

Foundations of Accounting & Finance

Prof. Arun Kumar Gopaldaswamy

Department of Management Studies - IIT Madras

Week - 11

Lecture – 48

Numerical on Bond and Stock Valuation

In Class Problems- Bond Valuation

Semi-annual Bond Valuation

Question: Consider a bond with a coupon rate of 8 percent that pays semiannual interest and matures in eight years. The market rate of return on bonds of this risk is currently 11 percent. What is the current value of a \$1,000 face value bond?

Solution:

Let us break down the components of this bond. The coupon rate is 8 percent, but remember it pays semi-annually, meaning it pays twice a year. With an 8-year maturity, we will receive 16 semi-annual payments.

Each semi-annual coupon payment is \$40, and the annual coupon is \$80. The market rate of bond is 11 percent annually, but since it's semi-annual, it's 5.5 percent.

The interest earned every 6 months' compounds because we reinvest the coupon payments. So, the total return includes the coupon payments plus the return on reinvested coupons.

If the payments were quarterly or monthly, the total return would increase accordingly, depending on the compounding frequency.

Now, let us calculate the market value of this bond. First, we determine the present value of the face value of the bond. Since we receive payments semi-annually, we have 16 periods. Using the semi-annual rate of 5.5 percent, we find the present value of the face value of the bond.

Next, we calculate the present value of the annuity. This involves using the coupon payment of \$40, the semi-annual discount rate of 5.5 percent, and 16 periods.

After computation, we find the present value of the annuity to be approximately \$418.49, and the value of the bond is \$843.

Coupon rate	8%			
Interest	Semi annually			
market rate of return on bonds	11%			
Face value	1000			
Maturity	8 Years			
Annual Coupon Payment	80			
Semi Annual Coupon Payment	40			
Annual Market rate	11%			
Semi annual market rate	5.5%			
Annual payments	8			
Semi Annual payments	16			
First	PV of Face value			424.58
Second	PV of Annuity			418.49
	Total Bond Value			843.07

Using excel function

<i>Using excel function</i>	
Settlement date	01-01-2015
Maturity date	01-01-2023
Annual coupon rate	8%
YTM	11%
Face value	100
Coupons per year	2
Bond Price	84.31

Zero-coupon Bond

Example: What is the value of a 20-year, zero-coupon bond with a face value of \$1,000 when the market required rate of return is 9.6 percent, compounded semiannually?

Solution:

Given that the bond matures in 20 years, has a face value of \$1,000, and the market required rate of return is 9.6 percent compounded semi-annually, we can calculate its present value.

Using the formula for present value of a single cash flow we find:

$$\text{Bond Value} = \frac{1000}{(1 + \frac{0.096}{2})^{20 \times 2}}$$

After computation, the value of the bond is approximately \$153.30. This calculation assumes semiannual compounding.

Maturity	20	Years
Face value	1000	
market required rate of return	9.60%	
Compounding	Semi annually	
Bond Value	153.30	

Yield to maturity (YTM)

Example

The bonds issued by Manson and Son bear a coupon of 6 percent, payable semiannually. The bond matures in 15 years and has a \$1,000 face value. Currently, the bond sells at par. What is the yield to maturity?

Solution:

Since the bond is selling at par, the yield to maturity will equal the coupon rate of 6 percent.

Example

A corporate bond has a coupon of 7.5 percent and pays interest annually. The face value is \$1,000, and the current market price is \$1,108.15. The bond matures in 14 years. What is the yield to maturity?

Solution:

Using excel function

<i>Using excel function</i>	
Settlement date	01-01-2015
Maturity date	01-01-2029
Annual coupon rate	7.50%
Bond Price	110.80
Face value	100
Coupons per year	2
YTM	6.33%

Using goal seek function

To calculate the yield to maturity (YTM) using Excel's Goal Seek function, we start by setting up the equation for the present value of the bond. The goal is to find the discount rate (YTM) that makes the present value equal to the current market price.

The present value of the bond consists of two components: the present value of the face value and the present value of the annuity.

1. Present Value of the Face Value:

$$PV_{\text{face value}} = \frac{\text{Face Value}}{(1+\text{YTM})^n}$$

Here, the face value is \$1,000, and $n = 14$ years.

2. Present Value of the Annuity (Coupon Payments):

$$PV_{\text{annuity}} = \text{Coupon} \times \left(1 - \frac{1}{(1+\text{YTM})^n}\right) \times \frac{1}{\text{YTM}}$$

Here, the coupon rate is 7.5 percent of the face value, and $n = 14$ years.

By summing up the present values of the face value and the annuity, we get the bond's present value. We set up this equation in Excel and then use the Goal Seek function to find the YTM that matches the bond's market price of \$1,108.15.

The steps to get the goal seek function:

Data > Forecast > What if analysis > Goal seek function

After performing Goal Seek, we find that the YTM is approximately 6.31 percent. This method allows us to find the YTM iteratively, though using Excel's YIELD function may provide a simpler solution.

Coupon rate	7.50%			
Interest	Annually			
YTM	6.31%			
Face value	1000			
Maturity	14 Years			
First	PV of Face value			424.37
Second	PV of Annuity			683.78
	Total Bond Value			1108.15

In Class Problems- Stock Valuation

Constant Growth

Example: How much are you willing to pay for one share if the company just paid an annual dividend of \$1.03, the dividends increase by 3 percent annually, and you require a rate of return of 15 percent?

Solution:

annual dividend	1.03
next annual dividend	1.0609
Annual Growth	3.00%
Required rate of return	15%
Price of the stock	8.84

1. Calculate the next annual dividend: Next annual dividend = $\$1.03 \times (1 + 0.03) = \1.0609
2. Use the Dividend Discount Model to find the price of the stock:

$$P_0 = \frac{\text{Div}_1}{R - g}$$

3. Substitute the values into the equation:

$$\text{Price of stock} = \frac{\$1.0609}{0.15 - 0.03} = \$8.84$$

Therefore, you are willing to pay approximately \$8.84 for one share based on the given parameters.

Zero growth

Example

Unique Stores common stock pays a constant annual dividend of \$1.75 a share. What is the value of this stock at a discount rate of 13.25 percent?

Solution

Use the Dividend Discount Model to find the price of the stock:

$$P_0 = \frac{\text{Div}}{R}$$

Substitute the values into the equation:

$$\text{Value of stock} = \frac{\$1.75}{0.1325}$$

Calculating: Value of stock \approx \$13.21

Therefore, the value of Unique Stores common stock, based on the given parameters, is approximately \$13.21.

constant annual dividend	1.75
discount rate	13.25%
Price of the stock	13.21

Firm's growth rate

Example: Lester's has a return on equity of 11.6 percent, a profit margin of 6.2 percent, and a payout ratio of 35 percent. What is the firm's growth rate?

Solution

1. Calculate the retention ratio: Retention ratio = 1 – Pay-out ratio

Substitute the given pay out ratio into the equation:

$$\text{Return generation ratio} = 1 - 0.35 = 0.65$$

2. Calculate the growth rate using the retention ratio and ROE:

$$\text{Growth rate} = \text{Retention ratio} \times \text{ROE}$$

Substitute the values into the equation:

$$\text{Growth rate} = 0.65 \times 11.6\% \approx 7.54\%$$

Therefore, the firm's growth rate is approximately 7.54 percent.

ROE	11.60%
Profit Margin	6.20%
Payout ratio	35%
Growth rate	7.54%

Price-earnings ratio

Example: Rudy's stock is currently valued at \$28.40 a share. The firm had earnings per share of \$1.86 last year and projects earnings of \$2.09 a share for next year. What is the trailing twelve-month price-earnings ratio? What is the forward price-earnings ratio?

Solution:

To calculate Rudy's trailing twelve-month (TTM) price-earnings (P/E) ratio and forward P/E ratio, we use the following formulas:

1. Trailing twelve-month P/E ratio:

$$\text{Trailing P/E ratio} = \frac{\text{Current share price}}{\text{Last year's EPS}}$$

2. Forward P/E ratio:

$$\text{Forward P/E ratio} = \frac{\text{Current share price}}{\text{Projected EPS}}$$

Following information are given with respect to the equation:

Current value of shares	28.4
Last years EPS	1.86
Projected EPS for next year	2.09

Let's calculate:

Trailing P/E ratio:

$$\text{Trailing P/E ratio} = \frac{28.40}{1.86}$$

$$\text{Trailing P/E ratio} \approx 15.27$$

Forward P/E ratio:

$$\text{Forward P/E ratio} = \frac{28.40}{2.09}$$

$$\text{Forward P/E ratio} \approx 13.59$$

Therefore, Rudy's trailing twelve-month P/E ratio is approximately 15.27, and the forward P/E ratio is approximately 13.59.

EV/EBITDA ratio

Example: Russell's has annual revenue of \$387,000 with costs of \$216,400. Depreciation is \$48,900 and the tax rate is 21 percent. The firm has debt outstanding with a market value of \$182,000 along with 9,500 shares of stock that is selling at \$67 a share. The firm has \$48,000 of cash of which \$29,500 is needed to run the business. What is the firm's EV/EBITDA ratio?

Solution

Enterprise Value (EV)

Market value of debt + Market value of equity – Excess cash balance

$$182,000 + (9,500 \times 67) - (48,000 - 29,500)$$

$$EV=182,000+636,500-18,500$$

$$EV=800,000$$

EBITDA

EBITDA= Annual Revenue – Annual Costs

$$EBITDA=387,000-216,400 = 170,600$$

$$EV \text{ TO EBITDA} = 800,000 / 170,600 = 21.33$$

Therefore, Russell's EV/EBITDA ratio is approximately 21.33

annual revenue	387000
annual costs	216400
Depreciation	48900
Tax	21%
market value of debt outstanding	182000
Number of shares	9500
Price per share	67
Cash balance	48000
Cash needed to run the business	29500
Enterprise value	800000
EBITDA	170600
EV TO EBITDA	21.33%

Summary

In summary, we have covered the valuation of both equity and bonds, including various methods such as price-earnings ratio, enterprise value to EBITDA ratio, and determining yield to maturity. Now, we will transition to the next stage, which involves exploring alternative projects and making capital investment decisions. This phase will focus on understanding how to evaluate different investment opportunities and make informed decisions regarding capital allocation.