STOCK/EQUITY VALUATION

Three approaches to valuing a firm's equity

1. PV of dividends (or, PV of total payouts to shareholders)
2. Multiples based on comparable firms ("comps")
3. PV of FCFs (=Enterprise Value), and subtract net debt

- Each approach has advantages and disadvantages
  - — No single technique can provide a definite answer on valuation
  - → Practitioners use a combination of these approaches
- Valuation is very much an art (with only a bit of math)!

DIVIDEND DISCOUNT MODEL

The Dividend-Discount Model

- Suppose you plan to invest in a stock for one year
- How much should pay to buy it today? (P_0)
- There are two potential sources of cash flows from owning the stock:
  1. Dividends paid during the year (Div_1)
     (for simplicity, we assume here dividend is paid at the end of the year)
  2. Price from selling the shares at the end of the year (P_1)
- Let's discount these cash flows to get the PV
  - Correct discount rate here is the firm's *equity cost of capital* (r_e)
  - So the value of a share today is then:

$$P_0 = \frac{Div_1 + P_1}{1 + r_e}$$

  - What is P_1? The investor who buys them at time 1 is willing to pay the PV, *i.e.* the discounted Div_2+P_2…

$$P_0 = \frac{Div_1 + \frac{(Div_2 + P_2)}{1+r_e}}{1+r_e} = \frac{Div_1}{1+r_e} + \frac{Div_2}{(1+r_e)^2} + \frac{P_2}{(1+r_e)^2}$$

The Dividend-Discount Model (cont.)

- Iterating forward, this implies that:

$$P_0 = PV(\text{future dividends per share})$$

- Special cases (using our familiar perpetuity formulas)
  - — If dividends are expected to be constant:

$$P_0 = \frac{Div_1}{r_e}$$

  - — If dividends are expected to grow at a constant rate *g:*

$$P_0 = \frac{Div_1}{r_e - g_{div}}$$

Example: Dividend-Discount Model

- AT&T plans to pay $1.44 per share in dividends in the coming year, and dividends are expected to grow by 4% per year going forward
- Its equity cost of capital is 8%
- Using the dividend discount model, what's the value of an AT&T share?

Solution:

$$P_0 = \frac{Div_1}{r_e - g} = \frac{1.44}{0.08 - 0.04} = \$36$$

“Gordon Growth Model”

- Recall, dividend discount model says: $P_0 = \frac{Div_1}{r_e - g_{div}}$
- We can solve for r_e to get:

$$r_e = \frac{Div_1}{P_0} + g_{div}$$

- This equation called the “Gordon Growth Model” (and for some reason it’s quite famous…)
- What does it mean?
  - The expected return on a stock is equal to: dividend yield + dividend growth rate
  - Assuming, of course, that dividends are expected to grow at the fixed rate *g!*

Limitations of the Dividend-Discount Model

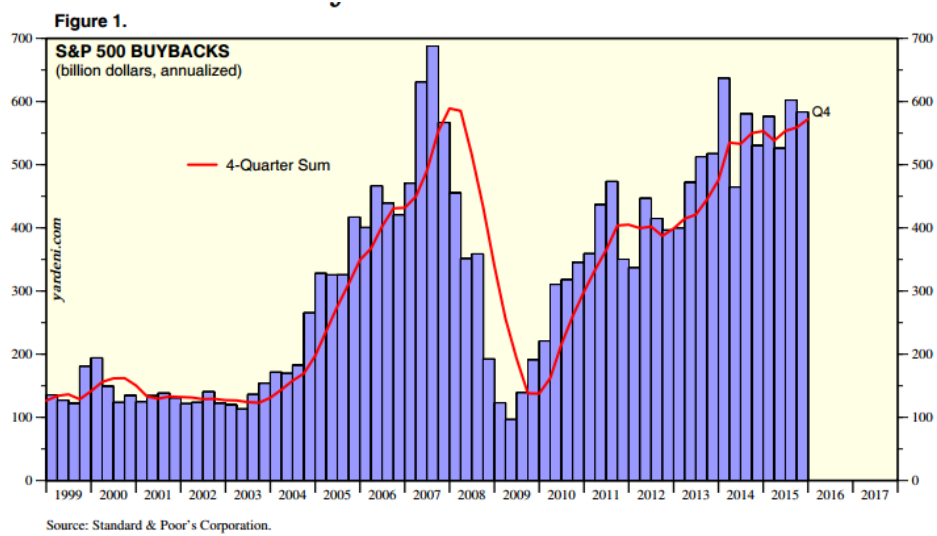
- Uncertain Dividend Forecasts
  - Dividends depend on firm's future size, profitability, payout policy, leverage policy, etc…
- How to value Non-Dividend-Paying Stocks?
  - If the firm is only temporarily not paying dividends, we can still use the dividend discount model
  - But, future dividends are now probably even more uncertain!
- Repurchases?
  - Requires modifying the dividend-discount model

Share Repurchases

- In a share repurchase, the firm uses cash to buy back some of its own shares
- Repurchases are an alternative way for firms to pay money to shareholders
  - In a dividend, all shareholders get a proportional part of the payout
  - In a repurchase, only people who sell their shares back to the company get the payout
- What if you don't sell your shares—what do you get out of a repurchase then?
  - There now remains fewer shares outstanding than before, so if you don't sell, you now own a larger fraction of the firm!

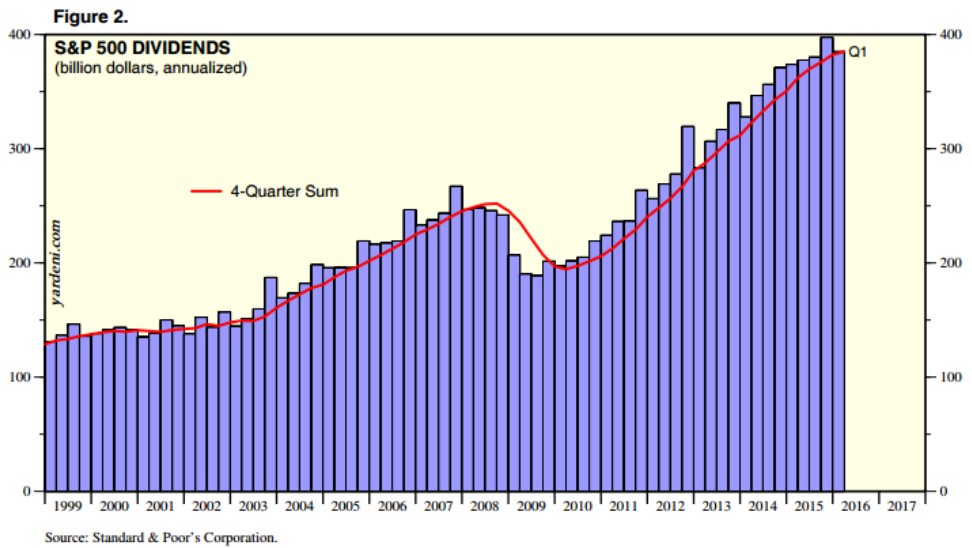
Share repurchases currently represent the majority of all payouts

Figure 1.



Source: Standard & Poor's Corporation.

Figure 2.



Source: Standard & Poor's Corporation.

Total Payout Model

- In the dividend-discount model, we value each share, discounting the dividends the share will receive:

$$P_0 = PV(\text{future dividends } per\ share)$$

- The reason why share repurchases makes the dividend discount model difficult to use is that the number of shares are changing!

- **Total Payout Model:** Values all of the firm's equity, rather than a single share
- Calculate the PV of all payouts that the firm makes to shareholders, and divide by the current number of shares:

$$P_0 = \frac{PV(\text{future total dividends and repurchases})}{\text{Shares Outstanding}_0}$$

COMPARABLES (OR “COMPS”) METHOD

Valuation based on Comparables

- **The Valuation Principle & No Arbitrage:** Two securities with identical cash flows must have the same price
  - Otherwise, there is arbitrage!
- **Example:** If Security A always has exactly twice the cash flow of Security B, it must trade at exactly twice the price
  - Instead of purchasing A, we could just buy two of B
  - *i.e.,* we can **scale** prices—this is the main idea behind comparables!
- **Example:** Suppose a 2,000 sqft house in Champaign sells for $200,000. What is your estimate for a neighboring house that's 2,500 sqft?

Applying the Comparables approach

Suppose we want to value **Company X**

1. Start with a sample of "comparable" companies (Companies A, B, C…) whose business characteristics are similar to Company X
2. Pick a *ratio ("multiple")* with the stock price, equity value, or enterprise value in the numerator:
   - E.g., Stock Price/EPS, Market/Book, Enterprise Value/Sales, Enterprise Value/EBITDA…
3. Calculate the average of this multiple for the comparables A, B, C…
4. Then, for Company X, we can back out its implied value (the numerator in the ratio) using the average multiple from Step 3 times Company X's denominator

Example: Applying P/E multiples

- Suppose furniture manufacturer Herman Miller, Inc., has earnings per share of $1.38
- The average P/E of comparable furniture stocks is 21.3
- What is your estimate for the value for Herman Miller's stock using the P/E as a valuation multiple?
- What are the assumptions underlying this estimate?

Solution

- We estimate a share price for Herman Miller by multiplying its EPS by the P/E of comparable firms:

P = (Average P/E of comparables) * EPS of Herman Miller =
21.3 * 1.38 = $29.39

- (This valuation assumes, among other things, that Herman Miller will have similar future risk, earnings growth rate, and payout rates as the comparable firms– these are arguably strong assumptions!)

What exactly does P/E comparables assume?

- That the P/E of the company we want to value ("Company X") should be exactly *the same* as the P/E of the comparable(s)
- (When) Is that a reasonable assumption?
- One way to think about when the P/E of companies should be similar is if both Company X and the comparable(s) can be valued using the dividend discount model, with **equal payout ratios (the fraction of earnings paid as dividends), growth rates, and costs of capital**:

$$\frac{P}{E_0} = \frac{PV(Dividends)}{E_0} = \frac{D_1/(r_e - g_{dividends})}{E_0} = \frac{\frac{E_1 * PayoutRatio}{r_e - g_{dividends}}}{E_0}$$
$$= \frac{(1 + g_{earnings}) * PayoutRatio}{r_e - g_{dividends}} = \frac{(1+g) * PayoutRatio}{r_e - g}$$

In other words: If g, $PayoutRatio$, r_e are the same, we would expect P/E to be the same too!

(Note: In the last step, because we assume a constant payout ratio, the growth rate of dividends will be equal to the growth rate of earnings)

Example: Enterprise Value multiples

- Fairview, Inc., is an ocean transport company
  - EBITDA of $50 million, cash of $20 million, debt of $100 million, and 10 million shares outstanding
  - The ocean transport industry as a whole has an average EV/EBITDA ratio of 8.5
- What is an estimate of Fairview's enterprise value?
- What is the corresponding estimate of its stock price?

Solution

- Using the EV/EBITDA comparables ratio, Fairview's enterprise value is:

$$\$50 \text{ million} \times 8.5 = \$425 \text{ million}$$

- Next, to get the equity value, subtract net debt from the enterprise value:

$$\$425 \text{ million} - \$100 \text{ million} + \$20 \text{ million} = \$345 \text{ million}$$

- Price per share is then:

$$\$345 \text{ million} \div 10 \text{ million shares} = \$34.50$$

What multiples to use?

- Some examples of common multiples:
  - P/E
    - Most common valuation multiple
  - Enterprise Value-to-Earnings Multiples (e.g., EV/EBITDA)
    - Because capital expenditures can vary widely across years (which affects FCF), it is common to use EV/EBIT or EV/EBITDA rather than EV/FCF
    - Many comparable companies have different capital structures → A good idea to use a multiple that is not affected by capital structure
    - Note: Use a measure of earnings before interest payments are made! For example, EBIT, EBITDA, Free cash flow. Why?
  - EV/Sales. Don't use EquityValue/Sales!
  - M/B
  - Industry-specific ratios (e.g., EV/customer, EV/"click", EV/"eyeball")
- Which multiple and which set of comparable companies should you choose?
  - There isn't a "right" answer
  - SENSITIVITY ANALYSIS!
- Comps method makes a bit of sense, but it is pretty "rough", so you definitely may want to use it only in combination with other methods…

Problems with the Comparables Method

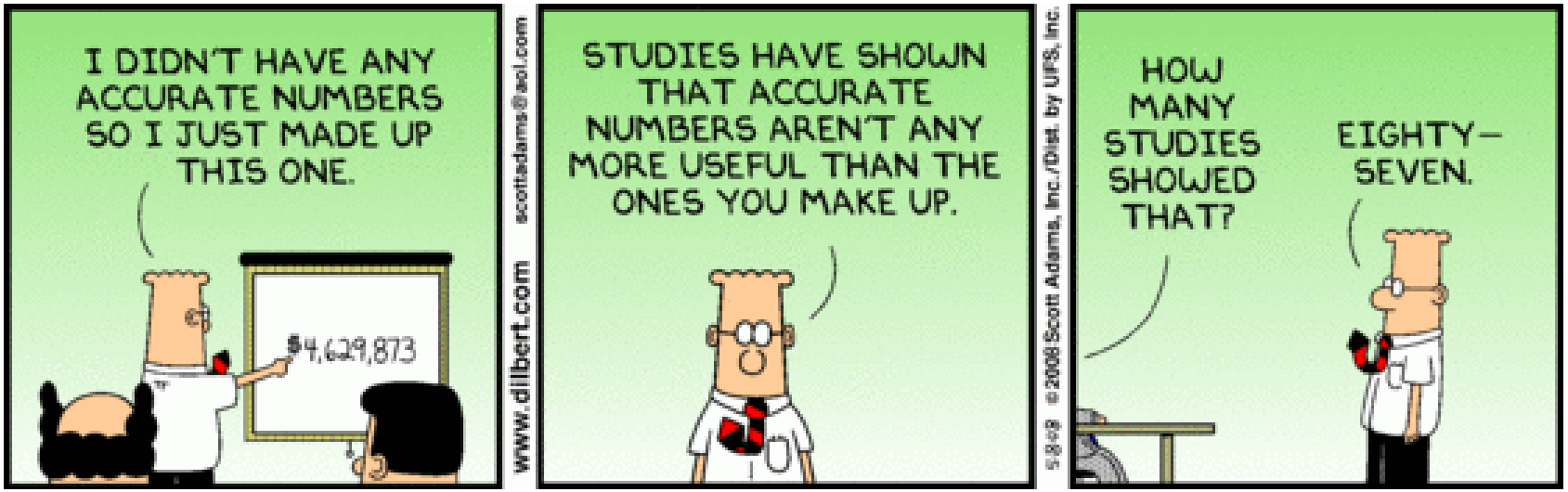
- Estimated value sensitive to the choice of multiple
  - E.g., whether we use P/E, EV/EBIT, M/B or something else
- Difficult to find good comparable companies
  - E.g., firms have different managerial talent, manufacturing processes, patents, customer base, etc…
  - Important if these differences affect future growth of cash flows or the risks that the firms face
- Assumes the comparables are priced correctly
  - Cannot help determine if an entire industry is overvalued/undervalued
  - E.g., would have been no help in correctly valuing tech firms during the "tech bubble"

DISCOUNTED FREE CASH FLOW MODEL

Discounted Free Cash Flow (DCF) Model

- Approach:
  - First, calculate PV(FCF) = Enterprise Value
  - To get the equity value, we subtract net debt:

    Enterprise Value = Market Value of Equity + Debt (and other non-equity capital) – Cash;
    So: Market Value of Equity = Enterprise Value – Debt (and other non-equity capital) + Cash
- Strengths:
  - Compared to dividend discount model:
    - Forecasting FCFs can be easier than forecasting dividends, because FCFs do not depend on payout policy, capital structure choices, interest expenses, etc…
  - Compared to comps:
    - More “bottom-up”
    - DCF allows us to incorporate more detailed information about differences between firms (which we typically assume away when we apply multiples; e.g., specific year-by-year assumptions about future growth rates, margins, costs of capital, etc…)
    - Potential to be more precise (On the other, also potential to be more precisely wrong!)
- Weaknesses:
  - DCF method still relies heavily on projections: Garbage In → Garbage out !
- Sensitivity analysis very important!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STUDIES HAVE SHOWN THAT ACCURATE NUMBERS AREN'T ANY MORE USEFUL THAN THE ONES YOU MAKE UP.
HOW MANY STUDIES SHOWED THAT?
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Enterprise Value (1)

Enterprise value, *EV*=

Market Value of Equity + Debt – Cash =

PV(FCF),

where we can calculate estimated Free Cash Flows as:

$$FCF_t = EBIT_t * (1\text{-tax rate}) + Depreciation_t – CapEx_t – \Delta NWC_t$$

Notice: Exactly the same way we calculate cash flows in capital budgeting!
For calculating these cash flows, we're again assuming that firm is "all-equity financed"

Enterprise Value (2)

- We are discounting the cash flows to both equity and debt, so we use the *Weighted Average Cost of Capital (WACC), r_{wacc}*
- We usually explicitly forecast FCFs up to some time horizon *N*, and then estimate a terminal value (T_N) of the enterprise:

$$EV_0 = \frac{FCF_1}{1+r_{wacc}} + \frac{FCF_2}{(1+r_{wacc})^2} \cdots \frac{FCF_N}{(1+r_{wacc})^N} + \frac{T_N}{(1+r_{wacc})^N}$$

- Finally, to get the share price:

$$P_0 = \frac{EV_0 + Cash_0 - Debt_0}{\text{Shares outstanding}_0}$$

How calculate r_{wacc}?

$$r_{wacc} = \frac{E}{E+D} r_e + \frac{D}{E+D} r_d (1 - taxrate_c) \qquad (1)$$

$$r_{wacc} = r_u - \frac{D}{E+D} r_d * taxrate_c \qquad (2)$$

<u>If the firm we want to value is **not** publicly traded:</u>

1. If we can find firm(s) with similar business risk *and* similar capital structure:
   - Estimate r_e (e.g. using CAPM) for the similar firm(s)
   - Estimate r_d either using CAPM, or, by adjusting the firm's yield *y* for the risk of default
   - Then apply formula (1) above
2. If we can't find any firm(s) with similar business risk *and* similar capital structure (only with similar business risk):
   - Estimate r_u for the similar firm(s)
   - Estimate r_d (for the firm we want to value) either using CAPM, or, by adjusting the firm's yield *y* for the risk of default
   - Then apply formula (2) above, *using the D and E of the firm we want to value*

<u>If the firm we want to value is publicly traded:</u>

Calculate its r_e and r_d and then apply *(1)* [or *(2)* if we first calculate the unlevered cost of capital, r_u]

Note: We want to use *net debt* when calculating *D*

How to get Terminal Value T_N?

Method 1: Assume a constant long-run growth rate g_{FCF} for FCFs beyond year *N*:

$$T_N = \frac{FCF_{N+1}}{r_{wacc} - g_{FCF}} = \frac{FCF_N * (1 + g_{FCF})}{r_{wacc} - g_{FCF}}$$

Method 2: Apply a EV/FCF multiple based on comps, *i.e.,*:

$T_N = x * FCF_N$, where *x* is the multiple

Note: these methods are really exactly the same thing if $x = \frac{1+g_{FCF}}{r_{wacc}-g_{FCF}}$

Example: Applying the DCF method (1)

- Nike had sales of $20 billion in 2015
- Suppose you expect :
  - Nike's sales to grow by $2 billion for the next 5 years (until 2020), and after that slow to 3% per year
  - EBIT to be 10% of sales
  - NWC to be 10% of sales (*i.e.*, increase proportionately with sales)
  - CapEx to be equal to depreciation expenses
- Nike currently has $2 billion in cash, $1 billion in debt, 500 million shares outstanding, a tax rate of 30%, and a WACC of 10%
- What is your estimate of the value of Nike's stock in early 2016?

Example: Applying the DCF method (2)

Assumption recap:
Sales $20 billion in 2015
Sales growth $2 billion for the next 5 years (until 2020); after that sales growth slows to 3% per year
EBIT 10% of sales
Net working capital to increase proportionately with sales (10% of sales)
Capital expenditures equal to depreciation expenses

Year	2015	2016	2017	2018	2019	2020	2021 ("steady state growth")
Sales	20,000	22,000	24,000	26,000	28,000	30,000	30,900 (3% growth)
EBIT (10% of sales)		2,200	2,400	2,600	2,800	3,000	3,090
Less EBIT*tax		660	720	780	840	900	927
Plus Depreciation		In this example, we're assume depreciation=capex, so they conveniently cancel out					
Less Capex							
NWC	*2,000*	*2,200*	*2,400*	*2,600*	*2,800*	*3,000*	*3,090*
Less ΔNWC		200	200	200	200	200	90
FCF		1,340	1,480	1,620	1,760	1,900	2,073

Example: Applying the DCF method (3)

- Given a g_{FCF} of 3% after 2020 and a WACC of 10%, we can calculate T_{2021}:

$$T_{2021} = \frac{FCF_{2021}(1+g_{FCF})}{r_{wacc}-g_{fcf}} = \frac{2{,}073*1.03}{0.10-0.03} = \$30{,}503 \text{ million}$$

- Note: It's not necessary that a 3% growth in *sales* will translate down to a 3% growth in *FCF*—you should check!
- Nike's EV at the start of 2016 is the present value of the forecasted FCF plus the discounted T_N:

$$EV_{2015} = \frac{1{,}340}{(1+10\%)^1} + \frac{1{,}480}{(1+10\%)^2} + \frac{1{,}620}{(1+10\%)^3} + \frac{1{,}760}{(1+10\%)^4} + \frac{1{,}900}{(1+10\%)^5} + \frac{2{,}073}{(1+10\%)^6} + \frac{30{,}503}{(1+10\%)^6} = \$24{,}428 \text{ million}$$

Example: Applying the DCF method (4)

- Finally, we want to get an estimate of the stock price
  - Recall: Nike's EV is $24.428 billion, it has $2 billion in cash, $1 billion in debt, and 500 million shares outstanding
- So:

$$P = \frac{EV - Debt + Cash}{\#\text{shares}} = \frac{24{,}428 - 1{,}000 + 2{,}000}{500} = \$50.86$$

Question: What belongs in “Debt”?

- To calculate Equity, we do:

  Equity=EV-Debt(and other non-equity capital)+Cash

- But the list of liabilities can be very complicated! What do we include in “Debt”?
  - For example, what about capitalized lease obligations, etc?

- Answer:
  - It doesn’t really matter as long as you’re careful about making sure any cash flow is exactly in one place!
  - Recall:

    EV [*i.e.*, Equity + *Debt* – Cash] = PV(FCF)

  - Any payment, e.g. going to suppliers or taxes, that has been subtracted when calculating the *FCF*, doesn’t belong in *Debt*
  - Payments to short-term and long-term debt are not subtracted when calculating FCF, so they clearly belong in *Debt*
  - You have some flexibility in dealing with trickier items such as lease obligations etc. either by subtracting from FCF on the left-hand side or by including the value as a financial claim on the right-hand side, as long every all cash flows are reflected *somewhere but only once*

STOCK PRICES AND INFORMATION EFFICIENCY

Information in Stock Prices

- For a publicly traded firm, the *stock price* should already provide very accurate information regarding the true value of these shares
  - Why?
- *Efficient markets hypothesis*:
  - Securities are fairly priced, and reflect all information that is available to investors
- What *type* of information is captured in the stock price?
  - All Public, Easily Available Information?
  - Also all Private or Difficult-to-Interpret Information?
- Implication for Investors
  - To *consistently* make money by betting on the value of publicly traded shares, an investor must have some very distinct competitive advantage
  - E.g., expertise/access to information that only a few people can figure out

Valuation in reverse

- *If we assume stock prices are efficient*, we can also use valuation models *in reverse*:

Instead of:

V=f(r,g,cash flows),

we can also do:

r=f(V,g,cash flows), or *g=f(V,r, cash flows)*

- In other words, if we know the current firm value, we can back out what the market thinks about expected FCFs, cost of capital, growth, or other *inputs* to the valuation model

Example: Valuation in reverse

- Suppose Tecnor will have free cash flows next year of $40 million . Tecnor has 10 million shares outstanding, no debt, and $20 million in cash. Tecnor's WACC is 11%
- If Tecnor's stock is currently trading for $55.33 per share, what does that imply about what the market thinks about the growth rate of FCFs?

Solution

- Applying the growing perpetuity formula, we have:

$$EV(g) = PV(FCF) = 40 \div (0.11\text{-}g)$$

- The price per share would be (EV(g) – 0 + 20) ÷ 10 million shares, which should be $55.33
- We can solve for g → g = 0.11 – 40/553.3 = 3.5%