#### VALUATION: PACKET 2 RELATIVE VALUATION, ASSET-BASED VALUATION AND PRIVATE COMPANY VALUATION

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# THE ESSENCE OF RELATIVE VALUATION (PRICING)

- In relative valuation, the price of an asset is compared to the prices assessed by the market for similar or comparable assets.
- To do relative valuation then,
  - we need to identify comparable assets and obtain market pricing for these assets
  - convert these market prices into standardized prices, since the absolute prices cannot be compared This process of standardizing creates price multiples.
  - compare the standardized price or multiple for the asset being analyzed to the standardized prices for comparable assets, controlling for any differences between the firms that might affect the multiple, to judge whether the asset is under or over priced.

#### RELATIVE VALUATION IS PERVASIVE...

- Most asset valuations are relative.
- Most equity valuations on Wall Street are relative valuations.
  - Almost 85% of equity research reports are based upon a multiple and comparable firms.
  - More than 50% of all acquisition valuations are based upon multiples.
  - **Rules of thumb** based on multiples are not only common but are often the basis for final valuation judgments.
- While there are more discounted cashflow valuations in consulting and corporate finance, they are often relative valuations masquerading as discounted cash flow valuations.
  - The objective in many discounted cashflow valuations is to back into a number that has been obtained by using a multiple.
  - The terminal value in a significant number of discounted cashflow valuations is estimated using a multiple.

# WHY RELATIVE VALUATION?

 "If you think I'm crazy, you should see the guy who lives across the hall"

Jerry Seinfeld talking about Kramer in a Seinfeld episode



" A little inaccuracy sometimes saves tons of explanation"

H.H. Munro

" If you are going to screw up, make sure that you have lots of company"

Ex-portfolio manager

# THE MARKET IMPERATIVE....

- Relative valuation is much more likely to reflect market perceptions and moods than discounted cash flow valuation. This can be an advantage when it is important that the price reflect these perceptions as is the case when
  - the objective is to sell a security at that price today (as in the case of an IPO)
  - investing on "momentum" based strategies
- With relative valuation, there will always be a significant proportion of securities that are under valued and over valued.
- Since portfolio managers are judged based upon how they perform on a relative basis (to the market and other money managers), relative valuation is more tailored to their needs

# MULTIPLES ARE JUST STANDARDIZED ESTIMATES OF PRICE...



# THE FOUR STEPS TO DECONSTRUCTING MULTIPLES

- Define the multiple
  - In use, the same multiple can be defined in different ways by different users. When comparing and using multiples, estimated by someone else, it is critical that we understand how the multiples have been estimated
- Describe the multiple
  - If you do not know what the crosssectional distribution of a multiple is, it is difficult to look at a number and pass judgment on whether it is too high or low.
- Analyze the multiple
  - It is critical that we understand the fundamentals that drive each multiple, and the nature of the relationship between the multiple and each variable.
- Apply the multiple
  - Defining the comparable universe and controlling for differences is far more difficult in practice than it is in theory.

# DEFINITIONAL TESTS

- Is the multiple consistently defined?
  - Proposition 1: Both the value (the numerator) and the standardizing variable ( the denominator) should be to the same claimholders in the firm.
  - In other words, the value of equity should be divided by equity earnings or equity book value, and firm value should be divided by firm earnings or book value.

#### Is the multiple uniformly estimated?

- The variables used in defining the multiple should be estimated uniformly across assets in the "comparable firm" list.
- If earnings-based multiples are used, the accounting rules to measure earnings should be applied consistently across assets. The same rule applies with book-value based multiples.

## **EXAMPLE 1: PRICE EARNINGS RATIO: DEFINITION**

- PE = Market Price per Share / Earnings per Share
- There are many variants on the basic PE ratio in use. They are based upon how the price and the earnings are defined.
   Price: is usually the current price

is sometimes the average price for the year

EPS: EPS in most recent financial year
EPS in trailing 12 months
Forecasted earnings per share next year
Forecasted earnings per share in future year

# EXAMPLE 2: STAYING ON PE RATIOS

- Assuming that you are comparing the PE ratios across technology companies, many of which have options outstanding. What measure of PE ratio would yield the most consistent comparisons?
  - a. Price/ Primary EPS (actual shares, no options)
  - b. Price/Fully Diluted EPS (actual shares + all options)
  - c. Price/ Partially Diluted EPS (counting only in-the-money options)
  - d. Other

# EXAMPLE 3: ENTERPRISE VALUE /EBITDA MULTIPLE

 The enterprise value to EBITDA multiple is obtained by netting cash out against debt to arrive at enterprise value and dividing by EBITDA.

 $\frac{\text{Enterprise Value}}{\text{EBITDA}} = \frac{\text{Market Value of Equity} + \text{Market Value of Debt} - \text{Cash}}{\text{Earnings before Interest, Taxes and Depreciation}}$ 

- a. Why do we net out cash from firm value?
- b. What happens if a firm has cross holdings which are categorized as:
  - Minority interests?
  - Majority active interests?

# EXAMPLE 4: A HOUSING PRICE MULTIPLE

- The bubbles and busts in housing prices has led investors to search for a multiple that they can use to determine when housing prices are getting out of line.
- One measure that has acquired adherents is the ratio of housing price to annual net rental income (for renting out the same house).
- Assume that you decide to compute this ratio and compare it to the multiple at which stocks are trading. Which valuation ratio would be the one that corresponds to the house price/rent ratio?
  - a. Price Earnings Ratio
  - b. EV to Sales
  - c. EV to EBITDA
  - d. EV to EBIT

# DESCRIPTIVE TESTS

- What is the **average and standard deviation** for this multiple, across the universe (market)?
- What is the median (and quartiles or deciles) for this multiple?
  - The median for this multiple is often a more reliable comparison point.
- How large are the outliers to the distribution, and how do we deal with the outliers?
  - Throwing out the outliers may seem like an obvious solution, but if the outliers all lie on one side of the distribution (they usually are large positive numbers), this can lead to a biased estimate.
- Are there cases where the multiple cannot be estimated? Will ignoring these cases lead to a biased estimate of the multiple?
- How has this multiple changed over time?

#### 1. MULTIPLES HAVE SKEWED DISTRIBUTIONS... US COMPANY PE RATIOS



PE Ratios at the start of 2025: United States



# 2. MAKING STATISTICS "DICEY"

	Current PE	Trailing PE	Forward PE
Sample Size	6062	6062	6062
# firms	2607	2576	2339
Average	57.11	48.86	31.6
Minimum	0.03	0.04	1.41
First Quartile	10.61	11.43	11.65
Median	18.66	18.73	17.24
Third Quartile	35.12	33.17	27.26
Maximum	7900	9489	3825
Skewness	15.92	26.45	23.62

US firms in January 2025

## 3. MARKETS HAVE A LOT IN COMMON : COMPARING GLOBAL PES



PE Ratios in January 2025: US and Global Stocks

#### 3A. AND THE DIFFERENCES ARE SOMETIMES REVEALING... PRICE TO BOOK RATIOS ACROSS GLOBE — JANUARY 2025



Price to Book Ratios in January 2025

US Global

#### 4. SIMPLISTIC RULES ALMOST ALWAYS BREAK DOWN...6 TIMES EBITDA WAS NOT CHEAP IN 2010...



# BUT IT MAY WORK IN 2025, UNLESS YOU ARE IN JAPAN OR RUSSIA..



EV to EBITDA in January 2025

US Global

# ANALYTICAL TESTS

- What are the **fundamentals** that determine and drive these multiples?
  - Proposition 2: Embedded in every multiple are all of the variables that drive every discounted cash flow valuation - growth, risk and cash flow patterns.

#### • How do **changes in these fundamentals** change the multiple?

- The relationship between a fundamental (like growth) and a multiple (such as PE) is almost never linear.
- Proposition 3: It is impossible to properly compare firms on a multiple, if we do not know how fundamentals and the multiple move.

# A SIMPLE ANALYTICAL DEVICE

	Start with a basic intrinsic value model	Divide both sides of the equation by the denominator of the multiple that you are trying to deconstruct,.	You should end up with an intrinsic version of your multiple, which should relate it to fundamentals.
lf Equity Multiple	Start with a dividend or FCFE model, preferably simple.	Divide your dividend or FCFE model by denominator of equity multiple.	Intrinsic version of equity multiple, with drivers of value
	Price= EPS * Payout / (r -g)	Prtce/Book = ROE * Payout / (r -g)	Price/Book = f(ROE, r, g, Payout)
If EV	Start with a operating asset value model, preferably simple.	Divide your operating asset model by denominator of EV multiple.	Intrinsic version of EV multiple, with drivers of value
Multiple	EV= EBIT (1-t) (1- BIB)/	ENVICATION Attraction Operation	

EV= EBIT (1-t) (1- RIR)/ (WACC -g)

EV/Sales = After-tax Operating Margin (1- RIR)/ (WACC -g) EV/Sales = f(After-tax Operating Margin, RIR, WACC, g)

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# 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

			Expected Growth Rate next 5 years					
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	
<b>_</b>	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 ]	RESUI	JTS	
	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



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#### B. PEG RATIOS ARE AFFECTED BY THE QUALITY OF GROWTH

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

			Expected Growth Rate for next 5 years						
		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
teo 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.

# **III. BOOK VALUE MULTIPLES**

- With book value multiples, you scale the market value (which is what the market values your company at) to its book value (which is the accounting estimate of value. It can take two forms:
  - Price to Book = Market Capitalization/ Book Value of Equity
  - EV to Invested Capital = Enterprise Value/ (Book Value of Equity + Book Value of Debt – Cash)
- To the extent that you believe that accountants have a better (or a more conservative) estimate of value, or that book value is a proxy for liquidation value, a company that trades at below its book value is cheap.

## PRICE TO BOOK RATIO: DETERMINANTS

Going back to a simple dividend discount model,

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

 Defining the return on equity (ROE) = EPS0 / 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,

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

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#### PRICE BOOK VALUE RATIO: STABLE GROWTH FIRM ANOTHER PRESENTATION

- 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:

$$V_0 = \frac{\Gamma C \Gamma \Gamma_1}{WACC - g}$$

Dividing both sides by the book value, we get:

$$\frac{V_0}{BV} = \frac{FCFF_1/BV}{WACC-g}$$

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 MULTIPLES

- With EV to EBITDA multiples, you scale enterprise value to earnings before interest, taxes, depreciation and amortization:
  - EV to EBITDA = Enterprise Value/ EBITDA
  - There are variants where even more gets added back, including stock-based compensation and R&D
- EV to EBITDA multiples have become far more widely used in the last four decades than they used to be for both good and bad reasons:
  - The good reasons include less sampling bias (since fewer companies have negative EBITDA) and that it is based on cash flows.
  - The bad reason is that it will give you lower absolute numbers than PE ratios, and for those without perspective, that may signify cheapness.

### EV TO EBITDA - DETERMINANTS

• 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,

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

- The determinants of EV/EBITDA are:
  - 1. The cost of capital
  - 2. Expected growth rate
  - 3. Tax rate
  - 4. 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



Yalue/EBITDA and Net Cap Ex Ra



Reinvestment Needs





# **V. REVENUE MULTIPLES**

- With revenue multiples, you scale market value to the revenues generated by a firm. There are two variants in use:
  - Price to Sales = Market Capitalization / Sales
  - EV to Sales = Enterprise Value / Sales
- The former, while widely used, is internally inconsistent and can be misleading for firms with significant debt loads and/or cash holdings.
- The biggest selling point for revenue multiples is that you lose far fewer firms when computing the multiple, since revenues cannot be negative.
- That said, you cannot compute this ratio for firms that either have no reportable revenues (financial service firms) or use wide variants on revenues (payment processing firms).

## **EV/SALES RATIO: DETERMINANTS**

- 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)

$$\frac{\text{Value}}{\text{Sales}_0} = \text{After-tax Oper. Margin}^* \left[ \frac{(1-\text{RIR}_{\text{growth}})(1+g)^* \left(1 - \frac{(1+g)^n}{(1+\text{WACC})^n}\right)}{\text{WACC-g}} + \frac{(1-\text{RIR}_{\text{stable}})(1+g)^n * (1+g_n)}{(\text{WACC-g}_n)(1+\text{WACC})^n} \right] \right]$$

- g = Growth rate in after-tax operating income for the first n years
- gn = Growth rate in after-tax operating income after n years forever (Stable growth rate)
- RIR Growth, Stable = Reinvestment rate in high growth and stable periods
- 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...



# **APPLICATION TESTS**

- 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.

# 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

# THE "CONTROL FOR DIFFERENCES" CHOICES

- 1. **Direct comparisons**: If the comparable firms are "just like" your firm, you can compare multiples directly across the firms and conclude that your firm is expensive (cheap) if it trades at a multiple higher (lower) than the other firms.
- 2. **Story telling**: If there is a key dimension on which the firms vary, you can tell a story based upon your understanding of how value varies on that dimension.

An example: This company trades at 12 times earnings, whereas the rest of the sector trades at 10 times earnings, but I think it is cheap because it has a much higher growth rate than the rest of the sector.

- **3. Modified multiple**: You can modify the multiple to incorporate the dimension on which there are differences across firms.
- 4. Statistical techniques: If your firms vary on more than one dimension, you can try using multiple regressions (or variants thereof) to arrive at a "controlled" estimate for your firm.

### 1. JUST STORY TELLING TRAILING PE ACROSS BEVERAGE COMPANIES

Company Name	Trailing PE	Expected Growth	Standard Deviation
Coca-Cola Bottling	29.18	9.50%	20.58%
Molson Inc. Ltd. 'A'	43.65	15.50%	21.88%
Anheuser-Busch	24.31	11.00%	22.92%
Corby Distilleries Ltd.	16.24	7.50%	23.66%
Chalone Wine Group	21.76	14.00%	24.08%
Andres Wines Ltd. 'A'	8.96	3.50%	24.70%
Todhunter Int'l	8.94	3.00%	25.74%
Brown-Forman 'B'	10.07	11.50%	29.43%
Coors (Adolph) 'B'	23.02	10.00%	29.52%
PepsiCo, Inc.	33.00	10.50%	31.35%
Coca-Cola	44.33	19.00%	35.51%
Boston Beer 'A'	10.59	17.13%	39.58%
Whitman Corp.	25.19	11.50%	44.26%
Mondavi (Robert) 'A'	16.47	14.00%	45.84%
Coca-Cola Enterprises	37.14	27.00%	51.34%
Hansen Natural Corp	9.70	17.00%	62.45%

#### Aswath Damodaran

# A QUESTION

- You are reading an equity research report on this sector, and the analyst claims that Andres Wine and Hansen Natural are under valued because they have low PE ratios. Would you agree?
  - a. Yes
  - b. No
- Why or why not?

#### 2: STATISTICAL CONTROLS COMPARING PE RATIOS ACROSS TELECOM COMPANIES

Company Name	PE	Growth
PT Indosat ADR	7.8	0.06
Telebras ADR	8.9	0.075
Telecom Corporation of New Zealand ADR	11.2	0.11
Telecom Argentina Stet - France Telecom SA ADR B	12.5	0.08
Hellenic Telecommunication Organization SA ADR	12.8	0.12
Telecomunicaciones de Chile ADR	16.6	0.08
Swisscom AG ADR	18.3	0.11
Asia Satellite Telecom Holdings ADR	19.6	0.16
Portugal Telecom SA ADR	20.8	0.13
Telefonos de Mexico ADR L	21.1	0.14
Matav RT ADR	21.5	0.22
Telstra ADR	21.7	0.12
Gilat Communications	22.7	0.31
Deutsche Telekom AG ADR	24.6	0.11
British Telecommunications PLC ADR	25.7	0.07
Tele Danmark AS ADR	27	0.09
Telekomunikasi Indonesia ADR	28.4	0.32
Cable & Wireless PLC ADR	29.8	0.14
APT Satellite Holdings ADR	31	0.33
Telefonica SA ADR	32.5	0.18
Royal KPN NV ADR	35.7	0.13
Telecom Italia SPA ADR	42.2	0.14
Nippon Telegraph & Telephone ADR	44.3	0.2
France Telecom SA ADR	45.2	0.19
Korea Telecom ADR	71.3	0.44

# PE, GROWTH AND RISK

- Dependent variable is: PE
- R squared = 66.2% R squared (adjusted) = 63.1%

Variable	Coefficient	SE	t-ratio	Probability
Constant	13.1151	3.471	3.78	0.0010
Growth rate	121.223	19.27	6.29	$\leq$ 0.0001
Emerging Market	-13.8531	3.606	-3.84	0.0009

Emerging Market is a dummy: 1 if emerging market 0 if not

## IS TELEBRAS UNDER VALUED?

- Plugging in Telebras's expected growth rate and the fact that it is an emerging market company into the regression:
  - Predicted PE = 13.12 + 121.22 (.075) 13.85 (1) = 8.35
  - At an actual price to earnings ratio of 8.9, Telebras is slightly overvalued.
- Bottom line: Just because a company trades at a low PE ratio does not make it cheap.

## 3: AN EYEBALLING EXERCISE PBV RATIOS ACROSS EUROPEAN BANKS IN 2010

Name	PBV Ratio	Return on Equity	Standard Deviation
BAYERISCHE HYPO-UND VEREINSB	0.80	-1.66%	49.06%
COMMERZBANK AG	1.09	-6.72%	36.21%
DEUTSCHE BANK AG -REG	1.23	1.32%	35.79%
BANCA INTESA SPA	1.66	1.56%	34.14%
BNP PARIBAS	1.72	12.46%	31.03%
BANCO SANTANDER CENTRAL HISP	1.86	11.06%	28.36%
SANPAOLO IMI SPA	1.96	8.55%	26.64%
BANCO BILBAO VIZCAYA ARGENTA	1.98	11.17%	18.62%
SOCIETE GENERALE	2.04	9.71%	22.55%
ROYAL BANK OF SCOTLAND GROUP	2.09	20.22%	18.35%
HBOS PLC	2.15	22.45%	21.95%
BARCLAYS PLC	2.23	21.16%	20.73%
UNICREDITO ITALIANO SPA	2.30	14.86%	13.79%
KREDIETBANK SA LUXEMBOURGEOI	2.46	17.74%	12.38%
ERSTE BANK DER OESTER SPARK	2.53	10.28%	21.91%
STANDARD CHARTERED PLC	2.59	20.18%	19.93%
HSBC HOLDINGS PLC	2.94	18.50%	19.66%
LLOYDS TSB GROUP PLC	3.33	32.84%	18.66%
Average	2.05	12.54%	24.99%
Median	2.07	11.82%	21.93%

# THE MEDIAN TEST...

- We are looking for stocks that trade at low price to book ratios, while generating high returns on equity, with low risk. But what is a low price to book ratio? Or a high return on equity? Or a low risk
- One simple measure of what is par for the sector are the median values for each of the variables. A simplistic decision rule on under and over valued stocks would therefore be:
  - **Undervalued stocks**: Trade at price to book ratios below the median for the sector, (2.07), generate returns on equity higher than the sector median (11.82%) and have standard deviations lower than the median (21.93%).
  - Overvalued stocks: Trade at price to book ratios above the median for the sector and generate returns on equity lower than the sector median.

# THE STATISTICAL ALTERNATIVE

- We are looking for stocks that trade at low price to book ratios, while generating high returns on equity. But what is a low price to book ratio? Or a high return on equity?
- Taking the sample of 18 banks, we ran a regression of PBV against ROE and standard deviation in stock prices (as a proxy for risk).

PBV =	2.27	+	3.63 ROE-	2.68 Std dev
	(5.56)		(3.32)	(2.33)

R squared of regression = 79%

- Reading the regression tea leaves:
  - Every 1% increase in the return on equity at a European bank increases its price to book ratio by 0.0363.
  - Every 1% increase in the standard deviation in equity reduces the price to book ratio by 0.0268.
  - The regression predictions will have a range, the size of which is inversely proportionate to the R squared.

# AND THESE PREDICTIONS?

Name	PBV Ratio	Return on Equity	Standard Deviation	Predicted PBV	Under/Over (%)
BAYERISCHE HYPO-UND VEREINSB	0.80	-1.66%	49.06%	0.89	-10.60%
COMMERZBANK AG	1.09	-6.72%	36.21%	1.05	3.25%
DEUTSCHE BANK AG -REG	1.23	1.32%	35.79%	1.36	-9.26%
BANCA INTESA SPA	1.66	1.56%	34.14%	1.41	17.83%
BNP PARIBAS	1.72	12.46%	31.03%	1.89	-8.75%
BANCO SANTANDER CENTRAL HISP	1.86	11.06%	28.36%	1.91	-2.66%
SANPAOLO IMI SPA	1.96	8.55%	26.64%	1.86	5.23%
BANCO BILBAO VIZCAYA ARGENTA	1.98	11.17%	18.62%	2.17	-9.12%
SOCIETE GENERALE	2.04	9.71%	22.55%	2.02	1.37%
ROYAL BANK OF SCOTLAND GROUP	2.09	20.22%	18.35%	2.51	-16.65%
HBOS PLC	2.15	22.45%	21.95%	2.49	-13.71%
BARCLAYS PLC	2.23	21.16%	20.73%	2.48	-9.96%
UNICREDITO ITALIANO SPA	2.30	14.86%	13.79%	2.44	-5.72%
KREDIETBANK SA LUXEMBOURGEOI	2.46	17.74%	12.38%	2.58	-4.79%
ERSTE BANK DER OESTER SPARK	2.53	10.28%	21.91%	2.05	23.11%
STANDARD CHARTERED PLC	2.59	20.18%	19.93%	2.47	5.00%
HSBC HOLDINGS PLC	2.94	18.50%	19.66%	2.41	21.91%
LLOYDS TSB GROUP PLC	3.33	32.84%	18.66%	2.96	12.40%

#### EXAMPLE 4: MORE STATISTICS AND A LARGER SAMPLE PRICE TO BOOK VERSUS ROE: LARGEST FIRMS IN THE US: JANUARY 2010



#### **MISSING GROWTH?**



#### PBV, ROE AND RISK: LARGE CAP US FIRMS



Aswath Damodaran

#### BRINGING IT ALL TOGETHER... LARGEST US STOCKS IN JANUARY 2010

#### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.819 <sup>a</sup>	.670	.661	1.19253

a. Predictors: (Constant), ROE, Expected Growth in EPS: next 5 years, Regression Beta

#### Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients		
		В	Std. Error	Beta	t	Sig.
1	(Constant)	.406	.424		.958	.340
	Regression Beta	065	.253	015	256	.799
	Expected Growth in EPS: next 5 years	9.340	2.366	.228	3.947	.000
	ROE	10.546	.771	.777	13.672	.000

a. Dependent Variable: PBV Ratio

#### UPDATED PBV RATIOS – LARGEST MARKET CAP US COMPANIES -UPDATED TO JANUARY 2025


### EXAMPLE 5: OVERLOOKED FUNDAMENTALS? EV/EBITDA MULTIPLE FOR TRUCKING COMPANIES

and the second		A LA DAMAGE AND A LABOR OF THE ADDRESS OF THE ADDRE
Value	EBITDA	Value/EBITDA
\$ 114.32	\$ 48.81	2.34
\$ 5,158.04	\$1,838.26	2.81
\$1,368.35	\$ 447.67	3.06
\$ 83.57	\$ 27.05	3.09
\$ 982.67	\$ 310.22	3.17
\$ 931.47	\$ 292.82	3.18
\$ 554.96	\$ 169.38	3.28
\$ 116.93	\$ 35.62	3.28
\$ 67.66	\$ 19.44	3.48
\$ 344.93	\$ 97.85	3.53
\$ 170.42	\$ 45.13	3.78
\$ 661.18	\$ 174.28	3.79
\$ 112.42	\$ 28.94	3.88
\$1,708.57	\$ 427.30	4.00
\$ 259.16	\$ 64.35	4.03
\$ 221.09	\$ 51.44	4.30
\$ 844.39	\$ 196.15	4.30
\$ 422.79	\$ 95.20	4.44
\$1.632.30	\$ 345.78	4.72
\$ 141.77	\$ 29.93	4.74
\$ 164.17	\$ 34.10	4.81
\$ 472.27	\$ 96.88	4.87
\$ 437.71	\$ 89.61	4.88
\$ 983.86	\$ 198.91	4.95
\$ 12.50	\$ 2.33	5.37
\$ 578.78	\$ 107.15	5.40
\$ 73.64	\$ 13.48	5.46
\$ 182.30	\$ 32.72	5.57
\$ 716.15	\$ 120.94	5.92
\$ 56.92	\$ 8.79	6.47
\$ 140.68	\$ 21.51	6.54
\$1,002.20	\$ 151.18	6.63
\$ 70.23	\$ 10.38	6.77
\$ 835.58	\$ 121.34	6.89
\$ 212.95	\$ 30.38	7.01
\$2,700.69	\$ 366.99	7.36
\$1,247.30	\$ 166.71	7.48
\$2,514.99	\$ 333.13	7.55
\$ 269.01	\$ 28.20	9.54
\$ 727.50	\$ 64.62	11.26
\$ 83.25	\$ 6.99	11.91
\$ 160.45	\$ 12.96	12.38
\$ 678.38	\$ 51.76	13.11
\$ 5.60	\$ (0.17)	NA
		5.61
	Value \$ 114.32 \$ 5,158.04 \$ 1,368.35 \$ 982.67 \$ 982.67 \$ 931.47 \$ 554.96 \$ 116.93 \$ 67.66 \$ 344.93 \$ 170.42 \$ 661.18 \$ 170.42 \$ 661.18 \$ 112.42 \$ 1,708.57 \$ 259.16 \$ 221.09 \$ 844.39 \$ 422.79 \$ 1,632.30 \$ 141.77 \$ 164.177 \$ 164.27 \$ 437.71 \$ 983.86 \$ 12.50 \$ 578.78 \$ 73.64 \$ 182.30 \$ 578.78 \$ 73.64 \$ 182.30 \$ 578.78 \$ 56.92 \$ 140.68 \$ 1,002.20 \$ 70.23 \$ 835.58 \$ 212.95 \$ 2,700.69 \$ 1,247.30 \$ 2,514.99 \$ 2,2514.99 \$ 2,250.69 \$ 1,247.30 \$ 727.50 \$ 33.25 \$ 160.45 \$ 678.38 \$ 5.60	Value         EBITDA           \$ 114.32         \$ 48.81           \$ 5,158.04         \$ 1,838.26           \$ 1,368.35         \$ 447.67           \$ 83.57         \$ 27.05           \$ 982.67         \$ 310.22           \$ 931.47         \$ 292.82           \$ 554.96         \$ 169.38           \$ 116.93         \$ 35.62           \$ 07.66         \$ 19.44           \$ 344.93         \$ 97.85           \$ 170.42         \$ 45.13           \$ 661.18         \$ 174.28           \$ 112.42         \$ 28.94           \$ 1,708.57         \$ 427.30           \$ 259.16         \$ 64.35           \$ 221.09         \$ 51.44           \$ 844.39         \$ 196.15           \$ 422.79         \$ 95.20           \$ 1,632.30         \$ 345.78           \$ 141.77         \$ 29.93           \$ 164.17         \$ 34.10           \$ 472.27         \$ 96.88           \$ 983.86         \$ 198.91           \$ 12.50         \$ 2.33           \$ 578.78         \$ 107.15           \$ 73.64         \$ 13.48           \$ 182.30         \$ 32.72           \$ 716.15         \$ 12.94

# A TEST ON EBITDA

 Ryder System looks very cheap on a Value/EBITDA multiple basis, relative to the rest of the sector. What explanation (other than misvaluation) might there be for this difference?

 What general lessons would you draw from this on the EV/EBITDA multiples for infrastructure companies as their infrastructure ages?

#### EXAMPLE 6: PRICING ACROSS TIME - PS RATIOS GROCERY STORES - US IN JANUARY 2007



<u>Whole Foods</u>: In 2007: Net Margin was 3.41% and Price/ Sales ratio was 1.41Predicted Price to Sales = 0.07 + 10.49 (0.0341) = 0.43

#### THE DIFFERENCE TWO YEARS CAN MAKE: GROCERY STORES - US IN JANUARY 2009



<u>Whole Foods</u>: In 2009, Net Margin had dropped to 2.77% and Price to Sales ratio was down to 0.31.

Predicted Price to Sales = 0.07 + 10.49 (.0277) = 0.36

### IS THIS STEADY STATE? IN 2010..



<u>Whole Foods</u>: In 2010, Net Margin had dropped to 1.44% and Price to Sales ratio increased to 0.50. Predicted Price to Sales = 0.06 + 11.43 (.0144) = 0.22

### THERE IS A NEW KID IN TOWN: JANUARY 2015



PS = 0.557 + 0.085 Net Margin Whole Foods = 0.557 + 8.50 (0.0408) = 0.90At 1.35 times sales, Whole Foods is overvalued (again)



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### EXAMPLE 7: NOTHING'S WORKING! INTERNET STOCKS IN EARLY 2000..



## PS RATIOS AND MARGINS ARE NOT HIGHLY CORRELATED

- Regressing PS ratios against current margins yields the following
  - PS = 81.36 7.54(Net Margin) R2 = 0.04
  - (0.49)
- This is not surprising. These firms are priced based upon expected margins, rather than current margins.

# SOLUTION 1: USE PROXIES FOR SURVIVAL AND GROWTH: AMAZON IN EARLY 2000

 Hypothesizing that firms with higher revenue growth and higher cash balances should have a greater chance of surviving and becoming profitable, we ran the following regression: (The level of revenues was used to control for size)

(0.66) (2.63) (3.49)

R squared = 31.8%

- Predicted PS = 30.61 2.77(7.1039) + 6.42(1.9946) + 5.11 (.3069) = 30.42
- Actual PS = 25.63
- Stock is undervalued, relative to other internet stocks.

### SOLUTION 2: USE FORWARD MULTIPLES WATCH OUT FOR BUMPS IN THE ROAD (TESLA IN 2013)



# THE MARKET SETS THE RULES...

- While we can compute multiples based upon accounting numbers (revenues, earnings, EBITDA or book value), you can also compute the multiple that market are paying on any quantifiable variable.
  - You can compute market cap or EV per employee, per subscriber, per customer etc.
  - The question of whether you should do so is not a theoretical one. It is set by the market.
- Ultimately, your job in pricing is to figure what the market cares about when pricing companies and replicate it.

### AN EXAMPLE: LET THE MARKET TELL YOU WHAT MATTERS.. SOCIAL MEDIA IN OCTOBER 2013

						Number of				
		Enterprise				users		EV/Revenu		
Company	Market Cap	value	Revenues	EBITDA	Net Income	(millions)	EV/User	е	EV/EBITDA	PE
	\$173,540.0	\$160,090.0								
Facebook	0	0	\$7,870.00	\$3,930.00	\$1,490.00	1230.00	\$130.15	20.34	40.74	116.47
Linkedin	\$23,530.00	\$19,980.00	\$1,530.00	\$182.00	\$27.00	277.00	\$72.13	13.06	109.78	871.48
Pandora	\$7,320.00	\$7,150.00	\$655.00	-\$18.00	-\$29.00	73.40	\$97.41	10.92	NA	NA
Groupon	\$6,690.00	\$5,880.00	\$2,440.00	\$125.00	-\$95.00	43.00	\$136.74	2.41	47.04	NA
Netflix	\$25,900.00	\$25,380.00	\$4,370.00	\$277.00	\$112.00	44.00	\$576.82	5.81	91.62	231.25
Yelp	\$6,200.00	\$5,790.00	\$233.00	\$2.40	-\$10.00	120.00	\$48.25	24.85	2412.50	NA
Open Table	\$1,720.00	\$1,500.00	\$190.00	\$63.00	\$33.00	14.00	\$107.14	7.89	23.81	52.12
Zynga	\$4,200.00	\$2,930.00	\$873.00	\$74.00	-\$37.00	27.00	\$108.52	3.36	39.59	NA
Zillow	\$3,070.00	\$2,860.00	\$197.00	-\$13.00	-\$12.45	34.50	\$82.90	14.52	NA	NA
Trulia	\$1,140.00	\$1,120.00	\$144.00	-\$6.00	-\$18.00	54.40	\$20.59	7.78	NA	NA
Tripadvisor	\$13,510.00	\$12,860.00	\$945.00	\$311.00	\$205.00	260.00	\$49.46	13.61	41.35	65.90
						Average	\$130.01	11.32	350.80	267.44
						Median	\$97.41	10.92	44.20	116.47

## READ THE TEA LEAVES: SEE WHAT THE MARKET CARES ABOUT

	Market Cap	Enterprise value	Revenues	EBITDA	Net Income	Number of users (millions)
Market Cap	1.					
Enterprise value	0.9998	1.				
Revenues	0.8933	0.8966	1.			
EBITDA	0.9709	0.9701	0.8869	1.		
Net Income	0.8978	0.8971	0.8466	0.9716	1.	
Number of users (millions)	0.9812	0.9789	0.8053	0.9354	0.8453	1.

Twitter had 240 million users at the time of its IPO. What price would you attach to the company?

# PRICING ACROSS THE ENTIRE MARKET: WHY NOT?

- In contrast to the 'comparable firm' approach, the information in the entire cross-section of firms can be used to predict PE ratios.
- The simplest way of summarizing this information is with a multiple regression, with the PE ratio as the dependent variable, and proxies for risk, growth and payout forming the independent variables.

#### PE RATIO VERSUS THE MARKET PE VERSUS EXPECTED EPS GROWTH: JANUARY 2025

**Broad Group: United States** 

100.0000 0 80.0000 **Trailing PE** 60.0000 0 0 40.0000 0 O 0 0 20.0000  $\circ$ 0 .0000 .5000 1.0000 -1.0000-.5000 .0000 1.5000 2.0000

Expected growth rate in EPS- Next 5 years

## PE RATIO: STANDARD REGRESSION FOR US STOCKS - JANUARY 2025

#### Model Summary<sup>a</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.496 <sup>b</sup>	.246	.244	2951.48154

a. Broad Group = United States

b. Predictors: (Constant), Beta, Expected growth rate in EPS- Next 5 years, Payout ratio

#### Coefficients<sup>a,b,c</sup>

		Unstandardize	d Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	16.085	1.472		10.928	<.001
	Expected growth rate in EPS- Next 5 years	51.916	4.386	.380	11.836	<.001
	Payout ratio	7.531	1.233	.196	6.107	<.001
	Beta	9.298	1.364	.242	6.817	<.001

a. Broad Group = United States

b. Dependent Variable: Trailing PE

c. Weighted Least Squares Regression - Weighted by Market Cap (in US \$)

#### Aswath Damodaran

The regression is run with

as 0.25)

growth and payout entered as decimals, i.e., 25% is entered

# PROBLEMS WITH THE REGRESSION METHODOLOGY

- Non-linearity: The basic regression assumes a linear relationship between PE ratios and the financial proxies, and that might not be appropriate.
- Non-stationarity: The basic relationship between PE ratios and financial variables itself might not be stable, and if it shifts from year to year, the predictions from the model may not be reliable. For instance, the 2022 regression has a markedly lower R-squared than the regressions in prior years, as the COVID effect on earnings plays out.
- Multi-collinearity: The independent variables are correlated with each other. For example, high growth firms tend to have high risk. This multi-collinearity makes the coefficients of the regressions unreliable and may explain the large changes in these coefficients from period to period.

# STATISTICALLY INSIGNIFICANT?

- If a coefficient in a regression is statistically insignificant, all it is doing is adding noise to the regression prediction.
  - There are simple statistical tests of significance, such as the t statistics (>2 is very good, 1-2 is marginal, <1 is noise)</li>
  - With small samples, don't overload the regression with independent variables.
- Take the variable out of the regression, even if the fundamentals say it should matter. In pricing, it is the market that determines what matters.

# THE NEGATIVE INTERCEPT PROBLEM

- When the intercept in a multiple regression is negative, there is the possibility that forecasted values can be negative as well.
- One way (albeit imperfect) is to re-run the regression without an intercept. When the intercept in a multiple regression is negative, there is the possibility that forecasted values can be negative as well. One way (albeit imperfect) is to re-run the regression without an intercept. In 2024, for instance, the regression yielded a negative coefficient, and the intercept-free regression looked like this:

		Coeffici	ents <sup>a,b,c,d</sup>	70. Y		~	
		Unstandardize	d Coefficients	Standardized Coefficients			
Mode	el	В	B Std. Error		t	Sig.	
1	Beta	19.344	.814	.575	23.776	<.001	
	Payout ratio	10.368	1.131	.135	9.170	<.001	
	Expected growth rate in EPS- Next 5 years	68.704	5.067	.301	13.558	<.001	
a.	Broad Group = United States						
b.	Dependent Variable: Trailing	PE					
с.	Linear Regression through the	Origin					
d.	Weighted Least Squares Regre	ession – Weighted	by Market Ca	p (in US \$)			

# IF A COEFFICIENT HAS THE WRONG SIGN: THE MULTICOLLINEARITY PROBLEM

		Trailing DE	Payout ratio	Expected growth rate in EPS- Next 5 years	Poto
		Training FL	rayout ratio	70000	Deta
Trailing PE	Pearson Correlation	1	.111**	.273**	.090 <sup>**</sup>
	Sig. (2-tailed)		<.001	<.001	<.001
	Ν	23188	23188	4225	20433
Payout ratio	Pearson Correlation	$.111^{**}$	1	.006	.001
	Sig. (2-tailed)	<.001		.682	.881
	Ν	23188	25169	4436	22142
Expected growth rate in	Pearson Correlation	.273**	.006	1	.090**
EPS- Next 5 years	Sig. (2-tailed)	<.001	.682		<.001
	N	4225	4436	5046	4849
Beta	Pearson Correlation	.090 <sup>**</sup>	.001	.090**	1
	Sig. (2-tailed)	<.001	.881	<.001	
	N	20433	22142	4849	35780

#### Correlations

\*\*. Correlation is significant at the 0.01 level (2-tailed).

# USING THE PE RATIO REGRESSION

- Assume that you were given the following information for Disney. The firm has an expected growth rate of 15%, a beta of 0.90 and a 20% dividend payout ratio. Based upon the regression, the predicted PE ratio for Disney is:
  - Predicted PE = 16.09 + 51.92 (.15) + 7.53 (.20) + 9.30 (0.90) = 33.75
- Disney is trading at 40.4 times earnings. What does the predicted PE tell you?

 Assume now that you priced Disney against just its peer group.
 Will you come to the same pricing judgment as you did when you looked at it relative to the market? Why or why not? THE VALUE OF GROWTH



Value of Growth and Price of Risk: US equities from 2000 to 2025

### II. PEG RATIO VERSUS THE MARKET PEG VERSUS GROWTH IN JANUARY 2025



Expected growth rate in EPS- Next 5 years

# PEG VERSUS LN(EXPECTED GROWTH) IN JANUARY 2025



## PEG RATIO REGRESSION - US STOCKS JANUARY 2025

#### Model Summary<sup>a</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.388 <sup>b</sup>	.151	.148	350.1116652		

a. Broad Group = United States

b. Predictors: (Constant), InGrowth, Payout ratio, Beta

#### Coefficients<sup>a,b,c</sup>

		Unstandardize	d Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	203	.327		621	.535
	Beta	1.203	.159	.301	7.580	<.001
	Payout ratio	.098	.033	.097	3.013	.003
	InGrowth	-1.194	.101	466	-11.856	<.001

- a. Broad Group = United States
- b. Dependent Variable: PEG
- c. Weighted Least Squares Regression Weighted by Market Cap (in US \$)

# I. PE RATIO REGRESSIONS ACROSS MARKETS

	_			• 101		T statis	stics in	brackets	below c	oefficients	ury 2020	
						Regress	sion				R Squared	Region
_	PE	E = 16.0 (0.93	9 + 9.30 ) (6.82)	) Beta + (11.)	51.92 g 84)	+ 7. (6.11	53 Payo )	out			24.4%	US
_	PE	E = 12.5 (8.70	8 + 3.70 ) (4.65	) Beta + ) (9.5	45.97 g 7)	<sub>EPS</sub> + 6. (8.48)	97 Payo	out			16.0%	Europe
	PE	E = 8.63 (5.43	+ 3.72 ] ) (4.66)	Beta + 3 ) (7.7	38.36 g <sub>E</sub> 7)	<sup>PS + 5.9</sup> (3.44)	9 Payoı	ıt			26.4%	Japan
	PE	E = 4.28 (1.47)	+ 13.96 () (7.40)	Beta + ) (8.6	72.58 g 4)	<sub>EPS</sub> + 4. (1.79)	08 Payo	out			46.0%	Aus, NZ & Canada
	PE	E = 23.4 (20.5	1 - 1.84 1) (3.6	Beta + 3) (14	33.66 g <sub>l</sub> .62)	<sub>EPS</sub> -2.30 (2.4	) Payou 6)	t			13.2%	Emerging Markets
-	PE	E = 24.1 (38.4	7 - 1.07 8) (2.6:	Beta + 5) (27	53.16 g <sub>j</sub> 7.59)	$_{\rm EPS}^{+1.0}$ (2.0	)8 Payo 5	ut			<u>    16.</u> 0%	Global

A. Market-wide Regressions of Multiples: PF Ratios in January 2025

g<sub>EPS</sub>=Expected Growth: Expected growth in EPS or Net Income: Next 5 years (decimals) Beta: Regression or Bottom up Beta

Payout ratio: Dividends/ Net income from most recent year. Set to zero, if net income < 0

# II. PEG RATIO REGRESSIONS ACROSS MARKETS

				.ţ∙Ma	rket-wie	de Regre T statis	essions o stics in l	of Multi brackets	ples: PE below o	G Ratic coefficie	os in Jan ents	uary 20	)25	
						Regress	sion					_R Sq	uared_	Region
	PI	EG = 0.1 (2.9	l 0 Payo 6)	ut -1.14 (13.03	ln(g <sub>EPS</sub>	) + 1.12 (13.03)	Beta					14.	8%	US
	PI	EG = 1.2 (28)	27 ln(g <sub>E</sub> 71)	$(1.20)^{+0.0}$	)8 Beta )							49.	3%	Europe
-	PI	EG = 0.0 $(0.8)$	)8 Payo 2)	ut – 11.0 (24.58	9 ln(g <sub>El</sub> )	<sub>PS</sub> ) + 0.0 (0.48)	)3 Beta					<u>    49.</u>	5%—	Japan
_	PI	EG = 1.0 (7.7	)3 - 0.08 (9) (1.1	8 Payout 12)	- 0.78 (14.92	ln(g <sub>EPS</sub> ) 2)	- 0.123 (5.38)	Beta				17.	2%	Emerging Markets
_	PI	EG = 1.6 (3.3	53 + 0.2 9) (3	7 Payou 3.08)	t +- 0.88 (5.76	8 ln(g <sub>EP</sub> 5) (3.75)	<sub>s</sub> ) - 0.90	Beta				27.:	5%	Aus, NZ & Canada
	PI	EG = 1.0 (9.0	(5+0.0) (2.4) (2.4)	45 Payo 47)	ut – 1.0 (24.58	0 ln(g <sub>EP</sub> 3)	<sub>s</sub> ) -0.04 (0.98)	4 Beta				16.	1%	Global

<u>g<sub>EPS</sub>=Expected Growth</u>: Expected growth in EPS or Net Income: Next 5 years (decimals) <u>Beta</u>: Regression or Bottom up Beta

<u>Payout ratio</u>: Dividends/ Net income from most recent year. Set to zero, if net income < 0

## III. PRICE TO BOOK RATIO: FUNDAMENTALS HOLD IN EVERY MARKET

	-	
<i>T statistics in brackets below coefficients</i>		
Regression	R Squared	Region
$PBV = 1.79 + 5.71 g_{EPS} + 0.88 Beta + 9.09 ROE - 0.06 Payout Ratio$	35.8%	US
$(8.07)(8.29)^{-175}(3.95)$ $(17.70)$ $(11.68)^{-175}$		
$PBV = 1.88 + 3.12 g_{TDS} + 0.20 Beta + 6.52 ROE - 0.06 Payout Ratio$	20.6%	Europe
$(9.91)(5.41)^{\circ}(1.95)(14.28)(3.14)$	-	
PBV= 3.65 g <sub>rpg</sub> + 0.24 Beta + 14.83 ROE - 0.25 Payout Ratio	51.6%	Japan
$(4.63)^{\circ}(2.08)$ $(12.66)$ $(1.84)$		
PBV= 1.37 +2.81 g <sub>-ref</sub> - 0.26 Beta + 12.37 ROE - 0.67 Payout Ratio	41.9%	Emerging
(12.23)(12.85) $(4.73)$ $(31.68)$ $(21.54)$		Markets
PBV= 3.93 +3.41 g <sub></sub> - 1.63 Beta + 3.76 ROE - 0.13 Payout Ratio	21.4%	Aus, NZ &
(13.81)(4.39) (6.38) (5.04) (4.41)		Canada
$PBV = 2.47 + 4.00 g_{} - 0.39 Beta + 9.14 ROE - 0.15 Payout Ratio$		Global
(27.24)(16.07) $(7.12)$ $(37.79)(10.74)$		

g<sub>EPS</sub>=Expected Growth: Expected growth in EPS/ Net Income: Next 5 years

Beta: Regression or Bottom up Beta

<u>Payout ratio</u>: Dividends/ Net income from most recent year. Set to zero, if net income < 0Asv<u>RtOEinNetaIncome</u>/ Book value of equity in most recent year.

# IV. EV/EBITDA ACROSS MARKETS

		Ļ	Market-	wide Re	egression T stati.	ns of Mi stics in l	iltiples: brackets	EV to E below	BITDA coefficie	Ratios in Jan ents	uary 2025	
					Regress	sion				R	Squared	Region
]	EV/EBIT	DA= 35 (40	5.25 + 23 9.93) (	3.00 g - 10.77)	0.40 DF (20.99)	<b>R - 0.5</b> (14	1 Tax Ra .89)	te + 0.2 (0.38)	26 ROC		40.1%	US
]	EV/EBIT	DA=18 (38	8.47+27 8.90) (	.76 g - ( 13.81)	).12 DFI (15.36)	R - 0.14 (10	Tax Ra ).05)	te $+ 3.6$ (13.1	4 ROC 6)		35.4%	Europe
]	EV/EBIT	DA = 16 (30)	(5.50 + 1) (5.21) (5.50)	.45 g - 5.92) (8	0.06 DF 8.02)	R - 0.1: (9.40	5 Tax Ra ) (3.8	ate + 3.0 34)	02 ROC	1	16.6%	Japan
]	EV/EBIT	DA= 21 (42	.09 + 23 2.61) (	8.79 g - 16.46)	0.12 DF (16.91)	R - 0.1' (11	7 Tax Ra .74)	ate + 2.7 (6)	75 ROC .39)		6.8%	Emerging Markets
]	EV/EBIT	DA= 18 (14	3.83 + 43 .30) (9	8.48 g - 9.89) ((	0.14 DF 6.14)	R - 0.1 (3.52	1Tax Ra ) (2.16	te + 3.9 5)	9 ROC		24.7%	Aus, NZ & Canada
]	EV/EBIT	DA= 26 (84	5.48 + 26 .66) (2	5.97 g - 26.97)	0.21 DF (37.76)	R - 0.29 (27	7.70) (	te + 1.0 4.39)	8 ROC		32.9%	Global

<u>g = Expected Revenue Growth</u>: Expected growth in revenues: Near term (2 or 5 years) <u>DFR = Debt Ratio</u>: Total Debt/ (Total Debt + Market value of equity) <u>Tax Rate: Effective tax rate in most recent year</u> ROIC = Return on Capital</u>

# V. EV/SALES REGRESSIONS ACROSS MARKETS...

		ł	i∙Marke	t-wide l	Regressi	ons of N	<i>Aultiples</i>	s: EV to	Sales R	atios in	January	, 2025	
					T stati.	stics in l	brackets	below d	coefficie	ents			
					Regress	sion					R Sq	uared	Region
E	V/Sales	= 5.45	+7.96 g	+ 3.55 (	Oper Ma	argin -0.	06 DFR	- 04 Tax	c rate			8%—	US
		(32.41	) (9.66	) (15.6	4)	(1	19.68)	(7.27)					
E	V/Sales	= 4.10	+ 4.81 g	+ 1.57	Oper M	argin -0	.04 DFF	R- 0.02 7	Fax rate		29.	1%	Europe
		(39.26	5) (10.1	2) (11.	32)		(23.14)	(5.96)					
E	V/Sales	= 2.06	+ 3.09 g	+ 8.31	Oper M	argin -0	.008 DF	R- 0.03	Tax rat	e	36.	0%	Japan
		(15.39	) (6.75	) (22.5	3)	(	4.76)	(7.50)					
E	V/Sales	= 3.34	+ 3.00 g	+ 1.51	Oper M	argin - (	0.034 D	FR- 0.00	04 Tax r	ate	18.9	9%	Emerging
		(44.54	4) (12.3	2) (15.	84)		(23.00)	(1.85	)				Markets
E	V/Sales	= 2.25	+6.71 g	+ 9.93 (	Oper Ma	argin -0.	002 DF	R- 0.04	Tax rate		40.	1%	Aus, NZ &
		(9.85)	(9.31)	(21.25	)	(0.	67) (7	7.10)					Canada
E	V/Sales	= 4.72	+ 3.88 g	+ 2.61	Oper M	argin - (	0.04 DF	R- 0.03	Tax rate	•	26.0	5%	Global
		(80.73	3) (16.2	7) (31.	18)		(45.50)	(16.0	63)				

<u>g =Expected Revenue Growth</u>: Expected growth in revenues: Near term (2 or 5 years) <u>Tax Rate:</u> Effective tax rate in most recent year <u>Oper Margin</u>: Operating Income/ Sales <u>DFR</u>: Debt to capital ratio (market value) <u>Aswath Damodaran</u>

# VI. EV/INVESTED CAPITAL

			.ᢤ <i>Mar</i>	ket-wid	e Regres	sions o	f Multip	les: EV	to Inves	ted Cap	ital Rati	ios in Ja	nuary 2	025
						T stati.	stics in	brackets	below o	coefficie	nts			
						Regress	sion					R Sq	lared	Region
-	E	V/Invest	ed Capi	tal= 6.0 (62.3	2 + 2.24 30) (5.13	g + 3.2 3) (15.	25 ROI( 55) (	C - 0.09 38.68)	DFR			56.4	1%	US
_	E	V/Invest	ed Capi	tal= 5.0 (74.3	8 + 1.86 39) (5.59	g + 0.0 9) (0.0	004 RO 8) (4	IC – 0.0 2.43)	7 DFR			44.9	9%	Europe
	E	V/Invest	ed Capi	tal= 2.5 (25.9	7 + 2.60 95) (5.60	g + 5. 0) (14.	18 ROI( 49) (	C – 0.03 18.73)	DFR			48.0	)%	Japan
	E	V/Invest	ed Capi	tal= 3.7 (83.4	1 + 3.19 41) (17.4	g + 0.' 40) (11	78 ROI( .74)	C – 0.05 (50.84)	DFR			43.8	8%	Emerging Markets
	E	V/Invest	ed Capi	tal= 3.3 (30.0	7 + 1.22 61) (2.68	g + 0.' 8) (3.5)	74 ROI 2) (1	C – 0.04 3.36)	DFR			22.9	9%	Aus, NZ & Canada
-	E	V/Invest	ed Capi	tal= 5.1 (144	2 + 1.89 .33) (11	g + 0.' .38) (1	76 ROI( 5.04)	C – 0.07 (83.19	DFR )			43.0	)%	Global

<u>g =Expected Revenue Growth</u>: Expected growth in revenues: Near term (2 or 5 years) <u>DFR</u>: Debt Ratio ROIC = Return on Invested Capital

# THE PRICING GAME: CHOICES

Measure	Choices	<b>Considerations/ Questions</b>
Value	Enterprise, Equity or Firm Value?	<ol> <li>Is this a financial service business?</li> <li>Are there big differences in leverage?</li> </ol>
Scalar	Revenues, Earnings, Cash Flows or Book Value?	<ol> <li>How are you measuring value?</li> <li>Is the scaling number positive?</li> <li>How (and how much) do accounting choices affect the scaling measure?</li> </ol>
Timing & Normalizin g	Current, Trailing, Forward or Really Forward?	<ol> <li>Where are you in the life cycle?</li> <li>How much cyclicality is there in the number?</li> <li>Can you get forecasted values?</li> </ol>
Comparab le	What is your peer group? (Global or local? Similar size or all firms?)	<ol> <li>How much do companies share in common globally?</li> <li>Does company size affect business economics?</li> </ol>
Aswath Damodaran		<ul><li>3. How big a sample of firms do you need</li><li>4. How do you plan to control for</li></ul>

# RELATIVE VALUATION: SOME CLOSING PROPOSITIONS

- Proposition 1: In a relative valuation, all that you are concluding is that a stock is under or over valued, relative to your comparable group.
  - Your relative valuation judgment can be right and your stock can be hopelessly over valued at the same time.
- Proposition 2: In asset valuation, there are no similar assets.
   Every asset is unique.
  - If you do not control for fundamental differences in risk, cash flows and growth across firms when comparing how they are priced, your valuation conclusions will reflect your flawed judgments rather than market misvaluations.

#### Bottom line: Relative valuation is pricing, not valuation.

# REVIEWING: THE FOUR STEPS TO UNDERSTANDING MULTIPLES

- Define the multiple
  - Check for consistency
  - Make sure that they are estimated uniformly
- Describe the multiple
  - Multiples have skewed distributions: The averages are seldom good indicators of typical multiples
  - Check for bias, if the multiple cannot be estimated
- Analyze the multiple
  - Identify the companion variable that drives the multiple
  - Examine the nature of the relationship
- Apply the multiple