I. PE RATIOS

- To understand the fundamentals, start with a basic equity discounted cash flow model.
 - With the dividend discount model, P

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

• Dividing both sides by the current earnings per share,

$$\frac{P_0}{EPS_0} = PE = \frac{Payout Ratio^*(1+g_n)}{r-g_n}$$

If you believe that companies don't pay out what they can:

$$P_0 = \frac{FCFE_1}{r - g_n} \qquad \qquad \frac{P_0}{EPS_0} = PE = \frac{(FCFE/Earnings)^*(1 + g_n)}{r - g_n}$$

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:

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

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	Stable Growth
Expected Growth Rate	15%	1.5%
Payout Ratio	25%	92.5% (based on ROE = 20%)
Beta	1.00	1.00
Number of years	5 years	Forever after year 5

- Riskfree rate = Treasury Bond Rate = 1.5%, ERP = 5%
- Required rate of return = 1.5% + 1(5%) = 6.5%

$$PE = \frac{.25 * 1.15 * \left(1 - \frac{1.15^5}{1.065^5}\right)}{(.065 - .15)} + \frac{.925 * 1.15^5 * (1.015)}{(.065 - .015)(1.065)^5} = 29.15$$

A. PE, GROWTH AND INTEREST RATES

As interest rates rise, holding all else constant, PE ratios drop, but they drop by more for high growth stocks than low growth stocks.

						-	
				% Change as rate goes			
		0.00%	1.50%	3.00%	4.50%	6.00%	from 0% to 6%
5	0.00%	20.00	17.86	15.91	14.13	12.50	37.50%
ext	3.00%	22.18	19.74	17.51	15.48	13.62	38.59%
- N	6.00%	24.57	21.79	19.26	16.95	14.84	39.60%
te .	9.00%	27.19	24.04	21.16	18.54	16.16	40.57%
Ra	12.00%	30.05	26.49	23.24	20.27	17.38	42.16%
vth 'eai	15.00%	33.17	29.15	25.48	22.15	19.11	42.39%
lore L	18.00%	36.57	32.04	27.92	24.17	20.75	43.26%
) <i>p</i> a	21.00%	40.25	35.18	30.55	26.35	22.52	44.05%
cte	24.00%	44.25	38.56	33.39	28.69	24.41	44.84%
<i>sdx</i>	27.00%	48.56	42.22	36.45	31.20	26.43	45.57%
E	30.00%	53.22	46.16	39.74	33.90	28.58	46.30%
% Change	e as growth goes						
from	0% to 30%	166.10%	158.45%	149.78%	139.92%	128.64%	

Earnings growth surprises have a much bigger impact on PE ratios, when interest rates are low, than high.

B. PE AND RISK: A FOLLOW UP EXAMPLE

Growth Augmentation If a firm can increase growth, it should see a payoff in higher PE Superstars

Combination of low risk and high growth

İ i		5.00%	10.00%	15.00%	20.00%	25.00%	
	0.50	43.26	52.68	63.79	76.81	91.96	Pick Po
	1.00	21.09	24.83	29.15	34.10	39.75	If a firm car
3eta	1.50	13.74	15.67	17.84	20.25	22.91	risk, it sho
_	2.00	10.10	11.17	12.33	13.56	14.84	payoff in
	2.50	7.93	8.53	9.13	9.71	10.24	

Risk Reduction firm can reduce its

risk, it should see a payoff in higher PE

Investment Dogs

Combination of high

risk and low growth

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C. PE AND GROWTH QUALITY: VALUE ADDITION AND DESTRUCTION

For any given growth rate, the higher the ROE, the higher the PE ratio of the stock.

		Expected Growth Rate for next 5 years					
		5%	10%	15%	20%	25%	
S	5%	13.24	11.19	8.2	4.04	Worthless	
ent	10%	18.47	20.28	22.16	24.08	25.99	
DE c stm	15%	20.21	23.31	26.82	30.76	35.17	
RC	20%	21.09	24.83	29.15	34.1	39.75	
	25%	21.61	25.74	30.55	36.11	42.5	
	Cost of equity $= 6.5\%$						

When ROE < Cost of equity, increasing growth lowers PE ratio

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EXAMPLE 1: THE CHEAPEST MARKETS AT THE START OF 2024

Country	# firms	median(EV/EBITDA)	median(Trailing PE)
Zambia	15	3.75	4.31
Kenya	50	3.70	4.43
Ghana	23	2.74	5.34
Cyprus	64	8.14	6.08
Pakistan	424	5.14	6.24
Serbia	17	5.64	6.69
Kazakhstan	21	5.78	6.82
Isle of Man	16	5.34	7.32
Sri Lanka	262	7.09	7.49
Mauritius	75	8.72	7.51
Tanzania	15	6.27	7.52
Nigeria	126	5.40	7.90
Macau	16	4.87	8.30
Ivory Coast	34	4.39	8.41
Tunisia	76	7.73	8.68
Bermuda	62	7.46	8.69
Malawi	14	5.02	8.71
Colombia	28	5.36	8.71
Chile	122	6.80	8.84
Lithuania	29	7.47	8.87

EXAMPLE 2: CONTROLLING FOR DIFFERENCES - 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

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	GDP Real	Country	Predicted PE
		Rates	Growth	Risk	
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

EXAMPLE 3: US STOCKS ARE EXPENSIVE, JUST LOOK AT THE PE RATIO



PE Ratios for S&P 500: 1960 to 2023

A COUNTER: NO, THEY ARE CHEAP, RELATIVE TO THE ALTERNATIVES..



THE TIE BREAKER: E/P RATIOS, T.BOND RATES AND TERM STRUCTURE



REGRES	SION]	RESULTS		
	Earnings Yield	T. Bond Rate	T.Bond minus T.Bill	
Earnings Yield	1.0000			C
T. Bond Rate	0.6873	1.0000		
T.Bond minus T.Bill	-0.0544	-0.0175	1.0000	

Correlation between E/P and interest rate

- In the following regression, using 1960-2025 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 = 0.0341 + 0.5618 T.Bond Rate 0.1161 (T.Bond Rate T.Bill Rate) (6.47) (7.45) (-0.08)
 - R squared = 47.4%
- In 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:

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

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).
- In short, using a PEG ratio and assuming that you can ignore growth differences is pricing malpractice.

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	15%	1.5%
Payout Ratio	25%	92.5%
Beta	1.00	1.00

- Riskfree rate = Treasury Bond Rate = 1.5%, ERP = 5%
- Required rate of return = 1.5% + 1(5%) = 6.5%
- The PEG ratio for this firm can be estimated as follows $PEG = \frac{.25 * 1.15 * \left(1 - \frac{1.15^5}{1.065^5}\right)}{.15 * (.065 - .15)} + \frac{.925 * 1.15^5 * (1.015)}{.15(.065 - .015)(1.065)^5} = 1.94$

A. PEG RATIOS ARE RISK-SENSITIVE

PEG Ratios, Risk and Growth



Aswath Damodaran

B. PEG RATIOS ARE AFFECTED BY THE QUALITY OF GROWTH

PEG ratios tend to increase with ROE, for every given growth rate.

		5%	10%	15%	20%	25%	
s	5%	2.65	1.12	0.55	0.20	NA	High growth
ent	10%	3.69	2.03	1.48	1.20	1.04	firms with very
DE c stm	15%	4.04	2.33	1.79	1.54	1.41	low ROE can
R(20%	4.22	2.48	1.94	1.71	1.59	trade at very
-	25%	4.32	2.57	2.04	1.81	1.70	low PEG ratios.

C. PEG RATIOS ARE NOT GROWTH NEUTRAL...

As risk free rates rise, PEG ratios decrease, for every growth rate.

			Riskfre			
		1.50%	3.00%	4.50%	6.00%	As growth
th	3.00%	4.34	3.89	3.48	3.10	increases, PEG
owi	15.00%	1.94	1.70	1.48	1.27	ratios initially
l Gr	30.00%	1.54	1.32	1.13	0.95	decline, but at a
tea st 5	45.00%	1.57	1.33	1.12	0.92	high-enough growth
pec firs	60.00%	1.73	1.45	1.20	0.97	rate, PEG ratios rise
EX	75.00%	1.97	1.63	1.33	1.06	again.

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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.