Introduction

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Data Analysis in Economics and Finance

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What is Research?

- Performing research is a formal way to ask questions and search for answers.
- To convince others that the answer we have found is convincing, we can't just tell them our results;
- We need to describe the process that lead us to those results, so that they can judge whether or not we've come to a valid conclusion.
- Key problem: what methods are to be used to ensure validity and credibility?

Source: Powers D., "How to Write a Research Paper in Economics?"

Examples of "Economic" Questions

- How would an individual/group solve a particular problem, or respond to a particular incentive?
  - E.g. If the interest rate on a deposit account increases by 5%, how much more would an individual save per month?
- How would a particular variable respond to an exogenous shock?
  - E.g. How would the USDRUB rate change in response to an increase in oil prices?
- Most interesting economic questions result in the need for predictions

Source: Powers D., "How to Write a Research Paper in Economics?"

Types of Economic Research

- Theoretical
- Empirical
- Theoretical + empirical
- The key difference between these paper types is how they try to answer the research question.

Source: Powers D., "How to Write a Research Paper in Economics?"

Types of Economic Research

- Theoretical papers make reasonable assumptions about the relevant environment and actors involved, and then predict what should "theoretically" happen if the event described by the research question came true.

- Empirical papers use data collected by observation, or by experiment, to answer a research question.

Current State of Economic Theory

- The sad truth about theoretical research: "Economics in its current form does not describe empirical reality but an idealized rational economic world." (Focardi & Fabozzi, 2012)

- The sad truth about academic empirical research: most discoveries are likely false (Lopez de Prado, 2017)
  - "Is Economics Research Replicable? Sixty Published Papers from Thirteen Journals Say "Usually Not"" (Chang & Li 2015)
  - Overfitting and p-hacking (Lopez de Prado, 2017, 2019)

Industrial Finance

- Finding a plausible explanation of the past is a no-brainer
- Bad models never get published
- Out-of-sample success is the only way to prove validity of any economic model
- What is the measure of success?

Validation of Economic Models

- Models are better evaluated through profits than through theoretical measures such as errors (Leitch, Tanner, 1991)

- Backtesting is the process of applying an analytical method to historical data to see how accurately the method would have predicted actual results.

- A good backtest could be easily designed but it will typically perform erratically out-of-sample (Bailey, Borwein, & Lopez de Prado, 2016)

- Researches should have "skin in the game", or have a measurable risk when taking a major decision (Thaleb, 2018)

- The only credible validation is the live performance of economic models

Investment Funds Performance

- Many actively managed mutual funds are struggling to match passive, index-linked equivalents (Morningstar's Active/Passive Barometer, February 2019; https://us.spindices.com/spiva/#/)

- Best funds are quantitative ones (https://mathinvestor.org/2019/03/majority-of-highest-earning-hedge-fund-managers-and-traders-are-at-quant-firms/)

Funds Earnings 2017 (Forbes)

Rank	Manager	2017 Earnings	Company	Type (Quantitative / Discretionary)
1	Jim Simons	$1.6 B	Renaissance Technologies Corp.	Q
2	Michael Platt	$1.2 B	BlueCrest Capital Management	D
3	Ray Dalio	$870 M	Bridgewater Associates	Q
4	Ken Griffin	$870 M	Citadel LLC	Q
5	John Overdeck	$700 M	Two Sigma Investments	Q
5	David Siegel	$700 M	Two Sigma Investments	Q
7	Israel Englander	$500 M	Millennium Management	Q
7	Paul Tudor Jones II	$500 M	Tudor Investment Corporation	D
7	David Shaw	$500 M	D.E. Shaw & Co., L.P.	Q
7	Jeffrey Talpins	$500 M	Element Capital Management	D
11	Carl Icahn	$480 M	Icahn Capital Management	D
12	Chase Coleman III	$450 M	Tiger Global Management	D
13	Alan Howard	$300 M	Brevan Howard Asset Management	D
14	Crispin Oley	$200 M	Odey Asset Management	D
15	Greg Jensen	$150 M	Bridgewater Associates	Q
15	Peter Muller	$150 M	PDT Partners	Q
15	Robert Prince	$150 M	Bridgewater Associates	Q
18	Steven Schonfeld	$130 M	Schonfeld Group	Q
19	Peter Brown	$100 M	Renaissance Technologies Corp.	Q
19	Paul Singer	$100 M	Elliott Management	D

Conclusions

- Data analyst skills are highly rewarded by the market

- Do not blindly trust the results of research papers in economic and financial journals

- Let the data speak for itself!

P. S. The #1 Master's program in finance in the world uses R

(https://bcf.princeton.edu/master-in-finance/courses/)