Valuing common stocks

Application of the DCF approach

TIP
If you do not understand something, ask me!

The plan of the lecture

- Review what we have accomplished in the last lecture
- Some terms about stocks
- Valuing stocks using
  - Dividend growth model
  - Corporate value model
  - the multiples of comparable firms

What have we accomplished?

- PV concepts
- Discount rates
- NPV rules for taking a project
- The formula for calculating perpetuity and annuity
- Compounding interest rate

Some terms about stocks

Common Stock - Ownership shares in a publicly held corporation.
Book Value - Total common equity on the balance sheet.
Market Value - Stock price per share * # of shares outstanding.

Some terms about stocks

Dividend - Periodic cash distribution from the firm to the shareholders.
P/E Ratio - Stock Price per share divided by earnings per share (EPS).
Dividend yield - Dividends per share (DPS) over the stock price of per share

Facts about common stock

- Represents ownership
- Ownership implies control
- Stockholders elect directors
- Directors elect management
- Management’s goal: Maximize the stock price
Types of stock market transactions

- Initial public offering market (“going public”) (Company sells shares to the public for the 1st time.)
- Primary market (Company sells shares to the public for the 2nd, 3rd,... times.)
- Secondary market (stockholders sell shares to each other)

Expected return

Expected Return - The percentage return that an investor forecasts from a specific investment over a set period of time.

At this stage, you do not need to distinguish between expected return and the discount rate.

Expected Return = \( r = \frac{Div_1 + P_1 - P_0}{P_0} \)

Example

If Fledgling Electronics is selling for $100 per share today and is expected to sell for $110 one year from now, what is the expected return if the dividend one year from now is forecasted to be $5.00?

Expected Return = \( \frac{5 + 110 - 100}{100} = .15 \)

Example

Jennifer has bought one IBM share in the beginning of this year and decides to hold this share until next year. The expected dividend this year is $10 per share and the stock is expected to sell at $110 per share in the end of the year. If the discount rate is 10%, what is the current stock price?

\[ P = \frac{(110 + 10)}{(1 + 0.1)} = 109.1 \]
**Valuing Common Stocks using dividends**

Stock value equals the present value of all expected future dividends plus the selling price of the stock.

\[ P_0 = \frac{D_{\text{Div}_1}}{(1+r)^1} + \frac{D_{\text{Div}_2}}{(1+r)^2} + \ldots + \frac{D_{\text{Div}_H}}{(1+r)^H} + P_H \]

H - Time horizon for your investment.

**Example**

Current forecasts for XYZ Company’s dividends are $3, $3.24, and $3.50 over the next three years, respectively. At the end of three years you anticipate selling your stock at a market price of $94.48. What is the price of the stock now given a 12% discount rate?

**Solution**

\[ P = 3.00 \left(\frac{1}{1+.12}\right) + 3.24 \left(\frac{1}{1+.12}\right)^2 + 3.50 \left(\frac{1}{1+.12}\right)^3 + 94.48 \]

\[ P = $75.00 \]

**Valuing common stocks using dividends**

If we forecast no dividend growth, and plan to hold out stock indefinitely, we will then value the stock as the PV of a perpetuity.

\[ PV(\text{perpetuity}) = P = \frac{D_{\text{Div}}}{r} \]

Assumes all earnings are paid to shareholders.

**Example**

Suppose that a stock is going to pay a dividend of $3 every year forever. If the discount rate is 10%, what is the current stock price for the following cases:

(a) you invest and hold it forever?

(b) you invest and hold it for two years?

(c) you invest and hold it for 20 years?

**Solution**

(a) \[ P_0 = \frac{3}{0.1} = $30 \]

(b) \[ P_0 = PV(\text{annuity}) + PV(\text{the stock price at year } 2) \]

\[ = \frac{3}{1.1} + \frac{3}{1.1^2} + (3/0.1)/1.1^2 \]

\[ = 3/0.1 = $30 \]

(c) \[ P_0 = PV(\text{annuity of 20 years}) + PV(\text{the stock price at the year of 20}) \]

\[ = $30 \]
Conclusion

The stock price does not depend on how long you intend to hold it!

Dividend growth model

Since the stock value does not depend on the investment horizon, let's assume the investor will hold onto it forever.

So, value of a stock is the present value of all future dividends expected to be generated by the stock.

\[ P = \frac{D_1}{(1 + r)^1} + \frac{D_2}{(1 + r)^2} + \frac{D_3}{(1 + r)^3} + \ldots + \frac{D_n}{(1 + r)^n} \]

Constant growth stock

A stock whose dividends are expected to grow forever at a constant rate, \( g \).

\[ D_1 = D_0 (1 + g) \]
\[ D_2 = D_0 (1 + g)^2 \]
\[ D_t = D_0 (1 + g)^t \]

I: Dividend Growth Model

Under the assumption that dividends grow at a constant rate, stocks can be valued as a perpetuity with a growth rate, (still remember the PV of a growth perpetuity?) that is

\[ P = \frac{Div_1}{r - g} \]

What happens if \( g > r \)?

If \( g > r \), the constant growth formula leads to a negative stock price, which does not make sense.

Example

Suppose that a stock is going to pay a dividend of $3 next year. Dividends grow at a growth rate of 3%. If the discount rate is 10%, what is the stock price?
Solution
\[ P = \frac{3}{0.1 - 0.03} = 42.86 \]

Will the stock value change if you plan to
\( \text{a) buy and hold it forever?} \)
\( \text{b) buy and hold it for two years?} \)
\( \text{c) buy and hold it for 20 years?} \)

\( \text{No.} \)

Using dividends models to estimate the discount rate or the growth rate

\[ P = \frac{D_{i}}{r - g} \]
\[ r = \frac{D_{i}}{P} + g \]

Valuing Common Stocks

Example- continued
A stock is selling for $100 in the stock market. Next year’s dividend is $3. The discount rate for this stock is 12%. What is the market estimate about the growth in dividends?

\[ g = \frac{3.00}{100} - 0.12 = 0.09 \]

Some terms about dividend growth rates

- If a firm elects to pay a lower dividend, and reinvest the retained earnings, the stock price may increase because future dividends may be higher.

- Payout Ratio: Fraction of earnings paid out as dividends/earnings per share
- Plowback (Retention) Ratio: Fraction of earnings retained by the firm
- Payout ratio = 1 - plowback ratio

Deriving the dividend growth rate \( g \)

Growth can be derived from applying the return on equity to the percentage of earnings plowed back into operations.

\[ \text{ROE} = \frac{\text{Return on Equity}}{\text{EPS}} = \frac{\text{Book Equity Per Share}}{\text{Return on Equity}} \]

\[ g = \text{return on equity} \times \text{plowback ratio} \]

Example

Our company forecasts to pay a $5.00 dividend next year, which represents 100% of its earnings. The discount rate is 12%. Instead of paying out all earnings, we decide to plow back 40% of the earnings at the firm’s current return on equity of 20%. What is the value of the stock before and after the plowback decision?
Solution

- Without growth
  \[ P = \frac{5}{0.12} = 41.67 \]
- With growth
  \[ g = 0.4 \times 0.2 = 0.08 \]
  \[ P = \frac{5 \times 0.6}{0.12 - 0.08} = 75 \]

Example (continued)

The difference between these two numbers (75.00-41.67=33.33) is called the Present Value of Growth Opportunities (PVGO).

Present Value of Growth Opportunities (PVGO) : Net present value of a firm’s future investments.

The importance of growth opportunity

- We often use earnings to value stocks as
  \[ P = \frac{EPS}{r} + PVGO \]
- Why do some hi-tech stocks have high prices even though they have little or negative earnings?

II: Corporate value model (Free Cash Flow model)

- Also called the free cash flow method. Suggests the value of the entire firm equals the present value of the firm’s free cash flows.
- A firm generates free cash flows for its stock holders and debt holders, so:
  \[ \text{Market value of a firm} = \text{Market value of stocks} + \text{market value of debt} \]

Applying the corporate value model

- Find the market value (MV) of the firm.
  - Find PV of firm’s future FCFs
  - Subtract MV of firm’s debt (and preferred stock, if any) to get MV of common stock.
  - \[ \text{MV of common stock} = \text{MV of firm} - \text{MV of debt} \]
- Divide MV of common stock by the number of shares outstanding to get intrinsic stock price (value).
  \[ P = \text{MV of common stock} / \# \text{ of shares of common stock} \]

Issues regarding the corporate value model

- Similar to dividend growth model, often assumes at some point free cash flow will grow at a constant rate.
- Terminal value (TV\_n) represents value of firm at the point of time that growth becomes constant.
Valuing common stocks using FCF (free cash flows)

The value of a business is usually computed as the discounted value of FCF out to a valuation horizon (H).

- The value after H is sometimes called the terminal value or horizon value.

\[ PV = \frac{FCF_1}{(1+r)^1} + \frac{FCF_2}{(1+r)^2} + \ldots + \frac{FCF_H}{(1+r)^H} + \frac{PV_H}{(1+r)^H} \]

FCF and PV

\[ PV = \frac{FCF_1}{(1+r)^1} + \frac{FCF_2}{(1+r)^2} + \ldots + \frac{FCF_H}{(1+r)^H} + \frac{PV_H}{(1+r)^H} \]

PV (free cash flows) \hspace{1cm} PV (terminal value)

Given the long-run \( g_{FCF} = 6\% \), and firm discount rate of 10\%, use the corporate value model to find the firm’s value.

\[
\begin{align*}
0 & \hspace{1cm} r = 10\% \\
1 & \hspace{1cm} -5 \\
2 & \hspace{1cm} 10 \\
3 & \hspace{1cm} 20 \\
4 & \hspace{1cm} 530 \\
\end{align*}
\]

\( g = 6\% \)

\( -5.545 \)

\( 8.264 \)

\( 15.026 \)

\( 398.197 \)

\( 416.942 \)

\( 21.20 \)

\( 0.10 \)

\( 0.06 \)

= TV3

If the firm has $40 million in debt and has 10 million shares of stock, what is the firm’s stock value per share?

- MV of equity = MV of firm - MV of debt
- MV of firm = $416.94m - $40m
- MV of firm = $376.94 million
- Value per share = MV of equity / # of shares
- Value per share = $376.94m / 10m
- Value per share = $37.69

Usually it is more difficult to predict dividend than free cash flows

- The corporate value model is often preferred to the dividend growth model, especially when considering firms that don’t pay dividends or when dividends are hard to forecast.
- Projecting free cash flows might give us more accurate estimates of a firm’s value.
- A lot of accounting information to predict free cash flow (FCF).

How to get free cash flows (FCF)?

- Remember, free cash flow is the firm’s after-tax operating income (NOPAT) less the net capital investment
- \( FCF = NOPAT - Net \text{ capital investment} \)
- NOPAT (net operating profit after tax) = EBIT* (1 - Tax rate)
- \( FCF = NOPAT - Net \text{ capital investment} \)
- How to get net capital investment then?
How to get net capital investment then? (Not required)

- Net capital investment = change in operating capital between adjacent years.
- Operating capital in year t = operating capital at the end of year t - operating capital at the end of year t-1.
- Operating capital = NOWC + Net Fixed Assets
- NOWC = Current assets - Non-interest bearing current liability
- Examples of Non-interest bearing current liability: account payable, unearned revenue.
- Example of interest bearing current liability: note payable
- If we ignore change in working capital, then net capital investment = capital expenditure - depreciation

III: Firm multiples method

- Analysts often use the following multiples to value stocks.
  - P/E
  - P/B
  - P/Sales

- EXAMPLE: Based on comparable firms, estimate the appropriate P/E. Multiply this by expected earnings per share to figure out an estimate of the stock price.

Example

- Firm ABC has EPS=$2, a similar firm in the same industry has a P/E ratio of 30. What's you estimate of ABC's stock price?

- $2*30=$60

- Simple and useful.