

Stock Valuation: Gordon Growth Model

Week 2

Approaches to Valuation

- 1. Discounted Cash Flow Valuation
 - The value of an asset is the sum of the discounted cash flows.
- 2. Contingent Claim Valuation
 - A contingent claim can be replicated and, thus, priced using other traded assets whose prices are known.
- 3. Relative Valuation
 - A company may be priced by comparing its price to another company that has similar characteristics (P/E, Price/Book, etc.)

Discounted Cash Flow (DCF)

- What is the net value today of a series (positive or negative) of (future) cash flows?
- Assumption: The asset has an intrinsic value that is based on its cash flows and risk characteristics.
- Examples:
 - Stock: What is the value of a stock that is expected to give a certain amount of dividend every year?
 - Bond: what is the value of a bond that gives a certain amount of coupon and principal payments?
 - Enterprise: What is the value of the firm as a whole (including the value of equity, debt, and any other securities, like convertible bonds, used to finance the firm)?

DCF and Stock Valuation

- To value a stock using DCF, we can proceed in two possible ways.
- First, we may value the entire firm as a whole by discounting the cash flows that accrue to the business, before interest is paid. The value that belongs to the shareholders is what is left after the debt-holders are paid off.
 - Value of stock = Enterprise value of firm – market value of debt.
- Second, we can directly consider the net cash available to be distributed to the shareholders (“free cash flow to equity”). We will begin the discussion using this second model.

Gordon Growth Model (1/3)

- The simplest stock valuation model – the Gordon Growth Model – values the stock by discounting dividends that are distributed to the shareholders.
 - Note that this model cannot be applied to all firms without modification.
 - This model is also called the Gordon Dividend Model.

Gordon Growth Model (2/3)

- Consider a firm that is in a *stable business*, is expected to experience *steady growth*, is *not expected to change its financial policies* (in particular, financial leverage), and that pays out all of its *free cash flow* as dividends to its equity holders.
- We can price such a stock as the present value of its expected dividends, assuming that the firm lives forever.

The Gordon Growth Model (3/3)

- With the additional assumption that the firm is expected to live forever, we can write the current stock price, P , as::
- $P = D_1 / (k - g)$
- D_1 is the expected dividend in the next period
 $D_1 = D_0 (1 + g)$ where D_0 is the current year's dividend.
- G is the expected growth in dividends.
- k is the cost of equity. This is required rate of return required by shareholders for investing in the stock.

Assumptions Underlying the Gordon Growth Model

- 1. *Stable business*: The assumption here is that the business model of the firm is stable. It is not expected to change its operations significantly as, for example, move into a different business.
- 2. *Steady growth*: We may assume that the firm (dividends, FCFE) will grow at a constant growth rate, g , year after year.
- 3. *Stable financial leverage*: A change in capital financial leverage would change the cost of equity capital. Stable business + Stable financial leverage \Rightarrow cost of equity capital, k , is constant.
- 4. *Dividend and FCFE*: All of the firm's free cash flow is paid out as dividends.

Free Cash Flow to Equity (FCFE)

- Free cash flow to equity (FCFE) is defined as the cash that is left over for the shareholders that is not required for regular business activities and growth of the business.
- If we assume that the debt-ratio of the firm (debt ratio = Debt/Equity) is stable, then an estimate of FCFE can be made as follows:
- $FCFE = \text{Net Income} - (\text{Cap Exp.} - \text{Depreciation}) \times (1 - \text{debt ratio}) - (\text{Incr. In WC}) \times (1 - \text{debt ratio})$.

FCFE vs. Dividends

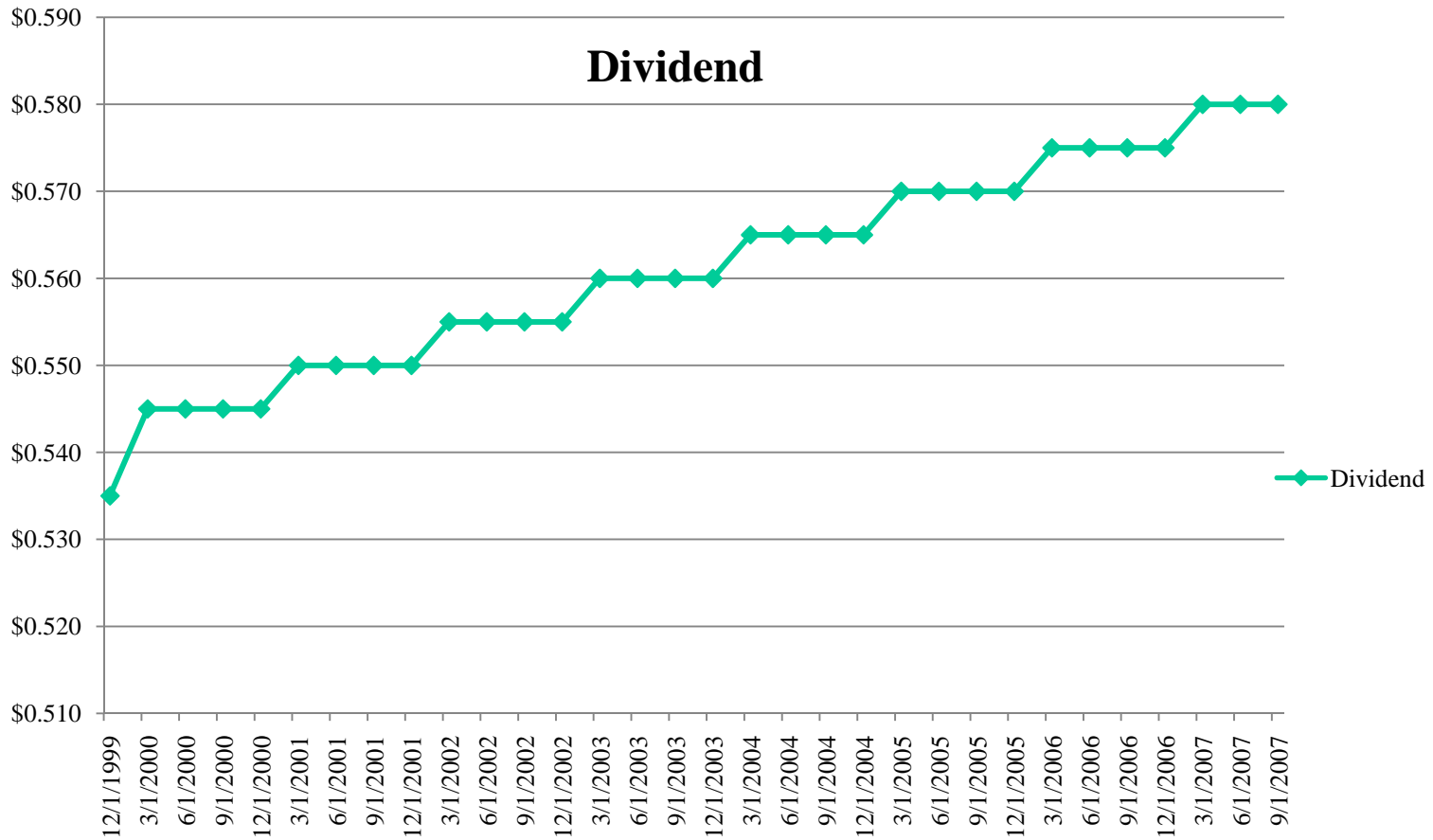
- Should we assume that all the FCFE will be paid out to the shareholder eventually as dividends?
- It may be argued that there is no guarantee that the managers of the firm will pay out the FCFE to its shareholders.
 - It is well-known that shareholder control over managers is imperfect, and consequently, managers do not always act in the best interests of the shareholders. The cost related to this is called “agency cost”.
- An alternative assumption then is that we should only consider dividends for stock valuation. This is the assumption underlying the most common implementation of the Gordon growth model.

An Example

Consolidated Edison (1/4)

- Consolidated Edison is a utilities/energy company. Its ticker symbol is ED. It fits our assumptions for the application of the Gordon Growth Model.
- It is in a stable business. On their website, they write as a description of the corporate strategy:
 - “The guiding principle of Con Edison's corporate strategy has been, and continues to be, to deliver shareholder value by focusing on what we do best - providing safe, reliable energy to our millions of customers in the Northeast. At Con Edison, we don't have to go back to basics - we never left the basics.”
- Its growth in dividends is stable at about 1% per year.

ConEd Quarterly Dividend History (2/4)



An Example

Consolidated Edison (3/4)

- Next, we need to check if its financial leverage is stable.
- To compute the financial leverage, we need market values of debt and equity.
- The market value of debt is usually difficult to get (unless the long-term debt comprises of traded bonds). So instead, we will assume that the book value of debt is close to the market value of debt.
- The market value of equity can be estimated using the price and the number of shares outstanding.
 - If you are using Yahoo as a source for your price data, you may have to go back and adjust for splits, as Yahoo reports the prices after adjustment for splits.

Cost of Equity

- What does the cost of equity depend upon? And how do we estimate the cost of equity?
- The cost of equity will depend on the two major risks the shareholder take
 - (a) the business of the firm,
 - (b) the financial risk because of the financial leverage of the firm.
 - Aside: The precise way in which financial leverage affects the cost of equity follows from the Miller and Modigliani Propositions.
 - Cost of capital for levered equity = Cost of capital for unlevered firm + $(D/E) \times (1 - \text{tax rate}) \times (\text{cost of cap for unlevered firm} - \text{cost of debt})$, where D = market value of debt, E= market value of equity
- We estimate the cost of equity through the “*beta*” of the stock. This follows from the CAPM (Capital Asset Pricing Model).

CAPM

- The CAPM states that, given the beta of the stock, the required return is:
- $R = R_f + (\text{beta}) \times (\text{Market Risk Premium})$
- R = required return on stock
- R_f = riskfree rate
- Market Risk Premium = $(R_m - R_f)$, where R_m is the required return on the market portfolio. The market portfolio may be proxied by a large diversified index like the S&P 500.
- The beta may be estimated from historical data by a regression of the stock return on the market return.

Estimating Beta (1/3)

- The beta is the “slope” coefficient in the regression of the returns of the stock on the returns on the market.
 - You can also estimate it from the function “slope”.
- To estimate the beta, you can use historical returns of both the market and the stock.
 - Usually, we will use the S&P 500 as a proxy for the market.
- How much data should you use? The more the data, the more accurate your estimate. But the longer you go back in history, the more stale the data.
- A reasonable compromise is to use 3 years of monthly data (or 1 year of weekly data).

Estimating Beta (2/3)

- Estimate of beta for ED from monthly data over the period 1/2004 to 8/2007 is 0.3678.
 - Please check that the estimate is statistically significant (absolute value of t-stat is at least 2). If the t-statistic is less than 2, then the estimate is not very reliable.
- The beta is also available on the Yahoo website. It is usually better to compute your own as you know precisely the assumptions you have made. But you may use the Yahoo estimate for convenience.
 - The Yahoo beta is 0.36.

Estimating Beta (3/3)

Regression sample output from Excel

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.232746
R Square	0.054171
Adjusted R Square	0.031102
Standard Error	0.032817
Observations	43

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.002529	0.002529	2.348194	0.133109
Residual	41	0.044155	0.001077		
Total	42	0.046684			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.003713	0.005234	0.709416	0.482082	-0.00686	0.014285	-0.00686	0.014285
X Variable 1	0.367753	0.239988	1.532382	0.133109	-0.11691	0.852418	-0.11691	0.852418

Notes:

1. The slope coefficient is the estimate of the beta. The "X-variable" coefficient is the "slope" - therefore, the estimate of the beta is 0.3678
2. The t-stat is 1.53 which is less than 2. Therefore, this estimate is not statistically different from zero at the standard confidence level.

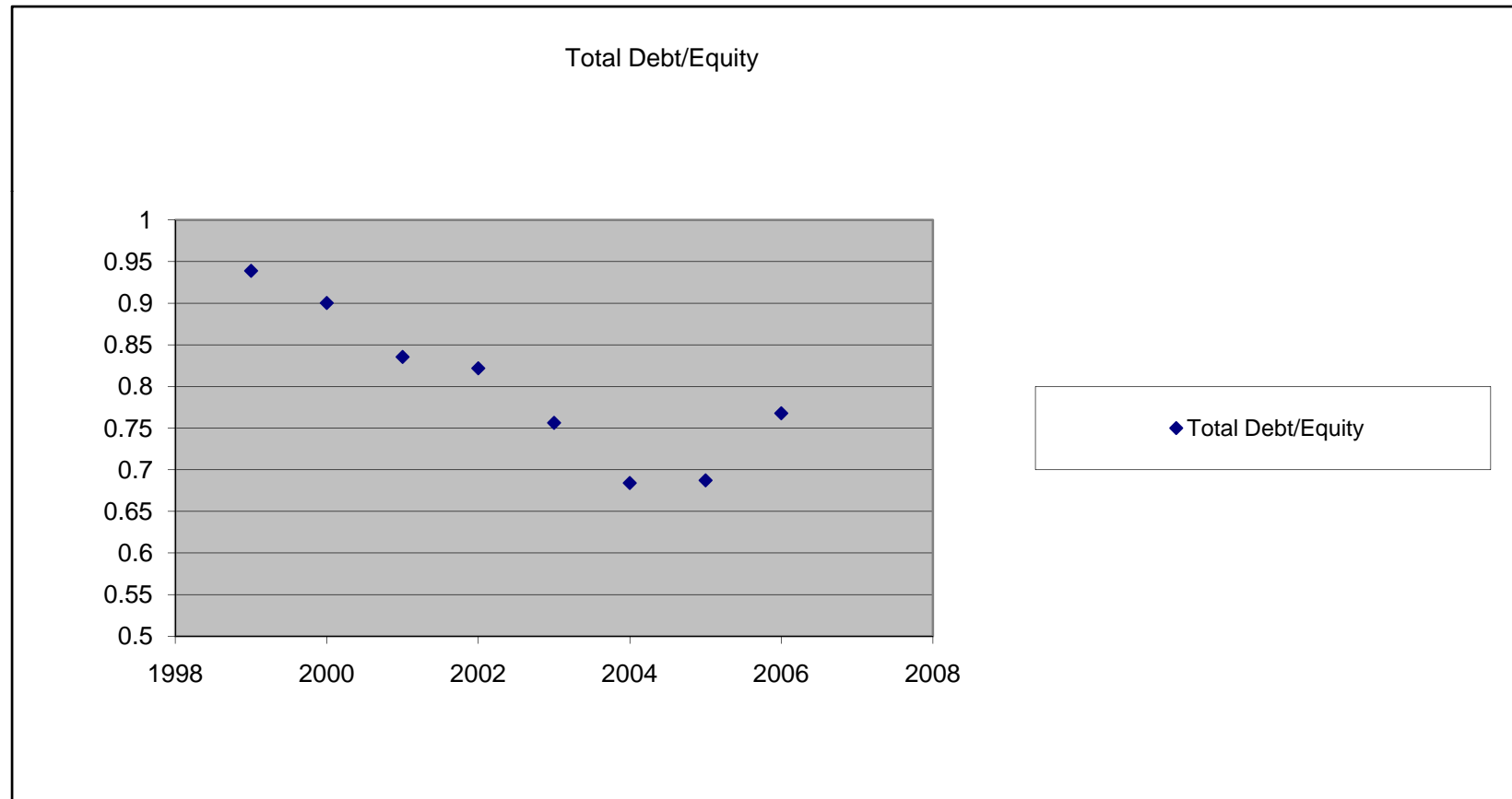
Beta for Different Leverage (1/2)

- Suppose we estimate the beta using historical data over the past when the firm had a particular financial leverage (say, $D/E=0.5$).
- We now expect the firm to change its financial leverage (say, the new $D/E=1$).
- How do we adjust the beta to reflect the new financial leverage?
- We do this using the following formula that relates the beta of the firm when it has no debt (“unlevered beta”) to its beta when it has debt (“levered beta”):
- $$\text{Beta}_{\text{levered}} = [1 + (1 - \text{tax rate}) \times (\text{Debt/Equity})] \times \text{Beta}_{\text{unlevered}}$$

Beta for Different Leverage: Example (2/2)

- We estimate the levered beta of a firm with financial leverage, $D/E=0.5$, to be 2. What would be its beta if the leverage was 1?
- First, we compute the unlevered beta, the beta if the firm had no debt. Assume the tax rate is 34%.
- Solve, $2 = [1 + (1 - 0.34) \times (0.5)] \times \text{Beta}_{\text{unlevered firm}}$,
- Therefore, $\text{Beta}_{\text{unlevered firm}}$ is 1.50.
- Now, we estimate the new levered beta with $D/E=1$.
- $\text{Beta}_{\text{levered}} = [1 + (1 - 0.34) \times (1)] \times 1.50 = 2.49$.

ConEd's Financial Leverage



ConEd's Financial Leverage

- The graph suggests that the financial leverage has been declining slightly, but it has increased in the most recent two-year period (the time-period over which we estimated the beta).
- Thus, the risk seems to be increasing and the beta that you estimate from the past data might *underestimate* the real risk of ConEd.

The Market Risk Premium (1/3)

- Next, we have to use an estimate of the market risk premium. For this, we can look at the historical returns of the S&P 500 (excess over the riskfree rate, $R_m - R_f$).
- The estimate of the market risk premium is sensitive to:
 - The length of history you use to estimate the risk premium
 - The type of averaging – geometric or arithmetic averaging.
 - Whether you consider excess returns over the 3-month treasury bill or the 30-year treasury bond.
 - The following estimates have been computed by Aswath Damodaran of NYU.

US Estimates of Market Risk Premium (2/3)

HISTORICAL RISK PREMIUM					
	Arithmetic Average			Geometric Average	
Period	Stocks-Tbill	Stocks_Tbond		Stocks-Tbill	Stocks_Tbond
1928-2003	7.92%	6.54%		5.99%	4.82%
1963-2003	6.09%	4.70%		4.85%	3.82%
1993-2003	8.43%	4.87%		6.68%	3.57%

The Market Risk Premium (3/3)

- Because we expect the stock to be of infinite life, we will use the 30-year bond rate as our proxy for the risk-free rate.
 - The 30-year rate is currently at about 4.7%.
- The geometric average more closely matches the actual holding-period returns of an investor. So we will use the geometric average as an estimate.
- Finally, let us use all the data we have for our estimate of the risk-premium (1929 onwards).
- Thus, we will use 5% as our estimate of the market risk premium.
 - But, as we do not really know what the true MRP is, we need to do sensitivity analysis.

Estimate of Required Return for ED

- Now, we can use the riskfree rate, and our estimates of the beta and MRP to estimate the cost of equity capital for ED.
- $R = R_f + \text{beta} \times (\text{MRP}) = 4.70\% + 0.37 \times 5\% = 6.54\%$.

Estimate of Stock Price

- The *current* annual dividend for EK is $0.58 \times 4 = \$2.32$ (D_0).
- The growth rate for dividends over the last few years is approximately 1%.
- Applying the Gordon Growth Model,
- $P = 2.32 \times (1 + 0.01) / (0.0654 - 0.01) = \42.47

Is the estimate of the price reasonable?

- Growth rate: Can the firm sustain the historical growth rate in earnings?
 - Earnings over the last 5 years have been volatile. The current EPS is much below its EPS of \$3.22 in 2002.
- Is dividend (approximately) equal to “free cash flow”?
 - Computations indicate that the FCFE in 2006 was *negative* – the firm did not generate enough cash to pay for growth. Dividends will have to be paid by borrowing more debt.
 - However, at the current level of dividend, the dividend payout ratio is 79%, and appears reasonable compared with analysts’ forecast of 2007 EPS of \$2.95.

Is the estimate of the price reasonable?

- Required rate of return and financial leverage:
Given the low free cash flow, it appears that the firm will have to increase debt. The data for the last two years also indicates an increase in financial leverage. An increase in financial leverage increases the required rate of return (and reduces the value of the stock).

Sensitivity of Price to Estimate of Growth Rate

