The Business of Quant

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Administrivia

- **Fridays** (Jan 10, 17, 24 & 31st), **1-2:30pm**
- **Location**: 32-D507 (Stata Center)
- Non-Credit course
- All are welcome: no prerequisites
- First offering of this course. Please do give feedback!

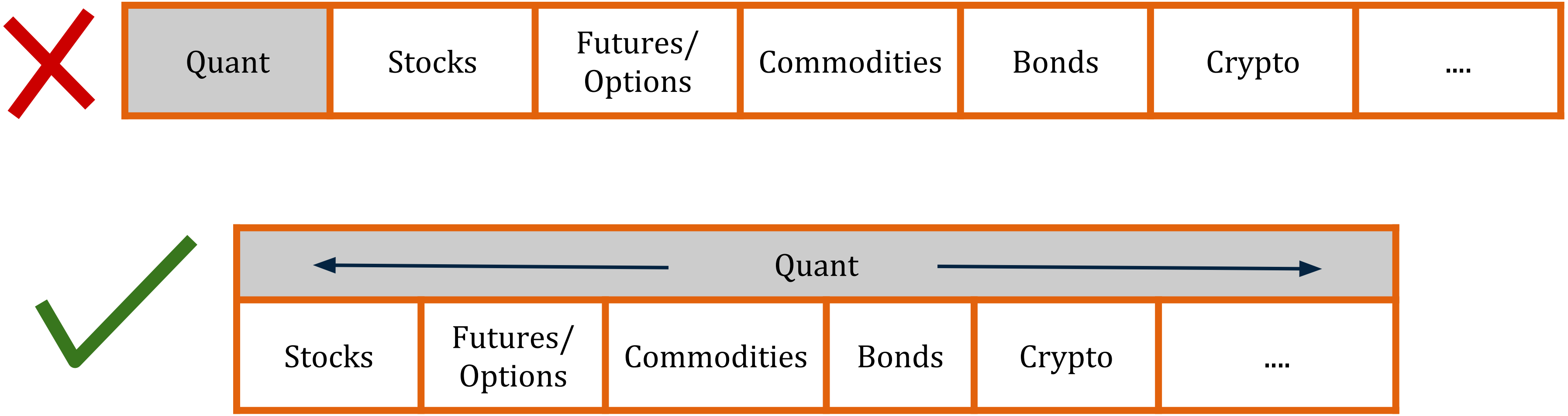
- Contacting the instructor: Rohit Singh (rsingh@mit.edu)

What is Quant Investing?

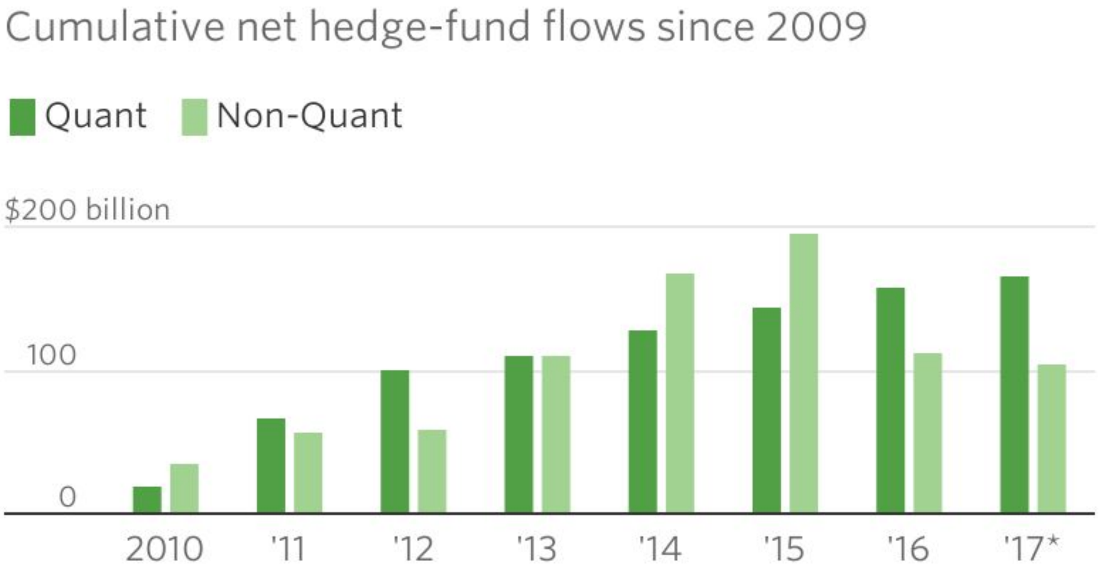
The style of investing where capital is allocated to a **diversified** set of **systematically** selected and **risk-managed** opportunities.

What are Quant Funds?

Asset managers that specialize in quantitative investing and offer it as a service, for a fee.



Quant Funds are Big and Getting Bigger…



*Through second quarter
Source: HFR

Benefits to Mom & Pop Investors

- Index funds are now cheap and easy to own
- Zero-fee trading
- Technological investments that make it convenient to invest

- Change in investor mindset about which investment advice is worth the money

Course Contents

- The quant investor’s way of thinking
- Building a quant strategy: objectives, data, competitive edge
- The business models of quant funds: HFT vs Mutual Funds
- The human aspect of quant investing: employees, managers, & customers.

Not a cookbook of quant algos!

Session 1: The Quant Way of Thinking

- Quant investing: the basics
- How quant investing differs from traditional investing…

  ... and how it does not

- Quant investing in financial markets…

  … and elsewhere

Session 2: Building a Quant Strategy

- Characterizing a quant strategy: the important metrics
- Strategy design: going from views to strategies
- Identifying your edge: Brains, Bravery & Brawn
- Broad categories of quant approaches:
  - Factor investing
  - Trend following
  - Statistical Arbitrage
  - High-frequency trading

Session 3: Building a Quant Business

- How does fee-based asset management work?
- Broad categories of quant funds
  - Mutual funds, hedge funds and proprietary trading shops
- Business Strategy: the connection between the following:
  - Quant approaches the firm specializes in
  - The fee it charges
  - The people it hires
  - The customers it targets
- Examples: AQR, Tower, RenTech, Cubist, Millennium

Session 4: The People of Quant

- The various roles available in a quant firm
- Day-to-day work in a quant firm
- Career progression: what does it look like?

- The Psychology of quant investing
- The Sociology of quant investing

- Being a quant fund owner/manager
- Being a quant fund investor/customer

About the Instructor

- Research Scientist & ex-PhD, CSAIL
- Merrill Lynch, Cubist Systematic
- Co-founder & CEO, Tech Square Trading

The Quant Way of Thinking

Investing is About Views

“Invest in what you know”

Peter Lynch

- Ran Fidelity’s Magellan Fund ($18M -> $40B)
- 29.2% per-year return over 23 years

Quant investing emphasizes precise, detailed views

- You know more and less than you think
- Put hard numbers around your view
- Explicitly say what you do NOT know
- Does your view generalize?

Case Study: Tesla in Aug '18

Aug 9, 2018.
Two days after the tweet, TSLA @ $352

What happens next ?

Digging into the TSLA view...

- Price prediction:
  - Up or down?
  - How much?
  - By when?
- What are the unknowns?
  - Is the prediction ex-market?
- Does your view generalize beyond TSLA?

Tesla

TSLA Tesla Inc. Nasdaq GS
©StockCharts.com
8-Jan-2020
Open 473.70 High 498.49 Low 468.23 Close 492.14 Volume 31.1M Chg +23.08 (+4.92%)
TSLA (Daily) 492.14
492.14
475
450
425
400
375
350
325
300
275
250
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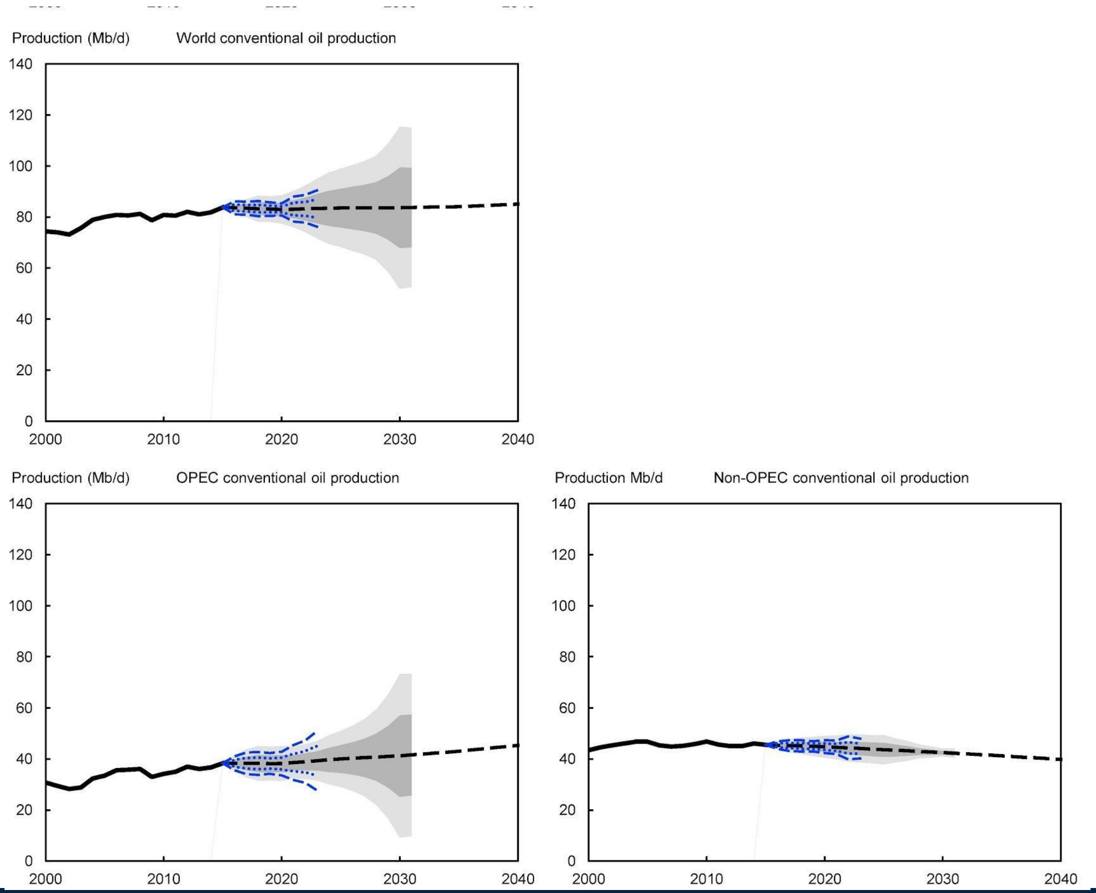
Quant Views: Alpha vs. Risk

”There are **known knowns**; there are things we know we know. We also know there are **known unknowns**; that is to say we know there are some things we do not know. But there are also **unknown unknowns**—the ones we don't know we don't know. And if one looks ... it is the latter category that tend to be the difficult ones.”

- Alpha = known knowns
- Risk = unknowns
  - Known Unknowns
  - Unknown Unknowns
  - Systematic vs Idiosyncratic risk

Alpha Research: Think in Probabilities



Choices:

- Non-parametric predictions
- Model-based predictions
  - Gaussian
  - Log-Normal

How do you calibrate these estimates?

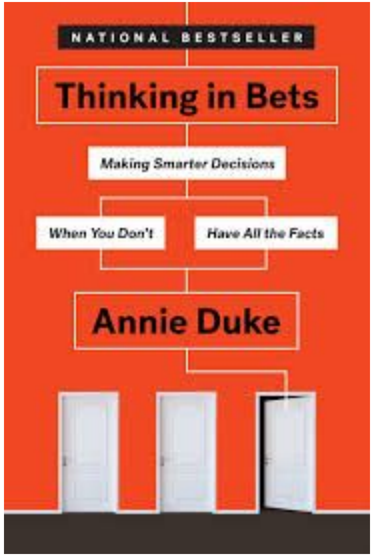
Frequently used shortcuts:

- Assume historical variance, just predict mean

https://www.sciencedirect.com/science/article/pii/S0306261918303428#f0070

Alpha Research: Distinguishing Skill from Luck

- How do you know your probabilities are correct ?
- Ex-ante vs ex-post correctness
- Two broad approaches:
  - Reduce the scope for luck
  - Take repeated shots at goal



Risk Management: Reduce the Role of Luck

- Systematic risk:
  - markets, competitors

- Idiosyncratic risk:
  - e.g. what if Elon Musk resigns or is incapacitated?
  - Bad publicity after a nasty Autopilot-related crash?

Generalization: Systematize Your View

- From: “Tesla will be super-successful”

↓

- To: “Electric Cars will be super-successful”
  - What about other electric car makers?
  - What about oil prices and oil companies?
  - What about other auto makers?

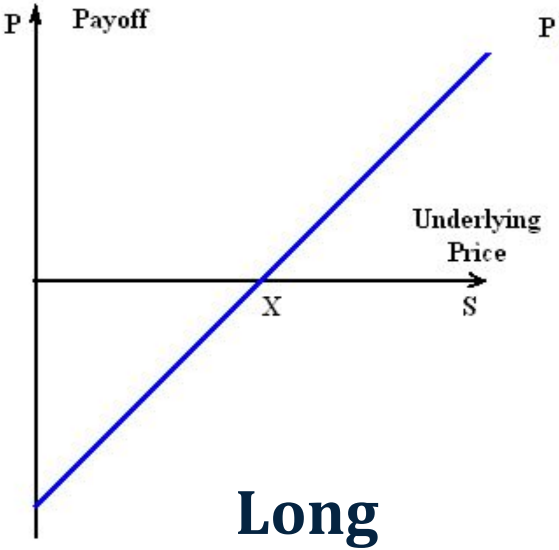
Generalization enables Diversification

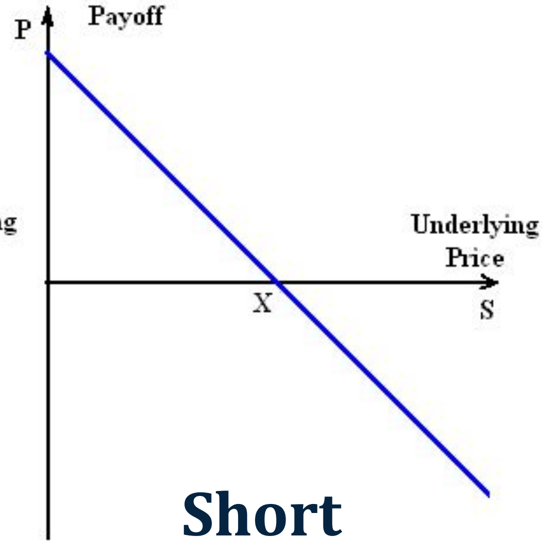
- Can spread our money around:
  - Instead of a single \$100 bet, make a hundred \$1 bets
- Why ?

- Reduce idiosyncratic risk
  - Systematic risk, less so
- Better ex-post evaluation of probabilistic estimates.

Embrace Leverage & Shorting

Why only allow for positive opinions on an opportunity?





Shorting:
Naked
Vs.
Covered

http://www.investorsoftware.net/InvestorPrimer/Derivatives.html

Embrace Leverage & Shorting

Which of these 3 investment opportunities is the best?

Expected Profits			
Mean	1%	2%	3%
Standard Deviation	1%	1.5%	4%
Ratio	1	1.33	0.75

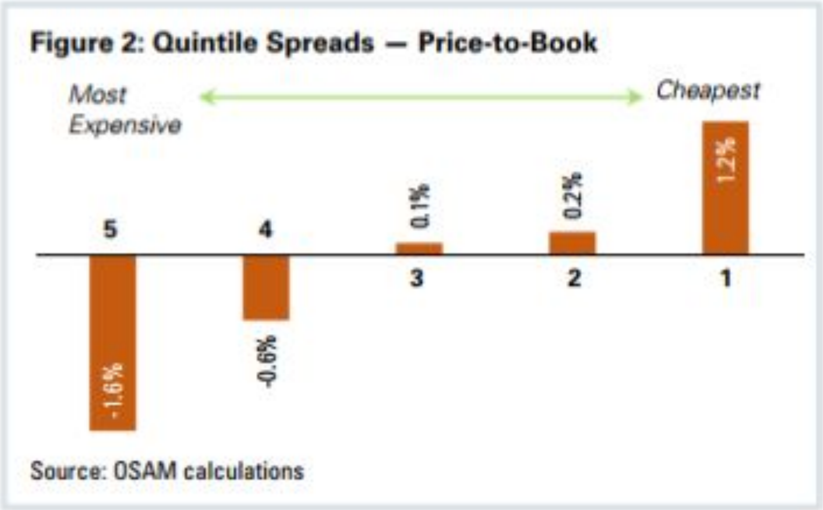
Putting It All Together

Quant Approach to Value Investing

- A share represents a claim on the earnings of a company
- High earnings but low current price = opportunity!

- P/E ratio: price / earnings
- P/B ratio: price / book-value

- How to improve alpha?
- Risk factors ?



Equity Quant Investing

One of the earliest and biggest domains of quant investing

- Easy diversification
- Many generalizable hypotheses
- Shorting and leverage are well-accepted
- Good understanding of systematic and idiosyncratic risk

Outside the Financial Markets

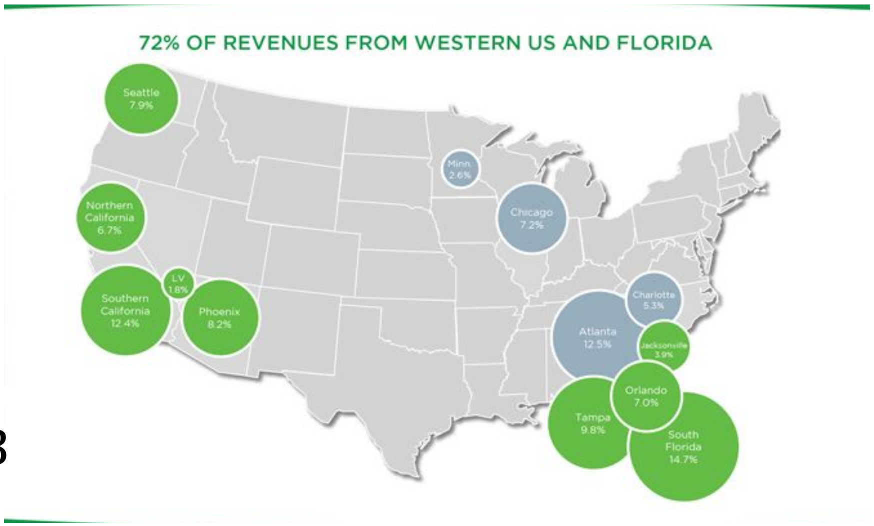
Quant methods now seen in Private Equity & Venture Capital too

- Lowering of friction in transactions
  - digitalization of assets
- Wider dissemination of quant investing ideas
- Availability of data for pattern recognition and ML
- Large scale of asset managers

Quant Real Estate Investing

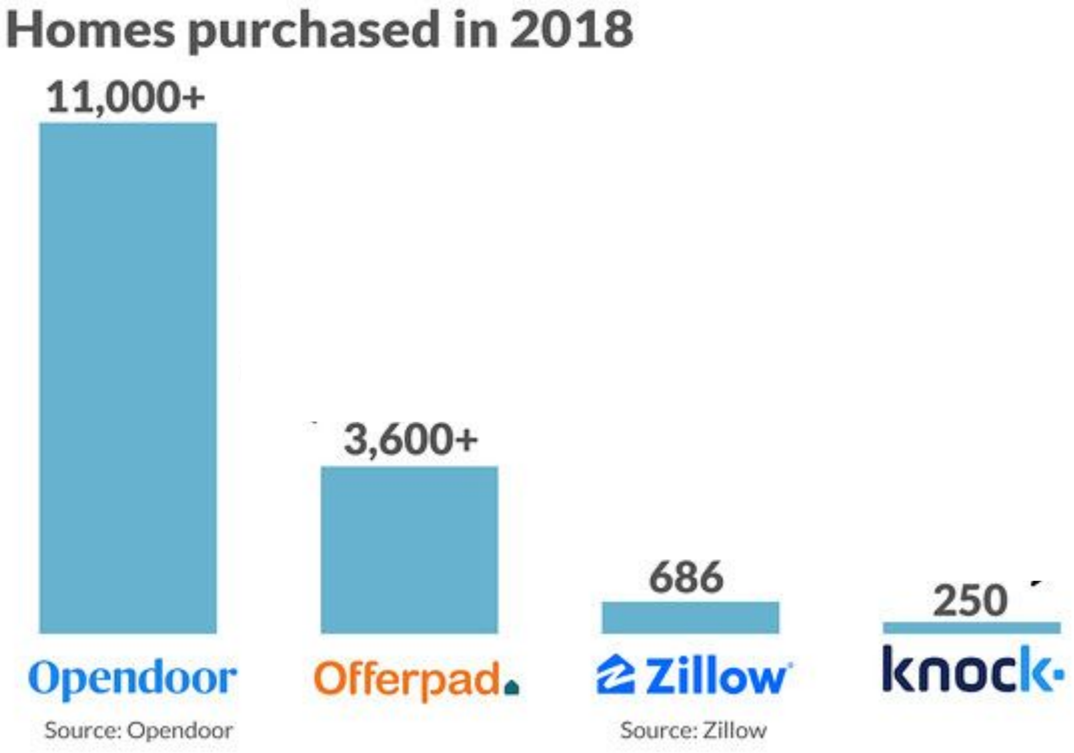
View: "A single family homes can provide an attractive rental income"

Alpha: think back to 2008-2011
Risk-factors: ??



Invitation Homes (INVH)
2012: Founded by Blackstone
2017: Listed on NYSE, Market cap of 11B
2020: Market cap of 16B

Many more players now…



https://www.marketwatch.com/story/sell-your-home-with-a-realtor-or-an-algo-maybe-both-2019-04-19

Quant Venture Capital

Key determinants of a VC firm’s success

- Deal Flow ✓
- Great judgement ?
- Post-investment support ✓
- Attractive terms ✓

Quant Venture Capital

CircleUp

Limited Focus:
- Consumer product startups (food, beverages, soap etc.)
- sub $15 million annual revenue

Build internal database on traction trajectories

Hired the Head Quant of Boston-based GMO as their CIO

Social Capital
Capital as a Service (Caas)

Limited Focus:
- Software companies with recurring revenues
- Require demonstration of revenue growth

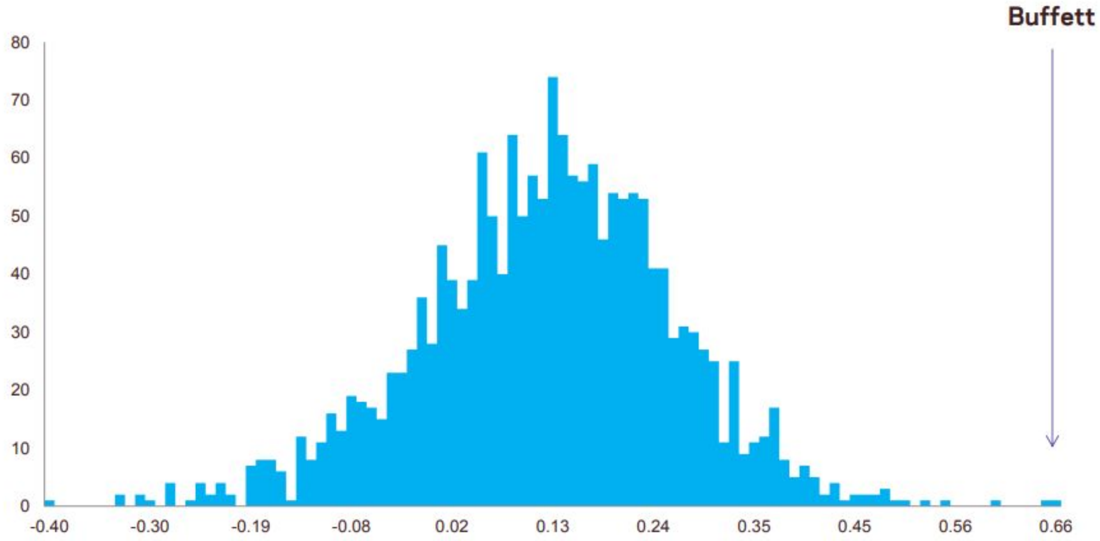
Leverage internal data on growth rates

Y-Combinator and other accelerators

A Quant View of Warren Buffet

How Good is Buffett's Record ? 1926 - 2011

- Information ratios of all stocks in the CRSP universe with more than 30 years



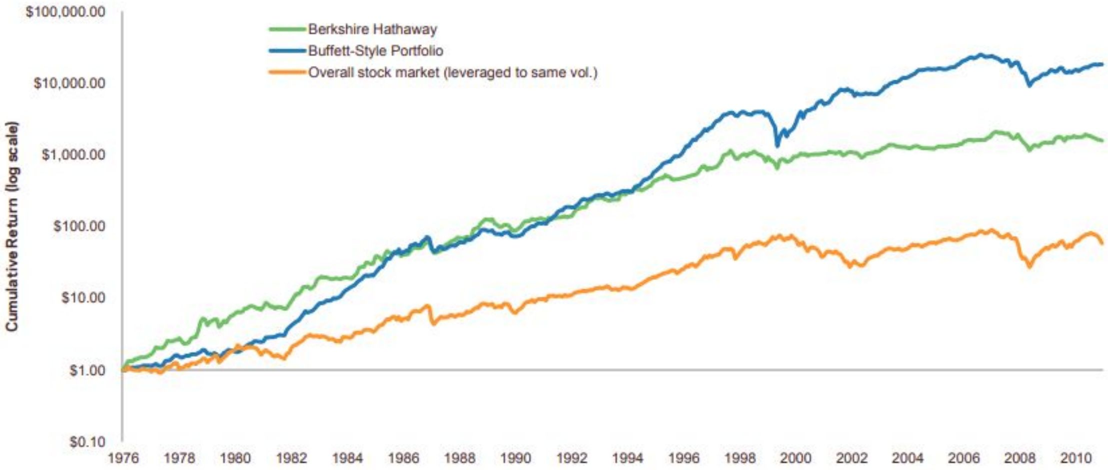
AQR: Pedersen et al.

A Quant View of Warren Buffet

Systematic Buffett-Style Strategy

A disciplined approach to high quality, low risk stocks may generate strong risk-adjusted and absolute-returns

- Based on Berkshire's Hathaway



"Quant" Buffet

"Original" Buffet

Stock Market

AQR: Pedersen et al.

In the next session...

- How do you go from views to strategies?
- What kind of views work?
- The trade-offs you will need to make

Thank you!