Price of a Bond

Assume that the Orradre Corporation decided to borrow $5,000,000 by issuing 5,000, $1,000 face value bonds. The bonds will pay interest semiannually on each June 30 and December 31 at a stated rate of 14% (7% semiannually). The bonds are term bonds, are issued on December 31, 1990, and mature in five years on December 31, 1995. These facts contain all the information needed to determine the amounts of the cash payments to be made by Orradre to bondholders over the life of the bonds.

There will be ten semiannual interest payments of $350,000 ($5,000,000 X .07) plus a lump sum payment of the $5,000,000 face value on December 31, 1995. The only cash flow not determined by the above terms is the proceeds the corporation will receive for issuing this debt. The question is, at what price will the bonds sell for on December 31, 1990, or in other words, how much will investors be willing to pay for the bonds?

Let's look at the question from the perspective of an individual who will be purchasing one, $1,000 face value bond. The investor, bondholder, will receive ten semiannual interest payments of $70 each ($1,000 X .07) and a lump sum payment of $1,000 on December 31, 1995. What will the investor be willing to pay for the promise to receive these future cash payments? The answer depends on the semiannual interest rate the investor could earn in the current market for investments of similar risk.[It will also depend on whether there are any special features to the bond, such as a conversion feature, that the investor believes has some value.]

If the answer is 7%, then the investor will compute the present value of the future cash receipts at the 7% rate. This will include the present value of the interest payments and the present value of the face value payment. Since interest payments are equal, we can use the annuity tables to compute their present value.

(Interest payments) PVA = $70 X 7.024 (annuity factor, 10 periods,7%)

= $492

(Face value) PV = $1,000 X .508 (PV of $1,10 periods,7%)

= $508

Total PV = $492 + $508 = $1,000

If the investor paid $1,000 for this bond, the bond would generate 7% semiannual interest over the life of the bond.[This is providing the corporation does not default on any of the required payments.] It is not a coincidence that if the stated rate of a bond is equal to the market rate, the bond will sell at its face value. Since the rate used to compute the interest

payments, 7%, is equal to the rate used to compute present value, the present value must equal the face value.

Corporations try to set stated rates on bonds that will equal an acceptable rate to the investment community (i.e., the market of potential bondholders). Bonds are usually sold through the intermediaries who give the corporation one price for the entire bond issue. The price will depend on the intermediaries perception of what individual investors will pay for the bonds, which, in turn, depends on the market interest rate. The intermediaries then sell the bonds to the public, possibly at varying prices.

Suppose the bonds are issued when the semiannual market rate for investments of similar risk is 8%. This can occur because there is a time lag between the date the bonds are authorized and printed, and the date they are actually issued for cash. Market rates can fluctuate significantly in a matter of weeks. However, the stated rate of the bond cannot be changed.

What would be the price an investor would be willing to pay for one bond under these circumstances? Once again, we must compute the present value of the cash payments at the market rate of 8%. The same cash payments will be made since those are determined by the stated rate and face value.

(Interest payments) PVA = \$70 X 6.710 (annuity factor, 10 periods,8%)

= \$469.70

(Face value) PV = \$1,000 X .463 (PV of \$1,10 periods,8%)

= \$463

Total PV = \$469.70 + \$463 = \$932.70

Bonds issued at an amount below face value are said to be issued at a **discount**. The discount represents the investor's way of adjusting for the fact that the stated rate is lower than an acceptable market rate. If you paid \$932.70 for this \$1,000 face value bond, you would earn 8% interest semiannually on your investment. This rate then becomes the effective rate on the bonds, as opposed to the 7% stated rate. Since the corporation will receive only \$932.70 per bond and still have to pay out ten, semiannual interest payments of \$70 and \$1,000 at the end of five years, the interest cost to the corporation is actually 8% semiannually, not 7%. Bonds are usually quoted on the security markets at a percentage of face value. Therefore, this bond will initially be quoted on the market at a selling price of **93.27** (i.e., 93.27% of face value).

If the market rate of interest is below the stated rate, investors will be willing to pay more than the face value of the bond. Bonds which sell at amounts above face value are said to

be issued at a **premium**. For example, if the semiannual market interest rate was 6%, the above bond would sell for 107.32 ($1,073.20), which is computed as follows:

(Interest payments) PVA = $70 X 7.360 (annuity factor, 10 periods,6%)

= $515.20

(Face value) PV = $1,000 X .558 (PV of $1,10 periods,6%)

= $558

Total PV = $515.20 + $558 = $1,073.20

Subsequent to initial issue, the market price of the bonds will fluctuate as market interest rates fluctuate. If rates go up, bond prices will go down and vice versa. For example, if the semiannual market interest rate in the above example rose to 9% by the end of 1991, the market price of the bond would go down to 88.90 ($889.00), which can be computed as follows: (At the end of 1991, there will be only 8 semiannual periods remaining)

(Interest payments) PVA = $70 X 5.535 (annuity factor, 8 periods,9%)

= $387

(Face value) PV = $1,000 X .502 (PV of $1,8 periods,9%)

= $502

Total PV = $387 + $502 = $889

In addition to fluctuations due to changes in market interest rates, the market price will gradually approach the face value as the bond gets closer to its maturity date. Immediately prior to the maturity date, a bond must be priced at its face value, since that is what the bondholder at maturity date will receive as final payment. Fluctuations in market price of the bonds has no direct effect on the issuing corporation. The corporation will simply send the agreed upon payments to whomever holds the bond on a payment date.

Accounting for Bonds Payable

Accounting for Bonds Issued at Face Value

Accounting for bonds issued at face value is quite straightforward. Orradre Corporation would record the following journal entries during 1990 and 1991:

1990

Dec. 31	Cash	5,000,000	
	Bonds Payable		5,000,000

To record the issuance of $5,000,000 face value, 14% stated rate bonds payable.

1991

June 30	Interest Expense	350,000	
	Cash		350,000

To record semiannual interest payment on bonds payable (.07 X $5,000,000).

Dec. 31	Interest Expense	350,000	
	Cash		350,000

To record semiannual interest payment on bonds payable (.07 X $5,000,000).

Since the bonds are sold at face value, the stated interest rate is equal to the effective interest rate and the periodic interest expense will equal the periodic interest payments. Journal entries for interest payments would be the same for the life of the bonds. In addition, on December 31, 1995, when the face value is repaid, a journal entry to decrease (debit) Bonds Payable and decrease (credit) Cash will be required.

Accounting for Bonds Issued at a Discount

Suppose the bonds were issued on December 31, 1990, but at a price of 93.27. Orradre Corporation would receive cash of $4,663,500 (93.27 X $5,000,000, or $932.70 per bond X 5,000 bonds). The bond purchasers are communicating to the corporation, through the

bond price, that the stated rate of 7% is too low in comparison to alternative investments of equal risk available in the economy. Orradre can easily determine the exact interest rate demanded by the market, by solving for the rate that will provide a present value of cash payments equal to the bond price. We already know that this rate is 8%, which we have called the effective rate.

Orradre will record the cash proceeds and corresponding liability valued at the cash equivalent of $4,663,500. This, of course, equals the present value of all cash payments discounted at the effective rate of 8%, which is illustrated below.

(Interest payments) PVA = $350,000 X 6.710 (annuity factor, 10 periods,8%)

= $2,348,500

(Face value) PV = $5,000,000 X .463 (PV of $1, 10 periods,8%)

= $2,315,000

Total PV = $2,348,500 + $ 2,315,000 = $4,663,500

The journal entry to record the issue of the bonds would be as follows:

1990			
Dec. 31	Cash	4,663,500	
	Discount on Bonds Payable	336,500	
	Bonds Payable		5,000,000

To record the issuance of $5,000,000 face value, 14% stated rate bonds payable at a discount.

The account **Discount on Bonds Payable** is a contra-account to Bonds Payable. At date of issue, under the long-term liabilities section of the balance sheet, Orradre would disclose the following:

Bonds Payable	$5,000,000
Discount on Bonds Payable	(336,500)
Book Value	$4,663,500

Reporting the face value less the discount (difference between face value and proceeds received) is simply a convention which provides more information to users of the financial statements than simply disclosing the book value. [Most corporations disclose only the book value on the balance sheet. The face amount is often disclosed in the long-term debt footnote.] This convention should not cause you to lose sight of the fact that the liability is measured at $4,663,500, which equals the present value of future cash payments discounted at the effective rate of 8%.

The discount amount can be thought of as the extra interest cost in dollars that the company will incur over the life of the bond that corresponds to the difference between the effective rate of 8% and the stated rate of 7%.

Every six months, beginning June 30, 1991, Orradre will make interest payments of 7% of face value, i.e., $350,000. However, interest expense will include the $350,000 cash payment plus a portion of the discount amount. Over the life of the bond, total interest expense will equal $3,836,500, which is the sum of the discount, $336,500, and the ten semiannual interest payments, $3,500,000. Interest expense will be determined each period by multiplying the effective interest rate times the book value at the beginning of the period. For example, on June 30, 1991, interest expense will equal $373,080 (.08 X $4,663,500) and will be recorded as follows:

1991			
June 30	Interest Expense	373,080	
	Discount on Bonds Payable		23,080
	Cash		350,000

To record semiannual interest expense
(.08 X $4,663,500) and interest payment
(.07 X $5,000,000) on bonds payable.

The $23,080 credit to Discount on Bonds Payable is called **discount amortization** and represents the extra interest cost for the period over and above the interest payment. This reduces the original discount to $313,420, which is referred to as the **unamortized discount**, and increases the book value to $4,686,580. A bond amortization schedule provides information to record the journal entries necessary over the life of the bond.

Notice that the discount balance is reduced to zero and the book value increases to $5,000,000 over the life of the bond. At any point in time, the book value will equal the present value of future cash payments discounted at the effective rate of 8%. For example, at 12/31/91, the present value over the remaining 8 periods can be computed as follows:

(Interest payments) PVA = $350,000 X 5.747 (annuity factor, 8 periods,8%)

= $2,011,450

(Face value) PV = $5,000,000 X .540 (PV of $1, 8 periods,8%)

= $2,700,000

Total PV = $2,011,450 + $2,700,000 = $4,711,450

The difference from this amount and the $4,711,506 amount in the amortization schedule is due to rounding of the present value factors.

At the end of 1991, using the amortization schedule amounts, the bonds would be shown in the long-term liability section of the balance sheet as follows:

Bonds Payable.....	$5,000,000
Discount on Bonds Payable.....	(288,494)
Book Value.....	$4,711,506

You should be able to record the necessary journal entry for any payment date over the life of the bond using the amortization schedule.

The method above used to compute interest expense and discount amortization is referred to as the **effective-interest method**. This is the theoretically correct method for accounting for bonds payable. The liability will always be measured at the present value of future cash payments. Some companies use a different method to amortize the Discount on Bonds Payable which is called the straight-line method. This method amortizes an equal amount of discount each period and then adds this amount to the cash interest payment to determine interest expense. For example, in the illustration above, the total bond discount of $336,500 would be divided by the 10 semiannual periods to determine periodic amortization of $33,650. Interest expense each period would then be $383,650 ($33,650 + $350,000).

The straight-line method is acceptable only if it results in interest expense and book value of bonds payable that are not materially different from the effective-interest method. The straight-line method, although easier computationally, produces periodic interest expense that does not equal the true cost of borrowing, since it does not reflect the effective interest, and also results in book value of the liability that does not equal the present value of future cash payments discounted at the effective interest rate.

Accounting for Bonds Issued at a Premium

The last situation we will consider is bonds issued at a premium. Suppose that on December 31, 1990, Orradre Corporation issued the bonds at a price of 107.32, or $1,073.20 for every $1,000 face value bond. This would occur if the market rate of interest was lower than the bond stated rate. We know from the previous discussion on bond pricing that the semiannual market interest rate at time of issue of the bonds must have been 6%, which then becomes the effective rate used by Orradre to measure interest expense.

Orradre will record the cash proceeds and corresponding liability valued at the cash equivalent of $5,366,000 (107.32 X $5,000,000, or $1,073.20 X 5,000 bonds). This, of course, equals the present value of all cash payments discounted at the effective rate of 6%, which is illustrated below.

(Interest payments) PVA = $350,000 X 7.360 (annuity factor, 10 periods,6%)

= $2,576,000

(Face value) PV = $5,000,000 X .558 (PV of $1, 10 periods,6%)

= $2,790,000

Total PV = $2,576,000 + $ 2,790,000 = $5,366,000

The journal entry to record the issue of the bonds would be as follows:

1990			
Dec. 31	Cash	5,366,000	
	Premium on Bonds Payable		366,000
	Bonds Payable		5,000,000

To record the issuance of $5,000,000 face value, 14% stated rate bonds payable at a premium.

The account **Premium on Bonds Payable** is added to Bonds Payable to arrive at book value. At date of issue, under the long-term liabilities section of the balance sheet, Orradre would disclose the following:

Bonds Payable.....…….....	$5,000,000
Premium on Bonds Payable.....……	366,000
Book Value.....…….....	$5,366,000

The premium amount can be thought of as the reduction in interest cost in dollars over the life of the bond that corresponds to the difference between the effective rate of 6% and the stated rate of 7%.

Periodic interest expense will include the $350,000 cash payment less a portion of the premium. Over the life of the bond, total interest expense will equal $3,134,000, which is the ten semiannual interest payments, $3,500,000, less the premium of $366,000. Interest expense will still be determined each period by multiplying the effective interest rate times the book value at the beginning of the period. For example, on June 30, 1991, interest expense will equal $321,960 (.06 X $5,366,000) and will be recorded as follows:

1991			
June 30	Interest Expense	321,960	
	Premium on Bonds Payable	28,040	
	Cash		350,000

To record semiannual interest expense
(.06 X $5,366,000) and interest payment
(.07 X $5,000,000) on bonds payable.

The $28,040 debit to Premium on Bonds Payable is called **premium amortization** and represents the reduction in interest cost for the period. This reduces the original premium to $337,960, which is referred to as the **unamortized premium** , and decreases the book value to $5,337,960.

Refer to the amortization schedule and notice that the premium balance is reduced to zero and the book value decreases to $5,000,000 over the life of the bond. [As with bonds issued at a discount, some companies use the straight-line method to determine interest expense and premium amortization.]

To summarize our discussion, bonds sold when the going market rate of interest is equal to the stated rate are issued at face value and shown as such on subsequent balance sheets until the bonds mature and the obligation is eliminated. Bonds sold at a discount are those issued when the market rate exceeds the stated rate; those sold at a premium are issued when the market rate is less than the stated rate. The amount of the discount or premium is paired with the Bonds Payable account to reflect the present value of future payments (interest and face value) remaining on the bonds. The premium or discount declines over the life of the bonds as this present value converges upon the face value.