2220 - Entrepreneurial Finance and Venture Capital

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Lecture #5

Uber in 2014: Damodaran vs Gurley

- Uber valuation in June 2014 investment round: $17B
- Aswath Damodaran (NYU): overvalued, worth only $5.9B
  - Uber will take 10% of global taxi market
- Bill Gurley (Uber investor): Damodaran is wrong because Uber will
  - Expand the taxi market size, not just take a slice
  - Capture a larger market share
- Gurley's conclusion: Uber plausibly worth 25x Damodaran's value!

http://aswathdamodaran.blogspot.pt/2014/07/possible-plausible-and-probable-big.html

“Evaluate Rubicon using a three-stage model”

Three-stage DCF model: Rubicon Global

Starting year 2014

Sales in year 0	30
Asset intensity in year 0	-30.0%
Profitability in year 0	-21.0%

Cost of capital 10.0%

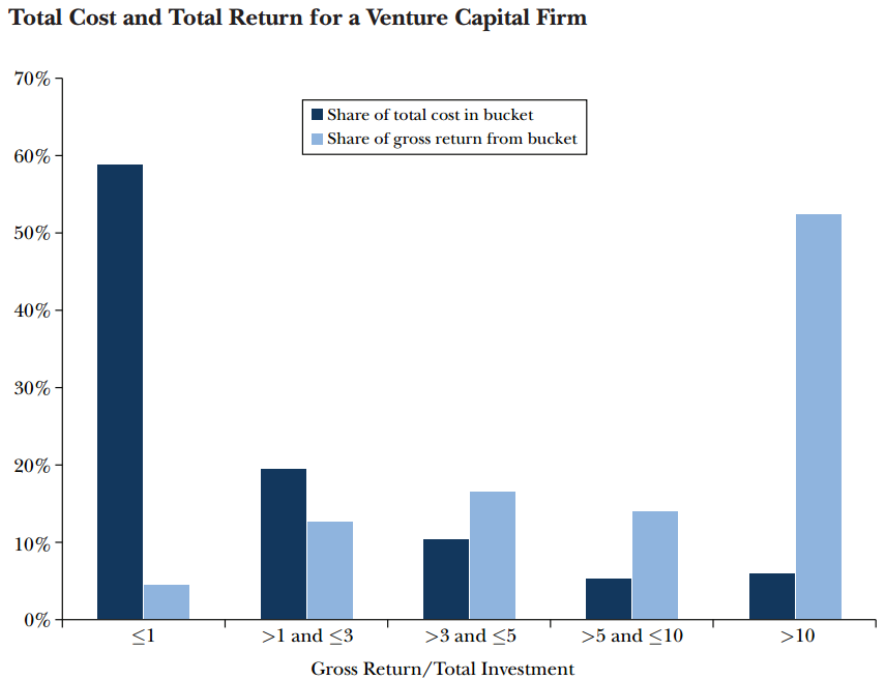
Years	**1-5**	**6-10**	**11+**
Growth (g)	50.0%	35.0%	2.5%
Profitability (p)	-21.0%	-8.0%	18.0%
Asset intensity (a)	-30.0%	-30.0%	-30.0%

NPV of terminal value	939.5
Entreprise Value	959.2
Funding needed	72.1

Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Sales	30.0	45.0	67.5	101.3	151.9	227.8	307.5	415.2	560.5	756.7	1,021.5	1,047.1	1,073.2
g		50%	50%	50%	50%	50%	35%	35%	35%	35%	35%	3%	3%
p	-21%	-21%	-21%	-21%	-21%	-21%	-8%	-8%	-8%	-8%	-8%	18%	18%
a	-30%	-30%	-30%	-30%	-30%	-30%	-30%	-30%	-30%	-30%	-30%	-30%	-30%
EBIAT	-6.3	-9.5	-14.2	-21.3	-31.9	-47.8	-24.6	-33.2	-44.8	-60.5	-81.7	188.5	193.2
NOA	-9.0	-13.5	-20.3	-30.4	-45.6	-68.3	-92.3	-124.6	-168.2	-227.0	-306.5	-314.1	-322.0
FCF		-5.0	-7.4	-11.1	-16.7	-25.1	-0.7	-0.9	-1.2	-1.7	-2.3	196.1	201.0
Cum. FCF		-5.0	-12.4	-23.5	-40.2	-65.3	-66.0	-66.9	-68.1	-69.8	-72.1	124.1	325.1
EV	959.2	1,060.1	1,173.5	1,302.0	1,448.9	1,618.9	1,781.5	1,960.5	2,157.8	2,375.3	2,615.1	2,680.5	2,747.5
EV/EBIAT		-101.5	-74.8	-55.2	-40.8	-30.3	-65.8	-53.6	-43.7	-35.6	-29.1	13.9	13.9
EV/Sales		21.3	15.7	11.6	8.6	6.4	5.3	4.3	3.5	2.9	2.3	2.5	2.5

Extreme uncertainty is the rule

- Uber in 2014 was already a huge success



- Predicting success at earlier stages is even harder

- How do VCs incorporate this uncertainty into valuation?

The Venture Capital method

1. Forecast performance in a success scenario (e.g. sales, earnings, cash flows)
2. Estimate time of exit (IPO or sale)
3. Value the firm at exit
   - Typically by assuming a multiple of sales or earnings
4. Discount this exit value back to the present at a very high discount rate
5. Use this value to determine the VC's equity stake

VC method simple example

1. Forecast earnings

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Earnings	-5	0	0	0	0	5

2. VC estimates exit at year 5
3. Estimated multiple of 20x earnings, for a value of 100M
4. VC targets a 50% return
   - $100/(1.5)^5 = 13.2$M
5. VC equity stake? VC will ask for
   - Investment/PV of exit value $= 5/13.2 = 38\%$
   - Alternatively:
     Future value of investment/Exit value $= 5 \times 1.5^5/100 = 38\%$

VC method simple example - implied valuation

- Post-money valuation: value of the firm after the VC invests

$$\text{Post-money valuation} = \frac{\text{Investment}}{\text{VC equity stake}} = 13.2$$

  - Note: equal to PV of exit value with one round, but not with multiple rounds

- Pre-money valuation: value before the investment; this is the entrepreneur's stake, or *sweat equity*

$$\text{Pre-money valuation} = \text{Post-money valuation} - \text{Investment} = 8.2$$

VC method simple example - shares and share price

- Assume founders own $N_0 = 1$M shares before the investment
- Upon investment, firm issues new shares that go to VC
- How many shares N_1 does VC get? Let s_1=VC equity stake
  - $s_1 = \frac{N_1}{N_0+N_1} \implies N_1 = s_1 \frac{N_0}{1-s_1} = 0.612$M shares
  - Note that $\frac{N_0}{1-s_1} = N_0 + N_1$ and $1 - s_1$ is the founders' retention percentage
- Implicit share price is therefore 5M/0.612M= 8.17

What if a second round is needed?

- VCs typically invest in stages
- Suppose earnings are instead

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Earnings	-5	0	-3	0	0	5

- The new investor in year 2 uses a 30% discount rate
  - At year 2, firm is valued at $100/(1.3)^3 = 45.5$M
  - Required equity stake s_2 equals $3/45.5 = 6.6\%$
- Now first VC has to worry about **dilution** when second VC comes in
  - After second VC invests, first VC and founders retain only $1 - s_2 = 93.4\%$
  - But first VC still requires $s_1 = 38\%$ at exit
  - At year 0, first VC must then own $\frac{38\%}{93.4\%} = 40.7\%$
- 1st round post-money valuation: $\frac{5}{40.7\%} = 12.3$M

Shares issued and share price with two rounds

- At year 0
  - First VC gets $N_1 = s_1 \frac{N_0}{1-s_1-s_2}$ shares (founder retention $= 1 - s_1 - s_2$)
  - $N_1 = .38 \frac{1\text{M}}{1-.38-.066} = 0.686\text{M}$ shares
  - Can verify VC equity stake at year 0 is $0.686/(1+0.686) = 40.7\%$
  - Implied share price is $5\text{M}/0.686\text{M} = 7.29$

- At year 2
  - Second VC gets $N_2 = s_2 \frac{N_0}{1-s_1-s_2}$ shares
  - $N_2 = .066 \frac{1\text{M}}{1-.38-.066} = 0.119\text{M}$ shares
  - As planned, first VC equity stake at year 2 becomes $0.686/(1+0.686+0.119) = 38\%$
  - Implied share price is now $3\text{M}/0.119\text{M} = 25.18$

General process with multiple rounds

1. Calculate what exit stakes must be for each investor
   - $\frac{\text{Investment}}{\text{Exit value}/(1+\text{Discount rate})^{\text{years to exit}}}$
2. Use exit stakes to obtain entry stakes and implied valuation
   - VC entry stake $= \frac{\text{VC exit stake}}{\text{1-exit stakes of future investors}}$
   - Post-money valuation $= \frac{\text{Investment}}{\text{VC entry stake}}$
3. Calculate the total number of shares at exit
   - $\frac{\text{Initial founder shares}}{\text{Founder retention \% at exit}} = \frac{\text{Initial founder shares}}{1-\text{sum of investor exit stakes}}$
4. Use these to get # of shares and share price for each round
   - Investor shares $=$ Total exit shares $\times$ Investor exit stake
   - Share price $= \frac{\text{Investment}}{\text{Investor shares}}$

Adding stock options

- VC deals commonly include the creation of a stock option pool
- At whose expense stock options are issued matters a lot
  - Typically created *before* investment, at expense of founders, to avoid VC dilution
  - An example of how deal terms beyond valuation affect the payoff for entrepreneurs
- Treat option pool as another investor

Stock options example

- Suppose the previous deal includes an option pool representing $m = 15\%$ of equity by the exit date, issued at expense of founders

- Total number of shares at exit: $\frac{N_0}{1-s_1-s_2-m} = 2.475\text{M}$
  - $N_1 = s_1 2.475 = 0.941\text{M}$ for the first VC
  - $N_2 = s_2 2.475 = 0.163\text{M}$ for the second VC

- And implied share prices are
  - 5M/0.941M= 5.33
  - 3M/0.163M= 18.40

Capitalization table

- Cap tables summarize a venture's ownership after each round
- In this example:

	1st round			2nd round		
	Shares	Ownership	Value	Shares	Ownership	Value
Founders	1,000,000	43.3%	5,325,465	1,000,000	40.4%	18,407,032
First VC	938,885	40.6%	5,000,000	938,885	38.0%	17,282,089
Second VC				162,981	6.6%	3,000,000
Option pool	370,918	16.1%	1,975,309	370,918	15.0%	6,827,492
Total	2,309,803	100.0%	12,300,774	2,472,784	100.0%	45,516,614

The Venture Capital method vs DCF

Two differences:

1. How to get exit values
   - Use of sales or earnings multiples vs future cash flow projections

2. How to discount exit values
   - Use of very high discount rates vs the standard CAPM discount rate

Funding stage	Discount rate
Seed	50% to 70%
First-stage	40% to 60%
Second-stage	30% to 50%
Later stage	20% to 35%

Using multiples instead of cash flow projections

- Note that VC method still requires forecasting *growth* (i.e. size at exit), which is the hardest

- Strengths
  - Tells you what the market is willing to pay

- Weaknesses
  - Naive use of industry comparables can be highly misleading (e.g. Rubicon)
  - Picking right comparables requires understanding cash flow characteristics of business model: profitability and asset intensity
  - Comparable firms may not be available at all, e.g. new product, new business model
  - Sensitive to market timing (e.g. bubbles)

- Can use both methods and probe where differences arise

Using three-stage model to get exit value

Three-stage DCF model: Rubicon Global

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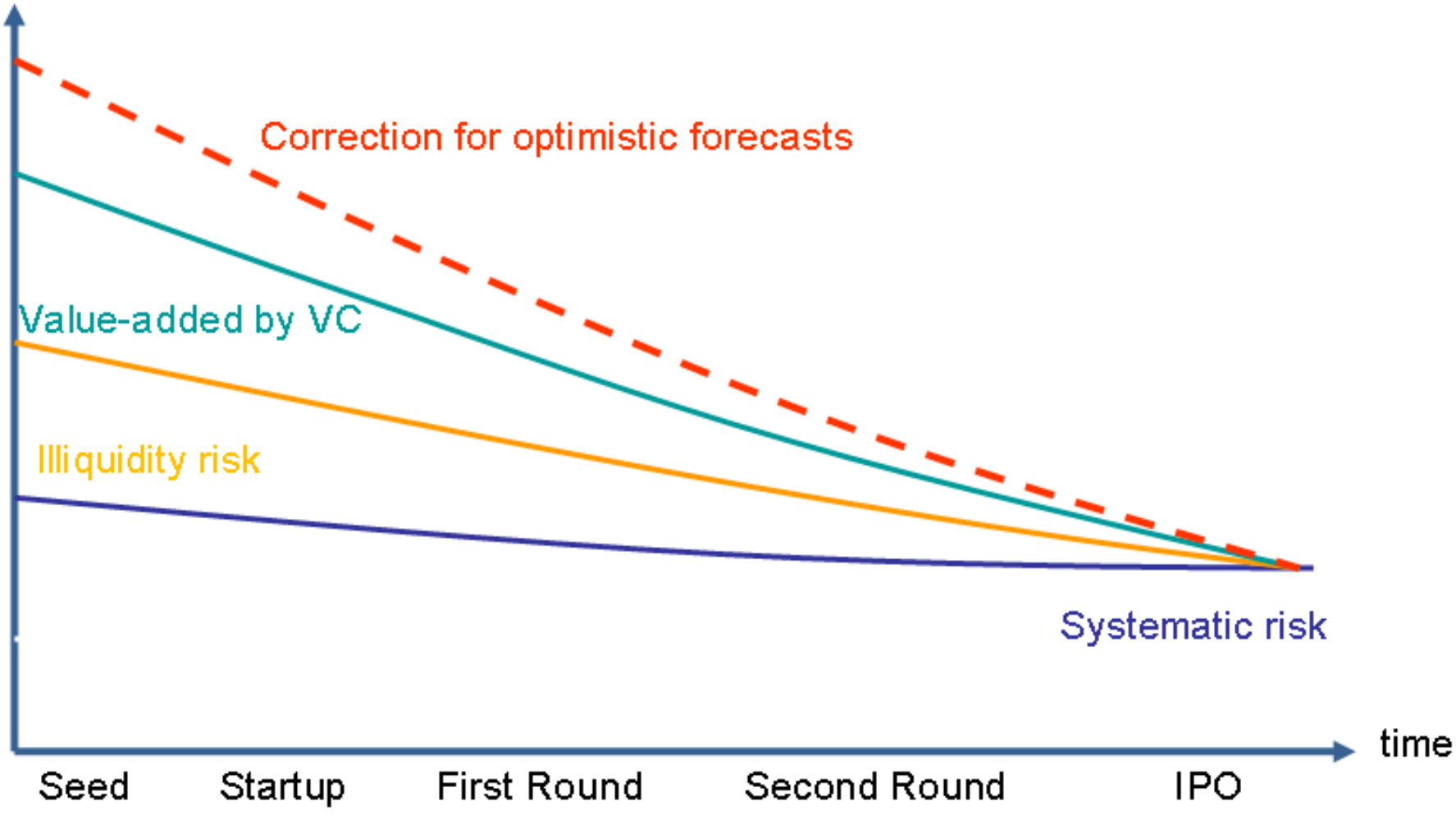
EV/Sales		21.3	15.7	11.6	8.6	6.4	5.3	4.3	3.5	2.9	2.3	2.5	2.5

- Cash flow projections as a function of g, p and a, which can be benchmarked against comparables
- Can contrast implied multiple with market data on comparables

Why are discount rates so high in the VC method?



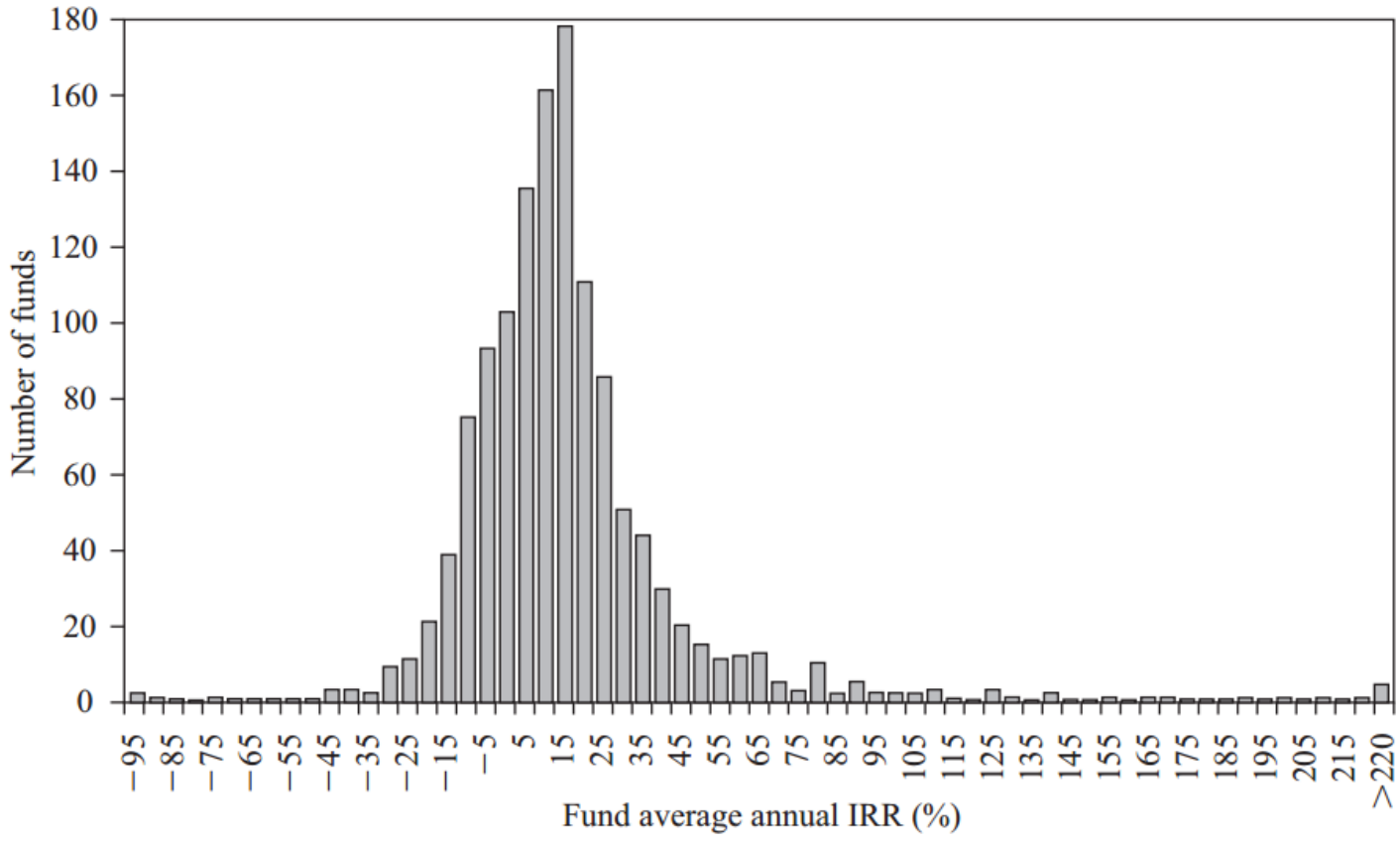
Rationale I: Illiquidity risk

- Investments in private companies are harder to sell than stock in public companies
- This makes VC investments less valuable than public stocks
- Problems:
  - Typical estimates of liquidity premium are too small to account for the difference in discount rates
  - Should be reflected in VC returns

Actual VC returns

FIGURE **9.1**
Distribution of VC fund average annual IRRs
Information is for funds launched between 1980 and 2004.

SOURCE: Preqin Private Equity Database; available at http://www.preqin.com/section/private-equity/1.



IRR: 13.7% (average), 9.6% (median)

N=1285

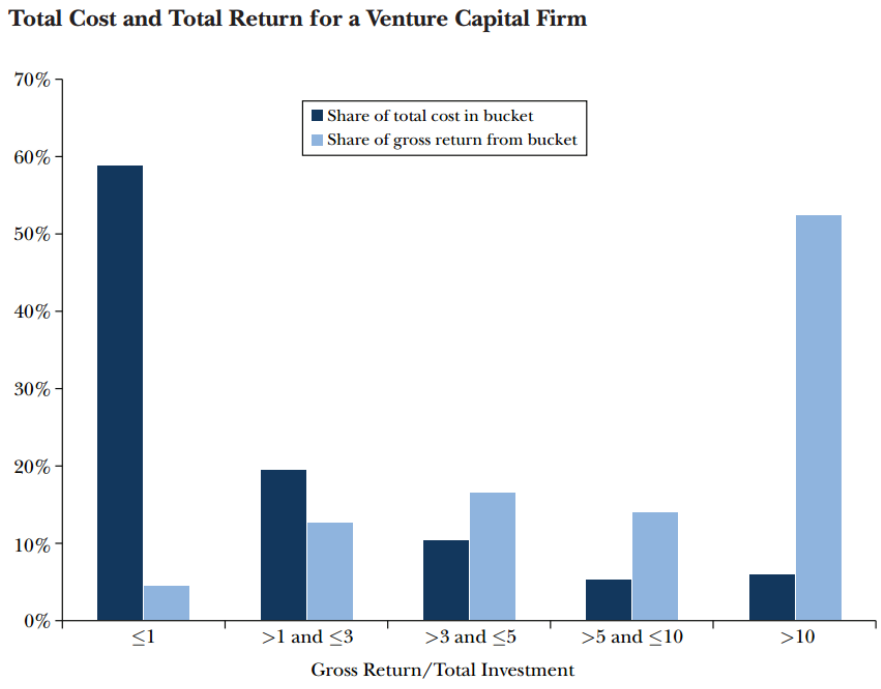
Source: Smith, Smith and Bliss (2011). Entrepreneurial finance: strategy, valuation, and deal structure

Rationale II: VC value-added

- VCs are active investors and bring in more than just funds
  - Expertise
  - Experience
  - Networks
- Value not reflected in VC returns, which are net of GP compensation
- Problem: typical GP compensation not enough to justify difference
  - A 13.7% net return could translate to a $\sim$ 17% gross return

Rationale III: Correction for optimistic forecasts

- Valuations are based on success scenario
- VC method uses discount rate to account for probability of failure and intermediate scenarios



- Example: if a successful project needs to return 10x and is held for 5 years, then the exit value must be discounted at $10^{\frac{1}{5}} - 1 = 58\%$ per year

How you would account for optimism in standard DCF?

- Calculate *expected* cash flows across possible scenarios
- Discount those at the true cost of capital
- Does it matter which way you do it?

An example

- Suppose you can invest in the following "project"
  - You pay 3 million euros upfront
  - You roll a die
  - You get paid 1 million euros $\times$ the number you roll, one year from now

- If the risk free rate is 5%, how would you value the project using standard DCF?

An example

- Expected cash flow? $\frac{1}{6}(1+2+3+4+5+6) = 3.5$
- Cost of capital? Risk is entirely idiosyncratic, use risk free rate
- NPV $= 3.5/1.05 - 3 = 0.33$

An example

- Suppose now that a VC values the project by
  - Focusing on success scenario where the number rolled is a 6
  - Discounting that outcome at a target IRR of 80%
- Then the VC also values the project at $6/1.8 - 3 = 0.33$
- With these inputs, the two methods lead to same investment decision

What if payoffs for other scenarios change?

- Suppose you now get paid 6 million if you roll a 6, and nothing otherwise
- Discounting expected cash flow at cost of capital: $1/1.05 - 3 = -2.05$
- Discounting success scenario at target IRR of 80%: $6/1.8 - 3 = 0.33$
- VC method ignores intermediate scenarios, biases decisions against "small successes"

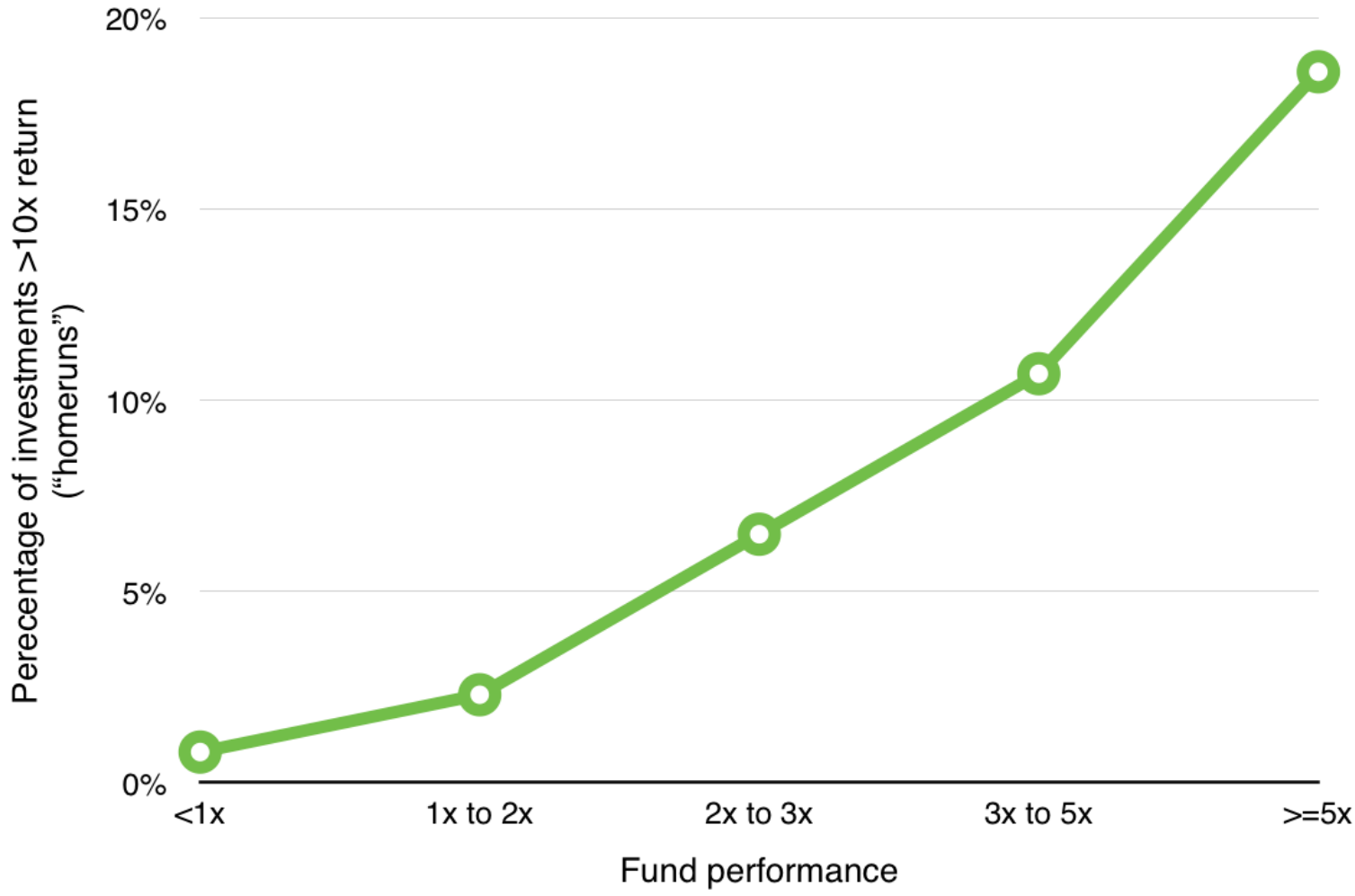
What if the project pays off in two years instead of one?

- Discounting expected cash flow at cost of capital: $3.5/1.05^2 - 3 = 0.17$
- Discounting success scenario at target IRR of 80%: $6/1.8^2 - 3 = -1.15$
- VC method may bias decisions towards short term projects

What if the project has a β of 2?

- Suppose market risk premium $= 7\%$
- Then cost of capital $= 5\% + 2 \times 7\% = 19\%$
- Discounting expected cash flow at cost of capital: $3.5/1.19 - 3 = -0.06$
- Discounting success scenario at target IRR of 80%: $6/1.8 - 3 = 0.33$
- VC method may bias decisions towards higher systematic risk projects

Why does VC method make this shortcut?



https://a16z.com/2015/06/08/performance-data-and-the-babe-ruth-effect-in-venture-capital/

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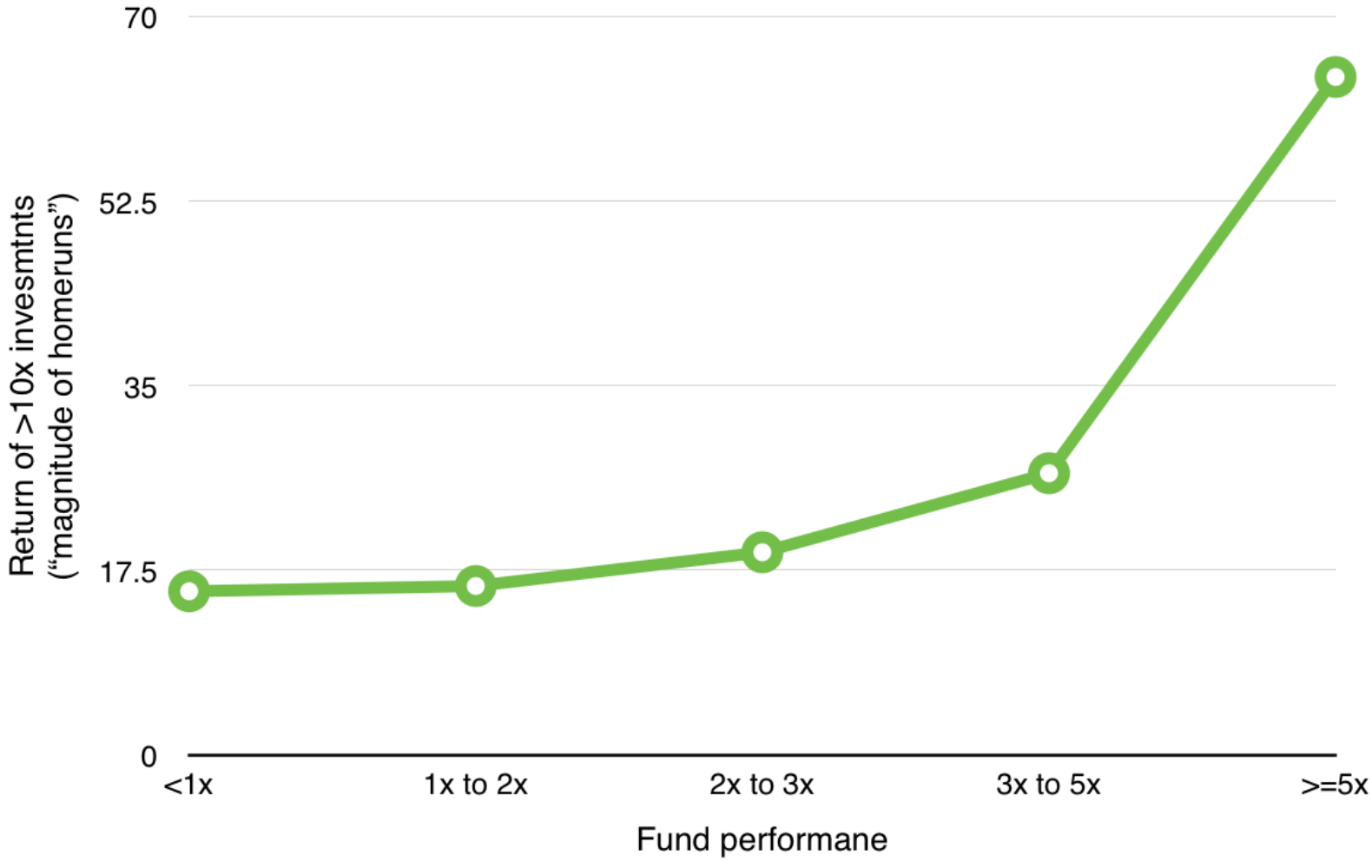

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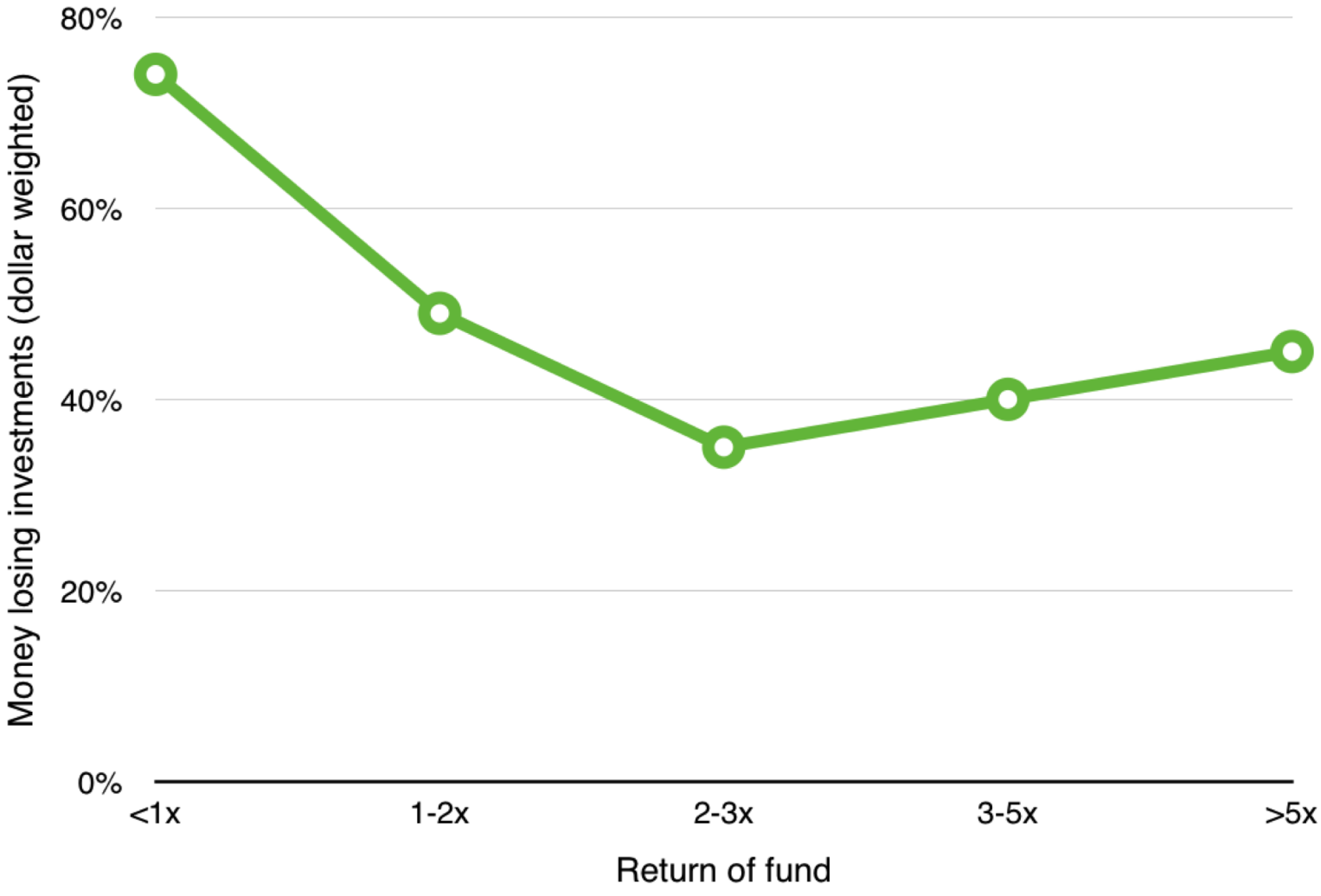

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Why does VC method make this shortcut?

- Returns are driven by investing in outlier deals that generate 10x, 50x, 100x etc
  - Not by minimizing probability of failure
  - This is different from other fields and counterintuitive for many people
- Implies key skill in valuation is identifying potential for such high returns
  - Understanding the success scenario and it's probability
- Any other factors tend to be second-order
  - Developing a range of scenarios and associated probabilities
  - Correctly estimating time to exit (given typically short holding periods)
  - Distinguishing between idiosyncratic and systematic risk

"You should try to limit yourself to opportunities that could be $10 billion companies if they work [...]. This is easy to say and hard to do, and I've been guilty of violating the principle many times. But the data are clear—the failures don't matter much, the small successes don't matter much, and the giant returns are where everything happens."

Sam Altman, Y Combinator

Understanding the success scenario: back to Uber

- At the time of Damodaran vs Gurley (2014), Uber was already very successful

- But when Gurley and Benchmark invested $11 million into Uber in Jan 2011, the company
  - Was only present in San Francisco, with an expensive black car service
  - Had provided 20,000 rides to 6000 users

- Sequoia passed on the investment, with partner Alfred Lin later remarking

  "We did not dream [...] what this could be. And I think if we had dreamed [...] that this could transform transportation I think it would have been easier than if we were thinking about it as a black car service."

Understanding the success scenario: back to Uber

- Benchmark invested $12 million in total
- In 2018, sold some shares for $900 million
- At IPO, remaining shares were worth 6.9 billion
- This yields a multiple of 650x
- Uber investment was part of a 425 million fund
  - Even if all other investments failed, the fund would have returned 18x its investment!

Next class

- Problem set 2

- Optional pre-reading "The Basic Venture Capital Formula"