic, bearer bonds are also called coupon bonds. Each coupon bears a date and a dollar amount. Once clipped, the coupons can usually be deposited into the bondholder's bank account at any teller window. New debt may no longer be issued in this form in the United States.

Bearer bonds are popular outside the United States, however. The Internal Revenue Service is largely responsible for this fact, as bearer bonds have for years been popular among those interested in evading taxes on their interest income. Interest earned on a bearer bond is difficult for the IRS to trace, and much of it was (and probably still is) unreported on individual income tax returns. They are also popular with international embezzlers and drug cartels. Ironically, the principal source of bearer bonds has historically been the U.S. Treasury department.

**Registered Bonds:**

Bonds that do show the bondholder's name are registered bonds. Rather than clipping coupons, holders of registered bonds receive an interest check in the mail from the issuer of the debt.

**Book Entry Bonds:**

The U.S. Treasury issues new bonds in book entry form only, meaning that ownership is reflected only in the accounting records. No actual bond certificate changes hands. Until a few years ago an investor could buy a Treasury note or bond and actually take delivery of the security. Now, however, a person who wants to buy these securities on their own must open a Treasury Direct Account (TDA) at any of the 35 Federal Reserve banks or branches. The Treasury department issues no certificates; instead, they open an account on an investor's behalf, crediting interest as it is earned and principal as it is repaid. The principal may also be reinvested m a new Treasury security.

Opening a Treasury Direct Account is a simple matter. Most local banks have the one-page application available from a customer service representative. Investors generally submit noncompetitive bids, meaning they agree to accept the average price and yield prevailing at the next Treasury auction. Figure 4-1 shows the application forms.

It used to be that investors interested in a TDA had to get a certified check from their bank and mail it in. Now, an investor can make arrangements with the U.S. Treasury authorizing a direct transfer from his or her checking or savings account. If an investor chooses to sell a Treasury security before its maturity, he or she can easily do so via the Sell Direct option.

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For a flat fee of $34 regardless of the size of the transaction, the government will take three bids and sell your bonds to the highest bidder within 24 hours.

You can check your TDA balance either by phone or over the Internet. The Treasury charges an annual custodial fee of $25 for accounts greater than $100,000, but nothing for smaller accounts. Given that interest on treasury securities is exempt from state and local tax, it is odd that more investors do not choose these investments.

Your local bank offers certificates of deposit backed by treasury securities, but CD interest is fully taxable, while the underlying assets are not. It would make much more sense to do the investing directly rather than going through the intermediary.

Investors also commonly buy Treasury securities through a brokerage firm, thereby eliminating the need to open a TDA. The brokerage firm lets investors use their account, but they pay a commission for the purchase or sale of bonds traded this way. Trading $10,000 par value of Treasury securities might cost as much as $200 at a full-service brokerage house. Another disadvantage of buying through a broker is that the newspaper price for a Treasury security is based on a $ l-million purchase. Buying a smaller quantity probably adds about 0.5 percent to the-bond price. This "premium" reflects the cost of the brokerage firm handling the "small" order. Depending on the bond term, this higher price lowers the yield by 7 to 10 basis points. A basis point is 0.01%. By using the TDA, an investor would not give up any of the yield.

**BOND FUNDAMENTALS Contd…**

**BOND PRICING AND RETURNS:**

As with any time-value-of-money application, there is a deterministic relationship between the current prices of a security, it’s promised future cash flows, and the riskiness of those cash flows. The current price is the market's estimation of what the expected cash flows are worth in today's dollars.

**Valuation Equations:**

**Annuities:**

For an ordinary annuity bond paying interest semiannually and assuming it has just made an interest payment, the valuation equation is as follows:

**Po=∑Ct/ (1+r/2)t**

where;

n = term of the bond in semiannual periods Ct = cash flow at time t

r = discount rate

Po = current price of the bond

t = time in semiannual periods from the present

The bond pricing relationship is customarily expressed in terms of the number of semiannual payment periods. An eight-year bond, for example, has 16 semiannual payments. This procedure also requires dividing the annual discount rate, r, by two to turn it into a semiannual equivalent.

To illustrate, we split equation into two parts, one for the interest component (the cash flows Ct and one for the principal:

**Po=∑Ct/ (1+r/2)t + Par/1+r/2)n**

**Bond price = PV (interest) +PV (principal)**

Suppose a bond currently sells for $900, pays $95 per year (interest paid semiannually), and returns the par value of $1,000 in exactly eight years. What discount rate is implied in these numbers? To find out, we solve the following valuation equation:

**$900=∑$47.50/(l+r/2)t + $1,000/(l+r/2)16**

This equation can be solved using time-value-of-money tables, a finance calculator, or a spreadsheet package such as Lotus 1-2-5 or Microsoft Excel. We find r = 11.44%.

This bond's return comes from two sources: periodic interest and the return of the bond principal in eight years. These two components can be valued separately after determining the appropriate interest rate. Using 11.44%, the value of the interest component is $489.40, while the principal value is $ 410.60 in current dollars. These two values sum to the bond's current market price of $900.

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***The bond pricing relationship is customarily expressed in terms of semiannual periods.***

**Yield to Maturity:**

In the preceding valuation equations, investors call the discount rate, r, the yield to maturity. This concept is precisely the same as internal rate of return in corporate finance applications.

**Calculating the Yield to Maturity:**

An easy-to-use approximation method usually provides an estimate within a few basis points of the true yield to maturity.

**YTM approximate = (annual interest – ((market price-par value)/years until maturity))/0.6(market price) + 0.4(par value)**

Plugging in the values from the previous example, we find an approximate yield to maturity of 6.32%

In this case, the value from the approximation formula is near the true value from the complete valuation equation. When the bond sells for near par, the approximation method is accurate. Some error is introduced when a bond sells for a substantial discount or premium.

**Spot Rates:**

For a given issuer, all securities of a particular maturity will not necessarily have the same yield to maturity, even if they have the same default risk. A spot rate is the yield to maturity of a zero coupon security of the chosen maturity. You can observe spot rates directly from the U.S. Treasury strips portion of the government bond. A treasury strip is a government bond or note that has been decomposed into two parts, one for the stream of interest payments and one for the return of principal at maturity - These are sometimes called interest only and principal only securities, respectively. The codes in the newspaper listing are ci for coupon interest, np for note principal, and bp for bond principal- The principal-only version of a U.S. treasury strip is a manufactured zero coupon security, but one whose price reflects the prevailing spot rate.

The yield to maturity is the single interest rate that, when applied to the stream of cash flows associated with a bond, causes the present value of those cash flows to equal the bond's market price. Yield to maturity is a useful and frequently cited statistic. It is akin to an average of the various spot rates over the security's life. The market, however, does not value a bond using the yield to maturity concept. Rather, the yield to maturity is a derived statistic after the bond value is already known; we need to know the bond price in order to get the yield to maturity.

For valuation purposes, a bond should be thought of as a package of zero coupon securities, each providing a single cash flow, and each valued using the appropriate spot rate. In other words, each component is discounted by a specific rate rather than by some average rate.

You can think of the yield to maturity as an "average" of the spot rates, or you can visualize it as a flat yield curve at some constant interest rate. This single interest rate makes the present value of the future cash flows equal to the bond's market price.

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It is important to note in the valuation process that the yield to maturity is an after-the-fact calculation. Investors value each cash flow by discounting them at the appropriate spot rate. The sum of these values is the bond's market price. From this price we derive the yield to maturity.

**Realized Compound Yield:**

A modest complication occurs when comparing a bond that pays semiannual interest with some competing investment that pays interest on a different lime schedule. If bonds are being compared to other securities, you can best reduce the likelihood that you compare apples with oranges by computing the effective annual rate for all of them.

We do this via equation:

**Effective annual rate = (1+ r/x)x -1**

Where;

r= yield to maturity

x = number of payments per year

**Current Yield:**

A bond's yield to maturity measures the total return the bondholder receives if the bond is kept for its entire life. The current yield, only measures the return associated with the bond's interest payments. Capital gains or losses are not included in the current yield.

Current yield is an important statistic for someone primarily concerned with the spendable income their investments generate. The fact that the long -run rate of return (the yield to ma-turity) may be higher is not as important. A zero coupon bond has a current yield of zero. It would be an inappropriate investment for a retired person who needed routine interest checks for living expenses.

A bond whose market price is less than its par value is selling at a discount. If the market price is more than the par value, the bond sells at a premium. Note that for bonds selling at a discount, the yield to maturity will always be greater than the current yield because of the capital gain an investor receives when the bond matures at par value. Similarly, for bonds selling at a premium, the yield to maturity will be less than the current yield.

The reason a coupon-paying bond sells for a discount is that its package of cash flows is worth less than that offered by the average competing investment.

**Accrued Interest:**

Bondholders earn interest each calendar day they hold a bond, unlike the situation with common stock, where the dividend is an all-or-nothing feature. Despite this aspect, firms generally only mail interest payment checks twice each year. Someone might buy a bond today and receive a check for six months' interest two weeks later — a substantial return in 14 days. The situation does not work this way, however, for the story is incomplete.

The buyer of a bond must pay the accrued interest to the seller of the bond. Similarly, the bond seller receives accrued interest from the new bond owner- One day's interest accrues

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for each day the bond exists. The owner of the bond is entitled to it even though it might not be distributed for several more months. The price of a bond including the accrued interest is known as the dirty price. The price without accrued interest is the clean price. By convention in (lie United States, we compute the accrued interest on corporate and municipal bonds using a 360 -day year (12 months of 30 days each) and do not count the transaction settlement date in the total. With Treasury securities, we use the actual number of days.

At the end of the calendar year, bond investors must report the interest they earned to the Internal Revenue Service. Interest income from bonds equals the interest checks received plus accrued interest received minus accrued interest paid.

**BOND RISKS:**

Statements Such as "stock is risky, bonds arc not," are not accurate. Bonds do carry risk, although the nature of their risk; is different from that of an equity security. To properly manage a group of bonds, an investor must understand the types of -risk they bear.

**Price Risks:**

The price of a bond can change ever)' day as the "net chg" column in Figure 4-2 indicates. The two components of price risk are default risk and interest rate risk.

**Default Risk:**

The possibility that a firm will be unable to pay the principal and interest on a bond in accordance with the bond indenture is known as the default risk. Standard & Poor's and Moody's are the two leading advisor)' services reporting on the default risk of individual bond issues. Standard & Poor's gives bonds a rating based on a scale of AAA (least risk) to D (bonds in default). The ratings from AA to CCC may carry a plus or minus. Table 4-5 shows the complete set of ratings. An investment grade bond is rated BBB or higher; any bond with a lower rating is known as a junk bond. .Many fiduciaries are limited by law to bonds that are investment grade.

Some bonds originate with an investment grade, but are later downgraded below BBB. Such a bond is a fallen angel. Salomon Brothers uses the term zombie bond to refer to a highly speculative bond, once thought long dead, that shows signs of life by a price run-up.

Standard & Poor's has a separate description for each of the ratings AAA, AA, A, and BBB. Junk bonds, however, are all covered by a single definition, the salient portion of which states that these bonds are regarded on balance, as predominately speculative with respect to capacity to pay interest and repay principal in accordance with the terms of the obligation.

**Interest Rate Risk:**

Bonds also carry interest rate risk, which is the chance of loss because of changing interest rates. If someone buys a bond with a 10.4% yield to maturity and market interest rates rise a week later, the market price of this bond will fall. It would fall because risk-averse investors will always prefer a higher yield for a given level of risk. Newly issued, equally risky bonds will yield more after the interest rate rise, and investors will only be willing to purchase the old bonds if their price is reduced. Relative to the purchase price, a bondholder has a paper

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loss after the rise in interest rates. If the bonds were to be sold at this point, there would be a realized loss.

Suppose in December 1999 an investor buys a newly issued, 7% coupon, 15-year bond at par. Because the bond is purchased at par, its yield to maturity equals the coupon rate of 7%. At the purchase date, the valuation equation is as follows:

**Po=∑$35.00/(1+.07/2)t + $1000/(1+.07/2)30 =$1000**

One year later (December 2000) bonds of similar risk yield 6.5%. The decline in interest rates will cause our investor's bond to appreciate. Its new price should be

**Po=∑$35.00/(1+.065/2)t + $1000/(1+.065/2)28 =$1045.5**

The principal value of the bond appreciated by 4.55% from the purchase price, plus the bondholder received $70 in interest over the year. If the bond were sold at this point, the investor's holding period return would be:

**(1045.51-1000+70)/1000 = 11.55%**

which is substantially greater than the anticipated 7% yield to maturity. Note that if the investor does not sell at this point, choosing instead to keep the bond until its maturity, the bond price will eventually converge on the $1,000 par value.

Suppose that two years later, in December 2002, interest rates have gone up to 8%. The bond price will necessarily come down:

**Po=∑$35.00/(1+.08/2)t + $1000/(1+.08/2)24 =$923.77**

These changing values illustrate the nature of interest rate risk: changing interest rates will change the market value of a bond investment. While it is true that investors who hold bonds until maturity almost always get their investment back, they can never know for certain what path the price will take as it moves toward its maturity date.

**Convenience Risks:**

Convenience risks comprise another category of risk associated with bond investments. These risks may not be easily measured in dollars and cents, but they still have a cost.