

# Concepts for Valuation

David Liang | Yosha Huang

## What is valuation? The intuition

### Valuing companies

- . Multiples
- . DCF
- . (LBO, Sum-of-the-Parts, Liquidation Value)

### Understanding Multiples and its Applications

# What is Valuation?

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Valuation Presentation

# What is Valuation?

Valuation is the way to determine what price we pay for an asset

## What is an asset?

An asset is an economic resource that generates future profits and value for a firm.



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## Why do we do valuation?

Valuation is the way that investors translate their qualitative research into a price that represents how much the company is worth.

Research -> Valuation model -> Determine intrinsic price (and compare to current market value). **Buy if intrinsic price is higher than current market price!**

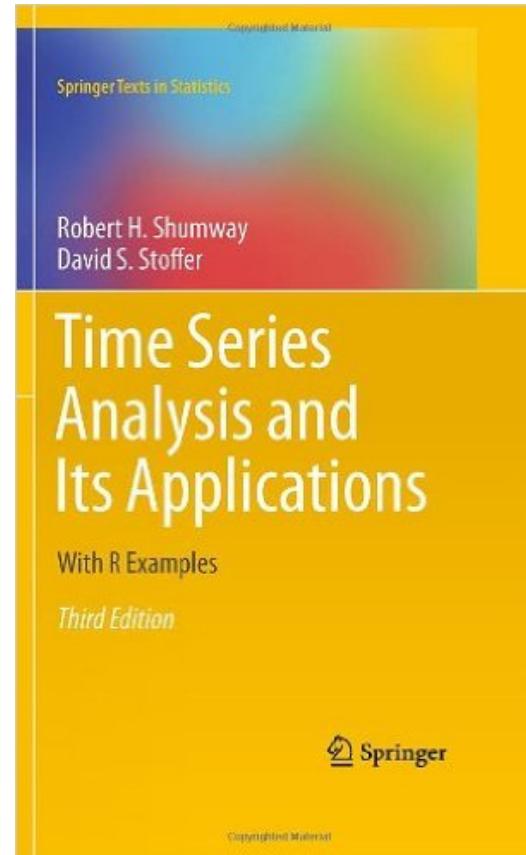
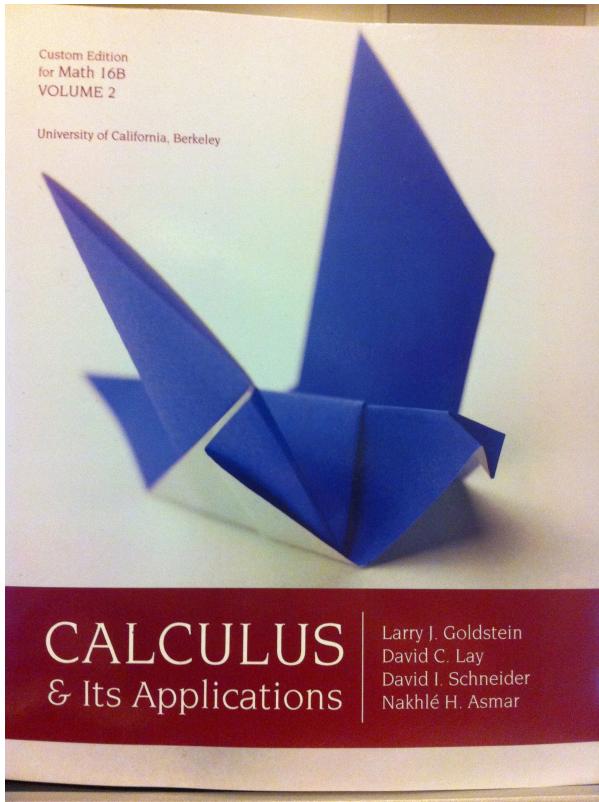


## Intrinsic Value

How much you think the company is worth, based on your independent research.

# The intuition

How would you value a textbook?



# The intuition

When in doubt,  
ask Google...  
or Amazon?

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Is it worth \$59  
or \$270?  
Or maybe the  
median?

# The intuition

## Another approach:

- Let's say that you can loan your book out for \$15/semester.
- Let's say that the professor will continue using this book version for 2 semesters.
- Some simple math tells us that you can make \$30.
- Amazon trade-in buys the book back at \$38.18!

$$\begin{aligned} \$30 + \$38.18 \\ = \$68.18 \end{aligned}$$



.....so is this the value?

# The intuition

- What happens if the professor switches textbook versions after a single semester?
- What if the friend you loaned to pays you only \$10?
- What if Amazon trade-in fills its inventory and stops buying back this book?

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$$\begin{aligned} &\text{Rental } \$10 \times 1 \\ &+ \text{Trade-in } \$0 \\ &= \$10 \end{aligned}$$

(Bear)

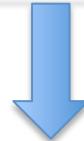
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$$\begin{aligned} &\text{Rental } \$15 \times 2 \\ &+ \text{Trade-in } \$48 \\ &= \$78 \end{aligned}$$

(Bull)

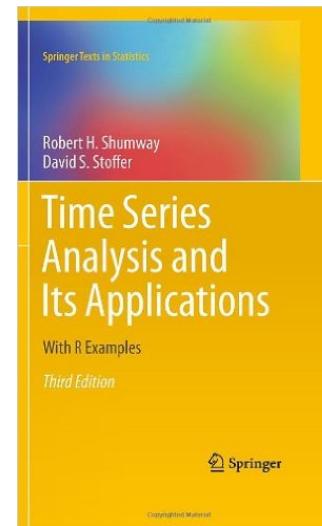
# The intuition

In Utopia, everything goes as planned...



?

=



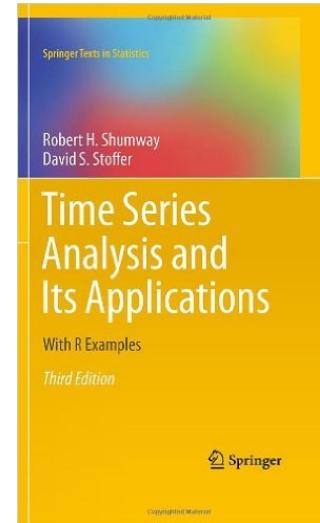
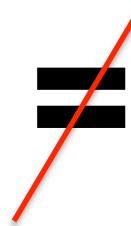
# The intuition

- Remember the time value of money?
- We need to discount the cash flows that come in after Semester 1, and Semester 2...

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{CF_n}{(1+r)^n}$$



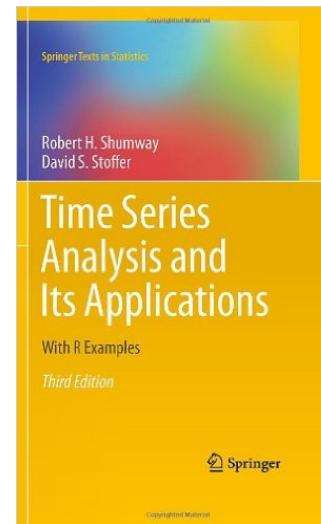
\$68.18



# The intuition

- Let's use today's 10Y Treasury yield as our discount rate
- For simplification, let's assume that a semester is 6 months long to compound semi-annually:

$$\$15 / (1+2.03/2) + \$15 / (1+2.03/2)^2 + \$38.18 / (1+2.03/2)^2 = \text{Value of our book}$$



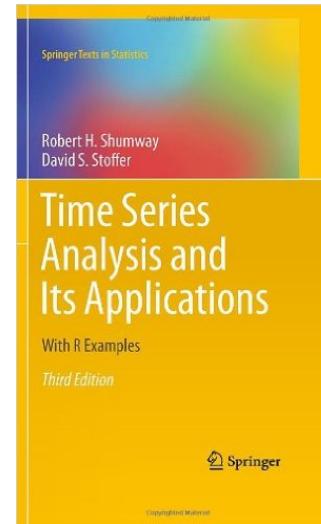
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\$68.18



BONUS: Why is the treasury yield a poor discount rate for our book?

# Valuing companies

- Companies are also valued based on the cash that they will generate for their owners and creditors
- But how do we publicly traded price and intrinsic value?

## Spam Company

(a quick example)



Sales: \$5,000

(Expenses: \$2,000)

Earnings: \$3,000

# shares outstanding: 1,000

P/E: 10x

Share price =  $3000 * 10 / 1,000$   
= \$30

# Common Types of Valuation

## Multiples Valuation

- How much the market is valuing a company relative to the value stakeholders are receiving
- Looking at what other people are paying for “similar” companies

## Discounted Cash Flow (DCF)

- A company is worth the sum of all its future cash flows discounted to the present period
- Need to project future cash flows (“pro forma”) and discount to the present period (time value of money)

## Leveraged Buyout Analysis (LBO)

- Estimates the returns that a financial buyer (e.g. private equity firm) will receive from acquiring a majority stake
- Takes into account the way the acquisition is paid for

## Sum-of-the-Parts Analysis

- Valuing a company’s different business segments as if they were individual companies (e.g. with different multiples)
- Especially relevant for conglomerates with various distinct revenue streams

# Multiples

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Valuation Presentation

# Some definitions first...

- What is share price?
- Difference between equity value (market cap.) vs. enterprise value (EV)?
- Difference between sales vs. earnings?
- What is EBITDA?

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- Difference between sales vs. earnings? **sales are pre-expenses**
- What is EBITDA? **Earnings before taxes, interest, depreciation and amortization**

# Price-to-Earnings Multiple

Price  
EPS



\$ investors are willing  
to pay/share  
\_\_\_\_\_  
\$1 of Earnings/share

- P/E represents how much an investor would pay for each dollar of earnings
- What is included in the P/E multiple?
  - Company's growth prospects
  - Company's risk profile

# Price-to-Earnings

- What causes the difference between a high P/E company and a low P/E company?

- Profitability (margins)
- Operating leverage
- Competitive advantage
- Cyclicalities
- Leverage (debt)
- Management
- Business model
- Macroeconomics

$$\frac{\text{Price}}{\text{Earnings}} \times \frac{\text{Earnings}}{\text{Price}} = 1$$

## NCI Building (NCS) Beats Q3 Earnings on Margin Growth



By Zacks Equity Research  
September 3, 2015 9:00 AM



**NCI Building Systems Inc.** NCS posted adjusted earnings of 15 cents per share in the third quarter (ended Aug 2, 2015) of fiscal 2015, which surged 50% from 10 cents earned in the prior-year quarter. Sales growth and expansion of gross profit margin benefitted results. Earnings per share also surpassed the Zacks Consensus Estimate of 13 cents.



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# Price-to-Earnings

$$\frac{\text{Price}}{\text{Earnings}} \times \text{Earnings} = \text{Price}$$

# How do we assign a P/E to a company?



Comparable  
companies  
("comps")

- Relative valuation methodology
- Use trading multiples of comparable companies to value “target”

## EXAMPLE: Permian Basin E&P Comparables

Name	EV/Sales			EV/EBITDA			EV/EBIT			Debt/EBITDA	
	TTM	FY1	FY2	TTM	FY1	FY2	TTM	FY1	FY2	Debt/Equity	FY1
RING ENERGY INC.	6.31	5.10	4.08	9.94	7.96	6.81	19.17	19.30	21.90	0.00	0.00
Approach Resources	2.50	3.14	2.99	2.96	4.41	4.44	5.79	58.00	45.45	0.52	2.73
Callon Petroleum	3.53	2.86	2.56	5.27	4.51	3.86	11.35	15.35	11.53	0.25	0.94
Concho Resources	6.10	7.31	5.67	8.46	9.63	7.89	16.22	42.87	24.73	0.66	1.98
Diamondback Energy	9.84	9.21	7.85	9.57	11.35	10.68	14.36	28.00	21.39	0.38	1.57
Energen	4.08	4.54	4.14	7.55	7.32	6.93	30.81	44.23	33.45	0.30	1.38
Laredo Petroleum	5.12	5.99	5.67	5.09	8.72	8.53	7.37	48.20	23.66	1.15	3.86
Matador Resources	5.49	5.43	4.25	7.79	7.74	6.45	14.79	71.28	22.84	0.31	1.02
Pioneer Natural Resources	5.63	7.36	6.32	8.64	12.97	11.29	13.76	46.45	28.18	0.31	1.42
Resolute Energy	2.25	3.42	3.51	N/A	6.97	8.24	N/A	N/A	N/A	1.37	6.40
Mean	5.08	5.44	4.70	7.25	8.16	7.51	14.85	41.52	25.90	0.53	2.13
Median	5.31	5.27	4.20	7.79	7.85	7.41	14.36	44.23	23.66	0.35	1.50
High	9.84	9.21	7.85	9.94	12.97	11.29	30.81	71.28	45.45	1.37	6.40
Low	2.25	2.86	2.56	2.96	4.41	3.86	5.79	15.35	11.53	0.00	0.00

What are some pros/cons of using a comparables companies analysis?

# How do we assign a P/E to a company?

Precedent  
transaction  
analysis

- Relative valuation methodology
- Use multiples of selected M&A transactions in the same industry to value “target”

## EXAMPLE: Precedent Transaction Analysis

Date Announced	Acquirer	Target	Transaction Type	Purchase Consideration	Equity Value	Enterprise Value	Enterprise Value /			LTM EBITDA Margin	Equity Value /			Premiums Paid		
							LTM Sales	LTM EBITDA	LTM EBIT		LTM Net Income	Days Prior to 1	Days Prior to 7	Days Prior to 30		
03/11/2010	A	K	Public / Public	Cash	\$1,600	\$1,900	1.5x	8.0x	9.1x	18%	13.6x	30%	27%	33%		
30/10/2010	B	L	Public / Public	Cash / Stock	900	1,200	1.2x	7.6x	8.7x	16%	13.9x	29%	32%	31%		
22/06/2010	C	M	Public / Private	Cash	600	800	1.1x	7.1x	8.1x	15%	12.0x	NA	NA	NA		
15/04/2010	D	N	Public / Public	Stock	1,300	1,350	1.6x	8.5x	12.5x	19%	14.4x	29%	36%	34%		
01/10/2009	E	O	Sponsor / Private	Cash	200	250	1.3x	7.7x	9.2x	17%	13.3x	NA	NA	NA		
01/07/2009	F	P	Public / Public	Stock	2,800	3,000	1.4x	8.0x	10.7x	18%	17.7x	33%	31%	36%		
06/07/2008	G	Q	Sponsor / Public	Cash	1,600	2,000	1.2x	7.5x	9.3x	15%	12.4x	38%	42%	43%		
09/11/2008	H	R	Sponsor / Public	Cash	900	950	1.2x	7.3x	8.3x	16%	13.1x	34%	35%	36%		
21/06/2008	I	S	Sponsor / Public	Cash	1,300	1,800	1.0x	7.2x	8.3x	13%	16.0x	35%	37%	39%		
20/03/2007	J	T	Public / Private	Cash	370	600	0.9x	6.5x	8.1x	14%	10.6x	NA	NA	NA		
<b>Mean</b>							<b>1.2x</b>	<b>7.5x</b>	<b>9.2x</b>	<b>16%</b>	<b>13.7x</b>	<b>33%</b>	<b>34%</b>	<b>36%</b>		
<b>Median</b>							<b>1.2x</b>	<b>7.5x</b>	<b>8.9x</b>	<b>16%</b>	<b>13.4x</b>	<b>33%</b>	<b>35%</b>	<b>36%</b>		
<b>High</b>							<b>1.6x</b>	<b>8.5x</b>	<b>12.5x</b>	<b>19%</b>	<b>17.7x</b>	<b>38%</b>	<b>42%</b>	<b>43%</b>		
<b>Low</b>							<b>0.9x</b>	<b>6.5x</b>	<b>8.1x</b>	<b>13%</b>	<b>10.6x</b>	<b>29%</b>	<b>27%</b>	<b>31%</b>		

What are some pros/cons of using a precedent transactions analysis?

# What happens when P/E doesn't work?

Recall:

$$\text{P/E} \quad = \quad \frac{\text{Price / share}}{\text{EPS}}$$

What are some problems with earnings (net income) and share price?

Share price:

- Private companies don't have a public share price
- Share price is only relevant to equity-holders of the company

Earnings:

- What happens if earnings are negative?
- Earnings can be “manipulated” through accounting

**Because share price and net income are only relevant to equity holders, P/E only values the equity portion and ignores debt holders.**

# What happens when P/E doesn't work?



LinkedIn Corporation (LNKD) - NYSE ★ Watchlist

**195.52** +0.87 (0.45%) 4:00PM EDT

After Hours : **195.50** -0.02 (0.01%) 6:06PM EDT

Prev Close:	<b>194.65</b>	Day's Range:	<b>193.15 - 196.17</b>
Open:	<b>194.94</b>	52wk Range:	<b>165.57 - 276.18</b>
Bid:	<b>192.01 x 200</b>	Volume:	<b>870,749</b>
Ask:	<b>195.48 x 200</b>	Avg Vol (3m):	<b>1,930,080</b>
1y Target Est:	<b>254.64</b>	Market Cap:	<b>25.49B</b>
Beta:	<b>0.956039</b>	P/E (ttm):	<b>N/A</b>
Next Earnings Date:	<b>29-Oct-15</b>	EPS (ttm):	<b>-0.89</b>

## Valuation Measures

Market Cap (intraday) <sup>5</sup> :	<b>25.49B</b>
Enterprise Value (Oct 7, 2015) <sup>3</sup> :	<b>23.45B</b>
Trailing P/E (ttm, intraday):	<b>N/A</b>
Forward P/E (fye Dec 31, 2016) <sup>1</sup> :	<b>55.86</b>
PEG Ratio (5 yr expected) <sup>1</sup> :	<b>2.07</b>
Price/Sales (ttm):	<b>9.91</b>
Price/Book (mrq):	<b>6.05</b>
Enterprise Value/Revenue (ttm) <sup>3</sup> :	<b>9.15</b>
Enterprise Value/EBITDA (ttm) <sup>6</sup> :	<b>108.20</b>

## EV / EBITDA



## Enterprise Value EBITDA

### Enterprise Value

- EV measures the value of the entire firm, including both debt and equity
- Takeover price of the firm

$$\text{EV} = \text{equity value} + \text{debt} - \text{cash}$$

### EBITDA

“Earnings before Interest, Taxes, Depreciation, and Amortization”

- Capital structure neutral (available to all stakeholders)
- Similar to actual cash flows
- Less room for manipulation

EV/EBITDA represents how much the company's stakeholders (both debt and equity) are willing to pay for \$1 of EBITDA

# How do we assign EV/EBITDA?

Recall our methods for P / E:

Comparable companies (“comps”)

- Relative valuation methodology
- Use trading multiples of comparable companies to value “target”

Precedent transaction analysis

- Relative valuation methodology
- Use multiples of selected M&A transactions in the same industry to value “target”

They are the **same** for EV / EBITDA!

# Other Common Multiples

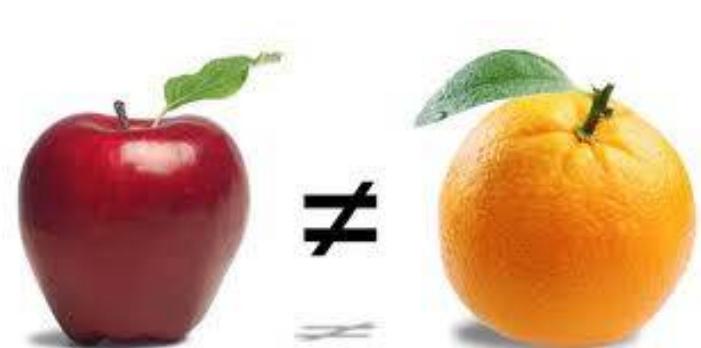
Multiple	What does it stand for?	Reasons to use?
P/E	Price/Earnings	Most commonly used, especially when companies have low leverage
P/S	Price/Sales	Good for companies that have yet to turn a profit (e.g. “top-line” growth more important than margin profile)
P/B	Price/Book Value	How much are shareholders paying for \$1 of equity book value? Used
EV/EBITDA	Enterprise Value / Earnings before Interest, Taxes, Depreciation & Amortization	Captures net debt and cash (for both debt and equity holders) but not CAPEX or taxes
EV/EBIT	Enterprise Value/Earnings before Interest and Taxes	Accounts for CAPEX
EV/FCF (unlevered)	Enterprise Value / Unlevered Free Cash Flow	Similar to EBITDA, but using actual FCF instead of a proxy

## Apples-to-Apples Comparisons

- The numerator and the denominator of a multiple must match in terms of the claims by the company's owners
- Equity value metrics cannot be mixed with enterprise value metrics

Examples:

- Price / Revenue valuation multiple?
- Enterprise Value / Earnings valuation multiple?



Whenever using a valuation multiple, always think about it is truly an “apples-to-apples” comparison.

# Q&A

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# Sum of the Parts Valuation



	2018 EBITDA	Multiple	Valuation	Per Share
Listing	45	8	359	5.1
Cash Trading	143	9	1287	18.4
Derivatives Trading	36	7	254	3.6
Derivatives Clearing	40	7	277	4.0
Market data & Indecies	69	8	549	7.8
Settlement	15	7	108	1.5
Market Solutions & Other	26	7	181	2.6
<b>2018 Total</b>	<b>374</b>	<b>8.1</b>	<b>3015</b>	<b>43.1</b>
Net Debt Estimate			-35	-0.5
2018 Equity Fair Value			2980	<b>42.6</b>

	<u>Cumulative</u>	<u>Annualized</u>
Price Appreciation	15.5%	4.9%
<u>Dividend Return</u>	<u>20.6%</u>	<u>6.4%</u>
<b>Total Return</b>	<b>36.1%</b>	<b>10.8%</b>

# Sum of the Parts Valuation (Bear)



	2018 EBITDA	Multiple	Valuation	Per Share
Listing	38	7	269	3.8
Cash Trading	97	7	677	9.7
Derivatives Trading	30	7	210	3.0
Derivatives Clearing	32	7	224	3.2
Market data & Indecies	58	7	406	5.8
Settlement	13	7	93	1.3
Market Solutions & Other	22	7	155	2.2
<b>2018 Total</b>	<b>290</b>	<b>7.0</b>	<b>2033</b>	<b>29.0</b>
Net Debt Estimate			-35	-0.5
2018 Equity Fair Value			1998	28.5

	<u>Cumulative</u>	<u>Annualized</u>
Price Appreciation	-22.6%	-8.2%
Dividend Return	14.7%	4.7%
<b>Total Return</b>	<b>-7.8%</b>	<b>-2.7%</b>

# Sum of the Parts Valuation (Bull)



	2018 EBITDA	Multiple	Valuation	Per Share
Listing	47	8	377	5.4
Cash Trading	177	10	1773	25.3
Derivatives Trading	38	7	266	3.8
Derivatives Clearing	42	7	291	4.2
Market data & Indices	72	8	576	8.2
Settlement	16	7	114	1.6
Market Solutions & Other	27	7	190	2.7
<b>2018 Total</b>	<b>419</b>	<b>8.6</b>	<b>3586</b>	<b>51.2</b>
Net Debt Estimate			-35	-0.5
2018 Equity Fair Value			3551	50.7

	<u>Cumulative</u>	<u>Annualized</u>
Price Appreciation	37.6%	11.2%
Dividend Return	24.3%	7.5%
<b>Total Return</b>	<b>61.9%</b>	<b>17.4%</b>

# Inputs to a DCF

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DCF

# What is a DCF? *Textbook Version*

*‘Project out free cash flow of a company for a foreseeable period of time (say 5 years). Determine an appropriate discount rate in order to find the ‘present value’ of those future cash flows. Then determine the value of the company beyond the projection period, aka the terminal value. To do this, decide on a long-term growth rate, which the company can continue to grow at to  $\infty$  (usually expected GDP growth or inflation) then compute FCF<sub>6</sub> onwards as a perpetuity.’*

Q.E.D.

# Six Steps to your very own DCF



- 1. Calculate cash flows for Years 1-5**
- 2. Estimate the discount rate**
- 3. Estimate the terminal growth rate**
- 4. Calculate the terminal value**
- 5. Discount all cash flows to the present**
- 6. ADD Years 1-5 and the terminal value together!**

- 1. Calculate cash flows for Years 1-5**
2. Estimate the discount rate
3. Estimate the terminal growth rate
4. Calculate the terminal value
5. Discount all cash flows to the present
- 6. ADD the projection period and terminal value together!**

# What is unit economics?

Unit economic analyzes a company by breaking down its sales into specific units.

Examples: Pokemon empire - # of pokemon  
 Apple (APPL) - # of ipads, iphones sold

- Example: Pokemon



Your Pokemon Empire



Another example for retail businesses specifically is same-store sales, or the amount of revenue and revenue growth attributable to stores that have been open for over a year or fiscal quarter, in relation to the portion attributable to new store openings.

# Why unit economics?

Gives us a relatively clear picture of the company and its upside/downside and allows us to break down the business into key levers.

Example: Automobile company

- We can quantify:
  - How many cars to break-even?
  - How many cars for X% profit (depending on operating leverage)?
  - How many to meet guidance from management?
- We can incorporate the impact of big orders, i.e. what would be the impact of a new order of 7,000 cars be on the topline?



# Bare-bones Financial Statements

The three financial statements are: (1) Income Statement (2) Balance Sheet (3) Statement of Cash Flows.

Income Statement

Revenue	\$ a
Cost of Goods Sold (COGS)	b
Gross Profit	a-b
Operating Expenses (SG&A)	c
Operating Income (EBIT)	a-b-c
Interest Expense	d
Income Tax Expense	e
<b>Net Income</b>	<b>\$a-b-c-d-e</b>

topline  
→

Balance Sheet

<b>Assets</b>	
Current Assets	a
Non-Current Assets	b
Total Assets	a+b
<b>Liabilities</b>	
Short-term Liabilities	c
Long-term Liabilities	d
Total Liabilities	c+d
<b>Shareholders' Equity</b>	
Total Shareholders' Equity	e

bottom line  
→

For illustrative purposes today, we will talk about assumptions going into revenue projections and you can project operating costs (SG&A and R&D) with either a historic growth rate, management guidance found in earnings call transcripts or a percentage of revenue for now.



## Case Study: IGT

International Gaming Technology

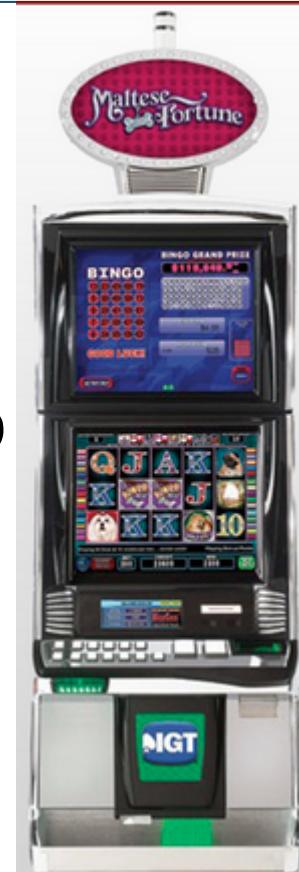
# IGT's business segments

IGT is a global gaming company that specializes in the design, development and manufacturing of casino-style gaming equipment/content. These are offered in land-based (physical machines), online real money and social gaming (fake currencies) settings.

## Business Segments

1. Gaming operations —
  - a. Leasing of Machines
2. Product Sales —
  - a. Sales of machines
  - b. non-machine revenues
3. Interactive — (Online products)
  - a. DoubleDown
  - b. IGTi

Ex:  
5,000



x \$1,000/ea = \$5M



# How does the company make money?



## AKA Income Statement Projections

After breaking down the business segments, dig deeper into the various ways the company makes money. What are the price points and margins of each product or business segment? Are there any growth opportunities?

### Gaming Operations

- Installed based? Yield?
- What drives growth?

### Product Sales

- # of Machines sold in a fiscal year?
- Average selling price?
- What drives growth?

### DCF

- # of Machines sold in a fiscal year?
- Average selling price?
- What drives growth?

# Sample Excel Inputs

## INTERNATIONAL GAME TECHNOLOGY (IGT)

(Fiscal year ends in September. USD in millions)

	2009	2010	2011	2012	2013	2014
Gaming	1,143	1,074	1,073	1,040	991	-
Product	875	843	884	967	1,085	-
<i>Machines</i>	538	521	558	654	756	-
<i>Non-Machine</i>	336	321	326	313	329	-
Interactive			37	144	265	47
<i>Social Gaming</i>			-	87	219	-
<i>IGTi</i>			37	56	47	47
<b>Total Revenue</b>	<b>2,019</b>	<b>1,917</b>	<b>1,993</b>	<b>2,151</b>	<b>2,341</b>	<b>47</b>
% Growth	N/A	-5.0%	4.0%	7.9%	8.9%	-98.0%
<u>COGS</u>						
Gaming COGS	483	432	403	405	374	-
Gaming Gross Profit	661	643	669	634	617	-
% Margin	57.8%	59.8%	62.4%	61.0%	62.2%	0.0%
Product COGS	423	398	396	445	520	-
Product Gross Profit	453	445	487	522	565	-
% Margin	51.7%	52.7%	55.1%	54.0%	52.1%	0.0%
Interactive COGS			18	62	103	47
Interactive Gross Profit			19	81	162	-
% Margin			50.8%	56.3%	61.2%	0.0%
Total Cost of revenue	905	829	819	913	997	47
<b>Total Gross Profit</b>	<b>1,114</b>	<b>1,087</b>	<b>1,175</b>	<b>1,238</b>	<b>1,344</b>	<b>-</b>
% Margin	55.2%	56.7%	58.9%	57.5%	57.4%	0.0%
% Growth	N/A	-2.4%	8.1%	5.3%	8.6%	-100.0%
<u>Operating expenses</u>						
Sales, General and administrative	401	330	353	410	460	-
% of Revenue	19.9%	17.2%	17.7%	19.1%	19.6%	0.0%
Research and Development	194	189	195	217	235	-
% of Revenue	9.6%	9.9%	9.8%	10.1%	10.0%	0.0%

# Discount Rate

Remember the time value of money?

EBITDA Margin Growth

**\$10 today is worth more than \$10 given to me tomorrow bc**

- (1) I value consumption now rather than later
- (2) I could have invested the money for tomorrow (lost opportunity cost)

**How much less is \$10 tomorrow worth?**

Let's say that other investments with the same level of risk return 25% over a day, then \$10 tomorrow is only worth \$8 today ( $\$10 / 1.25$ )

A discount rate is the return that investors expect from an investment with similar risk level.

**Free cash flow goes to both debt and equity holders:**

**WACC**



$$WACC = (E/(D+E)) K_E + (D/(D+E)) K_D (1 - t)$$

NEVER START A  
SENTENCE w/



“According to my  
model...”

Remember : Your model is only as good as your assumptions/inputs  
are and that's what all the original research is for.