PRICING 101

Price ≠ Value

Aswath Damodaran

RELATIVE VALUATION IS PERVASIVE...

- Much of what passes for valuation is pricing.
- Most "valuations" on Wall Street are pricing.
  - 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 live
the hall"

Jerry Seinfeld talking about Kramer in a Seinfeld epis

" 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

PRICING VERSUS VALUATION

Drivers of intrinsic value
- Cashflows from existing assets
- Growth in cash flows
- Quality of Growth

Drivers of price
- Market moods & momentum
- Surface stories about fundamentals

Accounting Estimates

Valuation Estimates

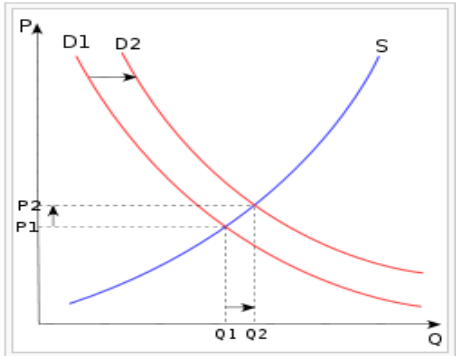
INTRINSIC VALUE

Value

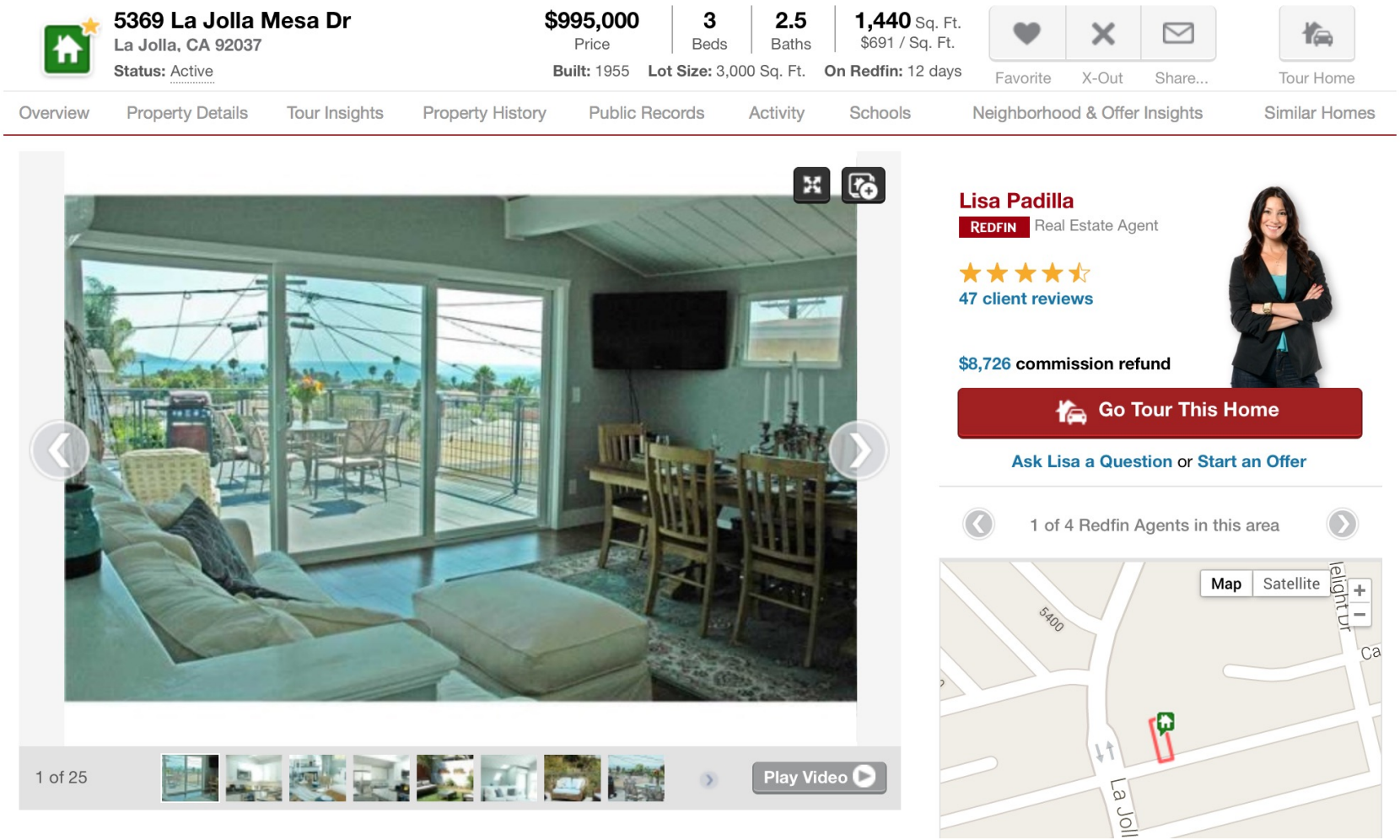
THE GAP
Is there one?
If so, will it close?
If it will close, what will cause it to close?

Price

PRICE



TEST 1: ARE YOU PRICING OR VALUING?



TEST 2: ARE YOU PRICING OR VALUING?

Rating
Buy

Europe
Switzerland

Biotechnology
Biotechnology

Company
BB BIOTECH

Reuters	Bloomberg	Exchange	Ticker
BION.S	BION SW	SWX	BION

Date
13 August 2013

Forecast Change

Price at 12 Aug 2013 (CHF) 124.00
Price Tar
52-week

Holger B
Research
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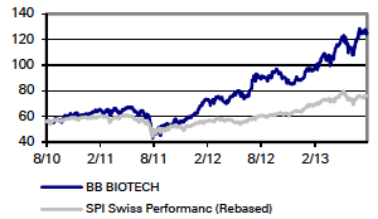
Key changes
Target Price 106.50 to 164.50 ↑ 54.5%
Source: Deutsche Bank

Price/price relative



Performance (%)	1m	3m	12m
Absolute	-1.4	5.4	37.4
SPI Swiss Performance IX	0.5	-1.4	26.4

Source: Deutsche Bank

Strong sector and stock-picking continue

Impressive performance

Over the past two years, BB Biotech shares have roughly tripled, which could tempt investors to take profits. However, this performance has been well backed by a deserved revival of the biotech industry, encouraging fundamental news, M&A, and increased money flow into health care stocks. In addition, BBB returned to index outperformance by modifying its stock-picking approach. Hence, despite excellent performance, the shares still trade at a 23% discount to the net asset value of the portfolio. Hence, the shares are an attractive value vehicle to capture growth opportunities in an attractive sector.

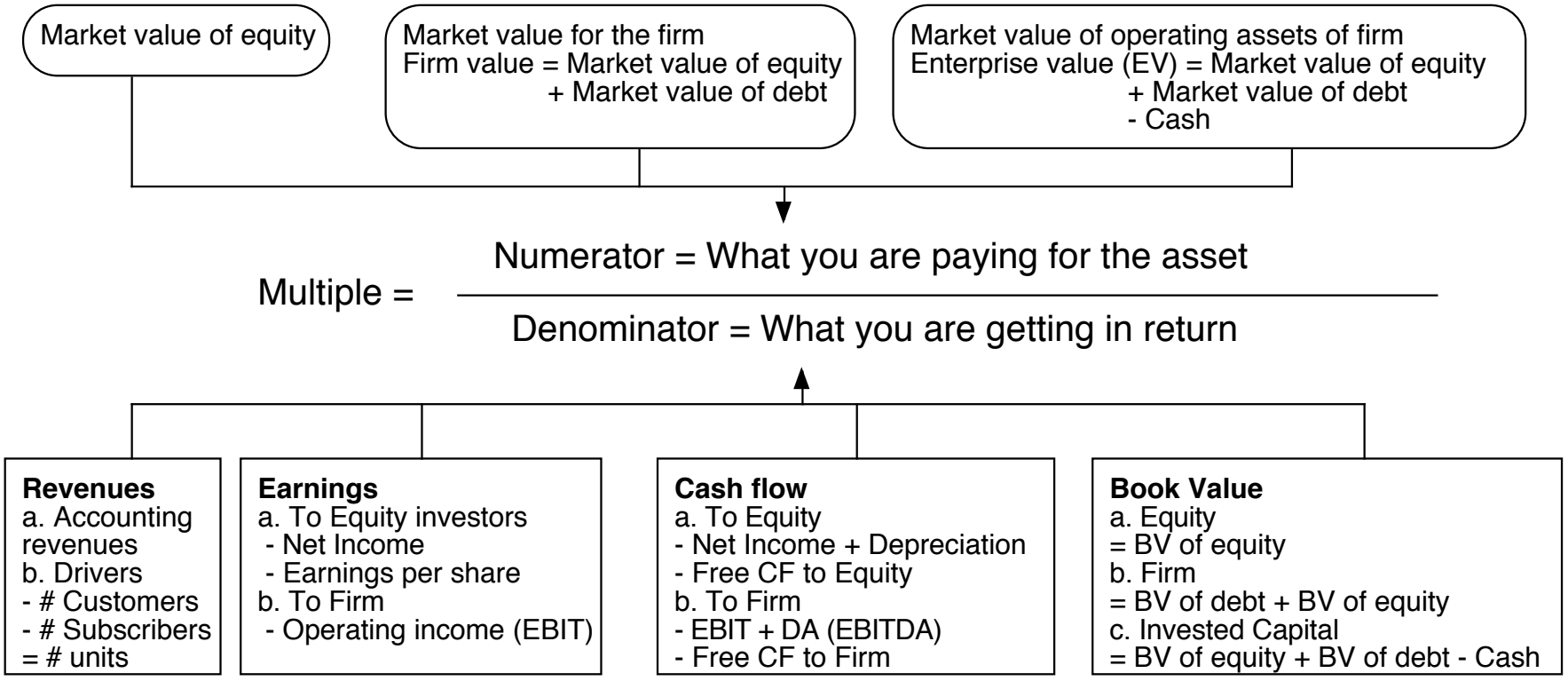
Biotech industry remains attractive

With the re-rating of the pharma sector, investors have also showed increased interest in biotech stocks. Established biotech stocks have delivered encouraging financial results and approvals, while there has also been substantial industry consolidation, which is not surprising in times of "cheap" money and high liquidity. BB Biotech remains an attractive vehicle to capture the future potential of the biotech sector. In addition, investors benefit from a 23% discount to NAV and attractive cash distribution policy of 5% yield p.a. Hence, we reiterate our Buy on BB Biotech shares.

BB Biotech shares remain attractive

In the first 6M of 2013, BB Biotech increased its NAV by 36%, which marks good outperformance against the Nasdaq Biotech Index (NBI)'s 27%. This is a remarkable performance after 2012, when BBB's NAV increase of 45% also

THE TOOL FOR PRICING: A MULTIPLE



THE FOUR STEPS TO DECONSTRUCTING MULTIPLES

- Define the multiple
  - In use, the same multiple can be defined in different ways by different users. In pricing, it is key that the multiple be **consistently defined** and **uniformly estimated**.
- Describe the multiple
  - Too many people who use a multiple have no idea what its cross sectional distribution is, using rules of thumb for what is cheap or expensive. Instead, **use all of the da**ta to develop perspective on what is low or high.
- 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 comparables** 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 a **number of 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 (Trailing PE)

Forecasted EPS for next year (Forward PE)

Forecasted EPS in future year

EXAMPLE 2: 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.

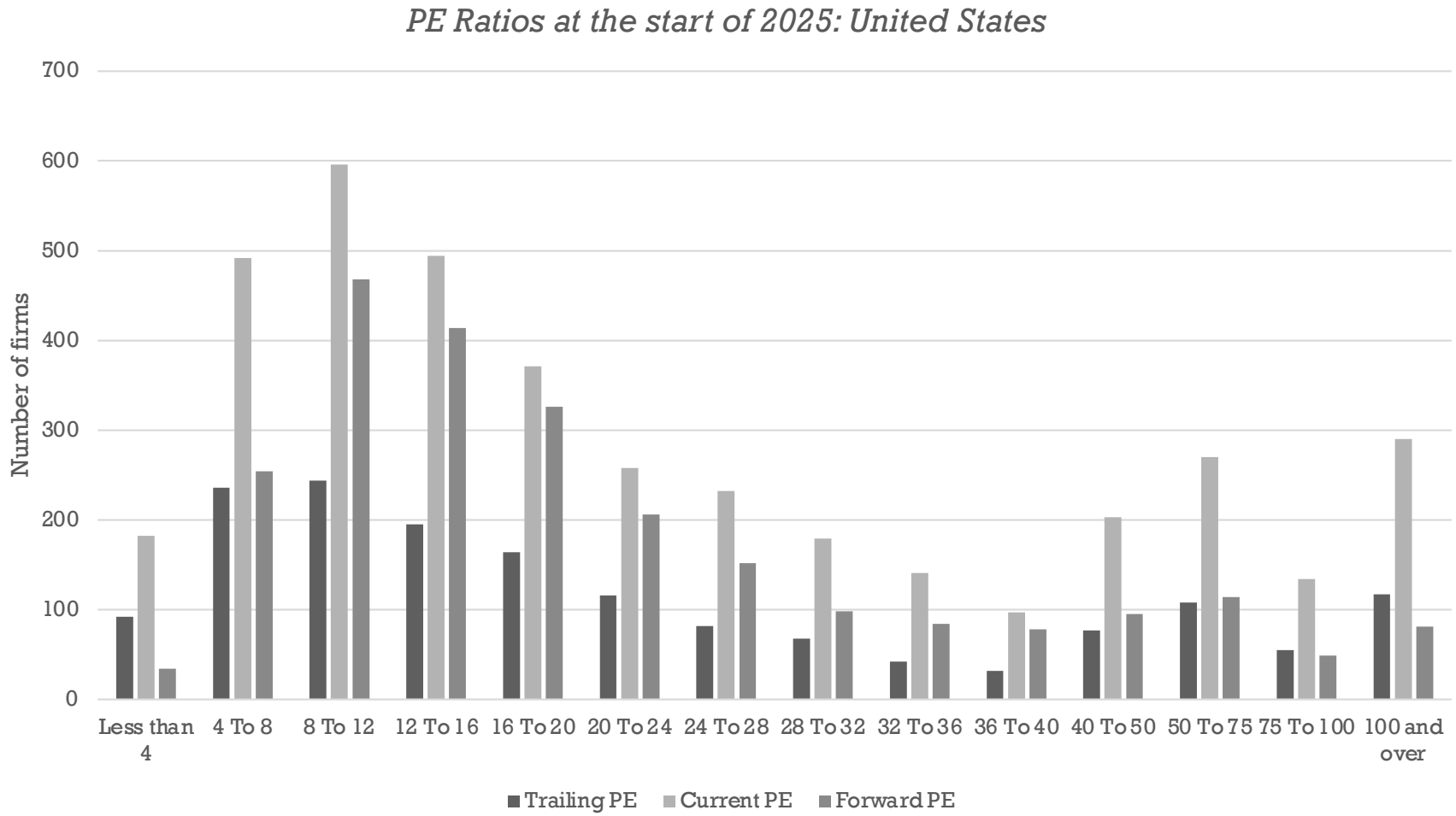
$$\frac{\text{Enterprise Value}}{\text{EBITDA}} = \frac{\text{Market Value of Equity} + \text{Market Value of Debt} - \text{Cash}}{\text{Earnings before Interest, Taxes and Depreciation}}$$

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

DESCRIPTIVE TESTS

- What is the **average and standard deviation** for this multiple, across the universe (market)?
- What is the **median** 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...



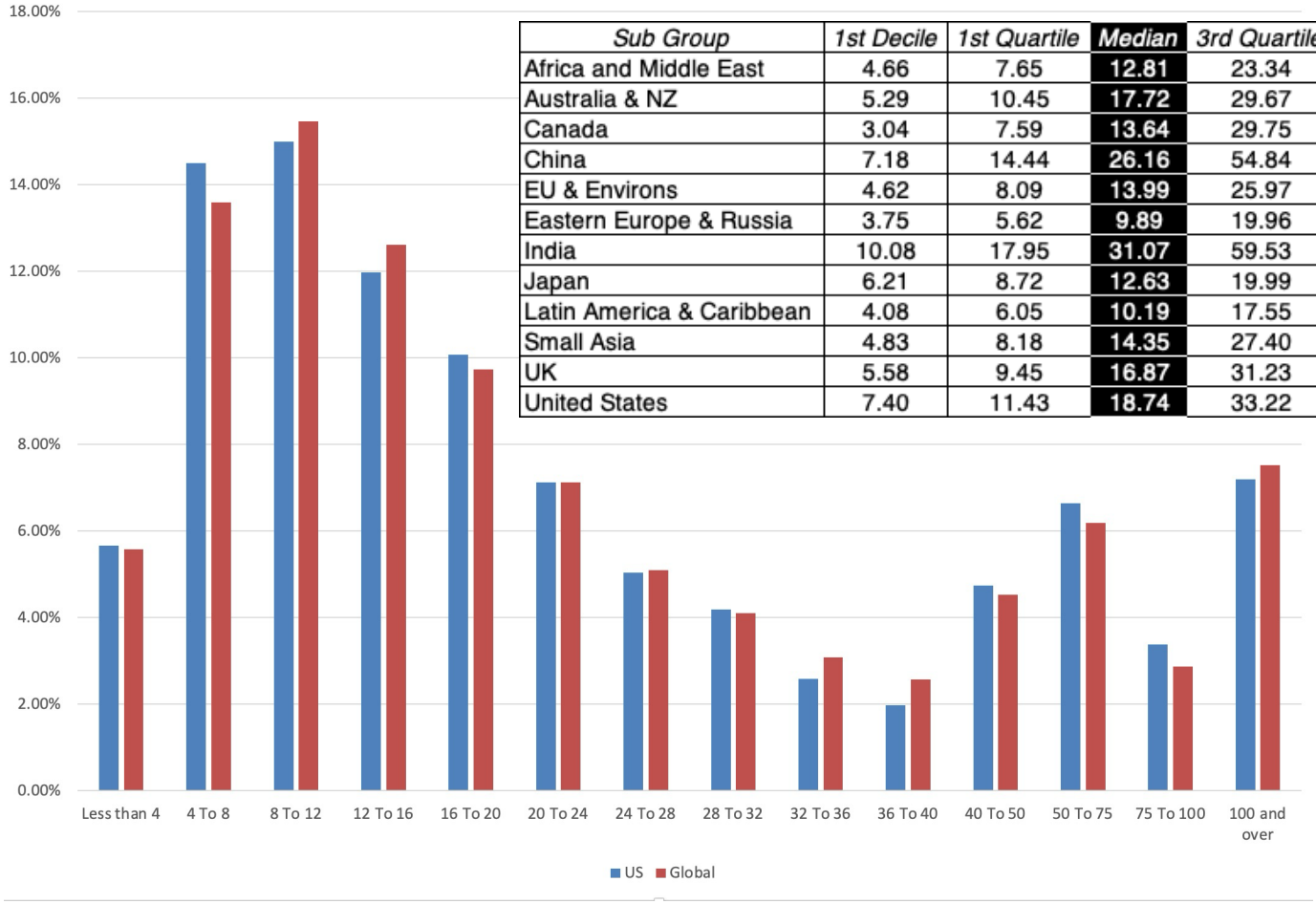
2. MAKING STATISTICS "DICEY"

	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

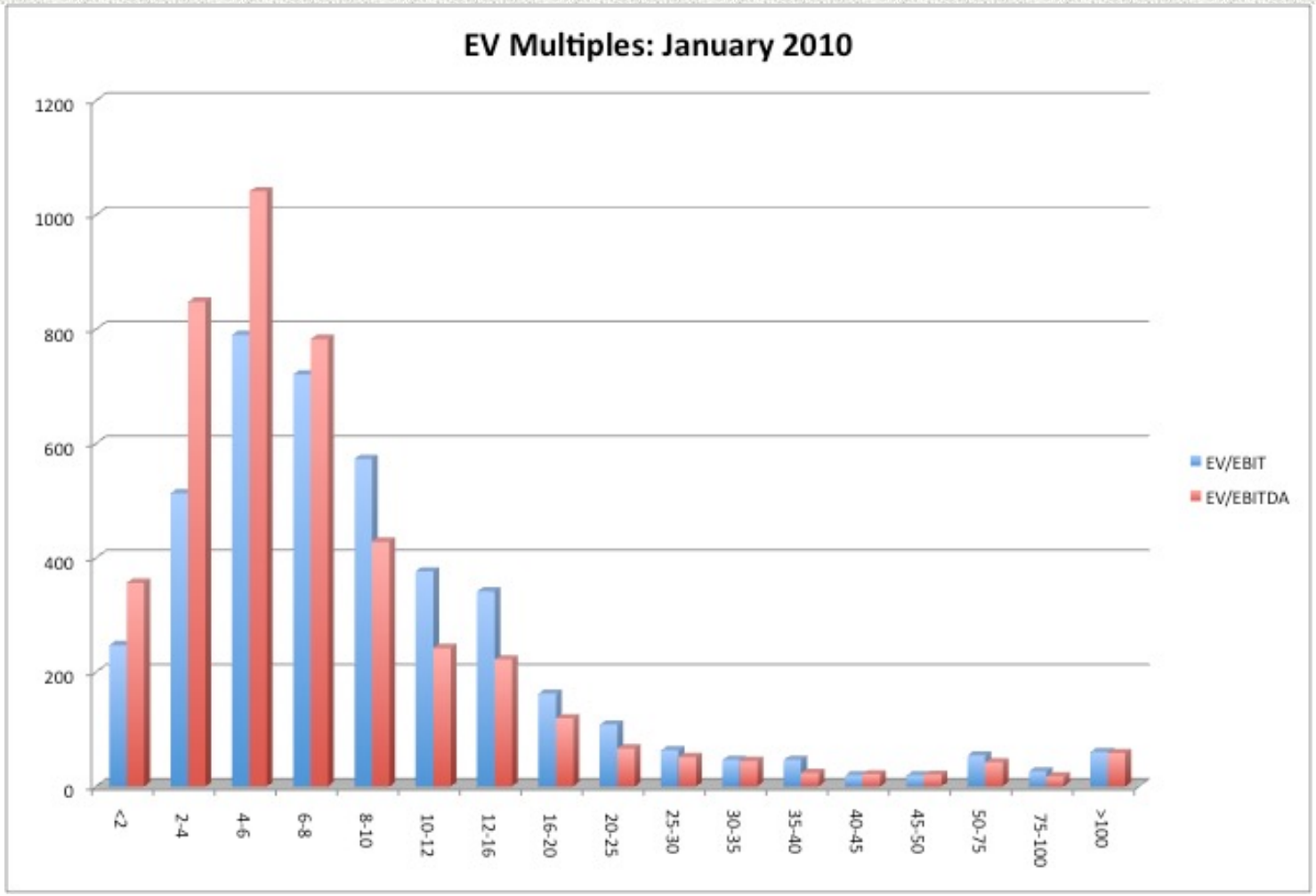
3. MARKETS HAVE A LOT IN COMMON : COMPARING GLOBAL PES

PE Ratios in January 2025: US and Global Stocks

Sub Group	1st Decile	1st Quartile	Median	3rd Quartile	9th Decile
Africa and Middle East	4.66	7.65	12.81	23.34	47.86
Australia & NZ	5.29	10.45	17.72	29.67	69.94
Canada	3.04	7.59	13.64	29.75	79.00
China	7.18	14.44	26.16	54.84	127.46
EU & Environs	4.62	8.09	13.99	25.97	55.99
Eastern Europe & Russia	3.75	5.62	9.89	19.96	46.54
India	10.08	17.95	31.07	59.53	120.10
Japan	6.21	8.72	12.63	19.99	36.49
Latin America & Caribbean	4.08	6.05	10.19	17.55	34.51
Small Asia	4.83	8.18	14.35	27.40	63.03
UK	5.58	9.45	16.87	31.23	53.11
United States	7.40	11.43	18.74	33.22	67.33

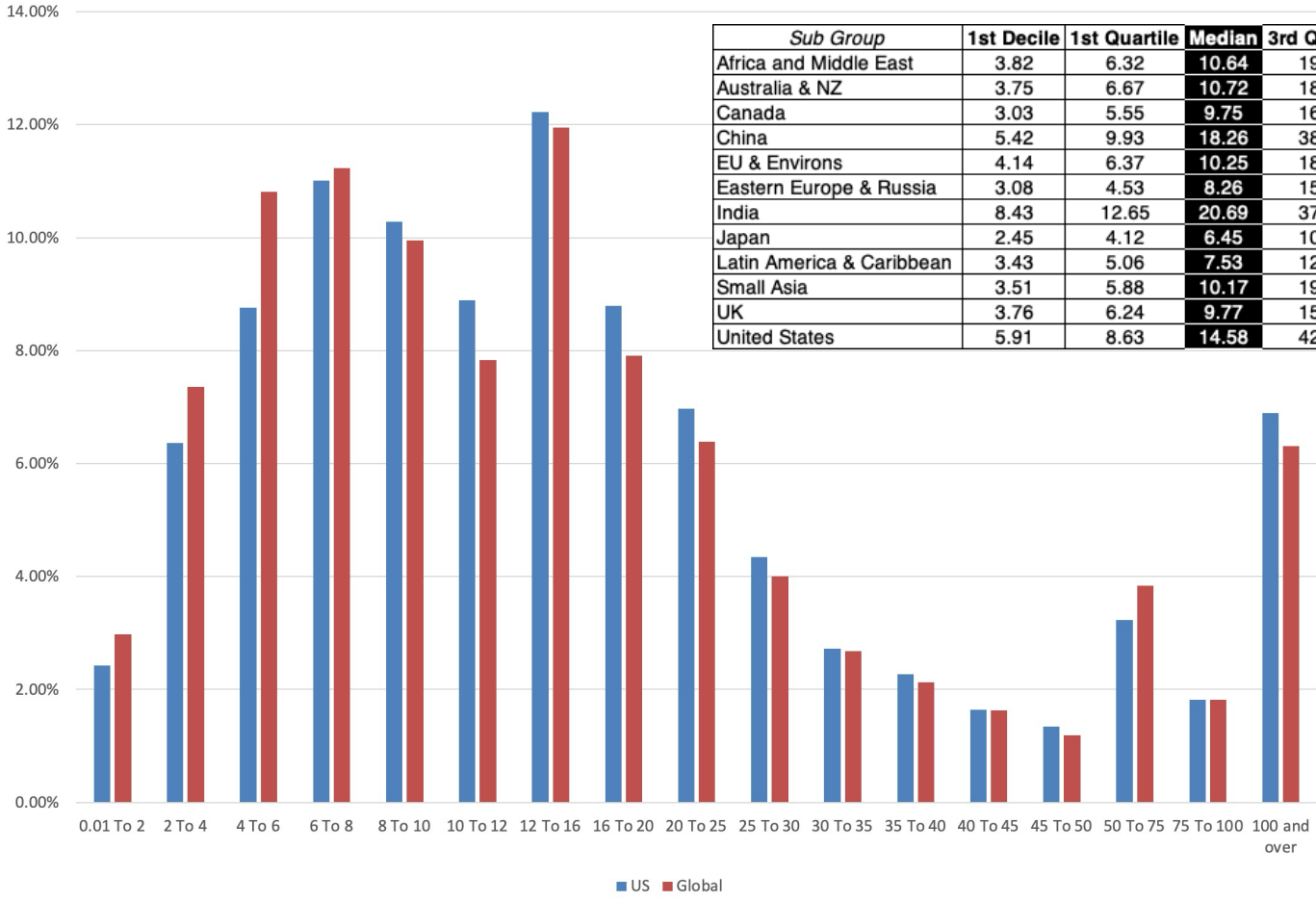


4. SIMPLISTIC RULES ALMOST ALWAYS BREAK DOWN...6 TIMES EBITDA WAS NOT CHEAP IN THE US IN 2010



BUT IT MAY BE IN 2024, UNLESS YOU IN JAPAN OR RUSSIA...

EV to EBITDA in January 2025

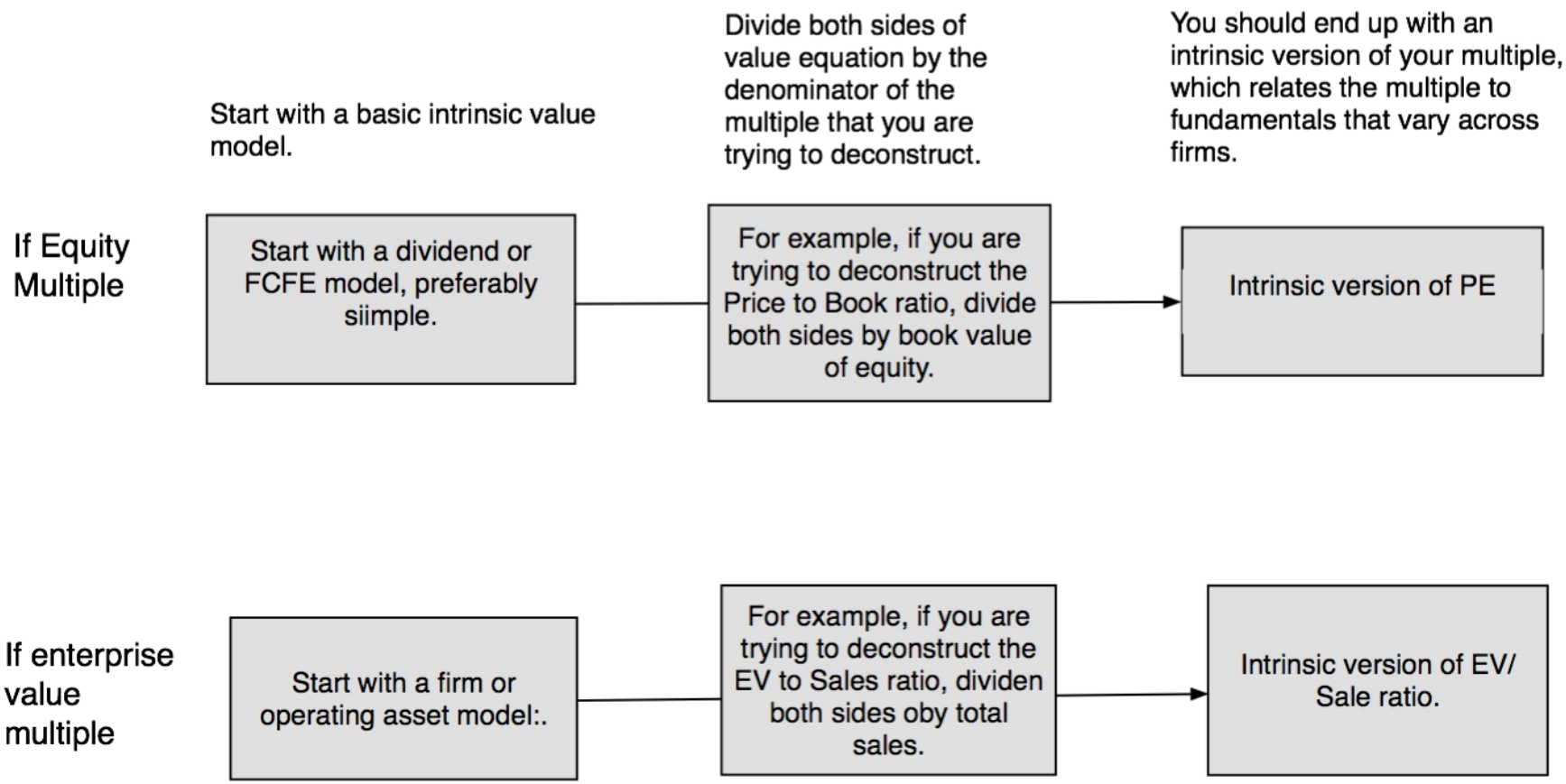


Sub Group	1st Decile	1st Quartile	Median	3rd Quartile	9th Decile
Africa and Middle East	3.82	6.32	10.64	19.20	41.57
Australia & NZ	3.75	6.67	10.72	18.43	44.88
Canada	3.03	5.55	9.75	16.65	37.89
China	5.42	9.93	18.26	38.04	87.79
EU & Environs	4.14	6.37	10.25	18.61	38.05
Eastern Europe & Russia	3.08	4.53	8.26	15.69	29.88
India	8.43	12.65	20.69	37.80	75.93
Japan	2.45	4.12	6.45	10.42	19.44
Latin America & Caribbean	3.43	5.06	7.53	12.24	23.80
Small Asia	3.51	5.88	10.17	19.22	43.57
UK	3.76	6.24	9.77	15.99	28.06
United States	5.91	8.63	14.58	42.92	353.16

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.
  - In fact, using a simple discounted cash flow model and basic algebra should yield the fundamentals that drive a multiple
- How do changes in these fundamentals change the multiple?
  - The relationship between a fundamental (like growth) and a multiple (such as PE) is **seldom linear.** For example, if firm A has twice the growth rate of firm B, it will generally not trade at twice its PE ratio
  - **Proposition 3**: It is i**mpossible to properly compare firms on a multiple**, if we do not know the **nature of the relationship** between fundamentals and the multiple.

A SIMPLE ANALYTICAL DEVICE



PE RATIO: UNDERSTANDING THE FUNDAMENTALS

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

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

- Dividing both sides by the current earnings per share,

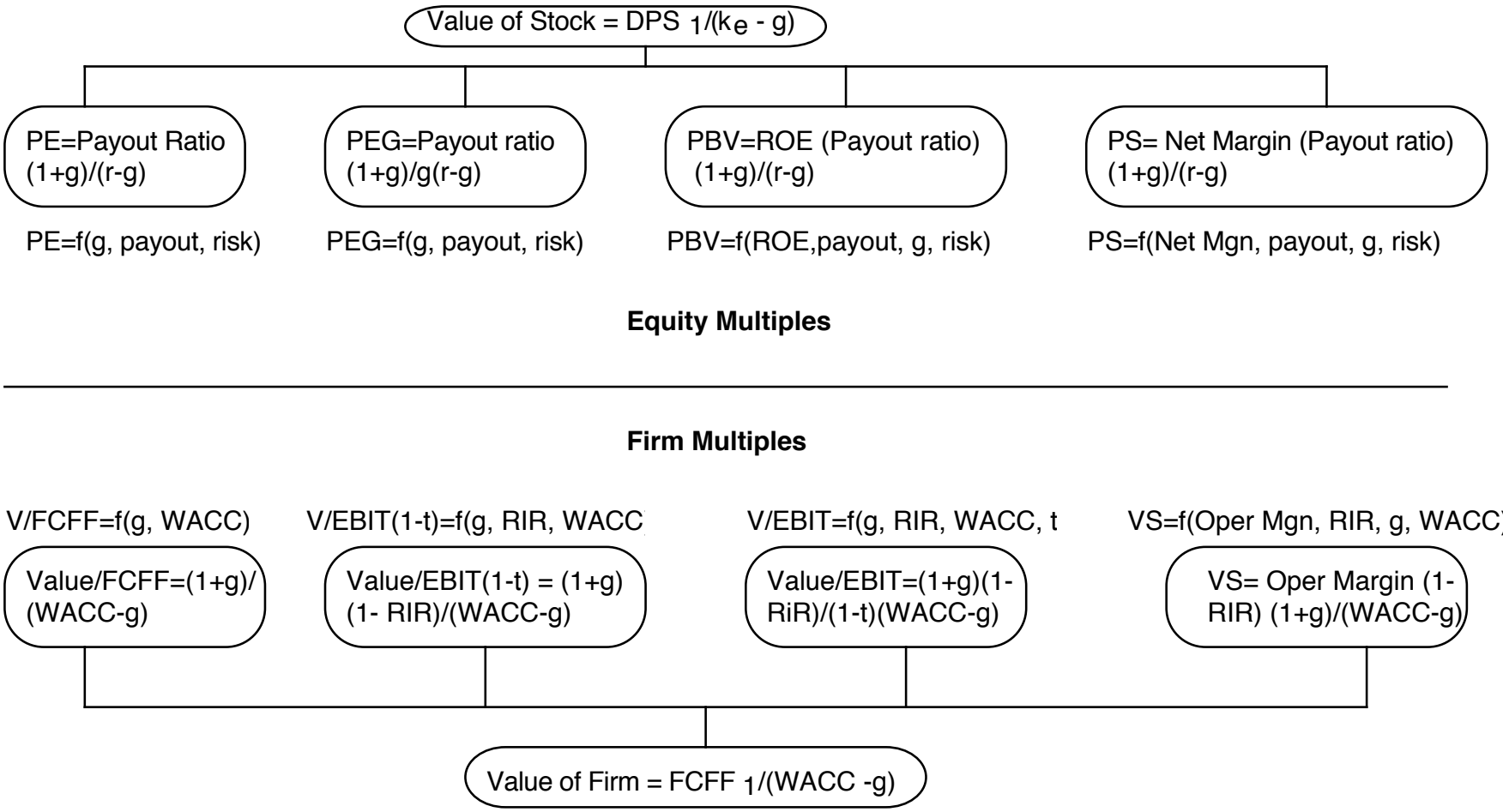
$$\frac{P_0}{EPS_0} = PE = \frac{\text{Payout Ratio} * (1 + g_n)}{r - g_n}$$

- If this had been a FCFE Model,

$$P_0 = \frac{FCFE_1}{r - g_n}$$

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

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.
  - **Proposition 4**: 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?
  - **Proposition 5**: It is **impossible to find an exactly identical firm** to the one you are valuing.

AN EXAMPLE: COMPARING PE RATIOS ACROSS A SECTOR: PE

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	≤ 0.0001
Emerging Market	-13.853	1	3.606	-3.84
0.0009				

Emerging Market is a dummy: 1 if emerging market

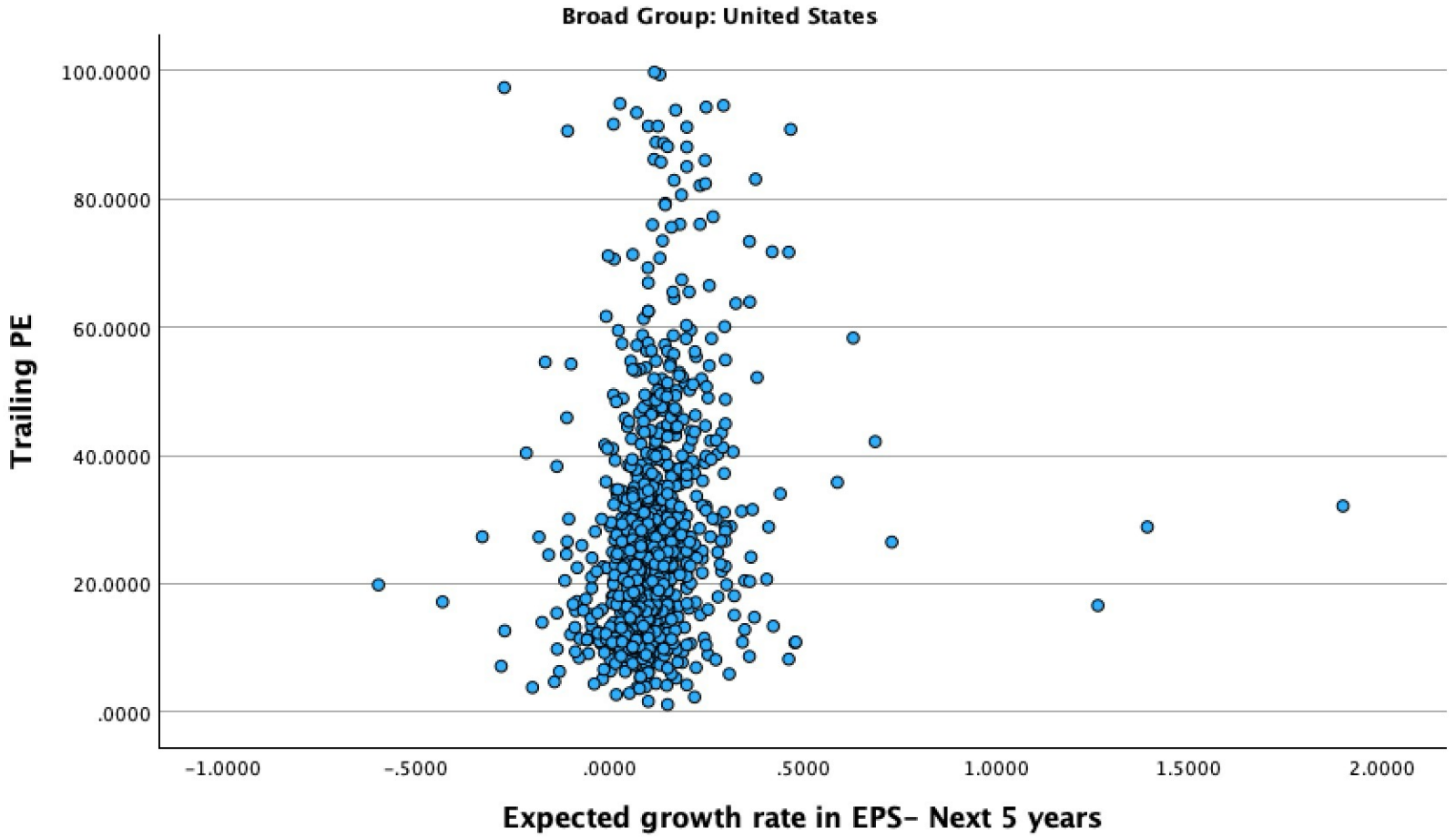
0 if not

- Is Indosat cheap?
  PE = 13.13 + 121.22 (.06) -13.85 (1) = 6.55
- At 7.8 times earnings, Indosat is over valued.

COMPARISONS TO 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.
- While there will be significant variation across the companies in the sample, the sample size will be large enough to yield statistical significance.

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



PE RATIO: STANDARD REGRESSION FOR US STOCKS - JANUARY 2025

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.496[b]	.246	.244	2951.48154

a. Broad Group = United States

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

The regression is run with growth and payout entered as decimals, i.e., 25% is entered as 0.25)

Coefficients[a,b,c]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	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 $)

PE RATIO REGRESSIONS ACROSS MARKETS

⚓ *Market-wide Regressions of Multiples: PE Ratios in January 2025*
T statistics in brackets below coefficients

Regression	R Squared	Region
PE = 16.09 + 9.30 Beta + 51.92 g_{EPS} + 7.53 Payout (0.93) (6.82) (11.84) (6.11)	24.4%	US
PE = 12.58 + 3.70 Beta + 45.97 g_{EPS} + 6.97 Payout (8.70) (4.65) (9.57) (8.48)	16.0%	Europe
PE = 8.63 + 3.72 Beta + 38.36 g_{EPS} + 5.99 Payout (5.43) (4.66) (7.77) (3.44)	26.4%	Japan
PE = 4.28 + 13.96 Beta + 72.58 g_{EPS} + 4.08 Payout (1.47) (7.40) (8.64) (1.79)	46.0%	Aus, NZ & Canada
PE = 23.41 - 1.84 Beta + 33.66 g_{EPS} -2.30 Payout (20.51) (3.63) (14.62) (2.46)	13.2%	Emerging Markets
PE = 24.17 - 1.07 Beta + 53.16 g_{EPS} + 1.08 Payout (38.48) (2.65) (27.59) (2.05	16.0%	Global

g_{EPS}=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

CHOOSING BETWEEN THE MULTIPLES

- As presented in this section, there are **dozens of multiples that can be potentially used** to value an individual firm.
- In addition, relative valuation can be **relative to a sector (or comparable firms) or to the entire market** (using the regressions, for instance)
- Since there can be only one final estimate of value, there are three choices at this stage:
  - Use a **simple average of the pricing** obtained using a number of different multiples
  - Use a **weighted average of the pricing** obtained using a nmber of different multiples
  - Choose **one of the multiples** and base your valuation on that multiple

PICKING ONE MULTIPLE

- This is usually the best way to approach this issue. While a range of values can be obtained from a number of multiples, the "best estimate" value is obtained using one multiple.
- The multiple that is used can be chosen in one of two ways:
  - **The Cynic**: Use the multiple that best fits your objective. Thus, if you want the company to be undervalued, you pick the multiple that yields the highest value.
  - **The Quant**: Use the multiple that has the **highest R-squared** in the sector when regressed against fundamentals. Thus, if you have tried PE, PBV, PS, etc. and run regressions of these multiples against fundamentals, use the multiple that works best at explaining differences across firms in that sector.
  - The Business Imperative: Use the multiple that seems to make the most sense for that sector, given how value is measured and created.

CONVENTIONAL USAGE...

Sector	Multiple Used	Rationale
Cyclical Manufacturing	PE, Relative PE	Often with normalized earnings
Growth firms	PEG ratio	Big differences in growth rates
Young growth firms w/ losses	Revenue Multiples	What choice do you have?
Infrastructure	EV/EBITDA	Early losses, big DA
REIT	P/CFE (where CFE = Net income + Depreciation)	Big depreciation charges on real estate
Financial Services	Price/ Book equity	Marked to market?
Retailing	Revenue multiples	Margins equalize sooner or later