Using the Fundamental Model to Estimate PE For a High Growth Firm

The price-earnings ratio for a high growth firm can also be related to fundamentals. In the special case of the two-stage dividend discount model, this relationship can be made explicit fairly simply:

$$P_{0} = \frac{EPS_{0}*Payout Ratio*(1+g)*\left(1 - \frac{(1+g)^{n}}{(1+r)^{n}}\right)}{r-g} + \frac{EPS_{0}*Payout Ratio_{n}*(1+g)^{n}*(1+g_{n})}{(r-g_{n})(1+r)^{n}}$$

For a firm that does not pay what it can afford to in dividends, substitute FCFE/Earnings for the payout ratio.

□ Dividing both sides by the earnings per share:

 $\frac{P_0}{EPS_0} = \frac{Payout Ratio * (1+g) * \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)}{r - g} + \frac{Payout Ratio_n * (1+g)^n * (1+g_n)}{(r - g_n)(1+r)^n}$

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A Simple Example

Assume that you have been asked to estimate the PE ratio for a firm which has the following characteristics:

Variable	High Growth Phase	Stable Growth Phase
Expected Growth Rate	25%	8%
Payout Ratio	20%	50%
Beta	1.00	1.00
Number of years	5 years	Forever after year 5

Riskfree rate = T.Bond Rate = 6%

Required rate of return = 6% + 1(5.5%) = 11.5%

$$\frac{P_0}{EPS_0} = \frac{.20^*(1.25)^* \left(1 - \frac{(1.25)^5}{(1.115)^5}\right)}{.115 - .25} + \frac{.50^*(1.25)^{5*}(1.08)}{(.115 - .08)(1.115)^5} = 28.75$$

a. PE and Growth: Firm grows at x% for 5 years,8% thereafter

PE Ratios and Expected Growth: Interest Rate Scenarios



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b. PE and Risk: A Follow up Example

PE Ratios and Beta: Growth Scenarios

Example 1: Comparing PE ratios across Emerging Markets- March 2014 (pre- Ukraine)

Source: Datastream, IBES, UBS GEMs Strategy

Example 2: An Old Example with Emerging Markets: June 2000

Country	PE Ratio	Interest	GDP Real	Country
		Rates	Growth	Risk
Argentina	14	18.00%	2.50%	45
Brazil	21	14.00%	4.80%	35
Chile	25	9.50%	5.50%	15
Hong Kong	20	8.00%	6.00%	15
India	17	11.48%	4.20%	25
Indonesia	15	21.00%	4.00%	50
Malaysia	14	5.67%	3.00%	40
Mexico	19	11.50%	5.50%	30
Pakistan	14	19.00%	3.00%	45
Peru	15	18.00%	4.90%	50
Phillipines	15	17.00%	3.80%	45
Singapore	24	6.50%	5.20%	5
South Korea	21	10.00%	4.80%	25
Thailand	21	12.75%	5.50%	25
Turkey	12	25.00%	2.00%	35
Venezuela	20	15.00%	3.50%	45

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Regression Results

The regression of PE ratios on these variables provides the following –

PE = 16.16 - 7.94 Interest Rates

+ 154.40 Growth in GDP

- 0.1116 Country Risk

R Squared = 73%

What do the coefficients tell you about how each of these variables play into PE ratio differences across countries?

Predicted PE Ratios

Country	PE Ratio	Interest Pates	GDP Real	Country Disk	Predicted PE
Argentina	14	18.00%	2.50%	45	13.57
Brazil	21	14.00%	4.80%	35	18.55
Chile	25	9.50%	5.50%	15	22.22
Hong Kong	20	8.00%	6.00%	15	23.11
India	17	11.48%	4.20%	25	18.94
Indonesia	15	21.00%	4.00%	50	15.09
Malaysia	14	5.67%	3.00%	40	15.87
Mexico	19	11.50%	5.50%	30	20.39
Pakistan	14	19.00%	3.00%	45	14.26
Peru	15	18.00%	4.90%	50	16.71
Phillipines	15	17.00%	3.80%	45	15.65
Singapore	24	6.50%	5.20%	5	23.11
South Korea	21	10.00%	4.80%	25	19.98
Thailand	21	12.75%	5.50%	25	20.85
Turkey	12	25.00%	2.00%	35	13.35
Venezuela	20	15.00%	3.50%	45	15.35

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Example 3: US Stocks are expensive, just look at the PE ratio

A Counter: No, they are cheap, relative to the alternatives..

The Tie Breaker: E/P Ratios , T.Bond Rates and Term Structure

Earnings to Price versus Interest Rates: S&P 500

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Regression Results

	Earnings Yield	T.Bond Rate	Bond-Bill
Earnings Yield	1.0000		
T.Bond Rate	0.6788	1.0000	
Bond-Bill	-0.1184	-0.0630	1.0000

Correlation between E/P and interest rates

 In the following regression, using 1960-2020 data, we regress E/P ratios against the level of T.Bond rates and a term structure variable (T.Bond - T.Bill rate)

EP Ratio = 0.0359 + 0.5534 T.Bond Rate - 0.1559 (T.Bond Rate - T.Bill Rate) (6.17) (7.01) (-0.79)

R squared = 44.81%

□ Going back to 2008, this is what the regression looked like:

E/P = 2.56% + 0.7044 T.Bond Rate - 0.3289 (T.Bond Rate-T.Bill Rate) (4.71) (7.10) (1.46)

R squared = 50.71%

The R-squared has dropped and the differential with the T.Bill rate has lost significance. How would you read this result?

II. PEG Ratio

- PEG Ratio = PE ratio/ Expected Growth Rate in EPS
 - For consistency, you should make sure that your earnings growth reflects the EPS that you use in your PE ratio computation.
 - The growth rates should preferably be over the same time period.
- To understand the fundamentals that determine PEG ratios, let us return again to a 2-stage equity discounted cash flow model:

$$P_{0} = \frac{EPS_{0}*Payout Ratio*(1+g)*\left(1 - \frac{(1+g)^{n}}{(1+r)^{n}}\right)}{r-g} + \frac{EPS_{0}*Payout Ratio_{n}*(1+g)^{n}*(1+g_{n})}{(r-g_{n})(1+r)^{n}}$$

 Dividing both sides of the equation by the earnings gives us the equation for the PE ratio. Dividing it again by the expected growth 'g:

$$PEG = \frac{Payout Ratio^{*}(1+g)^{*} \left(1 - \frac{(1+g)^{n}}{(1+r)^{n}}\right)}{g(r-g)} + \frac{Payout Ratio_{n}^{*}(1+g)^{n} (1+g_{n})}{g(r-g_{n})(1+r)^{n}}$$

PEG Ratios and Fundamentals

- Risk and payout, which affect PE ratios, continue to affect PEG ratios as well.
 - Implication: When comparing PEG ratios across companies, we are making implicit or explicit assumptions about these variables.
- Dividing PE by expected growth does not neutralize the effects of expected growth, since the relationship between growth and value is not linear and fairly complex (even in a 2-stage model)

A Simple Example

 Assume that you have been asked to estimate the PEG ratio for a firm which has the following characteristics:

Variable	High Growth Phase	Stable Growth Phase
Expected Growth Rate	25%	8%
Payout Ratio	20%	50%
Beta	1.00	1.00

- Riskfree rate = T.Bond Rate = 6%
- □ Required rate of return = 6% + 1(5.5%)= 11.5%

The PEG ratio for this firm can be estimated as follows: $0.2 * (1.25) * \left(1 - \frac{(1.25)^5}{(1.115)^5}\right) + \frac{0.5 * (1.25)^5 * (1.08)}{.25(.115 - .25)} = 115 \text{ or } 1.15$

PEG Ratios and Risk

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PEG Ratios and Quality of Growth

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PE Ratios and Expected Growth

PEG Ratios and Fundamentals: Propositions

- Proposition 1: High risk companies will trade at much lower PEG ratios than low risk companies with the same expected growth rate.
 - Corollary 1: The company that looks most under valued on a PEG ratio basis in a sector may be the riskiest firm in the sector
- Proposition 2: Companies that can attain growth more efficiently by investing less in better return projects will have higher PEG ratios than companies that grow at the same rate less efficiently.
 - Corollary 2: Companies that look cheap on a PEG ratio basis may be companies with high reinvestment rates and poor project returns.
- Proposition 3: Companies with very low or very high growth rates will tend to have higher PEG ratios than firms with average growth rates. This bias is worse for low growth stocks.
 - Corollary 3: PEG ratios do not neutralize the growth effect.

III. Price to Book Ratio

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□ Going back to a simple dividend discount model,

$$P_0 = \frac{DPS_1}{r - g_n}$$

Defining the return on equity (ROE) = EPSO / Book Value of Equity, the value of equity can be written as:

$$P_{0} = \frac{BV_{0}*ROE*Payout Ratio*(1+g_{n})}{r-g_{n}}$$
$$\frac{P_{0}}{BV_{0}} = PBV = \frac{ROE*Payout Ratio*(1+g_{n})}{r-g_{n}}$$

 If the return on equity is based upon expected earnings in the next time period, this can be simplified to,

$$\frac{P_0}{BV_0} = PBV = \frac{ROE*Payout Ratio}{r-g_n}$$

Price Book Value Ratio: Stable Growth Firm Another Presentation

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- This formulation can be simplified even further by relating growth to the return on equity:

g = (1 - Payout ratio) * ROE

Substituting back into the P/BV equation,

$$\frac{P_0}{BV_0} = PBV = \frac{ROE - g_n}{r - g_n}$$

- The price-book value ratio of a stable firm is determined by the differential between the return on equity and the required rate of return on its projects.
- Building on this equation, a company that is expected to generate a ROE higher (lower than, equal to) its cost of equity should trade at a price to book ratio higher (less than, equal to) one.

Now changing to an Enterprise value multiple EV/ Book Capital

To see the determinants of the value/book ratio, consider the simple free cash flow to the firm model: $V_0 = \frac{FCFF_1}{WACC - g}$ Dividing both sides by the book value, we get: $\frac{V_0}{BV} = \frac{FCFF_1/BV}{WACC-g}$ \square If we replace, FCFF = EBIT(1-t) - (g/ROC) EBIT(1-t), we get: $\frac{V_0}{BV} = \frac{ROC - g}{WACC - g}$

IV. EV to EBITDA - Determinants

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□ The value of the operating assets of a firm can be written as:

$$EV_0 = \frac{FCFF_1}{WACC - g}$$

Now the value of the firm can be rewritten as

$$EV = \frac{EBITDA (1-t) + Depr (t) - Cex - \Delta Working Capital}{WACC - g}$$

Dividing both sides of the equation by EBITDA,

 $\frac{\text{EV}}{\text{EBITDA}} = \frac{(1-t)}{\text{WACC} - g} + \frac{\text{Depr (t)/EBITDA}}{\text{WACC} - g} - \frac{\text{CEx/EBITDA}}{\text{WACC} - g} - \frac{\Delta \text{ Working Capital/EBITDA}}{\text{WACC} - g}$

- □ The determinants of EV/EBITDA are:
 - The cost of capital
 - Expected growth rate
 - Tax rate
 - Reinvestment rate (or ROC)

A Simple Example

- Consider a firm with the following characteristics:
 - Tax Rate = 36%
 - Capital Expenditures/EBITDA = 30%
 - Depreciation/EBITDA = 20%
 - Cost of Capital = 10%
 - The firm has no working capital requirements
 - The firm is in stable growth and is expected to grow 5% a year forever.
- In this case, the Value/EBITDA multiple for this firm can be estimated as follows:

$$\frac{\text{Value}}{\text{EBITDA}} = \frac{(1 - .36)}{.10 - .05} + \frac{(0.2)(.36)}{.10 - .05} - \frac{0.3}{.10 - .05} - \frac{0}{.10 - .05} = 8.24$$

The Determinants of EV/EBITDA

V. EV/Sales Ratio

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If pre-tax operating margins are used, the appropriate value estimate is that of the firm. In particular, if one makes the replaces the FCFF with the expanded version:

Free Cash Flow to the Firm = EBIT (1 - tax rate) (1 - Reinvestment Rate)

$$\frac{\text{Value}}{\text{Sales}_{0}} = \text{After-tax Oper. Margin}^{*} \left[\frac{(1-\text{RIR}_{\text{growth}})(1+g)^{*} \left(1 - \frac{(1+g)^{n}}{(1+\text{WACC})^{n}}\right)}{\text{WACC-g}} + \frac{(1-\text{RIR}_{\text{stable}})(1+g)^{n}*(1+g_{n})}{(\text{WACC-g}_{n})(1+\text{WACC})^{n}} \right]$$

$$g = \text{Growth rate in after-tax operating income for the first n years}$$

$$gn = \text{Growth rate in after-tax operating income after n years forever (Stable growth rate)}$$

$$\text{RIR}_{\text{Growth, Stable}} = \text{Reinvestment rate in high growth and stable periods}$$

$$\text{WACC = Weighted average cost of capital}$$

The value of a brand name

- One of the critiques of traditional valuation is that is fails to consider the value of brand names and other intangibles.
- The approaches used by analysts to value brand names are often ad-hoc and may significantly overstate or understate their value.
- One of the benefits of having a well-known and respected brand name is that firms can charge higher prices for the same products, leading to higher profit margins and hence to higher price-sales ratios and firm value. The larger the price premium that a firm can charge, the greater is the value of the brand name.
- In general, the value of a brand name can be written as:
 - Value of brand name ={(V/S)_b-(V/S)_g}* Sales
 - (V/S)_b = Value of Firm/Sales ratio with the benefit of the brand name
 - (V/S)_g = Value of Firm/Sales ratio of the firm with the generic product

Valuing Brand Name

	Coca Cola	With Cott Margins
Current Revenues =	\$21,962.00	\$21,962.00
Length of high-growth period	10	10
Reinvestment Rate =	50%	50%
Operating Margin (after-tax)	15.57%	5.28%
Sales/Capital (Turnover ratio)	1.34	1.34
Return on capital (after-tax)	20.84%	7.06%
Growth rate during period (g) =	10.42%	3.53%
Cost of Capital during period =	7.65%	7.65%
Stable Growth Period		
Growth rate in steady state =	4.00%	4.00%
Return on capital =	7.65%	7.65%
Reinvestment Rate =	52.28%	52.28%
Cost of Capital =	7.65%	7.65%
Value of Firm =	\$79,611.25	\$15,371.24

Value of brand name = \$79,611 -\$15,371 = \$64,240 million

The Determinants of Multiples...

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Net Margin)

EV/IC =

EV/ IC = (ROIC)(1-

RIR)/ (WACC -g)

Application Tests

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- Given the firm that we are valuing, what is a "comparable" firm?
 - While traditional analysis is built on the premise that firms in the same sector are comparable firms, valuation theory would suggest that a comparable firm is one which is similar to the one being analyzed in terms of fundamentals.
 - There is no reason why a firm cannot be compared with another firm in a very different business, if the two firms have the same risk, growth and cash flow characteristics.
- Given the comparable firms, how do we adjust for differences across firms on the fundamentals?
 - It is impossible to find an exactly identical firm to the one you are valuing.
 - You need to control for differences across firms.

1. The Sampling Choice

- Ideally, you would like to find lots of publicly traded firms that look just like your firm, in terms of fundamentals, and compare the pricing of your firm to the pricing of these other publicly traded firms. Since, they are all just like your firm, there will be no need to control for differences.
- In practice, it is very difficult (and perhaps impossible) to find firms that share the same risk, growth and cash flow characteristics of your firm.
 Even if you are able to find such firms, they will very few in number. The trade off then becomes:

Small sample of firms that are "just like" your firm

Large sample of firms that are similar in some dimensions but different on others

Aswath Damodaran