

# **BA870: Topics in Financial & Accounting Analytics**

**Lecture #7 (Tuesday, April 12, 2022)**

**Professor Peter Wysocki**

Topics: Intro to Financial Market Analytics: Stock  
Markets, Stock Prices, Present Values

The Boston University logo is a red rectangle with a white border. Inside, the words "BOSTON" and "UNIVERSITY" are written in white, serif, all-caps font, stacked one above the other.

**BOSTON  
UNIVERSITY**

# Financial Signals and Market Ratios

## Ford Motor Company (F)

NYSE - NYSE Delayed Price. Currency in USD



**15.05** +0.05 (+0.33%)

As of 11:35AM EDT. Market open.

[Summary](#)

[Company Outlook](#)

[Chart](#)

Get access to 40+ years of historical data

### Valuation Measures

	Current
Market Cap (intraday) <sup>5</sup>	59.36B
Enterprise Value <sup>3</sup>	167.21B
Trailing P/E	15.02
Forward P/E <sup>1</sup>	19.76
PEG Ratio (5 yr expected) <sup>1</sup>	0.40
Price/Sales (ttm)	0.46
Price/Book (mrq)	1.75
Enterprise Value/Revenue <sup>3</sup>	1.30
Enterprise Value/EBITDA <sup>7</sup>	8.27

## What are these ratios?

P/E Ratio (Trailing and Forward)

Price/Sales (ttm)

Price/Book (mrq)

Enterprise Value/Revenue

Enterprise Value/EBITDA

# Reminder: What is a Stock Price?

- Single Share in a Company
  - Voting Rights
  - Cash Flow Rights
- What Determines the Price of a Share?
  - Economics Answer: Supply and Demand!
  - Whatever someone is willing to pay for it (and whatever someone is willing to sell it for)
- But, what is a rational price to pay?
  - What is the benefit of owning 1-share?
- Gives Rise to “Present Value Analysis”

# Time Value of Money

In accounting (and finance), the phrase **time value of money** indicates a relationship between time and money—that a dollar received today is worth more than a dollar promised at some time in the future.

Why?

# Time Value of Money - Applications

1. Valuing a Firm (equity, debt)
2. Valuing Debt Securities (Bonds)
3. Fair Values of Assets and Liabilities
4. Investment Analysis
  - Rate of Return
  - Make Investment - Yes or No?

# Basic Concepts – Nature of Interest

- Interest is a payment for use of money (renting capital).
- Separate from the amount borrowed (principal).

## Variables involved in financing transaction:

1. **Principal** - Amount borrowed or invested.
2. **Interest Rate** - A percentage.
3. **Time** - The number of years or portion of a year that the principal is outstanding.

# Basics – Simple Interest (Full Year)

- Interest computed on the principal only.

**Illustration:** KC borrows \$20,000 for 1 year at a rate of 7% per year. Compute the total interest to be paid for the **1 year**.

**Annual  
Interest**

$$\begin{aligned}\text{Interest} &= p \times i \\ &= \$20,000 \times .07 \\ &= \$1,400\end{aligned}$$

# Basics – Compound Interest

- Computes interest on:
  - Principal and
  - Interest earned that has not been paid or withdrawn.
- Most business situations use compound interest.



# Basics – Compound Interest

**Illustration:** A company deposits \$10,000 in “Last National Bank”, where it will earn simple interest of 9% per year. It deposits another \$10,000 in the “First State Bank”, where it will earn compound interest of 9% per year compounded annually. In both cases, Vasquez will not withdraw any interest until 3 years from the date of deposit.

<i>Last National Bank</i>		
Simple Interest Calculation	Simple Interest	Accumulated Year-end Balance
Year 1 $\$10,000.00 \times 9\%$	\$ 900.00	\$10,900.00
Year 2 $\$10,000.00 \times 9\%$	900.00	\$11,800.00
Year 3 $\$10,000.00 \times 9\%$	900.00	\$12,700.00
	<u>\$2,700.00</u>	

<i>First State Bank</i>		
Compound Interest Calculation	Compound Interest	Accumulated Year-end Balance
Year 1 $\$10,000.00 \times 9\%$	\$ 900.00	\$ 10,900.00
Year 2 $\$10,900.00 \times 9\%$	\$ 981.00	\$ 11,881.00
Year 3 $\$11,881.00 \times 9\%$	\$1,069.29	\$ 12,950.29
	<u>\$2,950.29</u>	

\$250.29  
Difference

# DCF is important for many things in this course (and your career)

- Must understand time value of money
- Must understand DCF (Discounted Cash Flow) analysis:
  - When you want to know the value of a stock or a company, you perform a VALUATION ... It will always boil down to DCF!
- P/E and other price ratios
  - These all are transformations of DCF.

## 5 Baby Steps for Present Values (PV)

- Single cash flow in 1 year:
  - $PV = CF_1/(1+r)$
- Single cash flow in “n” years from now:
  - $PV = CF_n/(1+r)^n$
- Multiple cash flows in future:
  - $PV = CF_1/(1+r) + CF_2/(1+r)^2 + CF_3/(1+r)^3 + \dots$
- Perpetuity of fixed cash flows:
  - $PV = CF/r$  (1<sup>st</sup> CF is at the end of year 1!)
- Growing Perpetuity:
  - $PV = CF/(r-g)$  (1<sup>st</sup> CF at end of year 1, then grow at g)
- Understanding P/E ratio (just restating DCF!)

# Before We Start Taking Baby Steps: Future Value

- Question: “How much would you receive if you invested \$100 in a 'riskless' government bond that will repay you the Principal + Interest in one year?”
  - Future Value =  $FV = PV \cdot (1+r)$ 
    - What is “r” – Rate of interest on “riskless” 1-year government bond today (say  $r=1\%$ )
  - $FV = \$100 \cdot (1+0.01)$
  - $FV = \$101.00$

## Baby Step #1: “Simple PV”

- Question: “How much would you be willing to pay to purchase 1 share in a company that will pay you a one-time cash flow of \$100 to be paid (with no risk) in one year?”
  - $PV = CF_1/(1+r)$ 
    - Again, riskless interest rate today  $r=1\%$
  - $PV = \$100/(1+0.01)$
  - $PV = \$99.01$

## Baby Step #2: Future CF and Risk

- What is the present value of a one-time riskless cash flow of \$100 to be paid in two years (Current 2-year rate=1.5%)?
  - Why is  $r=1.5\%$  for 2 years?
  - $PV = CF/(1+r)^2 = 100/(1+0.015)^2 = \$97.07$
- What if we are not certain that we will receive exactly \$100 two years from now?
  - Use a higher discount rate!

## Baby Step #3: Many CF's

- What if the firm will generate many cash flows at different times in the future?
  - $PV = CF_1/(1+r) + CF_2/(1+r)^2 + CF_3/(1+r)^3 + \dots$
- Example: Calculate the present value of three \$10 cash flows paid at end of year 1, year 2 and year 3. Assume discount rate of 4%.
  - $PV = 10/(1.04) + 10/(1.04)^2 + 10/(1.04)^3$
  - $PV = 9.61 + 9.25 + 8.89 = \$27.75$

## Baby Step #3: Many CF's Financial Calculator

- Calculate the present value of three \$10 cash flows paid at end of year 1, year 2 and year 3. Assume discount rate of 4%.

Enter the following:

$$PV = ?$$

$$FV = 0$$

$$N = 3$$

$$PMT = \$10$$

$$I = 4\%$$

Solution will be  $PV = \underline{\$27.75}$



## Baby Step #4: Perpetuity

- What if we received \$10 a year indefinitely?  
Seems like a lot of work ....
  - $PV = CF_1/(1+r) + CF_2/(1+r)^2 + CF_3/(1+r)^3 + \dots$
  - Formula for perpetuity:  $PV = P = CF/r$
- Example: \$10 forever,  $r=10\%$   
Price =  $PV = CF/r = \$10 / 0.1 = \$100$

## Baby Step #5: Growing Perpetuity

- It seems a little extreme to assume that cash flows will be constant forever.
- Why might cash flows grow in the future?

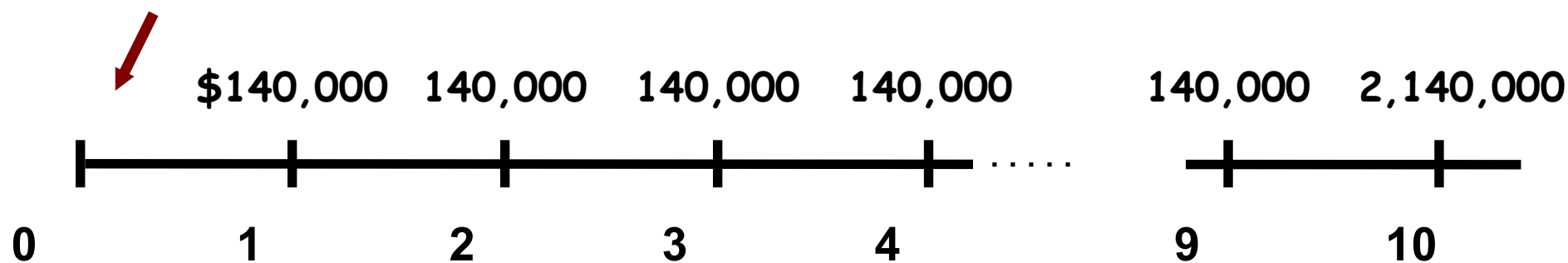
# Value of Growing Perpetuity

- Example: Calculate the present value of a cash flow stream that starts at \$10 one year from today, and then grows at a rate of 5% per year thereafter. Assume discount rate of 12%.
  - $PV = CF/(r-g)$
  - $PV = 10/(0.12-0.05)$
  - $PV = \$142.86$
- Warnings!!!

# Present Values

## Application Valuation of Long-Term Bonds

Present Value



A company issues a \$2,000,000 of 7% bonds due in 10 years with interest payable at year-end. **IMPORTANT: 7% is the payment or coupon rate, NOT the interest rate).** The current market rate of interest for bonds of similar risk is 8%. What amount will the company receive when it issues the bonds?

# First: Find present value of principal (Method 1: Use Excel Spreadsheet)

## Present Value of Principal

Year

0	1	2	3	4	5	6	7	8	9	10
										2,000,000

$$\begin{aligned} \text{PV} &= \text{Principal} / (1+r)^{10} \\ &= 2,000,000 / (1.08)^{10} \\ &\quad \underline{\underline{926387}} \end{aligned}$$

# Second: Find present value of interest (Method 1: Use Excel Spreadsheet)

## Present Value of Principal

Year	0	1	2	3	4	5	6	7	8	9	10
											2,000,000

$$\begin{aligned}
 PV &= \text{Principal} / (1+r)^{10} \\
 &= 2,000,000 / (1.08)^{10} \\
 &\quad \underline{\underline{926387}}
 \end{aligned}$$

## Present Value of 10 Interest (Coupon) Payments

Year	0	1	2	3	4	5	6	7	8	9	10
		140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000

## Present Value of 10 Interest (Coupon) Payments

$$PV = CF / (1+r) + CF / (1+r)^2 + CF / (1+r)^3 + \dots + CF / (1+r)^{10}$$

129629.6	120027.4	111136.5	102904.2	95281.65	88223.75	81688.66	75637.64	70034.86	64847.09
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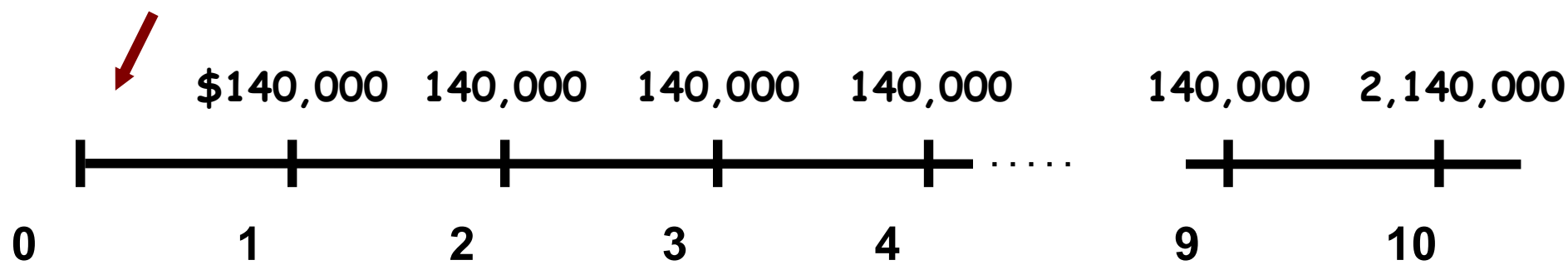
Add together =

**939411.4**

$$\text{Total PV} = \text{PV(Principal)} + \text{Sum of PV(Interest Payments)} = \quad \underline{\underline{\$1,865,798}}$$

## Method 2 – Financial Calculator

Present Value



PV = ?

FV = 2,000,000

PMT = 140,000

N = 10

i = 8%

Answer from calculator: PV = \$1,865,798

# Warnings!!!

- Always draw a time-line for yourself and label the cash flows!
  - Know when they occur (beginning/end of period)
  - Make sure discount rate and growth rates are reasonable!
- Growing perpetuity:
  - Discount rate “ $r$ ” must be larger than cash flow growth rate. Otherwise you will get garbage.



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# How to Determine Stock Price

## → P/E Ratios

- $P = \text{FCF} / (1+r) + \text{FCF} / (1+r)^2 + \dots$
- $P = E / (1+r) + E / (1+r)^2 + \dots$
- Perpetuity  $P = E/r$
- P/E ratio →  $P/E = 1/r$
- Growing Perpetuity:  $P = E/(r-g)$
- P/E ratio →  $P/E = 1/(r-g)$

# How to understand the value of a company (and shares in a company): Forecasting Revenues, Profits and Cash Flows

## GOALS:

- *Review important methods for developing “Top Down” and “Bottom Up” forecasts of a company’s future Sales, Profits and Cash Flows.*
- *Help develop a framework to translate one’s understanding of a company’s strategy, business model, competitive and economic environments to allow one to forecast future accounting numbers and then estimate the value of the company.*

## METHODS:

- **Use Top Down Method for Forecasting Revenues for a Pharmaceutical Startup – Necessary First Step for Valuing Company/Stock**
- **Use Bottom Up Method to Value UBER TECHNOLOGIES**

# Forecasting Sales Exercise – Top Down Method

- *PharmaCo* is a small biotech company with a single drug in development. This drug slows the onset of Alzheimer's disease and, upon approval, would be injected on a weekly basis at the first positive test of the disease for the remaining portion of the patient's life.
- Approval of the drug in the US is expected this year.
- Predict the annual sales of the drug in year 2020 for the US. Show your logic.
- Point is not to get a “correct” number, but to show how you would think through the problem.

\* This exercise is based on an actual job market interview question for investment banking. The candidate would be given only a moment to consider the answer and then was requested to respond.

# What Do/Should Investors Care Ultimately About?

- Two key issues for investors:

(1)

(2)

- Top Down vs Bottom Up Forecasting
  - Bottom Up Forecasting
    - Generally rely on historical financial statements to understand
      - Past Demand (Sales), Past Sales Trends (Operations)
      - Past Expenses, Past Expense Trends (Operations)
      - Past Capacity, Past Capacity Trends (Investment)
      - Past Investment, Past Depreciation (Investment)
      - Cash and Liquid Assets (Financing)
      - Past Financing – Debt and Equity; Interest and Dividends (Financing)
    - Forecast the Future – Focus on Sales – Sales Drives Everything
  - Top Down Forecasting – Examples?

# Forecasting Sales Exercise

---

US population in 2015<sup>1</sup>

Portion older than 65 in 2020 (projected)<sup>1</sup>

Number of people over 65 with Alzheimer's in 2015<sup>2</sup>

Projected number of people with Alzheimer's in 2020<sup>3</sup>

Portion who seek treatment (50%)<sup>4</sup>

Portion of those who are able to take drug (80%)<sup>4</sup>

Total number of possible doses per year per patient<sup>4</sup>

Compliance rate<sup>4</sup>

Total number of doses sold<sup>4</sup>

Price per treatment (i.e., per week)<sup>5</sup>

Forecasted 2020 sales<sup>6</sup>

- 
- 1) Census Bureau
  - 2) Alzheimer's Association
  - 3) Annual growth rate based on Alzheimer's Association estimate of 16 million Alzheimer's patients in 2050
  - 4) Fictitious
  - 5) Fictitious – The Alzheimer's Association estimates that \$200 billion per year is spent on caring for those with Alzheimer's, which is approximately \$700 per week.
  - 6) A recent Reuters article estimated the global market for Alzheimer's to be \$1 - \$5 billion
-

# Top Down Forecasting (Sales) Exercise

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US population in 2020 <sup>1</sup>	322 million people
Portion older than 65 in 2025 (projected) <sup>1</sup>	20% = 64 million people
Number of people over 65 with Alzheimer's in 2020 <sup>2</sup>	5.1 million people with Alzheimer's
Projected number of people with Alzheimer's in 2025 <sup>3</sup>	6.0 million people with Alzheimer's
Portion who seek treatment (50%) <sup>4</sup>	3.0 million people
Portion of those who are able to take drug (80%) <sup>4</sup>	2.4 million people
Total number of possible doses per year per patient <sup>4</sup>	___ weekly doses
Compliance rate <sup>4</sup>	___ compliance
Total number of doses sold <sup>4</sup>	___ million doses per year (1/week)
Price per treatment (i.e., per week) <sup>5</sup>	___ per week
Forecasted 2025 sales <sup>6</sup>	\$___ billion

- 
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# Top Down Forecasting (Sales) Exercise

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Portion of those who are able to take drug (80%) <sup>4</sup>	2.4 million people
Total number of possible doses per year per patient <sup>4</sup>	52 weekly doses
Compliance rate <sup>4</sup>	30% compliance
Total number of doses sold <sup>4</sup>	37.4 million doses per year (1/week)
Price per treatment (i.e., per week) <sup>5</sup>	\$50 per week
Forecasted 2020 sales <sup>6</sup>	\$___ billion

- 
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# Top Down Forecasting (Sales) Exercise

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Forecasted 2020 sales <sup>6</sup>	\$1.87 billion

- 
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  - 5) Fictitious – The Alzheimer's Association estimates that \$200 billion per year is spent on caring for those with Alzheimer's, which is approximately \$700 per week.
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-

# Forecasting: What do investors ultimately care about?

- Forecast Sales?
  - Forecast Margins?
  - Forecast Other Expenses (SG&A)?
  - Forecast Depreciation?
  - Forecast Interest Payments?
  - Forecast Taxes?
  - Forecast Investments?
  - Forecast Dividends and/or Share Repurchases?
- 
- What is the summary measure investors care about?

$$PV = CF_1/(1+r) + CF_2/(1+r)^2 + CF_3/(1+r)^3 + \dots$$

# Uber Technologies, Inc. (UBER)

NYSE - NYSE Delayed Price. Currency in USD

22.82 -0.86 (-3.63%)

At close: April 3 4:02PM EDT

# What is the value of UBER?



Summary Company Outlook Chart

Get access to 40+ years of historical data

## Valuation Measures

Market Cap (intraday) <sup>5</sup>

Current

43.91B



TIME

# Uber Reaches \$17 Billion Valuation in New Funding Round

Victor Luckerson @VLuck | June 6, 2014



Ride-hailing car service Uber has closed a \$1.2 billion venture funding round, valuing the company at \$17 billion. The eye-popping figure, more than quadruple Uber's worth a year ago, makes the company one of the most highly valued startups of all time.

“With our growth and expansion, the company has evolved from being a scrappy Silicon Valley tech startup to being a way of life for millions of people in cities around the world,” CEO Travis Kalanick said in a [blog post](#) announcing the new funding.

Investors in the funding round included Fidelity Investments, Wellington Management, BlackRock Inc. and Google Ventures, according to the [Wall Street Journal](#). The startup plans to raise an additional \$200 million before it closes the funding round.

Uber, which allows users to hail car rides through a mobile app, is available in 128 cities in 37 countries. The company has expanded from its original luxury car service to offer a cheaper ride-sharing program similar to competitors such as Lyft and a courier service currently being tested in New York.

## Uber Raises Funding at \$62.5 Billion Valuation: The ride-hailing company is said to seek \$2.1 billion in a new funding round.

**Bloomberg Business News, By Eric Newcomer, December 3, 2015**

*Uber Technologies* is looking to raise as much as \$2.1 billion in a financing round that would value the car-booking company at \$62.5 billion, said people familiar with the matter. Uber has filed paperwork in Delaware detailing the fundraising plans, said the people, who asked not to be named because the plans are private. The new funding shows Uber is accelerating its race to expand globally and branch into services beyond picking up and dropping off riders. The company has tested food and package delivery in some cities, and is working on new technology, such as [self-driving cars](#). Uber is spending aggressively to expand throughout Asia, particularly in China, where the company expects to spend \$1 billion, according to a June letter to investors from Chief Executive Officer Travis Kalanick.

As part of the current financing round, Uber has closed investments from Tiger Global Management and T. Rowe Price, and it's also seeking strategic investors with shared business interests, the people said. Uber, Tiger Global, and T. Rowe Price declined to comment. One strategic investor, Microsoft, [kicked in](#) about \$100 million as part of a previous round for the San Francisco ride-hailing company, people with knowledge of the matter said in July. Tiger Global backs some of Uber's main competitors outside of the U.S., including China's Didi Kuaidi, India's Ola, and Singapore's GrabTaxi. Didi Kuaidi [raised](#) about \$3 billion in a round this year, people familiar with the matter had said. The three Asian companies, along with Lyft in the U.S., are teaming up to form a global alliance that will make their apps cross-compatible for travelers, they said in a statement on Thursday.

Lyft, Uber's biggest U.S. rival, is currently seeking to raise \$500 million, according to [fundraising documents](#) obtained by Bloomberg last month. The materials also contain details about the company's finances that suggest it's spending aggressively to continue growing. The company lost \$127 million in the first half of 2015 on \$46.7 million in revenue, according to the documents. Lyft said last month that it has gained market share in key markets, such as San Francisco, and has a gross revenue "run rate" of \$1 billion.

For Uber's current round, the company is telling investors it has a gross revenue run rate of more than \$10 billion globally, people familiar with the matter said. The number is typically calculated by annualizing a recent week, month, or quarter of the company's gross revenue, which means actual annual revenue may differ substantially. The number doesn't reflect expenses, and it includes money paid out to drivers, who take most of that revenue. Uber has increased actual U.S. gross revenue about 200 percent this year, the people said. Uber, which launched its service more than five years ago, had already raised more than \$10 billion before the current round. While most of that money has come in exchange for equity, the closely held company took on at least \$1 billion in debt, part of a round led by Goldman Sachs's private wealth arm. Uber is profitable in more than 80 cities around the world, and the number of U.S. trips completed this year has increased 250 percent compared with the same period last year, people familiar with the matter said.



www.dilbert.com  
scottadams@aol.com



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# How Much is Uber Worth?

It is June 2014 and you have just read that this startup company called "Uber" is worth over **\$17 Billion!**

- Is such a high valuation justified?
- Should you find a way to invest in this company?
- Or, are investors crazy and this is an example of another "Internet Bubble"?

# How Much is Uber Worth?

To estimate Uber's value, perform a DCF analysis:

$$PV = CF_1/(1+r) + CF_2/(1+r)^2 + CF_3/(1+r)^3 + \dots$$

- (1) We need to estimate cash flows (CF's) – Understand accounting, finance, strategy, operations management and economics
- (2) We need to understand and estimate risk (r)

\*\* We are going to use some insights from Professor Damodaran's back of the envelope analysis

See: <http://aswathdamodaran.blogspot.com/2014/06/a-disruptive-cab-ride-to-riches-uber.html>

Step 1 – What cash flows do we use? In this example we will assume an all equity firm (no debt)



# How Much is Uber Worth?

## Step 1: Free Cash Flow to Shareholders

Step 1 – What cash flows do we use?

We need free cash flows available to Equityholders (Shareholders):

$$\text{FCF}_{\text{equity}} = \text{Cash Flow from Operations} - \text{Net Investment}$$

*(Investment cash flow is needed to maintain and grow business)*

Approximations:

$$\text{FCF}_{\text{equity}} = \text{Operating Income} - \text{Net Investment} \quad (\text{Approximately!})$$

$$\text{FCF}_{\text{equity}} = (\text{Net Income} + \text{Depreciation}) - \text{Net Investment} \quad (\text{Approximately!})$$

$$\text{FCF}_{\text{equity}} = \text{Net Income} \quad \approx 0 \quad (\text{Approximately!})$$

# How do we project future cash flows?

## Start with Revenue – June 2014 Projections

- What is the overall size of the market?
  - Global urban car service market is \$100 Billion in 2014
- How fast will overall market grow?
  - Assume market is expected to grow 6% per year for 10 years
- What is market share of Uber?
  - Currently 3.63% - Assume will grow to 10% in 10 years
- What is Uber's cut of each taxi ride (i.e., revenue)?
  - Uber get 20% cut of each taxi fare

# Let's first look at the next 5 years ...

## Revenue

Global taxi market is \$100 billion currently, expected to grow 6% a year for next ten years.

	1	2	3	4	5
Overall market	\$106,000	\$112,360	\$119,102	\$126,248	\$133,823
Share of market (gross)	3.63%	5.22%	6.41%	7.31%	7.98%
Revenues as percent of gross	20.00%	20.00%	20.00%	20.00%	20.00%
Annual Revenue	\$769	\$1,173	\$1,528	\$1,846	\$2,137

Uber's current market share is 3.63% and is expected to slowly grow to 10% globally.

Uber's gets a 20% cut of each fare (its revenue).

# Project future cash flows: What is operating margin?

- Uber is currently in the start-up, development, expansion and investing stage – lower margins
  - Leaked information suggest
- Assume that Uber's operating margin will gradually increase over the next 10 years and, in steady state in 10 years, will be 40%.
  - In the top 10% of technology companies

# Let's first look at the next 5 years ...

## Revenue

	1	2	3	4	5
Overall market	\$106,000	\$112,360	\$119,102	\$126,248	\$133,823
Share of market (gross)	3.63%	5.22%	6.41%	7.31%	7.98%
Revenues as percent of gross	20.00%	20.00%	20.00%	20.00%	20.00%
Annual Revenue	\$769	\$1,173	\$1,528	\$1,846	\$2,137
Operating margin	7.00%	10.67%	14.33%	18.00%	21.67%
Operating Income	\$54	\$125	\$219	\$332	\$463

Uber's current operating margin is around 7%  
and it will grow to 40% after 10 years

# What are taxes on profits?

- Must understand current and future projected taxes (all income taxes – U.S. federal, state, global, and even city taxes)
  - Understand politics, global trends, taxes across countries
- Assume 30% current tax rate and that it will slowly increase to 40% after 10 years.
  - Aside about sensitivity analysis – also look at other plausible scenarios – VERY IMPORTANT
  - How sensitive are results / recommendations to assumptions?

# Let's first look at the next 5 years ...

## Revenue

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Operating Income	\$54	\$125	\$219	\$332	\$463
Effective tax rate	31%	32%	33%	34%	35%
- Taxes	\$17	\$40	\$72	\$113	\$162
After-tax operating income	\$37	\$85	\$147	\$219	\$301

Uber's tax rate today is 30% - Assume that it will increase by 1% per year for next 10 years.

# What are necessary investing cash flows to maintain and grow business?

$$FCF_{\text{equity}} = \text{Cash Flow from Operations} - \text{Net Investment}$$

*(Investment cash flow is needed to maintain and grow business)*

Approximation:

$$FCF_{\text{equity}} = \text{After-tax operating Income} - \text{Net Investment}$$

(Approximately!)

- Assume that to maintain and grow revenues, that Uber must invest 20 cents for every dollar of current revenue.
  - Based on comparable business investment rates for growing technology companies. Thus Sales/Investment = 5



# Let's first look at the next 5 years ...

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After-tax operating income	\$37	\$85	\$147	\$219	\$301
Sales/Capital Ratio	5.00	5.00	5.00	5.00	5.00
- Reinvestment	\$94	\$81	\$71	\$64	\$58
Free Cash Flow to the Firm	-\$57	\$4	\$76	\$156	\$243

Sales (revenue) growth from year 1 to year 2 =  $1173 - 769 = \$404$  million  
 Increase Sales/ Increase in Capital = 5  
 So, we need  $1/5 * \$404$  million = \$81 million in investment DURING year 2

# So what are the free cash flows to shareholders over the next 10 years?

Uber's market share of this market will increase to 10% over the next 10 years.

	1	2	3	4	5	6	7	8	9	10
Overall market	\$106,000	\$112,360	\$119,102	\$126,248	\$133,823	\$141,852	\$150,363	\$159,385	\$168,948	\$179,085
Share of market (gross)	3.63%	5.22%	6.41%	7.31%	7.98%	8.49%	8.87%	9.15%	9.36%	10.00%
Revenues as percent of gross	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Annual Revenue	\$769	\$1,173	\$1,528	\$1,846	\$2,137	\$2,408	\$2,666	\$2,916	\$3,163	\$3,582
Operating margin	7.00%	10.67%	14.33%	18.00%	21.67%	25.33%	29.00%	32.67%	36.33%	40.00%
Operating Income	\$54	\$125	\$219	\$332	\$463	\$610	\$773	\$953	\$1,149	\$1,433
Effective tax rate	31%	32%	33%	34%	35%	36%	37%	38%	39%	40%
- Taxes	\$17	\$40	\$72	\$113	\$162	\$220	\$286	\$362	\$448	\$573
After-tax operating income	\$37	\$85	\$147	\$219	\$301	\$390	\$487	\$591	\$701	\$860
Sales/Capital Ratio	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
- Reinvestment	\$94	\$81	\$71	\$64	\$58	\$54	\$52	\$50	\$49	\$84
Free Cash Flow to the Firm	-\$57	\$4	\$76	\$156	\$243	\$336	\$435	\$541	\$652	\$776

## Step 2: What is the present value of the next 10 years of free cash flows → Need “r”

	1	2	3	4	5	6	7	8	9	10
Overall market	\$106,000	\$112,360	\$119,102	\$126,248	\$133,823	\$141,852	\$150,363	\$159,385	\$168,948	\$179,085
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Cost of capital for first 5 years =  
Top decile of US companies =  
12%

Cost of capital declines from 12% to  
8% from years 6 to 10.



# What is the present value of the next 10 years of free cash flows → Need “r”

	1	2	3	4	5	6	7	8	9	10
Overall market	\$106,000	\$112,360	\$119,102	\$126,248	\$133,823	\$141,852	\$150,363	\$159,385	\$168,948	\$179,085
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Discount rate each yr:	12%	12%	12%	12%	12%	12%	11%	10%	9%	8%
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Cost of capital for first 5 years =  
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# What is the present value of the next 10 years of free cash flows → Need “r”

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Sales/Capital Ratio	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
- Reinvestment	\$94	\$81	\$71	\$64	\$58	\$54	\$52	\$50	\$49	\$84
Free Cash Flow to the Firm	-\$57	\$4	\$76	\$156	\$243	\$336	\$435	\$541	\$652	\$776

Discount rate each yr:	12%	12%	12%	12%	12%	12%	11%	10%	9%	8%
PV of 10 free cash flows:	-\$50M	\$3M	\$54M	\$99M	\$138M	\$170M	\$210M	\$252M	\$300M	\$359M

Total Present Value of Free Cash Flows to Equity in Next 10 years = \$1,535M

# What about free cash flows beyond year 10?

In this case, you use your trusty growing perpetuity:

$$PV_{\text{at year 10}} = FCF_{11} / (r - g)$$

- What are “g”, “ $FCF_{11}$ ” and “r”
  - Long-term GDP growth of 2.5% per year (g)
  - $FCF_{11} = FCF_{10} * (1 + 2.5\%) = \$776M * 1.025 = \$795M$
  - On-going cost of capital  $r=8\%$  - established technology companies.

# What about free cash flows beyond year 10?

Use your trusty growing perpetuity formula:

$$PV_{\text{at year 10}} = FCF_{11} / (r-g)$$

$$PV_{\text{at year 10}} = \$795 / (0.08-0.025) = \$14,455M$$

- What is the present value of the \$14,455 from year 10?
  - PV of terminal amount  
 $= 14,455 / \{(1.08) * (1.09) * (1.10) * (1.11) * (1.12)^6\} = \$5,095M$
  - PV of first 10 years of free cash flows = \$1,535M
  - Total Value = \$5095M + \$1535M = \$6,630M

# Final analysis of Value

- Prof “D” assumes a 10%-12% failure rate (no value)
  - So adjusted PV =  $\$6,630 * 89\%$  chance of success  
= \$5,895M
- This is based on assumptions of:
  - \$100B current market global market
  - 10% eventual market share for Uber
  - Uber’s 20% share of gross taxi fares (receipts)



# Sensitivity analysis

		Potential market (in millions of US\$)					
		\$50,000	\$100,000	\$150,000	\$200,000	\$250,000	\$300,000
Target Market Share (in %)	5.00%	\$1,545	\$2,995	\$4,445	\$5,895	\$7,345	\$8,795
	7.50%	\$2,270	\$4,445	\$6,620	\$8,795	\$10,970	\$13,144
	10.00%	\$2,995	\$5,895	\$8,795	\$11,694	\$14,594	\$17,494
	12.50%	\$3,270	\$7,345	\$10,970	\$14,594	\$18,219	\$21,844
	15.00%	\$4,445	\$8,795	\$13,144	\$17,494	\$21,844	\$26,194
	17.50%	\$5,170	\$10,245	\$15,319	\$20,394	\$25,468	\$30,543
	20.00%	\$5,895	\$11,694	\$17,494	\$23,294	\$29,093	\$34,893

		Potential market (in millions of US\$)		
		\$100,000	\$200,000	\$300,000
Uber's share of gross receipts	5%	\$1,818	\$3,556	\$5,294
	10%	\$3,294	\$6,269	\$9,360
	15%	\$4,536	\$8,982	\$13,472
	20%	\$5,895	\$11,694	\$17,494
	25%	\$7,254	\$14,407	\$21,561

Uber's value is claimed to be greater than \$17Billion

# What has changed in a year?

<i>Input</i>	<i>June 2014</i>	<i>September 2015</i>	<i>Rationale</i>
Total Market	\$100 billion; Urban car service	\$230 billion; Logistics	Market is broader, bigger & more global than I thought it would be. <u>Uber's</u> entry into delivery & moving businesses is now plausible, perhaps even probable.
Growth in market	Increase market size by 34%; CAGR of 6%.	Double market size; CAGR of 10.39%.	New customers being drawn to car sharing, with more diverse offerings.
Market Share	10% (Local Networking)	25% (Weak Global Networking)	Higher cost of entry will reduce competitors, but remaining competitors have access to capital & in Asia, the hometown advantage.
Slice of gross receipts	20% (Left at status quo)	15%	Increased competition will reduce car service company slice.
Operating margin	40% (Low cost model)	25% (Partial employee model)	Drivers will become partial employees, higher insurance and regulatory costs.
Cost of capital	12% (Ninth <u>decile</u> of US companies)	10% (75 <sup>th</sup> percentile of US companies)	Business model in place and substantial revenues.
Probability of failure	10%	0%	Enough cash on hand to fend off threats to survival.
Value of equity	\$5.9 billion	\$23.4 billion	<b>Value increased more than four fold.</b>

# Revised UBER Valuation – Fall 2015

	Base	1	2	3	4	5	6	7	8	9	10	Terminal year
Overall market	\$230,000.00	\$253,897.00	\$280,276.90	\$309,397.67	\$341,544.09	\$377,030.52	\$416,203.99	\$459,447.58	\$507,184.18	\$559,880.62	\$618,052.22	\$631,958.39
Share of market (gross)	4.71%	6.742%	8.770%	10.799%	12.828%	14.857%	16.885%	18.914%	20.943%	22.971%	25.000%	25.00%
Revenues as percent of gross	20.00%	19.50%	19.00%	18.50%	18.00%	17.50%	17.00%	16.50%	16.00%	15.50%	15.00%	15.00%
Annual Revenue	\$2,168.00	\$3,337.83	\$4,670.49	\$6,181.27	\$7,886.28	\$9,802.38	\$11,947.08	\$14,338.42	\$16,994.82	\$19,934.84	\$23,176.96	\$23,698.44
Operating margin	-23.06%	-18.26%	-13.45%	-8.64%	-3.84%	0.97%	5.77%	10.58%	15.39%	20.19%	25.00%	25.00%
Operating Income	-\$500.00	-\$609.37	-\$628.19	-\$534.30	-\$302.65	\$94.95	\$689.93	\$1,517.17	\$2,615.07	\$4,025.59	\$5,794.24	\$5,924.61
Effective tax rate	30.00%	31.00%	32.00%	33.00%	34.00%	35.00%	36.00%	37.00%	38.00%	39.00%	40.00%	40.00%
- Taxes	-\$150.00	-\$188.90	-\$201.02	-\$176.32	-\$102.90	\$33.23	\$248.38	\$561.35	\$993.73	\$1,569.98	\$2,317.70	\$2,369.84
After-tax operating income	-\$350.00	-\$420.46	-\$427.17	-\$357.98	-\$199.75	\$61.72	\$441.56	\$955.82	\$1,621.34	\$2,455.61	\$3,476.54	\$3,554.77
Sales/Capital Ratio		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	
- Reinvestment		\$233.97	\$266.53	\$302.16	\$341.00	\$383.22	\$428.94	\$478.27	\$531.28	\$588.01	\$648.42	\$319.93
Free Cash Flow to the Firm		-\$654.43	-\$693.70	-\$660.14	-\$540.75	-\$321.50	\$12.62	\$477.55	\$1,090.06	\$1,867.60	\$2,828.12	\$3,234.84
Terminal value											\$56,258.04	
Present value of FCFF		-\$594.94	-\$573.31	-\$495.97	-\$369.34	-\$199.63	\$7.15	\$247.76	\$519.79	\$821.54	\$1,151.91	
Present value of terminal value											\$22,914.27	
Cost of capital	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	9.60%	9.20%	8.80%	8.40%	8.00%	
Cumulated cost of capital =		1.1000	1.2100	1.3310	1.4641	1.6105	1.7651	1.9275	2.0971	2.2733	2.4552	
Imputed Return on capital												25.00%
PV of cash flows during next 10 year:	\$514.96											
PV of terminal value =	\$22,914.27											
Value of operating assets	\$23,429.23											
Probability of failure	0%											
Adjusted value of operating assets	\$23,429.23											

\$23.4 Billion vs \$62.5 Billion?

**UBER Valuation: May 10, 2019: \$76 Billion**

**April 3, 2020: \$44 Billion**

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# Uber's High-Profile IPO Upsets With Weak Debut

Company's shares closed their first day of trading at \$41.57, blemish for San Francisco-based company

By *Corrie Driebusch* and *Maureen Farrell*

Updated May 10, 2019 6:54 pm ET

SHARE TEXT

Uber Technologies Inc. skidded into the public markets Friday, falling 7.6% below the ride-hailing giant's already conservative offering price in a bleak debut for the nation's most valuable startup.

The company's shares closed their first day of trading at \$41.57, a rare initial drop for a high-profile stock. That gives Uber a valuation of roughly \$76 billion.

## Uber Technologies, Inc. (UBER)

NYSE - NYSE Delayed Price. Currency in USD

**22.82** -0.86 (-3.63%)

At close: April 3 4:02PM EDT

Summary

Company Outlook

Chart

Get access to 40+ years of historical data

## Valuation Measures

Current ?

Market Cap (intraday) <sup>5</sup>

43.91B

BOSTON  
UNIVERSITY

# Takeaways:

- Full blown valuation forces you to understand:
  - What is the business model?
  - How will sales grow?
  - What are the margins? Are they sustainable?
  - What is the necessary re-investment to maintain/grow business?
- What are my assumptions?
  - As we can see, slight changes in assumptions make a big difference
- Sensitivity Analysis is Key!
  - Do the assumptions seem reasonable to justify valuation
  - GI-GO (Garbage In – Garbage Out)