

The Complete Bond Problem

- 0. A company issues \$10,000, 10%, 5-year bonds with semiannual payments.**

Principal amount, face value, maturity value, or par value: \$10,000

Stated or contract interest rate: 10% (per year)

Term: 5 years

These amounts are fixed and are stipulated in the bond contract.

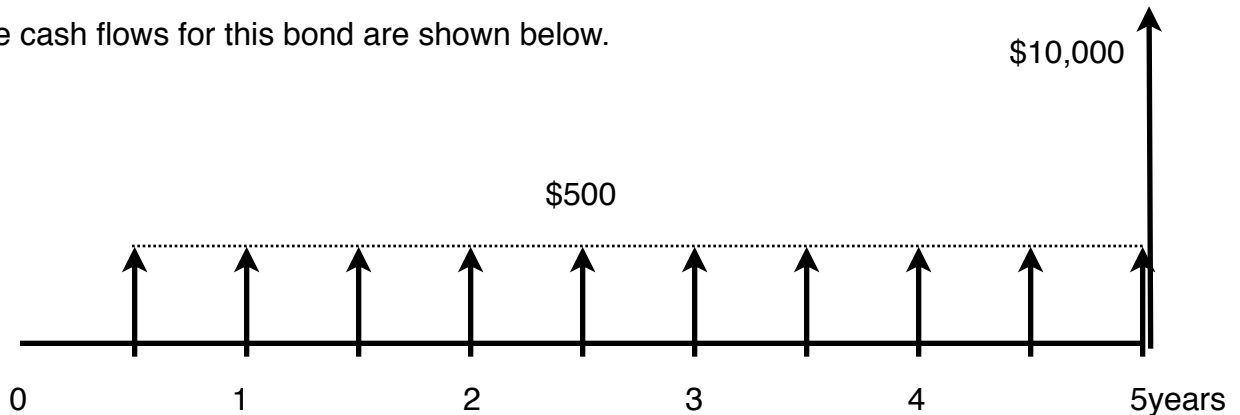
- 1. Calculate the semiannual payments.**

Principal x stated rate (per period) = \$10,000 x 10% x 1/2 = \$500

The interest rate is divided by 2 because the bond makes payments every six months, so the semiannual interest rate is 10% ÷ 2. The bond will pay \$500 every six months for the next five years.

- 2. Calculate the selling price of the bond assuming market interest rate is 12%.**

The cash flows for this bond are shown below.



To calculate the selling price find the present value of these cash flows using the market interest rate. We use the market rate and not the contract rate because the investor expects to get the current market rate at the time he buys the bond.

- a. Calculate the present value of the \$500 semiannual payments.

$$P = A \left(\frac{1 - (1+i)^{-n}}{i} \right)$$

A = \$500, i = 12% ÷ 2, n = 5 years x 2

P_{payments} = \$3,680.04

b. Calculate the present value of the maturity value \$10,000.

$$FV = P(1+i)^n$$

$$FV = \$10,000, \quad i = 12\% \div 2, \quad n = 5 \text{ years} \times 2$$

$$P_{\text{maturity value}} = \$5,583.95$$

c. Add present value of payments and maturity value.

$$\text{Selling price} = \$3,680.04 + \$5,583.95 = \$9,263.99$$

The bond sells at a discount because market rate is higher than the contract rate. The only way an investor will buy the bond is if the company reduces the price so that the investor earns an interest rate equivalent to the market rate.

If you know how to use the TVM Solver application of the TI 83/84 you can calculate the selling price of the bond in one step. Enter N, I, PMT, and FV and solve for PV. The result will look like this:



3. Record the sale of the bond.

Date		Dr.	Cr.
Year			
MM DD	Cash	\$9,263.99	
	Discount on Bonds Payable	\$736.01	
	Bond Payable		\$10,000.00

Balance sheet presentation:

Long-term liabilities

Bonds payable	\$10,000.00	
Discount on bonds payable	(736.01)	\$9,263.99

4. Record the first payment.

There are two ways to amortize bond discount and premium: straight-line method and effective-interest method. The effective-interest method is preferred because it accurately records interest expense based on the bond carrying value. The straight-line method is simpler, but it can only be used when it differs insignificantly from the effective interest method. Both methods are shown below.

a. Calculate the interest expense using the effective-interest method.

At the time of the first \$500 payment the carrying value of the bond is \$9,263.99.

$$\text{Interest expense} = \text{Carrying value of bond} \times \text{Market interest rate}$$

$$\text{Interest expense} = \$9,263.99 \times 12\% \div 2 = \$555.84$$

Date		Dr.	Cr.
Year			
MM DD	Interest expense	\$555.84	
	Discount on Bonds Payable		\$55.84
	Cash		\$500.00

Notice that the discount on bonds payable account has been reduced by \$55.84. Therefore, the carrying value of the bond has been increased by the same amount.

Bonds Payable	Discount on Bonds Payable				
\$10,000	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">\$736.01</td> <td style="width: 50%; padding: 5px;">\$55.84</td> </tr> <tr> <td style="border-top: 1px solid black; padding: 5px;">\$680.17</td> <td style="border-top: 1px solid black;"></td> </tr> </table>	\$736.01	\$55.84	\$680.17	
\$736.01	\$55.84				
\$680.17					

Balance sheet presentation:

Long-term liabilities		
Bonds payable	\$10,000.00	
Discount on bonds payable	(680.17)	\$9,319.83

When the company makes the next payment, interest expense will be calculated based on the new carrying value of \$9,319.83.

b. Calculate interest expense using straight-line method.

At the time of the first payment the unamortized bond discount is \$736.01.

Divide the unamortized discount by the number of payments.

$$\$736.01 \div 10 = \$73.60$$

Use this constant amount to amortize bond discount for every payment.

Date		Dr.	Cr.
Year			
MM DD	Interest expense	\$573.60	
	Discount on Bonds Payable		\$73.60
	Cash		\$500.00

Bonds Payable	
	\$10,000

Discount on Bonds Payable	
\$736.01	\$73.60
\$662.41	

Balance sheet presentation:

Long-term liabilities

Bonds payable	\$10,000.00	
Discount on bonds payable	(662.41)	\$9,337.59

When the company makes the next payment, interest expense will be the same as the first payment and discount on bonds payable will be amortized by \$73.60.

Notice that you should use either the effective-interest method or the straight-line method to amortize bond discounts and premiums, but not both. This example is for a very small bond issue (\$10,000); typically large companies will issue bonds for tens of millions or hundreds of millions of dollars. Unless the bond discount or premium is very small, GAAP requires the use of the effective interest method.

5. Paying off bonds at maturity.

After making the last semiannual payment of \$500 the discount on bonds payable account will have a zero balance and the carrying value of the bond will be its face value.

Date		Dr.	Cr.
Year			
MM DD	Bond Payable	\$10,000.00	
	Cash		\$10,000.00

6. Calling bonds before their maturity date.

Some bonds are callable, giving the issuer the option to pay them off early. A company would do this if interest rates have come down. It would make sense to retire the existing bonds and reissue new ones at a lower interest rate, thus reducing interest payments.

Assume our bond is callable at 101 (101% of its face value) and that at the time the bond is called the discount on bonds payable account has a balance of \$491.73.

Date		Dr.	Cr.
Year			
MM DD	Bonds Payable	\$10,000.00	
	Loss on retirement of bonds payable	\$591.73	
	Discount on Bonds Payable		\$491.73
	Cash		\$10,100.00