Today’s Agenda

- Constant Growth stock Valuation
- Supernormal or non-constant growth stock valuation
- Income vs. Growth
- Market Efficiency

Stock Valuation

_Infinite Holding Periods_  
Stock Value = PV of Future Expected Dividends

\[
P_0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \ldots + \frac{D_\infty}{(1+r)^\infty}
\]
Stock Valuation: Dividend Patterns

For Valuation: we will assume stocks fall into one of the following dividend growth patterns.

- Constant growth rate in dividends
- Zero growth rate in dividends, like preferred stock
- "Supernormal" (non-constant) growth rate in dividends

Stock Valuation Case Study: Doh! Doughnuts

- We have found the following information for Doh! Doughnuts:
  - current dividend = $2
  - Required return = 12%
Analysts Estimates for Doh! Doughnuts

- NEDFlanders predicts a constant annual growth rate in dividends and earnings of zero percent (0%).
- Barton Kruston Simpson predicts a constant annual growth rate in dividends and earnings of 8 percent (8%).
- Moe Homer Simpson & Bernard expect a dramatic growth phase of 20% annually for each of the next 3 years followed by a constant 8% growth rate in year 4 and beyond.

Our Task: Valuation Estimates

- What should be each analyst’s estimated value of Doh! Doughnuts?
Valuing Common Stocks: Constant Growth

Constant Growth DDM - A version of the dividend growth model in which dividends grow at a constant rate (Gordon Growth Model).

\[ P_0 = \frac{D_{iv_0}(1+g)}{r-g} = \frac{D_{iv_1}}{r-g} \]

\( r > g \)

Ned Flanders’ Valuation

\[ D_{iv_0} = $2 \quad g = 0\% \quad r = 12\% \quad r-g = 12\% - 0 = 12\% \]

\[ P_0 = \frac{D_{iv_0}(1+g)}{r-g} = \frac{D_{iv_0}}{r-g} \]

\[ P_0 = \frac{\$2}{0.12} = \$16.67 \]
Barton Kruston Simpson’s Valuation

\[ \text{Div}_0 = \$2, \quad g = 8\% = 0.08, \quad r = 12\% = 0.12 \]

\[ \text{P}_0 = \frac{\text{Div}_0 (1 + g)}{r - g} = \frac{\$2 (1.08)}{0.12 - 0.08} \]

\[ \text{P}_0 = \frac{\$2.16}{0.04} = \$54 \]

Constant growth and Expected Rate of Return

\[ \text{P}_0 = \frac{\text{Div}_0 (1 + g)}{r - g} \]

know \( \text{P}_0 \), want to solve for \( r \)

\[ r = \frac{\text{Div}_0 (1 + g)}{\text{P}_0} \]

\[ g = \frac{\text{Div}_0 (1 + g)}{\text{P}_0} + g \]

exp. div. yld. \text{ exp. capital gains yld.}
Moe Homer Simpson & Bernard Valuation

- “Supernormal” (non-constant) growth
- Years 1-3 expect 20% growth
- After year 3: constant growth of 8%

\[ \text{Div}_0 = \$2 \quad r = 12\% \]

Let’s check Bart’s work

\[ p_0 = \$54 \quad \text{Div}_0 = \$2 \quad g = 8\% \]

\[ r = \frac{\text{Div}_0(1+g)+g}{p_0} = \frac{\$2(1.08)+.08}{\$54} \]

\[ 12\% \leq 1.12 = .04 + .08 \]

What is \( r \) if \( p_0 = \$50 \)?

\[ r = \frac{\$2(1.08)}{\$50} + .08 = .123 \text{ or } 12.3\% \]
Non-constant Growth Stock Valuation

- **Framework**: Assume Stock has a period of non-constant growth in dividends and earnings and then eventually settles into a normal constant growth pattern ($g_n$).

\[0 \quad g_1 \quad 1 \quad g_2 \quad 2 \quad g_3 \quad 3 \quad g_n \quad 4 \quad g_n \quad 5 \quad g_n \quad \ldots\]

\[D_1 \quad D_2 \quad D_3 = \frac{Div_{1}(1+g_n)}{r-g_n}\]

- **Non-constant Growth Period** | **Constant Growth**

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Non-constant Growth Valuation Process

- **3 Step Process**
  - Estimate Dividends during non-constant growth period.
  - Estimate Price, which is the PV of the constant growth dividends, at the end of non-constant growth period which is also the beginning of the constant growth period.
  - Find the PV of non-constant dividends and constant growth price. The total of these PVs = Today’s estimated stock value.
Back to Homer et al’s Valuation

\[ \text{Div}_0 = $2, \quad g_1 = g_2 = g_3 = 20\% \text{ or } 0.2 \]

After 3 yrs: \( g_c = 8\% \text{ or } 0.08 \quad r = 12\% \)

**Step 1:** Find non-constant dividends

\[ \text{Div}_1 = \text{Div}_0 (1 + g_1) = $2(1.2) = $2.40 \]
\[ \text{Div}_2 = \text{Div}_1 (1 + g_2) = $2.40(1.2) = $2.88 \]
\[ \text{Div}_3 = \text{Div}_2 (1 + g_3) = $2.88(1.2) = $3.46 \]

**Step 2:** Find constant growth

\[ \text{Div}_3 = 3.46, \quad P_3, \quad g_c = 8\% \quad r = 12\% \]

\[ P_0 = \frac{\text{Div}_0 (1 + g)}{r - g} \Rightarrow P_3 = \frac{\text{Div}_3 (1 + g_c)}{r - g_c} \]

\[ P_3 = \frac{$3.46(1.08)}{0.12 - 0.08} = $93.31 \]
Valuing Common Stocks: Income vs. Growth

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

**Payout Ratio** - Fraction of earnings paid out as dividends

**Plowback Ratio** - Fraction of earnings retained by the firm.
Valuing Common Stocks: Income vs. Growth

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

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

Example

MAD Inc. forecasts a $3.00 dividend next year, which represents 100% of its earnings. This will provide investors with a 15% expected return. Instead, MAD Inc is considering plowing back 70% 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 assuming constant growth?
**Original:**

\[ q = 0\% \quad r = 15\% \]

\[ \text{Div}_1 = \text{EPS}_1 = 3 \quad P_0 = \frac{\text{Div}_1}{r} = \frac{3}{.15} = 20 \]

**Plowback:**

Plowback ratio = 70% or 0.7  \( \text{ROE} = 20\% \)

\[ \text{Div payout} = (1 - .7) = .3 \text{ or } 30\% \]

\[ \text{Div}_1 = .3 (3) = 0.9 \quad (\text{EPS}_1) = 0.90 \]

\[ g = \text{plowback} \times \text{ROE} = .7 (20\%) = 14\% \]

\[ P_0 = \frac{\text{Div}_1}{r - g} = \frac{0.90}{.15 - .14} = 90 \]

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**PVGO (PV of growth opportunities):**

The difference between growth price and no-growth price.

In this case:

\[ \text{growth price} = 90 \]

\[ \text{no-growth price} = 20 \]

\[ \text{PVGO} = 70 \]
Valuing Common Stocks

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

Sustainable Growth Rate - Steady rate at which a firm can grow: plowback ratio $X$ return on equity. \( PVGO > 0 \) if \( ROE > r \)

Efficient Market Theory

- Weak Form Efficiency
  - Market prices reflect all historical information

- Semi-Strong Form Efficiency
  - Market prices reflect all publicly available information

- Strong Form Efficiency
  - Market prices reflect all information, both public and private