

투자론

- R과 Excel을 통한 금융데이터 분석 -

12주차
성과분석 및 자본(주식) 가치 평가

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Unit 02

Equity Valuation Model

Overview

- Definition of Valuation
- Models of Equity Valuation
- Intrinsic Value vs. Market Price
- Valuation Model
 - Dividend Discount Model
 - Constant Growth Dividend Discount Model
 - Price-Earnings Ratio and Growth
 - Free Cash Flow Model

◆ Valuation

- ◎ Question 1: Are these stock values "correct?"
- ◎ Question 2: What assumptions could justify these values?

◆ Definition

- **Valuation is the art/science of determining what a security or asset is worth**
- **Sometimes we can observe a market value for a security and we are interested in assessing whether it is over or under valued (e.g., stock analysis)**
- **The value of a security or asset is going to depend crucially on the asset pricing model we choose. (As we shall see next, the effect is through the appropriate discount rate.)**
- **The most common kind of valuation problem is equity valuation**

◆ Models of Equity Valuation

- Balance Sheet Models
- Dividend Discount Models (DDM)
- Price/Earnings Ratios
- Free Cash Flow Models

◆ Intrinsic Value vs. Market Value

- The return on a stock is composed of dividends and capital gains or losses

$$\text{Expected HPR} = E(r) = \frac{E(D_1) + [E(P_1) - P_0]}{P_0}$$

- The expected HPR may be more or less than the required rate of return
 - Variation based on the stock's risk

◆ Expected Return Determination

- In a CAPM framework, use the SML; this approach allows you to explicitly make adjustments to your Beta estimate to reflect your assessment of the future Beta of the stock
- If valuing existing equity, can also use a historical average return as an estimate of expected return
- $k = r_f + \beta[E(r_M) - r_f]$
: required rate of return if the stock is priced correctly
- k is called the market capitalization rate

◆ Finding Mispricing

- The intrinsic value (IV) is the “true” value, according to a model
- The market value (MV) is the consensus value of all market participants
- Trading Signal:
 - $IV > MV \rightarrow \text{Buy}$
 - $IV < MV \rightarrow \text{Sell or Short Sell}$
 - $IV = MV \rightarrow \text{Hold or Fairly Priced}$

◆ Dividend Discount Model

- Assume that dividends are paid annually and that the time 0 dividend has just been paid
- If the stock is held on year, the return, r , on the stock is

$$r = \frac{D_1 + P_1}{P_0} - 1 \rightarrow P_0 = \frac{E[D_1 + P_1]}{1 + E[r]}$$

- Present value considers the expected cash flows received if we buy the stock:
 - Expected dividends
 - Expected price received upon sale of the stock at conclusion of holding period

◆ Dividend Discount Model -- Multiperiod

- $$V_0 = \frac{D_1}{1+k} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \dots$$

- V_0 = current value

- D_t = dividend at time t

- k = required rate of return

- DDM implies that V_0 = the present value of all expected future dividends into perpetuity.

◆ Dividend Discount Model

- If the stock is held forever, the present value is given by

$$P_0 = \frac{E[D_1]}{1 + E[r]} + \frac{E[D_2]}{(1 + E[r])^2} + \dots + \frac{E[D_t]}{(1 + E[r])^t} + \dots = \sum_{t=1}^{\infty} \frac{E[D_t]}{(1 + E[r])^t}$$

- This is known as a dividend discount model
- Let $k=E[r]$ be the discount rate. So, given the expected value of future cash flow, the (systematic) risk adjustment is performed via discounting.

◆ Dividend Discount Model

- When we want to stress that the DDM calculates the intrinsic value (which may differ from the observed price), we denote the result V_0 and usually write the sum without the $E[]$'s:
- $$V_0 = \frac{D_1}{1+k} + \frac{D_2}{(1+k)^2} + \dots$$
- The formula highlights the relation between expected return and price and why we call a model that tells us something about expected return an asset pricing model.
- We can see that holding expected dividends fixed, stock price today is decreasing in expected stock return; the higher the expected return needed to compensate for the stock's risk the lower the stock's price.

◆ Constant Growth DDM

- Assume dividends grow at a constant growth rate g :

$$D_2 = D_1(1 + g)$$

$$D_3 = D_2(1 + g) = D_1(1 + g)^2$$

$$\vdots$$

$$D_t = D_{t-1}(1 + g) = D_1(1 + g)^{t-1}$$

- Assume $g < k$, then the intrinsic value is growing perpetuity:

$$\bullet V_0 = \frac{D_1}{1 + k} + \frac{D_1(1 + g)}{(1 + k)^2} + \frac{D_1(1 + g)^2}{(1 + k)^3} + \dots = \frac{D_1}{k - g}$$

◆ Example

- Expected-earnings-per-share growth-rate for GE is 14.28%
- Dividends: GE \$1.64
- Beta GE = 1.37
- Current $r_f = 6\%$
- Historical average market risk premium
 $r_M - r_f$ approximates 8%;
- $E[r_{GE}] = 6\% + 1.37 \times 8\% = 16.96\%$

◆ Example

- The intrinsic value of GE is

- $V_0 = \frac{D_1}{k-g} = \frac{D_0(1+g)}{k-g} = 1.64 \times \frac{1.1428}{0.1696-0.1428} = 69.9$ (vs. 139 that is observed in the market)

- Solving for k : $139 = \frac{1.64 \times 1.1428}{k-0.1428} \Rightarrow k = 15.63\%$ (vs. 16.96%)

- Solving for g : $139 = \frac{1.64 \times (1+g)}{0.1696-g} \Rightarrow g = 15.6\%$ (vs. 14.28%)

◆ DDM, Investment Opportunity, and Payout Policy

- Assume that Growth results from reinvestment of earnings (no other funds are raised).
- Payout ratio is dividends/earnings.
- Plowback ratio = $b = 1 - \text{payout ratio}$ < 1 is the proportion of earnings that are reinvested in the firm, and we assume b to be constant over time (i.e., constant payout policy).
- So, $D_t = (1 - b) E_t$, where E_t is earnings per share.
- ROE is the expected return on equity, and it measures the investment opportunities of a firm (per unit of book value of equity). We assume ROE to be constant over time.

◆ Relevant Questions

- What is the growth rate of B_t , the Book Value of Equity per Share?
- What is the growth rate of E_t , the Earnings per share?
- What is the growth rate of D_t , the Dividend per share?

◆ Book Value Growth

- ⊙ $E_1 = ROE \times B_0$

- ⊙ $B_1 = B_0 + b \times E_1 = B_0 + b \times ROE \times B_0 = B_0 \times (1 + b \times ROE)$

⇒ book value per share grows at rate $b \times ROE$

◆ Earnings' Growth

⊙ $E_2 = ROE \times B_1 = ROE \times B_0 \times (1 + b \times ROE) = E_1(1 + b \times ROE)$

⇒ earnings per share grow at rate $b \times ROE$ (since ROE is constant)

◆ Dividend Growth

$$\odot D_2 = (1 - b) \times E_2 = (1 - b) \times E_1 \times (1 + b \times ROE) = D_1 \times (1 + b \times ROE)$$

\Rightarrow dividend per share grows at rate $b \times ROE$
(since payout ratio is constant)

◆ Implications for the Payout policy

- So, if b and ROE are constant, all per share values grow at rate $g = ROE \times b$

- Therefore, firm value is represented as

- $$V_0 = \frac{(1 - b)E_1}{k - g} = \frac{(1 - b)E_1}{k - b \times ROE}$$

- How does our dividend payout policy affect our firm value?

- As long as $ROE > k$, increasing b (retention) will increase V_0
(The firm is investing the shareholders' money at a rate higher than they demand.)
- If $ROE < k$, increasing b will decrease V_0

◆ Price-Earnings Ratio

- The Price/Earnings or P/E ratio is defined as the price per share divided by the earnings per share (after interest).

- Example

: On 3/17/00, the WSJ reports the P/E ratio of IBM to be 27.

(This can be obtained by dividing the price per share at the close of 3/16/00 by the earnings per share for 1999.) On 10/31/03, the WSJ reports the P/E ratio of IBM to be 26.

- The P/E ratio is sometimes used to describe the price as \$IBM is selling at 27 times earnings,# and hence P/E is often called “the multiple.”

◆ Use of P/E for Valuation

● The P/E ratio is sometimes used to get a rough measure of the intrinsic value of a company that is not publicly traded:

1. An average P/E ratio for all publicly traded firm in the industry is calculated.
2. The current earnings of the firm are multiplied by this average P/E to obtain an estimate of the firm s intrinsic value.

◆ Caveat for the P/E Valuation Approach

- Indiscriminate use of the P/E ratio for valuation purposes can lead to trouble because of unstable accounting practices distorting accounting earnings.

◆ The Economic Meaning of the P/E Ratio

1. How P/E relates to plowback, growth, and risk adjustment?

- Start with $V_0 = \frac{(1-b)E_1}{k-g}$
- Assume the market consensus valuation is the price:
 $V_0 \text{ (for the market)} = P_0$
- Then, $\frac{P_0}{E_1} = \frac{(1-b)}{k-g}$

◆ The Economic Meaning of the P/E Ratio

2. An alternative interpretation of P/E, emphasizing the importance of growth:

- With $b = 0$

$$V_0 = \frac{(1-b)E_1}{k-g} = \frac{E_1}{k} = \text{"No Growth Value"}$$

- With $b > 0$

$$V_0 = \frac{E_1}{k} + (\text{Present Value of Growth Opportunities})$$

◆ The Economic Meaning of the P/E Ratio

- That is, if a firm paid out all its earnings as dividend ($b=0$), its stock price at time zero would be E_1/k . The difference between this value and the constant growth DDM value is due to growth, and we call it **the Present Value of Growth Opportunities (PVGO)**.
 - When the PVGO is a large component of the price, the firm is often called a “Growth” firm.
 - Since investors buy growth stocks for what they will be earnings many years later, a tiny change in outlook can have a dramatic impact on the present value.

◆ The Economic Meaning of the P/E Ratio

- Given the decomposition of the stock value, assuming the market consensus valuation is the price, $P_0 = V_0$

- Then,
$$\frac{P_0}{E_1} = \frac{1}{k} + \frac{PVGO}{E_1}.$$

- So, growth firms have high multiples because their price reflects large PVGO, which investors expect to realize in the (possibly distant) future.

◆ Exercise Problem 1

Deployment Specialists pays a current (annual) dividend of \$1.00 and is expected to grow at 20% for 2 years and then at 4% thereafter. If the required return for Deployment Specialists is 8.5%, what is the intrinsic value of its stock?

◆ Exercise Problem 2

The market consensus is that Analog Electronic Corporation has an ROE = 9%, a beta of 1.25, and plans to maintain indefinitely its traditional plowback ratio of $2/3$. This year's earnings were \$3 per share. The annual dividend was just paid. The consensus estimate of the coming year's market return is 14%, and T-bills currently offer a 6% return.

- Find the price at which Analog stock should sell.
- Calculate the P/E ratio.
- Calculate the present value of growth opportunities.
- Suppose your research convinces you Analog will announce momentarily that it will immediately reduce its plowback ratio to $1/3$. Find the intrinsic value of the stock.
- The market is still unaware of this decision. Explain why V_0 no longer equals P_0 and why V_0 is greater or less than P_0 .

◆ Exercise Problem 3

The Duo Growth Company just paid a dividend of \$1 per share. The dividend is expected to grow at a rate of 25% per year for the next three years and then to level off to 5% per year forever. You think the appropriate market capitalization rate is 20% per year.

- What is your estimate of the intrinsic value of a share of the stock?
- If the market price of a share is equal to this intrinsic value, what is the expected dividend yield?
- What do you expect its price to be one year from now?
- Is the implied capital gain consistent with your estimate of the dividend yield and the market capitalization rate?