# Original Issue Deep Discount Bonds

In response to the high and volatile levels of interest rates experienced in the United States during the past two years, borrowers in the corporate bond market have increasingly experimented with alternatives to the traditional fixed-rate, long-term bond as a means of raising funds. These alternatives include bonds with warrants, variable rates, links to commodities prices, and stock convertibility features (Box 1). Another such innovation, which has been heavily used since the spring of 1981, is the original issue deep discount bond (henceforth referred to as a discount bond). When issued, discount bonds offer coupon payments well below the market rate of return and, therefore, must be sold at a substantial discount from par. Thus, in general, the return on a discount bond held to maturity consists of both coupon payments and the appreciation from the discounted issue price to par value at maturity However, in the extreme, a bond sold at a discount may offer no coupon (a zero coupon bond) and provide a return solely through its appreciation from the discounted value to par.

Discount bonds offer both advantages and disadvantages to borrowers and investors when compared with current coupon bonds (hereafter referred to as conventional bonds) [1] While it is difficult to place precise monetary values on the different characteristics of the bonds, it is probably true that the advantages outweigh the disadvantages for participants on both sides of the market. For investors, the (implicitly) increased call protection and lower reinvestment risk are attractive features of discount bonds, while the potentially large tax disadvantage is of no consequence to a significant groups of buyers—nontaxable entities and foreign investors. Borrowers benefit greatly from the tax treatment of these bonds, so that they, too, prefer them to conventional bonds. Therefore, investors would be willing to accept lower yields on discount bonds than on conventional bonds, and borrowers would be willing to pay higher yields. Since discount bonds have actually been sold at effective rates below those on comparable conventional bonds, issuers have definitely benefited by offering these innovative bonds. Investors also may have gained, to the extent that the market rates have exceeded the minimum rate at which they would buy discount bonds instead of conventional bonds.

This article examines how original issue discount bonds provide the various advantages and disadvantages to borrowers and lenders, with special attention being paid to the tax considerations. It also shows how the value of some of the bonds' characteristics are accentuated by high and/or volatile interest rates, thus offering a possible explanation for the fact that discount bonds have only recently become a popular means of raising funds in the bond market

[1] The term "current coupon bonds" refers to bonds issued at or near par, with coupons reflecting the current level of market interest rates For example, if the current level of market yields is 15 percent, then a current coupon bond would promise coupon payments of $15 per year per $100 of face value

**Background**

The first publicly placed discount bond by a highly rated United States corporation was issued in early March 1981 by Martin Marietta Corporation. Prior to

Table 1

**Publicly Placed Corporate Bonds**

Total funds raised and funds raised with original issue discount bonds

| 1981 | All bonds (millions of dollars) | Discount bonds (millions of dollars) | Discount bonds as a percentage of all bonds |
|---|---|---|---|
| March | 3,778 | 256 | 6 8 |
| April | 3,668 | 781 | 21 3 |
| May | 2,520 | 169 | 6 7 |
| June | 4,603 | 490 | 10 6 |
| July | 1,925 | 327 | 17 0 |
| August | 905 | 78 | 8 6 |
| September | 2,198 | 168 | 7 6 |
| October | 2,582 | 107 | 4 1 |
| November | 6,560 | 1,601 | 24 4 |
| March-November | 28,739 | 3,977 | 13 8 |

that time, these bonds had been issued only by companies with low credit ratings or by higher rated companies through private placements. Following the Martin Marietta issue, other major corporations followed in quick succession, and by the end of July there had been twenty-one publicly placed discount issues, raising funds totaling $2 0 billion. Although the pace slowed somewhat from August through October (both on a dollar-volume basis and as a percentage of total funds raised with corporate bonds), it picked up considerably in November, when discount bonds accounted for more than 24 percent of the total funds raised publicly in the domestic bond market. For the entire March-through-November period, the comparable figure was approximately 14 percent (Table 1).

The discount bonds issued in 1981 (from March through November) varied widely with respect to coupons, prices, yields, credit ratings, and terms to maturity. Coupons ranged from 16 percent to zero, and prices from $85.50 to $25.25. The Martin Marietta issue and a recent Security Pacific Corp. offering (rated A and Aa, respectively, by Moody's Investors Service, Inc ) both had the lowest yield to maturity of any discount bond to date—13 25 percent—while another recent offer, by Lorimar (rated B), was priced to yield 20.01 percent. (Box 2 explains how yields to maturity are calculated ) In the March-through-May period, most discount bonds that were issued had thirty years to maturity; the weighted average term to maturity for that period was twenty-eight years, compared with approximately twenty years for conventional bonds. However, in the subsequent five months (through October), the weighted average term to maturity for discount bonds was similar to that for conventional issues, approximately eighteen years

Bonds sell at more of a discount the lower the coupon and, as long as the coupon is below the market rate, the longer the term to maturity (Box 2). While some discount bonds have been issued with zero coupons and others have had very long maturities (thirty years), there has been neither a zero coupon bond issue with a maturity of longer than ten years nor a thirty-year bond with a coupon of less than 6 percent. Thus, by combining a zero coupon bond with a thirty-year maturity, there is the potential for bonds to be issued at even deeper discounts than the market has heretofore seen. As will be shown in the following sections, such bonds would tend to accentuate most of the advantages and disadvantages of discount bonds.

### Tax advantage to borrower

Discount bonds that pay the same yield to maturity as conventional bonds provide distinct tax advantages to taxable borrowers. This is because of special provisions in the tax laws which apply to the treatment of the original issue discount amount. Discounts on orig-

**Box 1: Other Unconventional Bonds**

A number of bonds that have been issued over the past year have offered investors some combination of the characteristics of conventional bonds and those of instruments of other markets. By combining features of different markets in such "hybrid" instruments, borrowers have sought to attract investors at lower costs than with conventional bonds. A few of the types of unconventional bonds, and examples of their uses, are described below.

*Variable rate bonds* are bonds that periodically adjust interest payments to reflect market rates. Therefore, in contrast to fixed-rate bonds, if interest rates rise during the term of the bond, investors will not earn below-market rates for any extended period of time. Furthermore, since variable rate bonds earn approximately the market rate of interest, their prices should not vary much from par; consequently, investors have little risk of incurring capital losses if interest rates have risen and they sell the bonds before maturity. Of course, with variable rate bonds, investors give up the opportunity, for the most part, to "lock in" current rates and to earn capital gains should interest rates fall in the future. In these respects, purchasing variable rate bonds is similar to buying a series of short-term investments, such as commercial paper.

As is the case with issuing commercial paper and then turning it over repeatedly, issuers are not sure of their future borrowing costs with variable rate bonds. However, variable rate bonds offer borrowers a long-term commitment for funds, unlike a commercial paper offering and, in this respect, are similar to conventional bonds.

Variable rate bonds have been used rarely in the United States corporate bond market, though they are seen frequently in the Eurobond market. One of the few examples of a domestically issued variable rate bond is a twenty-year issue offered in February 1981 by General Felt Industries, Inc. The interest payments are adjusted quarterly and set at 133 percent of a twenty-day average of the constant maturity yields on twenty-year Treasury bonds.

*Commodity linked bonds* are another type of unconventional security. The principal of these bonds is convertible, at the option of the buyer, into a fixed quantity of some commodity. To the extent that the price of the commodity tracks the general level of prices in the economy, commodity linked bonds provide protection against unexpected increases in the rate of inflation.

In effect, a commodity linked bond is similar to a combination of a conventional bond and an options contract for the linked commodity. The major difference is that, in the hybrid instrument, exercise of the option also terminates the bond contract. If the conventional bond and option were purchased separately, the option could be exercised but the bond retained.

HMW Industries, Inc., issued an example of this type of bond, a silver-indexed bond with 8 percent coupons. Starting May 1, 1983, investors may redeem each $1,000 principal amount for cash equal to the market price of forty-three ounces of silver, or for the quantity of silver itself. However, since the value of forty-three ounces of silver was $472.57 at the time of the bond offering, the convertibility option would provide value to the investor only after a very considerable increase in the price of silver.

A more common alternative to conventional bonds is the *convertible bond,* which may be converted into

inal issue discount bonds are "deductible as interest and shall be prorated or amortized over the life of the obligation".[2] With a straight-line prorating procedure, borrowing firms realize a tax advantage with discount bonds *vis-à-vis* conventional bonds because the present value of the deductible interest expenses is higher with the discount bonds.

This tax advantage can be illustrated with a simple example. Consider, first, a two-year $100 conventional bond with a 10 percent coupon paid annually, thus providing the following pretax cash flows to the borrower:

| Period | 0 | 1 | 2 |
|---|---|---|---|
| Cash flow | $100 | −$10 | −$110 (*i.e.*, $100 principal repayment plus $10 coupon) |

The pretax yield to maturity (and cost to the borrower) of this bond is obviously 10 percent. For tax purposes, the borrower is allowed to deduct the $10 coupon payments as interest expense.

Now consider an alternative way of raising $100: a

[2] *Treasury Regulations*, Section 1 163-4(a), 1971. Borrowers are allowed to prorate the discount and take it as an interest expense deduction regardless of the size of the original issue discount. However, in the tax treatment of investors, an original issue discount bond is defined as one that is sold at an original issue discount greater than or equal to ¼ percent of the redemption price at maturity multiplied by the number of complete years to maturity. Therefore, a twenty-year bond would be considered an original issue discount bond if it were sold at a price of less than or equal to $95.

**Box 1: Other Unconventional Bonds** *(continued)*

a fixed number of shares of common stock at a set price. Typically, that price represents a premium of 10 to 20 percent over the current share price. For instance, in August 1981, Toys "R" Us, Inc., issued a bond at par, which, for each $1,000 principal amount, was convertible into 31 01 shares of common stock. Therefore the initial conversion price, or minimum price at which investors would profit by converting the bond principal into stock, was $32 25 *(i.e.,* the $1,000 principal amount divided by 31.01 shares). Since the price of Toys "R" Us stock was $29.95 at the time of the offering, the conversion price represented a 10 3 percent premium.

In the past year, there also have been a number of bond issues with *warrants* attached. Warrants are options to purchase either shares of stock at a set price or other bonds with a fixed coupon, at some future date *(i.e.,* they are essentially options contracts). When the warrants represent options to buy stock, they provide protection similar to that of convertible bonds; if the price of the corporation's stock rises above the price specified by the warrant, then investors holding bonds with warrants can purchase the stock at a discount. However, warrants are different from convertible bonds in that they are essentially separate from the bond itself; if the warrant option is exercised, the investor still retains the bond.

As an example, consider the offering by Unifi, Inc., in June 1981. The company offered notes in denominations of $1,000, each with 45 warrants. Each warrant represents a right to purchase a share of common stock at $17.625 until maturity (July 1, 1988). Since Unifi's stock was selling in the $17 to $18 range at the time of the offering, any price appreciation could be converted into an immediate gain by investors holding warrants.

Warrants representing options to buy bonds provide a different kind of potential benefit to investors. These warrants reinforce the benefits of holding long-term bonds when interest rates *fall,* since they entitle the holder to purchase another bond yielding a higher return. For instance, the warrant on the ten-year bond with 13⅜ percent coupon issued by Beneficial Corporation in January 1981 entitled the holder to purchase another 13⅜ percent bond, at par, any time before June 30, 1981. The warrants were allowed to trade separately from the bonds If bond yields had dropped below 13⅜ percent before June 30, the bonds with coupons of 13⅜ percent would have sold at a premium. Therefore, investors would have been able to realize a capital gain on the original bond, as well as on the bond purchased with the warrant.

Of the different types of unconventional bonds mentioned, only convertible issues were used with any frequency in the past year However, even those bonds have not comprised a major share of the total volume of funds raised in the bond market. The major reason that none of these alternative types of bonds have become very popular is that, although they offer certain advantages to investors, they also present corresponding disadvantages to borrowers. Only when the value placed on the advantage by the investor is larger than the value placed on the disadvantage by the borrower, will the borrower choose to issue the unconventional bond instead of the traditional, fixed-rate bond.

bond offering no coupon payments. To provide the investor with the same pretax yield to maturity as the conventional bond (and thus, to provide the borrower with the same pretax cost), this zero coupon bond must repay a par value of $121 at the end of the second year; this is because the value of the conventional bond's coupon payments at the end of year 2, compounded at a 10 percent rate, is $21. The pretax cash flow for the zero coupon bond is therefore:

| Period ..... | 0 | 1 | 2 |
|---|---|---|---|
| Cash flow ... | $100 | 0 | −$121 *(i.e.,* $100 return of principal plus $21 discount) |

For tax purposes, however, the $21 discount may be prorated between the two years, *i.e.,* $10.50 may be deducted each year by the borrowing firm as interest expense. Thus, while the pretax payment streams of the two bonds are equivalent (on a present value basis), the annual tax deductions generated by the zero coupon bond are higher than on a conventional bond, making the zero coupon bond a more desirable instrument for any taxable borrower (Table 2). A taxable borrower, therefore, would be willing to offer a *higher* pretax yield to maturity on a zero coupon bond than on a conventional bond; on bonds with equal yields to maturity, zero coupon bonds (and, in fact, all discount bonds) result in lower aftertax costs to the borrower.

The cost savings to the borrower because of this

Table 2

**Comparison of Tax Deductions on Zero Coupon Bonds and Current Coupon Bonds**

In dollars

| Bonds | Period 1 | Period 2 |
|---|---|---|
| Zero coupon bonds ..... | 10 50 | 10 50 |
| Current coupon bonds . . . | 10 00 | 10 00 |

tax advantage can be very large on discount bonds with characteristics (*i e*, yields, coupons, maturities, etc) similar to those issued in recent months Consider, for instance, two hypothetical twenty-year bonds yielding 16 percent to maturity—one is a conventional bond with a coupon rate of 16 percent, the other a discount bond with a coupon rate of 7 percent Both bonds pay $100 at maturity With market rates at 16 percent, the discount bond would sell at a price of $46 34, the conventional bond, of course, would sell at $100. For a corporate borrower in the 46 percent tax bracket, the aftertax cost of the 16 percent conventional bond is 8 64 percent However, the aftertax cost of the discount bond yielding the same 16 percent would be only 7 95 percent; this is equal to the aftertax cost of a conventional bond yielding 14 72 percent before taxes. Thus, by issuing a bond with a 7 percent coupon instead of a 16 percent coupon, the issuer in effect could save 128 basis points before taxes, or 69 basis points after taxes—the difference between 8 64 percent and 7 95 percent (Table 3)

The amount of the tax saving available at a given market rate of interest depends on the amount of the discount, which in turn, depends on the coupon payments and the term to maturity As illustrated in Table 4, lower coupons and longer terms to maturity increase the discount and the tax saving The table shows the potential tax saving is huge—with a zero coupon thirty-year issue, borrowing costs would be 47 percent lower than on a comparable conventional bond However, as noted earlier, borrowers have not yet fully exploited this potential tax advantage, since bonds with the longest maturities have not had the lowest coupons (*i.e*, zero)

The size of the potential tax saving also depends on the market rate of interest, higher rates raise the potential advantage With market rates at 10 percent (Table 4), a thirty-year zero coupon bond could save only 263 basis points, far less than the 748 basis point saving for a similar bond when the market rate is 16 percent This relationship between the tax saving and the market rate of interest may account for the fact that borrowers have turned to discount bonds only recently, in a period in which interest rates have reached record highs

The borrower's marginal tax rate also plays a major role in determining the size of the tax saving due to issuing discount bonds instead of conventional bonds Higher tax rates imply larger savings For instance, if the marginal tax rate were 40 percent instead of 46 percent, the tax saving of a thirty-year zero coupon bond yielding 16 percent (compared with a similar conventional bond) would fall to 712 basis points from 748 basis points (before taxes)

The fact that discount bonds result in a tax savings to issuers implies that borrowers should be willing to offer these bonds at higher pretax rates than comparable conventional bonds. But, paradoxically, market analysts have estimated that borrowers have been issuing discount bonds at yields to maturity 40 to 100 basis points *lower* than on comparable conventional bonds This is because certain investors have been willing to sacrifice yield in exchange for other advantages offered by discount bonds (explained below)

**Call protection**

Most conventional bonds can be called after a five- to ten-year (nonrefundable) period That is, the borrower has the option, any time after the end of the nonrefundable period, to buy back all or part of the original bond issue at par or, as is more frequently the case, at a premium [3] Thus, if interest rates fall between the time a bond is issued and sometime after the end of the noncall period, the corporation may call the bonds and refinance its activities at lower interest rates Similarly the investor must reinvest the refunded funds at the lower market rates Therefore, the investor's yield to maturity on a callable bond is not assured If the bond is called, the series of investments consisting of the original bond (to call) and a new lower yielding bond will produce an overall yield to maturity less than that of the original bond (if held to maturity).

For example, consider a twenty-year conventional bond issued at par with 16 percent coupons, callable after ten years at a price of $110 At the end of ten years, the borrower is faced with the choice of continuing its financing for another ten years with the ten-year-old conventional bond or calling that bond

[3] This premium has recently ranged from zero (*i e*, the bond is callable at par) to as high as 18 75 percent (*i e*, the bond is callable at $118 75) Frequently, the premium is scheduled to decline gradually to zero sometime before maturity

Table 3

## Comparison of Borrowing Costs on Current Coupon Bonds and Original Issue Discount Bonds Yielding 16 Percent to Maturity

| Item | | Current coupon bonds | Discount bonds |
|---|---|---|---|
| (1) | Term to maturity | 20 years | 20 years |
| (2) | Original price | $100 | $46 34 |
| (3) | Pretax yield to maturity | 16% | 16% |
| (4) | Pretax coupon payments | $16 00 | $7 00 |
| (5) | Aftertax coupon payments* | $8 64 | $3 78 |
| (6) | Income deduction due to prorated discount† | — | $2 68 |
| (7) | Tax saving due to income deduction‡ | — | $1 23 |
| (8) | Periodic cash outflow§ | $8 64 | $2 55 |
| (9) | Principal repayment at maturity | $100 | $100 |
| (10) | Aftertax yield to maturity | 8 64% | 7 95% |
| (11) | Pretax current coupon bond-equivalent yield to maturity‖ | 16% | 14 72% |
| (12) | Pretax savings on issuing 7 percent discount bonds instead of 16 percent current coupon bonds | — | 128 basis points |

* Aftertax coupon payments are equal to Cx (1—t), where C is the pretax coupon payments (line 4) and t is the borrower's marginal tax rate, 46 percent

† Income deduction due to prorated discount amount is equal to (100-P)/n, where P is the original price, $46 34 (line 2), and n is the term to maturity, twenty years (line 1)

‡ Tax saving is equal to txI, where I is the income deduction (line 6)

§ Periodic cash outflow is equal to the aftertax coupon payment (line 5) minus the tax saving due to the income deduction (line 7)

‖ Pretax current coupon bond-equivalent yield to maturity is the pretax rate a current coupon bond would need to pay to obtain the aftertax yield to maturity on line 10, or Y/(1—t), where Y is the aftertax yield to maturity

Table 4

## Comparison of Borrowing Costs on Current Coupon Bonds and Original Issue Discount Bonds

Bonds issued at various coupons, terms to maturity, and under different market rates of return

| Market rate of interest (percent) | Coupon rate (percent) | Term to maturity (years) | Current coupon bond-equivalent cost (percent) | Basis point saving over current coupon bonds |
|---|---|---|---|---|
| 16 | 7 | 20 | 14 72 | 128 |
| 16 | 7 | 30 | 14 30 | 170 |
| 16 | 0 | 20 | 11 44 | 456 |
| 16 | 0 | 30 | 8 52 | 748 |
| 10 | 7 | 20 | 9 80 | 20 |
| 10 | 7 | 30 | 9 68 | 31 |
| 10 | 0 | 20 | 8 67 | 133 |
| 10 | 0 | 30 | 7 37 | 263 |

## Box 2: The Yield to Maturity Calculation

Bond purchases generally involve an initial cash outlay (the price of the bond), some periodic cash inflows (the coupon payments), and a large cash inflow at maturity (the principal repayment). When the price of the bond is equal to the principal repayment, the coupon rate provides a good measure of the bond's rate of return. However, when comparing the returns on bonds, some of which may be purchased at prices other than par, one should take into account the price appreciation or depreciation that will occur on the bonds. One way to do that is to calculate the bond's current yield, or the coupon payment divided by the bond price. However, the current yield does not take into account the length of time over which that appreciation or depreciation is to occur. For example, it does not differentiate between a one-year bond with 10 percent coupons that sells for $90 and a two-year bond with the same coupons and price; the current yield on both bonds is 11.11 percent. While both bonds appreciate $10 in value, the one-year bond does so in half the time and, in that sense, is better from the investor's point of view.

The yield to maturity takes into account all these factors—the coupon payments, the price appreciation or depreciation, and the period of time over which that appreciation or depreciation takes place. Implicit in the yield calculation is the assumption that all periodic payments are reinvested at the same rate; the yield to maturity represents the rate at which the initial price of the bond would have to grow so that, at maturity, it equaled the sum of the principal repayment and the value of the coupon payments (after reinvestment). In algebraic terms, the yield to maturity is the rate that satisfies the equation:

$$(1)\quad P = \frac{C_1}{(1+r/2)^1} + \frac{C_2}{(1+r/2)^2} + \cdots + \frac{C_{2n}}{(1+r/2)^{2n}} + \frac{F}{(1+r/2)^{2n}}$$

or

$$(2)\quad P = \sum_{i=1}^{2n} \frac{C_i}{(1+r/2)^i} + \frac{F}{(1+r/2)^{2n}}$$

where P is the initial price of the bond, $C_i$ is the periodic cash flow, F is the principal repayment, and n is the number of years to maturity.*

The complexity of equation (1), or (2), does not allow one to solve explicitly for the yield, given specific values for the parameters P, F, and $C_i$. Instead, one must resort to a trial and error procedure, where different values of r are tested to see if they are consistent with the other given parameters. (A computer simulation program is often used to shorten the time necessary to do all the required calculations.) For example, to calculate the yield to maturity for a twenty-year bond with a coupon rate of 14 percent selling at a price of $88.08, one would try different values of r until the following equation was satisfied.

$$88.08 = \frac{7}{(1+r/2)^1} + \frac{7}{(1+r/2)^2} + \frac{7}{(1+r/2)^3} + \cdots + \frac{7}{(1+r/2)^{40}} + \frac{100}{(1+r/2)^{40}}$$

The yield to maturity for this bond is 16 percent.

From equation (1), or (2), it is obvious that, given a yield to maturity, bond face value and term to maturity, the lower the coupon payments, the lower the price at which the bond can be sold; the borrower must offer some price appreciation in exchange for the lower coupon payments. For example, a twenty-year bond with 12 percent coupons would sell at only $76.51 to yield 16 percent to maturity. Furthermore, the longer the period of time investors are to be paid below-market coupons, the lower the price the investor is willing to pay for the bond. Changing the term to maturity in the preceding example to thirty years, for instance, reduces the investor's offering price to $75.25. Therefore, bonds with the lowest coupons and longest maturities would sell at the deepest discounts and thus would present the most extreme examples of original issue discount bonds.

* By convention, yields to maturity on bonds are calculated assuming semiannual compounding—that is, the yield is calculated on a semiannual basis and then doubled to get an annual yield to maturity. Therefore, a conventional bond bought at par with a coupon yield of 16 percent also has a yield to maturity of 16 percent, this is true despite the fact that the coupons are paid in semiannual instalments of $8 each, and thus offer the potential for reinvestment and a compound-interest effect on an annual basis.

and issuing a new conventional bond with ten years to maturity. If interest rates on ten-year debt have fallen, say to 12 percent, then the corporation can certainly reduce its borrowing costs by calling the bond. However, in doing so, it reduces the twenty-year yield to maturity for the investor, from the expected 16 percent to just 15.64 percent (even with the 10 percent call premium).

The risk to the investor of an original issue discount bond being called, however, is far less than with a conventional bond, despite the fact that discount bonds are generally callable at par at any time. Because of the very low coupon payments associated with discount bonds, market rates would need to fall very substantially for the borrower to find it profitable to call the bonds. For example, a discount bond with 7 percent coupons would not be called unless interest rates fell to approximately 7 percent.[4]

The call protection advantage to the investor provided by a discount bond is associated with a corresponding *disadvantage* to the borrower. Should interest rates fall, the corporation can no longer reduce its cost by calling the bond. Thus, *ceteris paribus,* the conventional bond is preferable to the discount bond from the borrower's perspective, given the possibility that rates may decline enough to make the call provision on the conventional bond (but not the discount bond) important. Hence, without the tax considerations discussed above, the corporation would issue a discount bond only if it could do so at a lower rate than a conventional bond. While investors might be willing to accept lower yields because of the increased call protection, it is not clear *a priori* that the differential acceptable to investors is enough to compensate borrowers. Furthermore, if the call protection characteristics are the reason that discount bonds have become popular, there is no obvious reason that a completely noncallable (but otherwise) conventional bond would not be just as popular Thus, one is led to believe that the call protection characteristics form, at best, only part of the explanation for the popularity of discount bonds

### Reinvestment risk

As mentioned previously, the return on a new conventional bond held to maturity is derived solely from coupon payments. The standard calculation of the yield to maturity of this type of bond assumes that the coupons can be reinvested at the same rate, thus achieving a compound interest effect But the rates at which investors will be able to reinvest the future coupon payments are not known with certainty at the time the bond is purchased. Therefore, when buying conventional bonds, investors incur some reinvestment risk

For a given yield to maturity, however, there is less reinvestment risk on a discount bond than a conventional bond This is because less of the return on a discount bond is due to coupon payments and more is due to the price appreciation of the original investment. The growth of the price of the original investment takes place at an *assured* (implicit) rate, thus reducing the number of dollars which must be reinvested at uncertain future rates An extreme example is the zero coupon bond, on which the yield to maturity represents the implicit compounded rate at which the original dollar investment grows to par; no coupons need be reinvested, resulting in zero reinvestment risk during the life of the investment.

Table 5 illustrates the point in the following hypothetical situation reinvestment rates for the coupons of twenty-year bonds (originally priced to yield 16 per-

Table 5

**Realized Yields to Maturity for Twenty-Year Bonds with Various Coupons**

When reinvestment rates drop from 16 percent to 12 percent after ten years

| Coupon (in dollars) | Realized yield to maturity (in percent) |
|---|---|
| 16 | 14 248 |
| 15 | 14 254 |
| 14 | 14 261 |
| 13 | 14 270 |
| 12 | 14 279 |
| 11 | 14 290 |
| 10 | 14 303 |
| 9 | 14 319 |
| 8 | 14 338 |
| 7 | 14 362 |
| 6 | 14 392 |
| 5 | 14 435 |
| 4 | 14 493 |
| 3 | 14 581 |
| 2 | 14 728 |
| 1 | 15 029 |
| 0 | 16 000 |

[4] While one's first guess might be that interest rates would need to fall at least to the coupon rate for the refunding to be undertaken by the corporation, this is not quite the case, due to tax considerations Firms are allowed to deduct from taxable income the difference between the bond's redemption value and its amortized value (to be discussed later), reducing the aftertax price of the bond being refunded Thus, firms would be willing to call bonds even when the market yields are slightly above the coupon rate

cent) are 16 percent for the first 10 years and then drop to 12 percent for the final 10 years. As the table shows, the lower the discount bond coupon rate, the higher the realized twenty-year yield. Furthermore, the relationship between changes in coupon rates and changes in realized yields is highly nonlinear; the effect on a 1 percentage point change in coupon rates is much larger at lower levels of coupon rates. Finally, it should be noted that the zero coupon bond provides the ultimate protection against reinvestment risk, guaranteeing the 16 percent return, and thereby providing 175 basis points more yield than the conventional bond, if rates should fall to 12 percent.

However, the advantage reaped by the investor in reducing reinvestment risk may result in either an advantage or disadvantage to the borrower. The effect depends on the cash flows generated by the investment project for which the corporation has borrowed funds. In general, the corporation can reduce its reinvestment risk by attempting to match the investment project's cash inflows to the firm's outflows of bond payments. Hence, if the investment project generates funds throughout the life of the bond, a conventional bond would result in a lower reinvestment risk to the firm—a discount bond would require that the firm save funds for the large payout at maturity by reinvesting those cash flows at uncertain future rates. Alternatively, a firm which expects not to receive any cash flows until the very end of the project would need to raise funds at uncertain future rates to pay the coupons on a conventional bond; a discount bond would be less risky in this situation. Therefore, depending on their cash flow positions, borrowing firms may be willing to offer either lower or higher yields on discount bonds than on conventional bonds.

**Tax considerations for investors**

While the call protection and reinvestment risk characteristics of discount bonds are attractive to certain investors, the tax treatment of these bonds makes them less appealing when compared with conventional bonds. This is due to the fact that investors must prorate the discount on a straight-line basis and treat this amortization as interest income each year.[5] Therefore, just as the present value of the tax deductions for the borrower is higher on a discount bond than a comparable conventional bond, the present value of the tax *liabilities* of the investor is larger, creating a tax *disadvantage*.

Nontaxable investors, however, are not subject to the negative tax implications of discount bonds. Furthermore, some of these investors are particularly attracted by the nonpecuniary advantages of discount bonds—increased call protection and lower reinvestment risk. As a result, nontaxable investors, such as pension funds, have become the principal buyers of discount bonds.

Another group of investors on whom the negative tax consequences of discount bonds would have little impact is foreign investors. As a result, these investors have also shown some interest in purchasing discount bonds. Foreign investors are subject to a 30 percent withholding tax on interest payments from United States corporate bonds. While the withholding tax applies to both the coupon payments and the prorated discount amount, the sum withheld cannot exceed the amount of the coupon. Any excess liability would be withheld from the principal repayment at maturity, if the bond were still held by the same owner. Thus, with deeply discounted bonds, foreign owners can at least delay some of their tax liabilities (until maturity), reducing the present value of those payments. Furthermore, since only the issuing corporation is required to withhold taxes, and on the earnings only of the current holder of the bond, the foreign investor can avoid the excess tax withholding liability entirely by selling the bond shortly before maturity. For example, on a zero coupon bond, no taxes can be withheld until the principal repayment If the original holder sells the bond just before maturity, the corporation withholds (from the principal repayment) the tax liability incurred during the relatively short period of time the bond is held by the new owner (and only if the new owner is also a foreign investor). The original holder, in this case, would not have *any* tax withheld on the interest earned on the zero coupon bond.

**Other considerations**

Although discount bonds "guarantee" a larger portion of their returns than do conventional bonds if held to maturity, investors may also be interested in comparing the volatility of realized yields for other holding periods, given that interest rates may fluctuate and investors may decide to sell the bonds before maturity, thereby earning capital gains or losses. For a given interest rate change, deeply discounted bonds (whether or not issued originally at a discount) exhibit more volatility in holding period yields than do current coupon bonds. This is because a relatively large portion of the yield on discount bonds is paid late in the life of the bond (in the form of price appreciation); a change in interest rates affects the present value of a stream of payments that includes a large distant payment more than it does a smooth stream

[5] The treatment of an original issue discount is in contrast to the treatment of the discount on a bond issued at par but bought in the secondary market below par; the latter discount is treated as a capital gain

Table 6

**Summary of Advantages and Disadvantages of Original Issue Discount Bonds Relative to Current Coupon Bonds**

| Feature | Impact on borrower | Impact on investor |
|---|---|---|
| Tax treatment | Advantage | Disadvantage for taxable investor, of no consequence to nontaxable investor |
| Call protection | Disadvantage | Advantage |
| Reinvestment risk protection | Can be advantage, disadvantage, or of no consequence, depending on cash flows | Advantage |
| Intermediate holding period yield volatility | Of no consequence | Can be advantage or disadvantage, depending on investors' expectations of future interest rate movements and views on rate volatility |
| Credit risk | Of no consequence | Disadvantage |

that includes only coupon payments (as for a conventional bond). Therefore, a discount bond's price is relatively more volatile than that of a conventional bond and, as a result, discount bond holding period yields vary over a wider range than do conventional bond yields.

The greater volatility of discount bond yields may be regarded either as an advantage or a disadvantage, depending on investors' views on the future direction of interest rates and the appropriateness (to the investor) of risk taking. If investors believe that interest rates will decline, they will probably prefer discount bonds to conventional bonds, to take advantage of the higher potential holding period yields. Similarly, if they think that interest rates will rise, they will prefer conventional bonds.[6] When investors have a "neutral" interest rate outlook, that is, when they feel that interest rates have as much of a chance of rising as they do of falling, investors will choose the conventional bonds if they are "risk averse" (*i.e.*, if they prefer less yield volatility to more, all else being equal); otherwise, they will choose the discount bond.

Another consideration in evaluating the choice between conventional and discount bonds is that the latter generally have more "credit risk", that is, the risk that the borrower may default on all or part of the coupon and principal payments. The risk is higher with discount bonds because they "pay out" more slowly than conventional bonds, since the return on discount bonds relies less on coupons (paid periodically) and more on price appreciation (realized at maturity). Therefore, investors get their return "earlier" with conventional bonds and stand to lose less if the borrower defaults. Consequently, investors to whom this risk is very important would prefer conventional bonds to discount bonds. However, this disadvantage is probably not a major consideration in judging the merits of a highly rated company's discount bond.

**Summary**

The many advantages and disadvantages of discount bonds relative to conventional bonds are summarized in Table 6. In deciding which type of bond to issue (invest in), borrowers (investors) must place a value, positive or negative, on each of the features which differentiate the two types of bonds. If the net result is positive (that is, if the positively valued features of discount bonds outweigh the negatively valued features), then these bonds are the appropriate instrument. Obviously, given the relatively large volume of discount bond issues since March, many market participants have come to that conclusion.

Of all the characteristics of discount bonds which differentiate them from conventional bonds, the tax treatment is undoubtedly the most important. The potential savings in borrowing costs is tremendous and tends to swamp the potential disadvantages that the

[6] This analysis only examines the choice between discount bonds and conventional bonds In reality, investors can also choose a third type of financial investment, a sequence of short-term instruments The conclusions reached in the text depend on the implicit assumption that the conventional bond rates are set at a level which makes investors indifferent between those bonds and a sequence of short-term investments of the same total term

call protection and reinvestment risk characteristics pose to the issuer This is true for two reasons First, the call protection and reinvestment risk features are disadvantages only if interest rates decline, which may or may not happen; the tax advantage of discount bonds is effective regardless of the future course of rates. Second, even if interest rates decline substantially during the term of the bond, the total aftertax cost of issuing a conventional bond, calling it, and then issuing a new, lower yielding conventional bond, would probably still be higher than the cost of borrowing with a single discount bond for the entire term. For example, the aftertax cost of a thirty-year zero coupon bond yielding 16 percent to maturity is only 4 6 percent (for an issuer in the 46 percent marginal tax bracket). If, instead, the borrower originally issued a 16 percent conventional bond, called it after fifteen years (at par), and then issued a fifteen-year conventional bond at, say, 6 percent, the average aftertax cost over the thirty years would be approximately 5 9 percent Therefore, even with a decline in rates from 16 percent to 6 percent, the discount bond would be less costly

If borrowers prefer the characteristics of discount bonds to those of conventional bonds, why have discount bonds been issued at lower yields? One necessary reason is that investors also value the relative advantages of discount bonds more than their disadvantages. But this is not a sufficient condition, because the combination of preferences for discount bonds by both issuers and investors suggests only that there is a *range* of rates at which a discount bond could sell, a range which includes the rate on a comparable conventional bond.

There are a number of factors that determine where within the range the actual market rate will fall. Included in these factors are the negotiating powers of the market participants and the levels of competition among buyers and sellers. Since discount bonds are relatively new instruments, it is conceivable that not all investors and borrowers have been fully aware of the value of each of the advantages and disadvantages of the bonds As a more complete understanding becomes widespread with the passage of time, the supply of, and demand for, these securities may shift, altering the yield at which the bonds are sold.

Andrew Silver