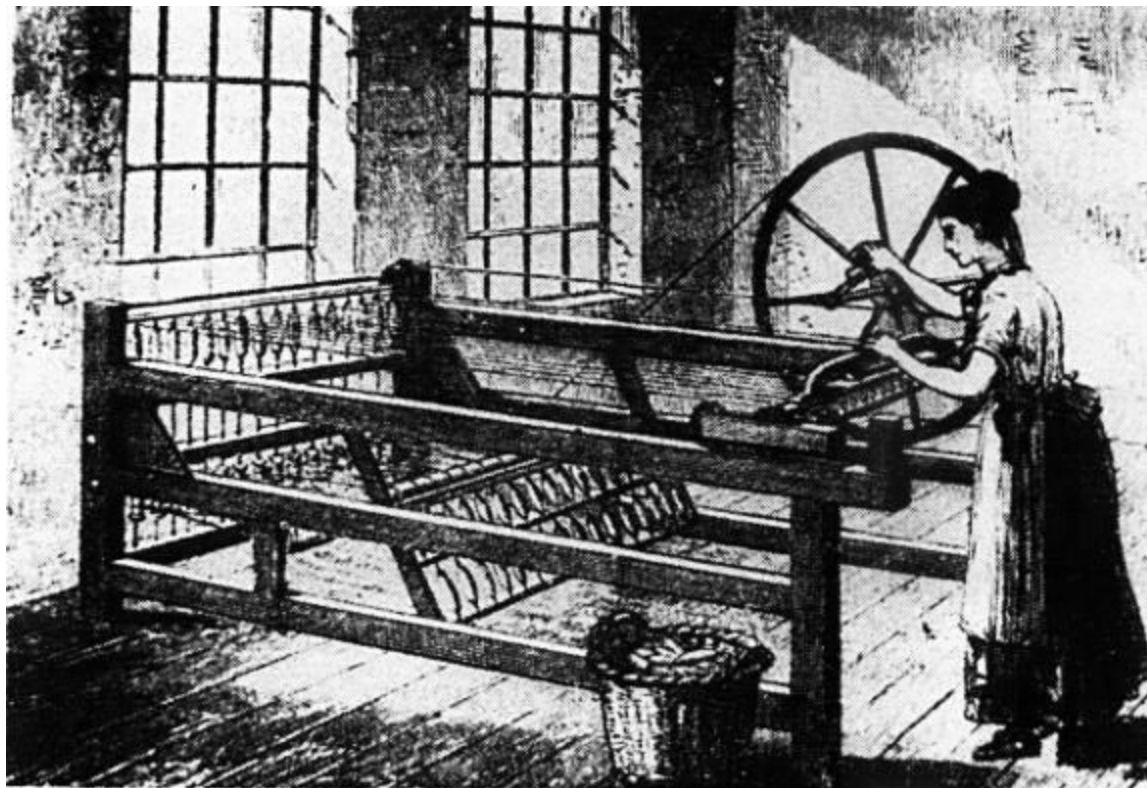


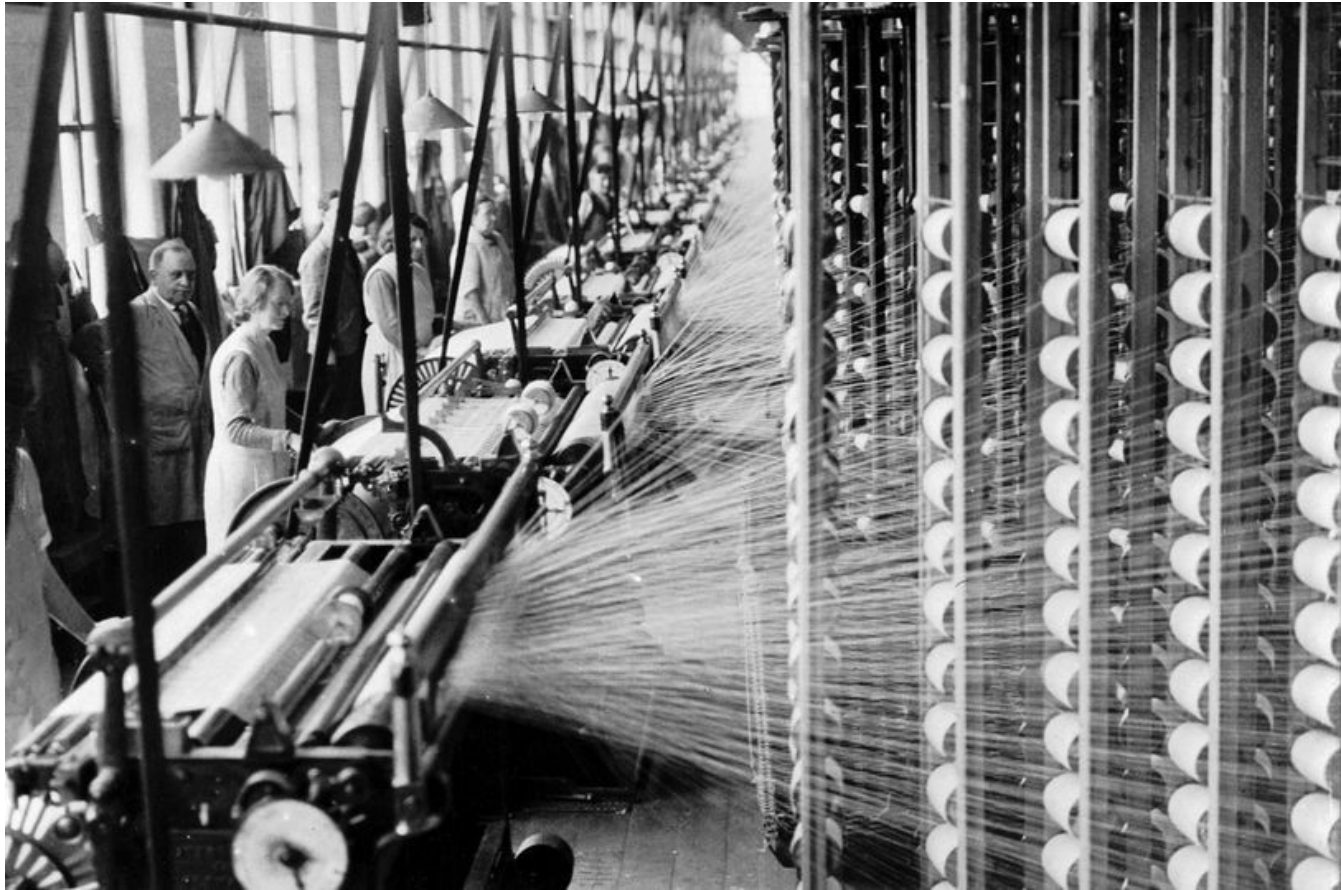
Idea to Algorithm

Delaney Mackenzie

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Automation Benefits

Cheaper and More Reliable

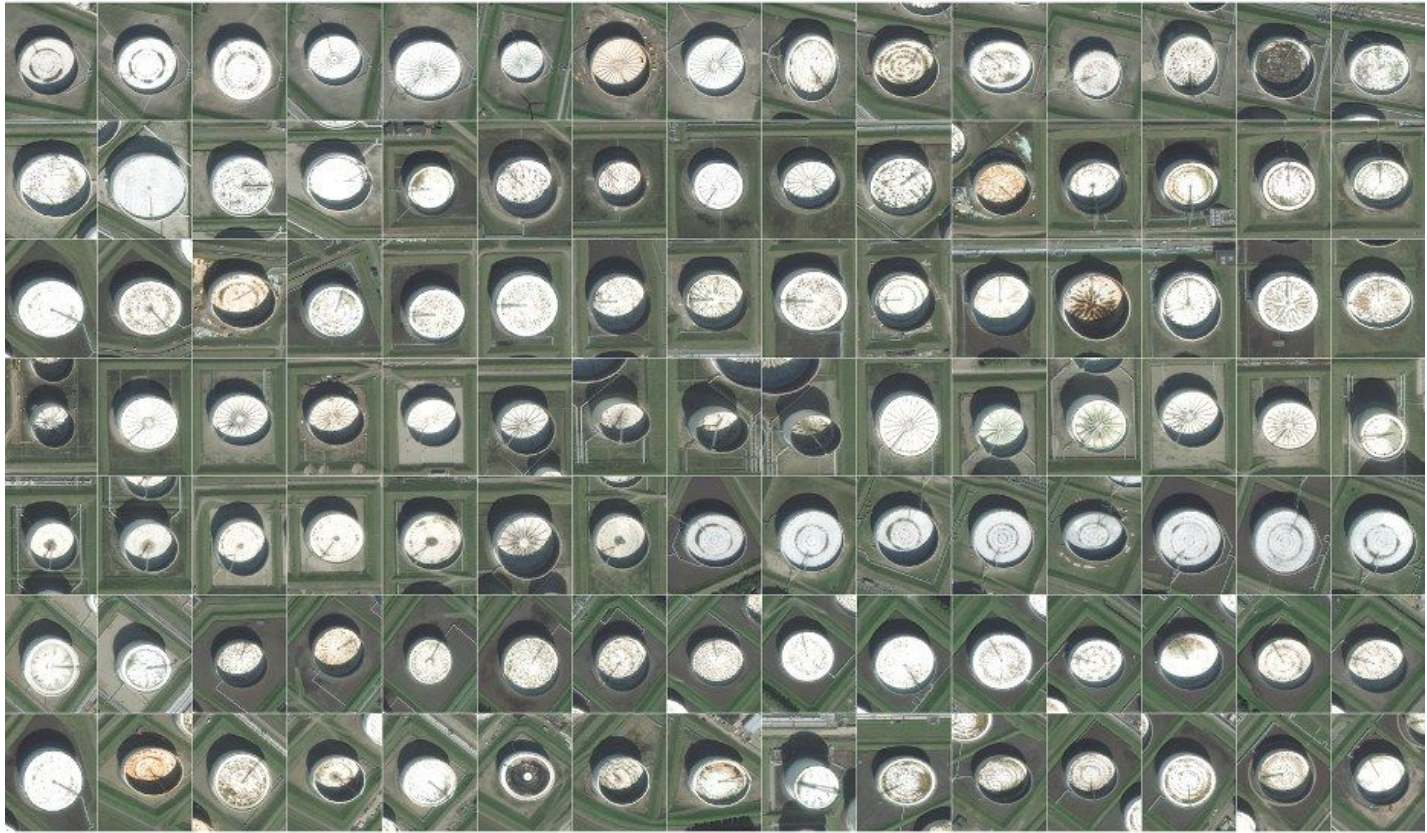
- Lower cost
- Higher quality
- Higher production capacity

More Sophistication

- New tech enables entirely new products

Cheaper and More Reliable

- BARN
- COW
- CUT
- FOIL
- PBJ



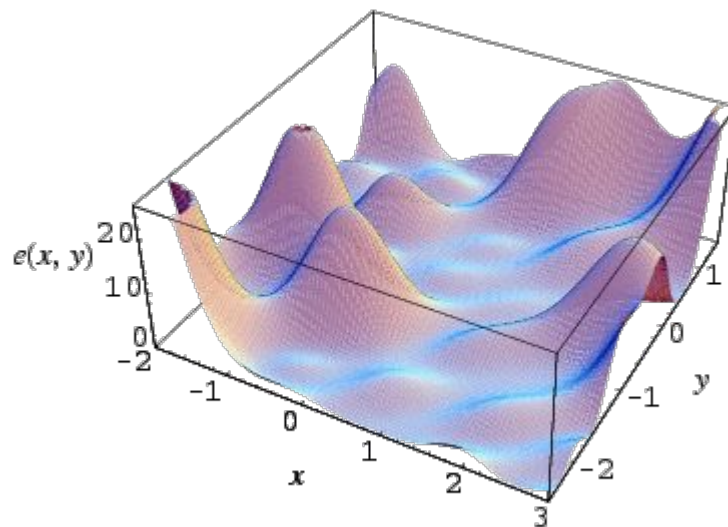
Background: Mathematical Optimization

Generalized technique

Optimize $f(x)$ subject to constraints on x .

Let $R(p)$ be forecasted returns on portfolio p .

Optimize $R(p)$ subject to risk constraints on p .



Intuition for Optimization

- Negotiation
- Optimizer tries an answer, constraints decide if it's okay. If not optimizer tries a new direction. Process repeats as optimizer tries better and better answers.
- Maybe optimizer trying to build house on landscape, constraints are zoning company.

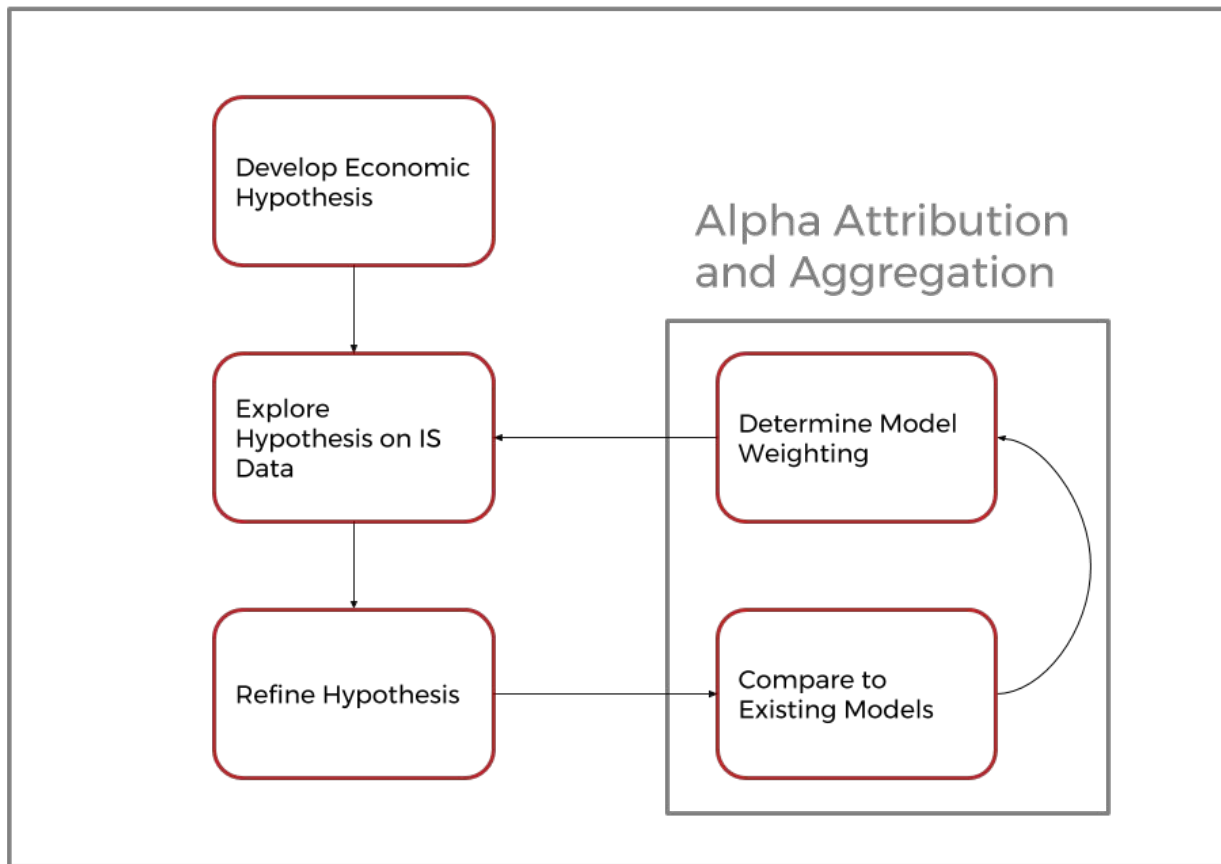
Lots more info

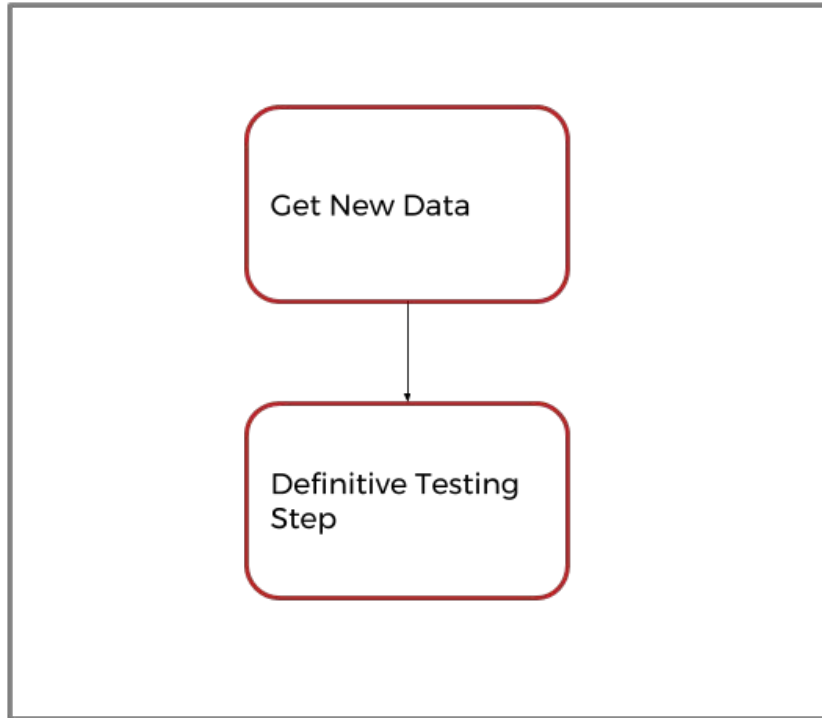
<https://www.quantopian.com/lectures/risk-constrained-portfolio-optimization>

Three Perspectives on The Quant Workflow

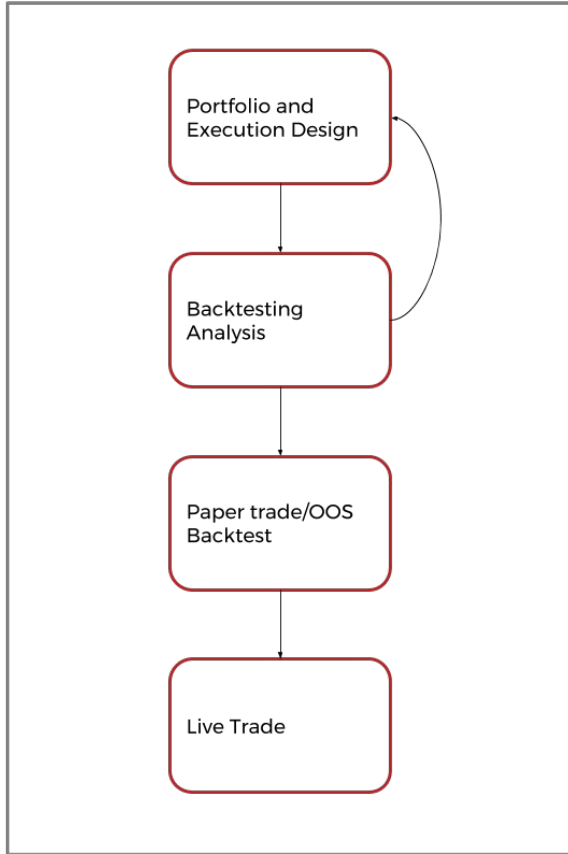
Perspective 1

Exploratory (In-Sample) Analysis



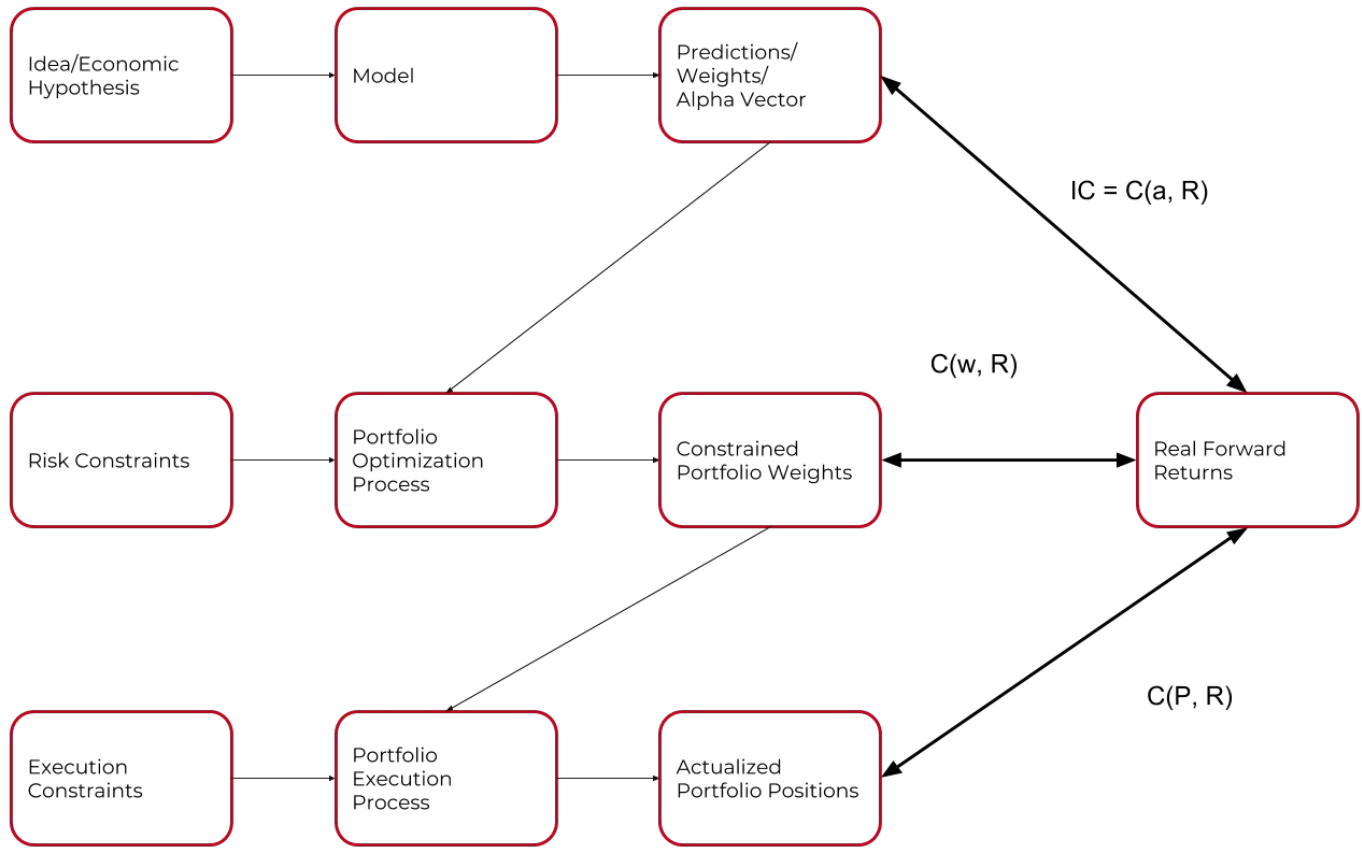


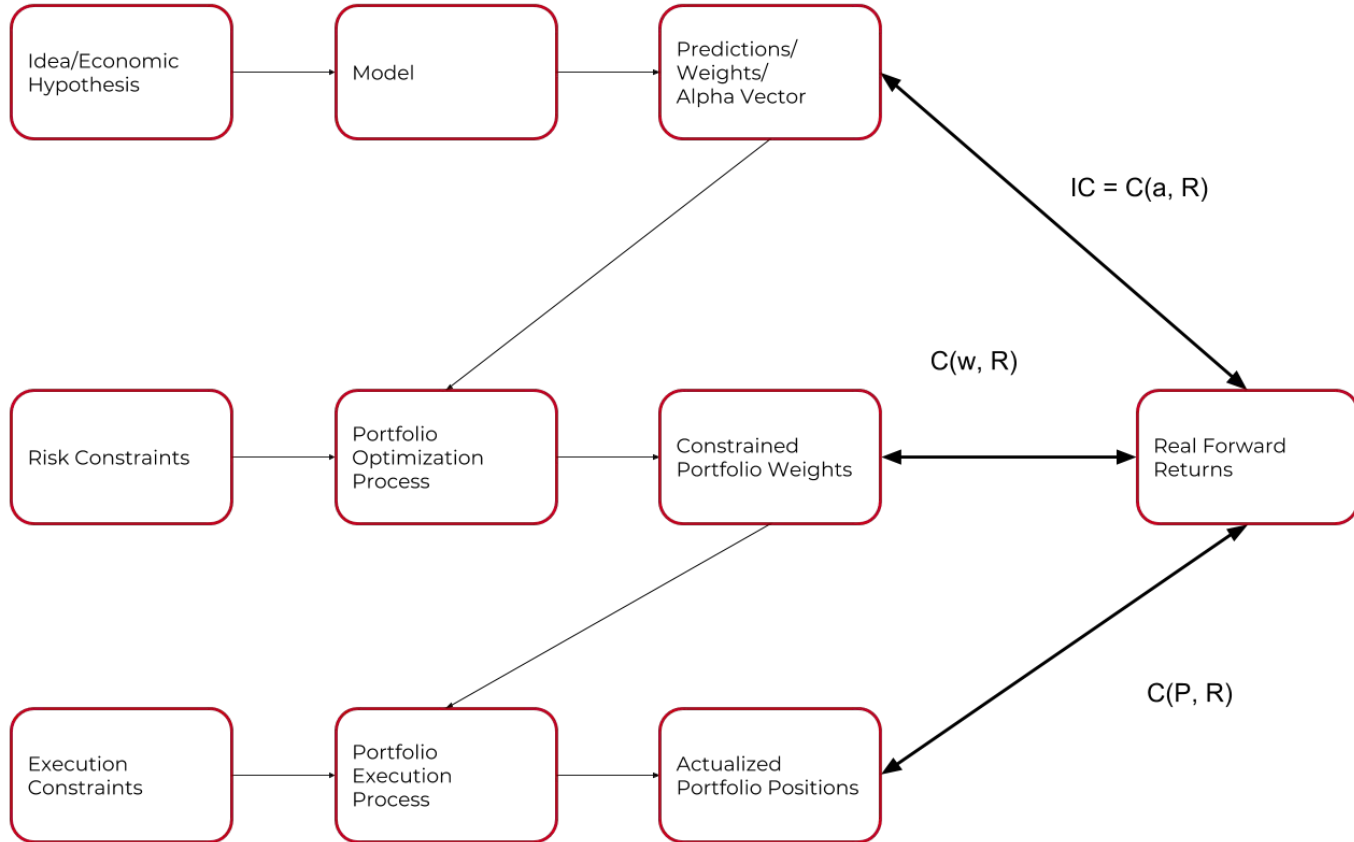
Definitive Testing
(Out of Sample)



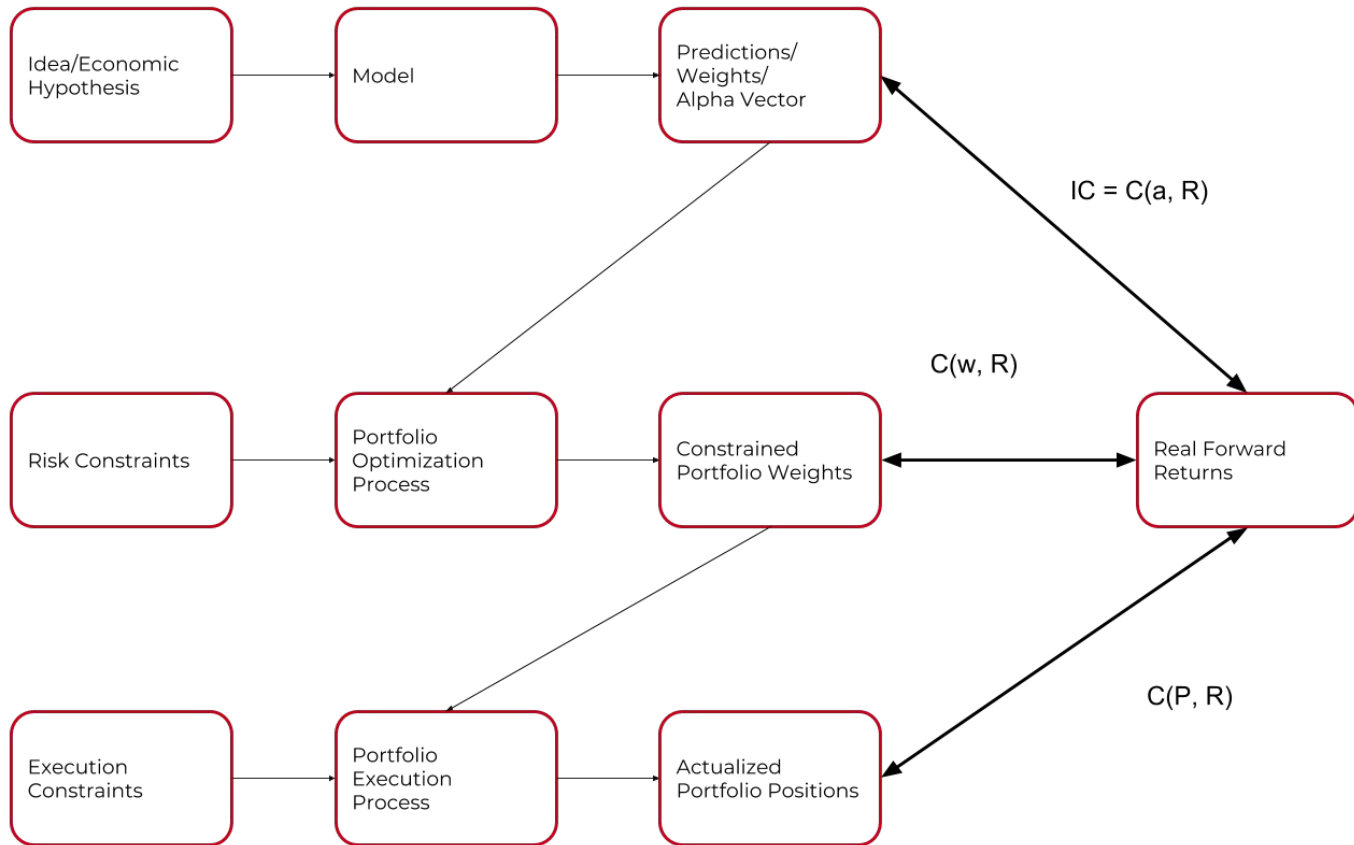
Real Market
Testing

Perspective 2





System is profitable if $C(P, R) > 0$ and costs sufficiently low.



$$C(a, R) > C(w, R) > C(P, R)$$

Each constraining step is effectively a discount

$C(a, R)$ is if your model predictions could magically be transformed into positions.

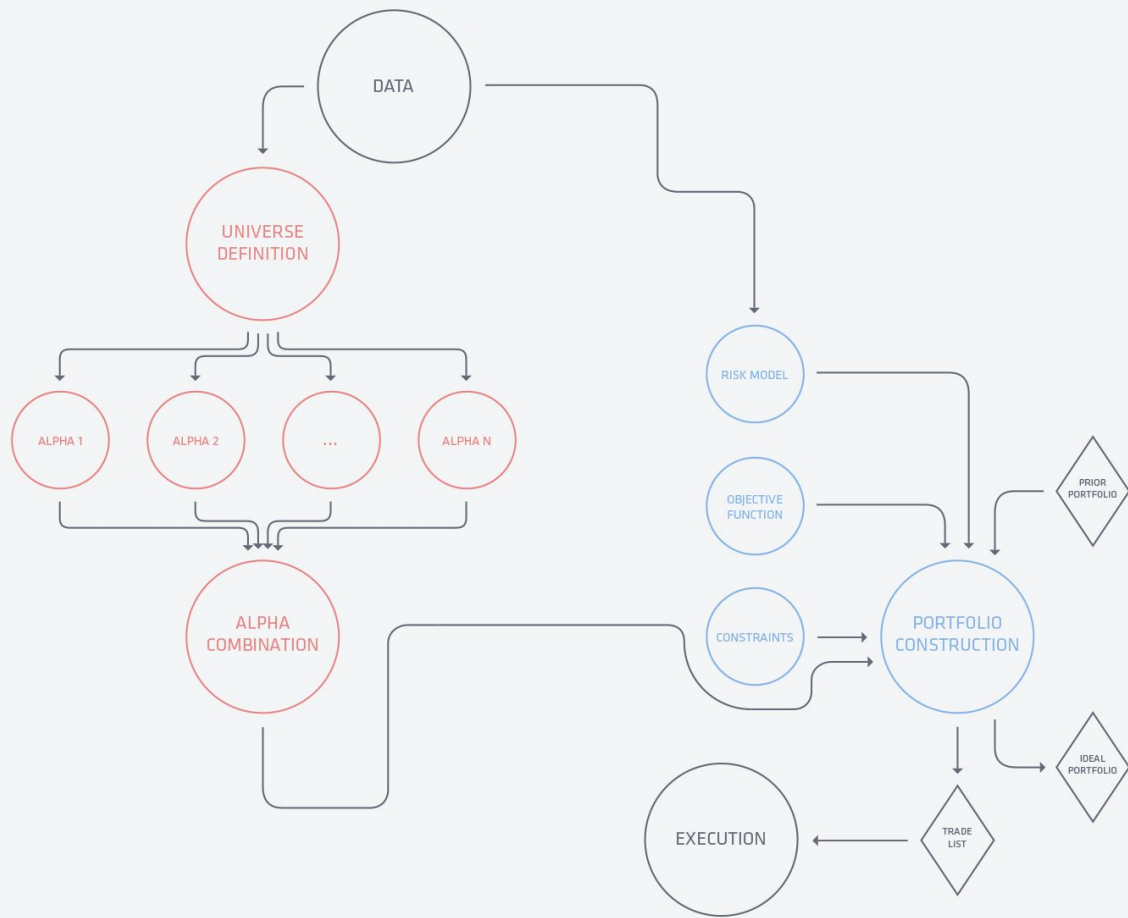
Portfolio optimization will distort a to get to w , likely reducing $C(a, R)$.

$C(w, R)$ is if your weights could magically be transformed into positions.

Execution is imperfect and will distort w while incurring costs to get to P .

$C(P, R)$ is what actually earns you money, although you still have to pay to trade out of positions and liquidate.

Perspective 3



Free Open Source Tools

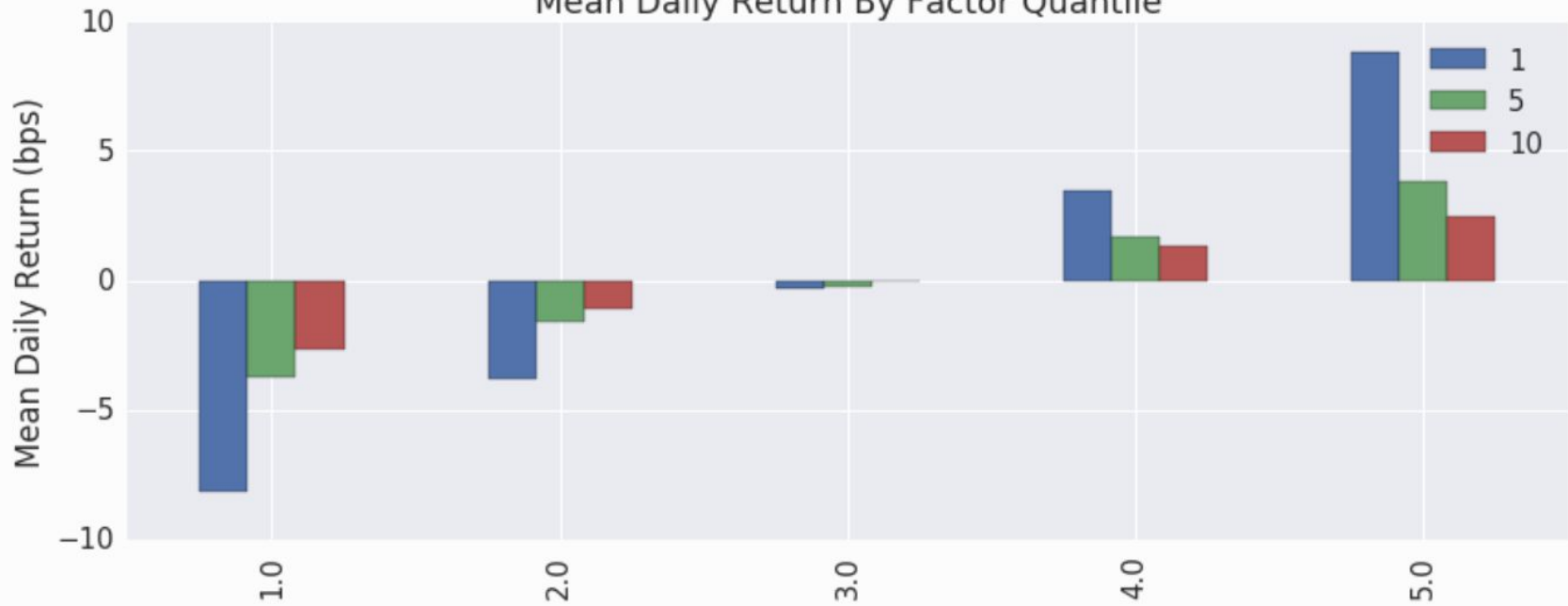
Checking C(a, R): <http://quantopian.github.io/alphalens/>

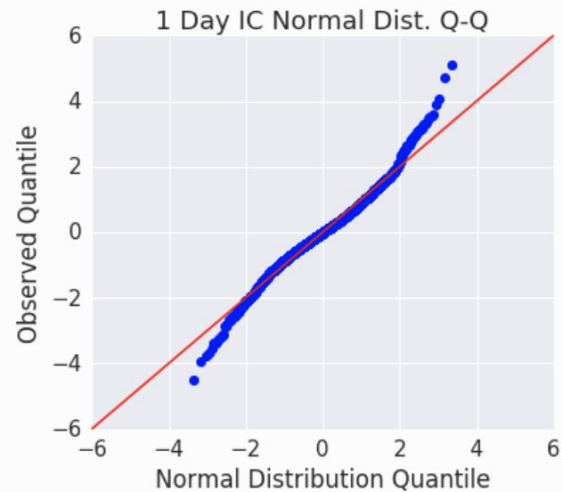
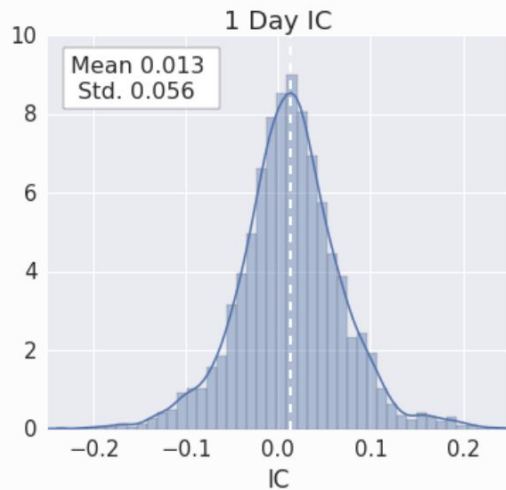
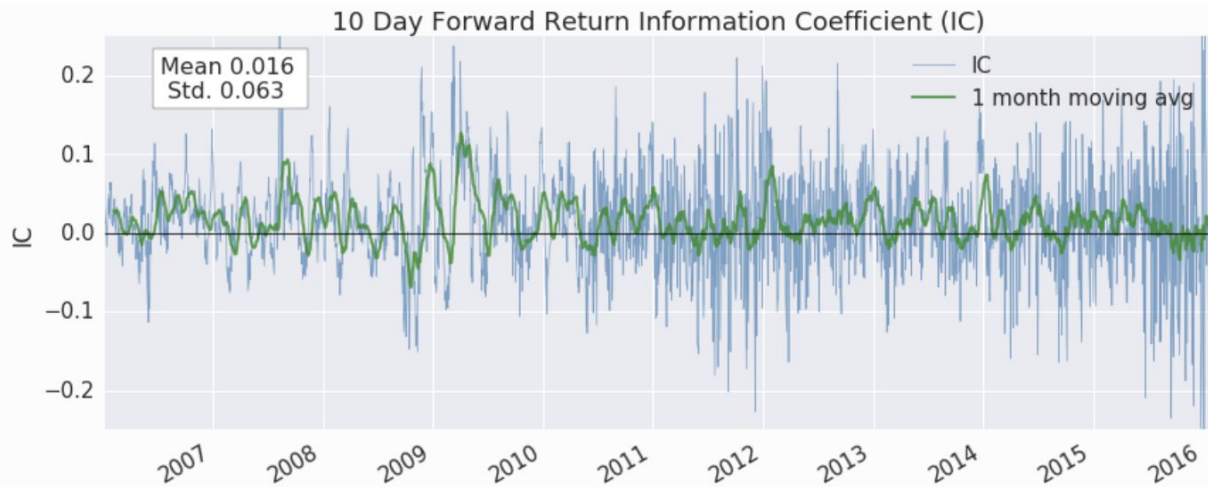
Simulating Full Backtest: <http://www.zipline.io/>

Analyzing Backtest Results: <https://quantopian.github.io/pyfolio/>

Alphalens - $C(a, R)$

Mean Daily Return By Factor Quantile

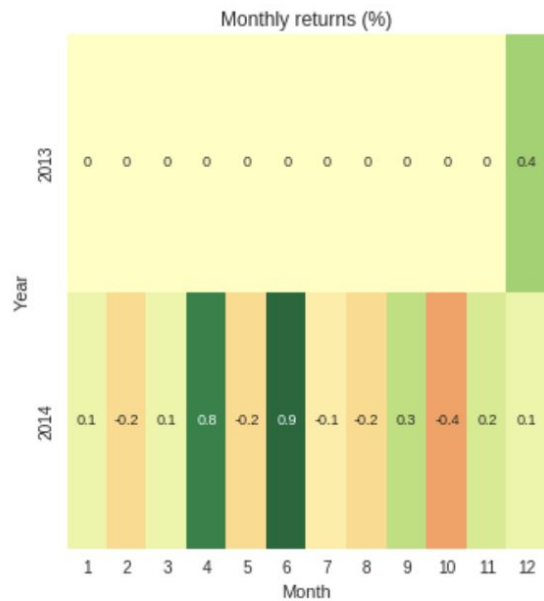
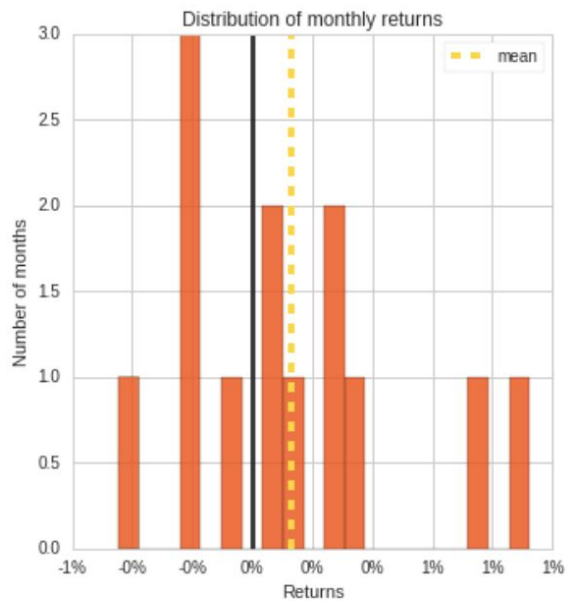
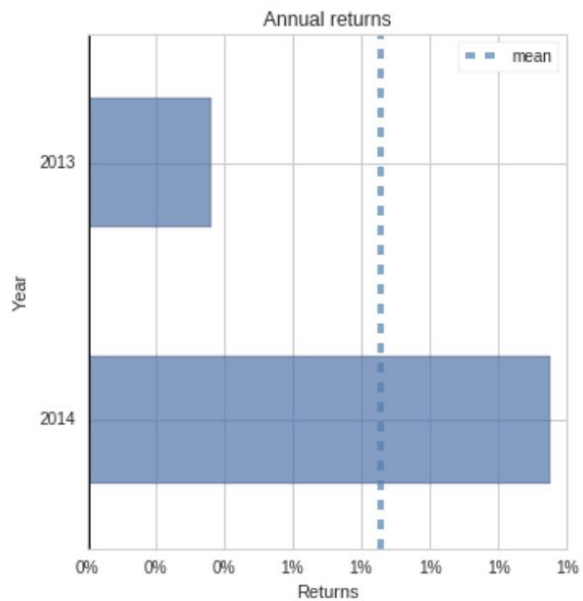




Pyfolio C(w, R)

Rolling Sharpe ratio (6-month)





Make Yourself Blind to Biases

<https://www.princeton.edu/pr/news/00/q4/1127-auditions.htm>

For more info on all of this

<https://www.quantopian.com/lectures>

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