The Business of Quant

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Administrivia

- **Jan 18 (Mon), Jan 21, 28 (Thu), 4-5:30pm**
- **Location**: Zoom
- **TA**: Kylie Ying
- Non-Credit course
- All are welcome: no prerequisites
- Please do give feedback! http://tiny.cc/quant2021

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

About the Instructor

- Research Scientist & ex-PhD, CSAIL
- Co-founder, martini.ai
- Advisor, Mathisys LLC
- Previously:
  - Co-founder & CEO, Tech Square Trading
  - Merrill Lynch, Cubist Systematic

Guest Speakers

Ross Garon
Global Head of Quant Strats
Millennium Partners
Jan 21st

Sanjiv Kumar
Co-founder and CIO
FORT LP
Jan 28th

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 on Wall Street …

Quant Funds are Big…

eVestment

*Through second quarter

Source: HFR

… and Beneficial to Main Street

- Index funds are now cheap and easy to own
- Zero-fee trading (Robinhood!)
- 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

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

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
8-Jan-2020
© StockCharts.com
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
225
200
175
150
Apr Jul Oct 16 Apr Jul Oct 17 Apr Jul Oct 18 Apr Jul Oct 19 Apr Jul Oct 20

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 due to a forced recall or 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?

STREETWISE

Believe in Tesla? So Why Aren’t Others Crashing?

To justify Tesla’s valuation, the share prices of other car companies should be falling at the same time. But they aren’t. 164

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 ?

Quant Approach to 2020 Investing

- Buy the winners, Sell the losers

- 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!