Chapter 8

Stock Valuation

- Key financial variables forecast technique
- Intrinsic value and required rate of return on stocks
- Dividend discount models
- Other types of present-value-based stock model

Stock Valuation Process

*Stock Valuation:* Investors use risk and return concept to determine the worth of a security.

In the valuation process:

- The intrinsic value of any investment equals the present value of its expected future cash flows.
- If the intrinsic value equals or exceeds the current market value, the security could be a worthwhile investment candidate.
- However, the stock is still subject to economic, industry, company and market risks. Therefore, stock valuation models are used NOT to guarantee success but to help you better understand the return and risk dimensions of a proposed transaction.
The first step in the stock valuation process is to estimate its future cash flows.

This involves projecting key financial variable into the future:

- Forecast future sales and profits
- Forecast future EPS and dividends
- Forecast future stock price

The Forecasts are based upon:

- “Naïve” approach using continued historical trends, sometimes adjusted for anticipated changes in operations or environment
- Forecasting horizon usually one to three years. Longer time periods forecast tend to be very unreliable.

Example: Using historical financial statement, forecast EPS, dividends and stock price for *Universal Office Furnishings* in the next three years.

First, we look at the Income Statement for the past two years.

**TABLE 7.5**

<table>
<thead>
<tr>
<th>Corporate Income Statement</th>
<th>Universal Office Furnishings, Inc.</th>
<th>Income Statements Fiscal Year Ended December 31 ($ in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2004</td>
<td>2003</td>
</tr>
<tr>
<td>Net Sales</td>
<td>$1,938.0</td>
<td>$1,766.2</td>
</tr>
<tr>
<td>cost of goods sold</td>
<td>1128.5</td>
<td>1034.5</td>
</tr>
<tr>
<td>Gross operating profit</td>
<td>$809.5</td>
<td>$731.7</td>
</tr>
<tr>
<td>Selling, administrative, and other operating expenses</td>
<td>497.7</td>
<td>446.3</td>
</tr>
<tr>
<td>Depreciation and amortization</td>
<td>77.1</td>
<td>62.1</td>
</tr>
<tr>
<td>Other income, net</td>
<td>0.5</td>
<td>12.9</td>
</tr>
<tr>
<td>Earnings before interest and taxes</td>
<td>$235.2</td>
<td>$237.2</td>
</tr>
<tr>
<td>Interest expense</td>
<td>13.4</td>
<td>7.3</td>
</tr>
<tr>
<td>Earnings before taxes</td>
<td>$221.8</td>
<td>$229.9</td>
</tr>
<tr>
<td>Income taxes</td>
<td>82.1</td>
<td>88.1</td>
</tr>
<tr>
<td>Net profit after taxes</td>
<td>$139.7</td>
<td>$141.8</td>
</tr>
<tr>
<td>Dividends paid per share</td>
<td>$0.15</td>
<td>$0.13</td>
</tr>
<tr>
<td>Earnings per share (EPS)</td>
<td>$2.26</td>
<td>$2.17</td>
</tr>
<tr>
<td>Number of common shares outstanding (in millions)</td>
<td>61.8</td>
<td>65.3</td>
</tr>
<tr>
<td>Book value per share</td>
<td>$4.77</td>
<td>$3.20</td>
</tr>
<tr>
<td>Stock Price</td>
<td>$41.50</td>
<td>$34.29</td>
</tr>
</tbody>
</table>
Next, we calculate the following key ratios:

1. Net profit margin = net profit after taxes / sales

Net profit margin (2004): = 7.2%
Net profit margin (2003): = 8.0%

2. Earnings per share.

\[ EPS = \frac{\text{net profit after taxes - preferred dividends}}{\text{number of common shares outstanding}} \]

EPS (2004) = 2.26
EPS (2003) = 2.17

3. Dividend payout ratio:

\[ \text{dividend payout ratio} = \frac{\text{dividends per share}}{\text{earnings per share}} \]

Dividend payout ratio (2004) = 0.15/2.26 = 6.6%

In addition, we look at the growth of sales. From 2003 to 2004, sales growth is at: (1938/1766.2) – 1 = 9.7%.

In order to forecast future cash flows, we make the following assumptions:

1. Sales will continue to grow at around 10%.
2. Net profit margin and dividend payout ratio remain constant.
3. Number of shares outstanding continues to decrease slightly, with the company’s stock repurchase program.

We can then forecast the profit, EPS and dividends for the next three years.

For year 2005:

- If sales still grow at 10%:
  Sales = $1,938 * (1+10%) = $2,131.8m

- Profit margin assumed to be 8%:
  Net profit = $2,131.8 * 8% = $170.54.

- Number of shares outstanding assumed to be 61.5m:
  EPS = $170.54 / 61.5 = $2.77.

- Dividend payout ratio remain at 6.6%:
  Dividend per share = $2.77 * 6.6% = $0.18.
Estimating Future Cash Flows - 5

We can also forecast future stock prices with certain assumptions. For example, this can be done with an estimated P/E ratio and the forecasted EPS.

P/E = market price of common stock / EPS.

Stock price at the end of 2004 was $40.50, therefore, P/E = 40.50/2.26 = 17.9.

Suppose we want to estimate stock price in one year. Assuming that P/E will remain at around 18, we have:

P (2005) = EPS * P/E = 2.77 * 18 = $49.86*.

<table>
<thead>
<tr>
<th></th>
<th>Latest Actual Figures (Fiscal 2004)</th>
<th>Forecasted Figures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual rate of growth in sales</td>
<td>9.7%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Net sales (millions)</td>
<td>$1,938.0</td>
<td>$2,131.8</td>
</tr>
<tr>
<td>x Net profit margin</td>
<td>7.2%</td>
<td>8.0%</td>
</tr>
<tr>
<td>= Net after-tax earnings (millions)</td>
<td>$139.5</td>
<td>$170.5</td>
</tr>
<tr>
<td>/ Common shares outstanding (millions)</td>
<td>61.8</td>
<td>61.5</td>
</tr>
<tr>
<td>= Earnings per share</td>
<td>$2.26</td>
<td>$2.77</td>
</tr>
<tr>
<td>x Payout ratio</td>
<td>6.6%</td>
<td>6.6%</td>
</tr>
<tr>
<td>= Dividends per share</td>
<td>$0.15</td>
<td>$0.18</td>
</tr>
<tr>
<td>Earnings per share</td>
<td>$2.26</td>
<td>$2.77</td>
</tr>
<tr>
<td>x P/E ratio</td>
<td>17.9</td>
<td>18.0</td>
</tr>
<tr>
<td>= Share price at year end</td>
<td>$40.50</td>
<td>$49.92</td>
</tr>
</tbody>
</table>

*Numbers may not be the same in the table due to rounding error.

Estimating Required Rate of Return

Required rate of return is the return necessary to compensate an investor for the risk involved in an investment.

Normally, we use CAPM to estimate the required rate of return of a stock.

Example: assume Company Z has a beta of 1.30, the risk-free rate is 5% and the expected return of the market is 12%. What is the required rate of return of stock Z?

E(R_Z) = R_f + \beta [E(R_m) – R_f] = 5% + 1.3 * (12% - 5%) = 14.1%.

Required rate of return can then be compared to the estimated rate of return over the same time horizon, to decide whether it appears to be an attractive investment.
**Estimating Intrinsic Value**

To estimate the *intrinsic value* of a stock, we need to answer the following questions:

1. How long do you plan to hold the stock?
2. What is the expected dividend during the holding period?
3. What is the expected selling price?
4. What is the required rate of return on the stock?

Using the previous example on *Universal Office Furnishings*, assuming that we plan to hold the stock for the next three years, and that the required rate of return on the stock is 12%, we can estimate its intrinsic value as follows:

\[
P_0 = \frac{D_1}{1 + r} + \frac{D_2}{(1 + r)^2} + \frac{D_3 + P_3}{(1 + r)^3}
\]

That is,

\[
P_0 = \frac{0.18}{1 + 12\%} + \frac{0.20}{(1 + 12\%)^2} + \frac{0.23 + 62.96}{(1 + 12\%)^3} = 45.30
\]

Current market price of the stock is $41.50. Therefore, the stock appears to be an attractive investment given the risk involved.

**Stock Valuation Models**

There are many types of stock valuation models. The example above uses the *dividend and earnings* approach.

For stocks that pay dividends, the methods include:

- Dividend discount models
  - Zero growth
  - Constant growth
  - Variable growth
- Dividend and Earnings approach

For stocks that do not pay dividends yet, we have:

- Price/Earnings approach
- Other price relative approaches
  - Price-to-cash-flow ratio
  - Price-to-sales ratio
  - Price-to-book-value ratio
Dividend Discount Model - 1

According to the fundamental theory of value, the value of a financial asset at any point in time equals the present value of all future dividends.

If all future dividends are the same, the present value of the dividend stream constitutes a perpetuity.

Using the present value of perpetuity formula the price of the stock equals:

\[ P_0 = \frac{D}{r} \]

Example: Acme, Inc. common stock currently pays a $1.00 dividend, which is expected to remain constant forever.

If the required return on Acme stock is 10%, what should the stock sell for today?

\[ P_0 = \frac{$1.00}{0.10} = $10 \]

What will the stock be worth one year from today?

Dividend Discount Model - 2

One year from today, the value of the stock, \( P_1 \), must be equal to the present value of all remaining future dividends.

Since the dividend is constant, \( D_2 = D_1 = $1.00 \), and

\[ P_1 = \frac{D_2}{r} = \frac{$1.00}{0.10} = $10 \]

In other words, in the absence of any changes in expected cash flows (and given a constant discount rate), the price of a no-growth stock will never change.

Put another way, there is no reason to expect capital gains income from this stock.
Dividend Discount Model - 3

In reality, investors generally expect the firm (and the dividends it pays) to grow over time. How do we value a stock when dividends grow over time?

As long as the rate of change from one period to the next, \( g \), is constant, we can apply the growing perpetuity model:

\[
P_0 = \frac{D_1}{1 + r} + \frac{D_2}{(1 + r)^2} + \frac{D_3}{(1 + r)^3} + \frac{D_4}{(1 + r)^4} + \ldots
\]

\[
= \frac{D_1}{1 + r} + \frac{D_1(1 + g)}{(1 + r)^2} + \frac{D_1(1 + g)^2}{(1 + r)^3} + \frac{D_1(1 + g)^3}{(1 + r)^4} + \ldots
\]

Or

\[
P_0 = \frac{D_1}{r - g}.
\]

This equation is known as the “Gordon Growth Model”.

Dividend Discount Model - 4

Example:

Suppose that a stock just paid a $5 per share dividend. The dividend is projected to grow at 5% per year indefinitely. If the required return is 9%, what is the price of the stock today?

\[
P_0 = \frac{D_1}{r - g} = \frac{\$5(1 + 0.05)}{0.09 - 0.05} = \frac{\$5.25}{0.04} = \$131.25.
\]

What will the price be one year from today?

\[
P_1 = \frac{D_2}{r - g} = \frac{\$5.25(1 + 0.05)}{0.09 - 0.05} = \frac{\$5.5125}{0.04} = \$137.8125
\]

By what percentage does \( P_1 \) exceed \( P_0 \) and why?
Dividend Discount Model - 5

Example:

Suppose that a stock just paid $5 a share dividend. The dividend is expected to grow at 5% per year indefinitely. If the stock sells today for $65.625, what is the required return?

\[
p_0 = \frac{D_1}{r - g} \\
\]

\[
r - g = \frac{D_1}{P_0} \\
\]

\[
r = \frac{D_1}{P_0} + g = \frac{5.25}{65.625} + \frac{0.05}{0.13} = 0.13, \text{ or } 13\%.
\]

Question:

Why is \(D_1\) $5.25 instead of $5?

Estimating g - 1

How to estimate \(g\), the dividend growth rate?

Assume that every year a firm pays out a constant percentage of its earnings and invests the rest. In addition, assume the return on equity is constant through time.

Step 1. Estimate the "plowback" and "payout" ratios. The plowback ratio is the percentage of the company's profits that are reinvested every year. The payout ratio is the percentage of the firm's profits that are returned to the investors every year.

Define EPS as the firm's earnings per share. Then

\[
\text{Plowback ratio} = 1 - \text{Payout ratio} = 1 - \frac{D}{EPS}.
\]

Step 2.

Estimate the return on equity (ROE).

\[
ROE = \frac{EPS}{Book \ value \ per \ share}
\]
Estimating g - 2

**Step 3.** Calculate \( g \), where the dividend growth rate is estimated by

\[ g = \text{Plowback ratio} \times \text{ROE}. \]

*A word of warning*: the above formulas require that the Plowback ratio, ROE, and the discount rate remain constant forever. If they do not, the formula will not necessarily provide accurate estimates. Read questions carefully to ensure the conditions for the formulas are met before trying to find an answer.

**Example:** ABC, Inc. has earnings per share of $10. It pays a $2 dividend and has a book value per share of $100. What is \( g \)?

Plowback ratio = 1 - 2/10 = 0.8.

ROE = 10/100 = 0.1.

\[ g = 0.8 \times 0.1 = 0.08. \]

Dividend Discount Model - 6

**Example:** At present XYZ Co. will pay an $8 dividend per share on earnings per share of $10. Its present book value per share equals $100. Using the perpetual growth model described above, the market values the stock at $110. What is the required return on the stock?

The firm now discovers a new investment opportunity, with the same return as its previous projects. Therefore, it alters its plowback ratio, and as a result next period's dividend falls to $6. What will the stock sell for?

In order to solve the problem it might be useful to list what we know:

- Dividend: $8
- Earnings: $10
- Book value: $100
- Stock price: $110

What is missing?

Plowback ratio, Return on equity, Growth rate, Discount Rate.
Plowback ratio = 1 - Dividend/Earnings = 0.20

ROE = Earnings/Book value = 0.10

g = Plowback ratio \times ROE = 0.2 \times 0.1 = 0.02

Therefore, the required return is:
\[ r = \frac{D}{P} + g = \frac{8}{110} + 0.02 = 0.0927 \]

Now we know everything there is to know about the firm.

To answer the second question, we need to calculate how the factors in the model change.

Plowback ratio = 1 - 6/10 = 0.40.

What is the ROE after the new investment policy? The question states that the return on the new project equals the return on the previous projects. Is this important? Yes.

If the ROE on the new project equals that on the previous projects, we can continue to use ROE = Earnings/Book = 0.10 in our calculations.

If the new project has a different ROE, then as time goes on the firm's ROE changes, and we cannot use our formulas.

\[ g = 0.4 \times 0.1 = 0.04. \]

\[ P = \frac{D}{(r-g)} = \frac{6}{(0.0927-0.04)} = $113.85 \]

Notice that the stock price has gone up $3.85.

Why?

Because the cost of capital is only 9.27%, but the new investment returns 10%. This leads to a gain for the shareholders.
Exercise:
GoGo Inc. will pay $6 dividend per share on earnings per share of $10. Book value per share is $80, and the required return on the stock 15%. What is the price of the stock today?

On the next day, the company announces a new investment opportunity, with the same return as its previous projects. As a result, the next dividend is changed to $2 only. What is the new stock price? What is the return on the stock over one day?

Question: What if the cost of capital is 12% instead?

Dividend Discount Model - 10

Sometimes stock dividend grows at a variable rate for a number of years before it settles down to a constant growth rate.

In this case, we can value the stock using the following approach:

Intrinsic value = PV (future dividends during the initial variable growth period) + PV (stock price at the end of the variable growth period)

Example:
Assume that Sweatmore Industries will see its dividends grow at a variable rate for the next three years. After that, the dividend will grow at a constant rate of 8%. Last year's dividend per share was $2.21, and growth rates for the next three years are expected to be 20%, 16% and 13% respectively. If the required rate of return of the stock is 14%, what is the intrinsic value of the stock?
### TABLE 8.4 Using the Variable-Growth DVM to Value Seatmore Stock

<table>
<thead>
<tr>
<th>Step</th>
<th>Year</th>
<th>Dividends</th>
<th>PVIF14%</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2003</td>
<td>$2.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>$2.65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>$3.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>$3.48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Projected annual dividends:
   - 2004: $2.65
   - 2005: $3.08
   - 2006: $3.48

Estimated annual rate of growth in dividends, g, for 2004 and beyond: 8%

2. Present Value of dividends, using a required rate of return, k, of 14% during the initial variable growth period:

<table>
<thead>
<tr>
<th>Period</th>
<th>Year</th>
<th>Dividends</th>
<th>PVIF14%</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2004</td>
<td>$2.65</td>
<td>0.877</td>
<td>$2.33</td>
</tr>
<tr>
<td>2</td>
<td>2005</td>
<td>$3.08</td>
<td>0.769</td>
<td>$2.37</td>
</tr>
<tr>
<td>3</td>
<td>2006</td>
<td>$3.48</td>
<td>0.675</td>
<td>$2.35</td>
</tr>
</tbody>
</table>

$7.04 (to step 5)

3. Price of the stock at the end of the initial growth period:

\[ P_{2006} = \frac{D_{2007}}{(k - g)} = \frac{D_{2006}(1 + g)}{(k-g)} = 62.57 \]

4. Discount the price of the stock (as computed above) back to its present value, at k = 14%.

\[ PV(P_{2006}) = $62.57 \times 0.675 = 42.23 \] (to step 5)

5. Add the present value of the initial dividend stream (step 2) to the present value, of the price of the stock at the end of the initial growth period (step 4):

Value of Seatmore stock = $49.27

Note: The figures slightly differ from the figures found in Table 8.4 in your textbook due to rounding.

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### Price/Earnings Approach

For stocks that do not pay dividends yet, we cannot use the dividend discount model.

An alternative approach is to relate the stock price to certain ratios, such as P/E ratio, Price-to-cash-flow ratio, etc.

#### Price/Earnings Approach

- Future price is based upon the appropriate P/E ratio and forecasted EPS
- Widely used in stock valuation

Stock price = EPS * P/E ratio

- P/E ratio depends on
  - Expected rate of growth in earnings
  - Potential changes in capital structure
  - Economic and market environment
Other Price-Relative Approaches

Price-to-Cash-Flow Approach

- Future price is based upon the appropriate Price-to-Cash-Flow ratio and forecasted cash flows
- Many consider cash flow to be more accurate than profits to evaluate a stock
  - Most popular measure of cash flow is EBITDA (earnings before interest, taxes, depreciation and amortization)
  - Other measures include Cash flows from operations, free cash flow, etc.

P/CF ratio = \( \frac{\text{Market price of common stock}}{\text{cash flow per share}} \)

Price-to-Sales Approach

- Future price is based upon the appropriate Price-to-Sales ratio and forecasted sales
- Useful for companies with no earnings or erratic earnings

P/S ratio = \( \frac{\text{Market price of common stock}}{\text{Sales per share}} \)

Readings and Homework

- Readings: Chapter 8
- Exercises: Chapter 8 (will NOT be collected)
  - Text Website: Self-assessment quiz
  - End-of-Chapter CFA questions (Page 359)
  - Problems: Odd-numbered problems
- Homework (will be collected and graded, due date to be announced)
  - Chapter 8: Case Problem 8.2
  - Chapter 8: Excel with Spreadsheet (Page 367)