Idea to Algorithm

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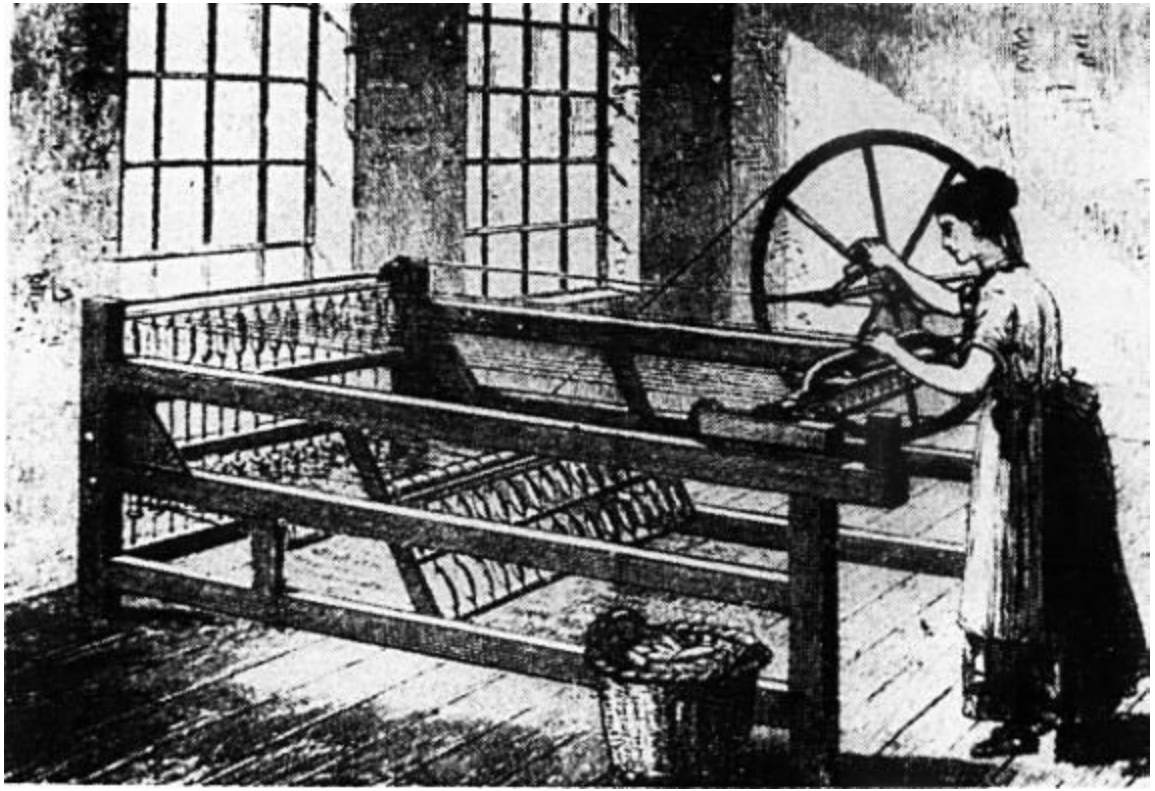
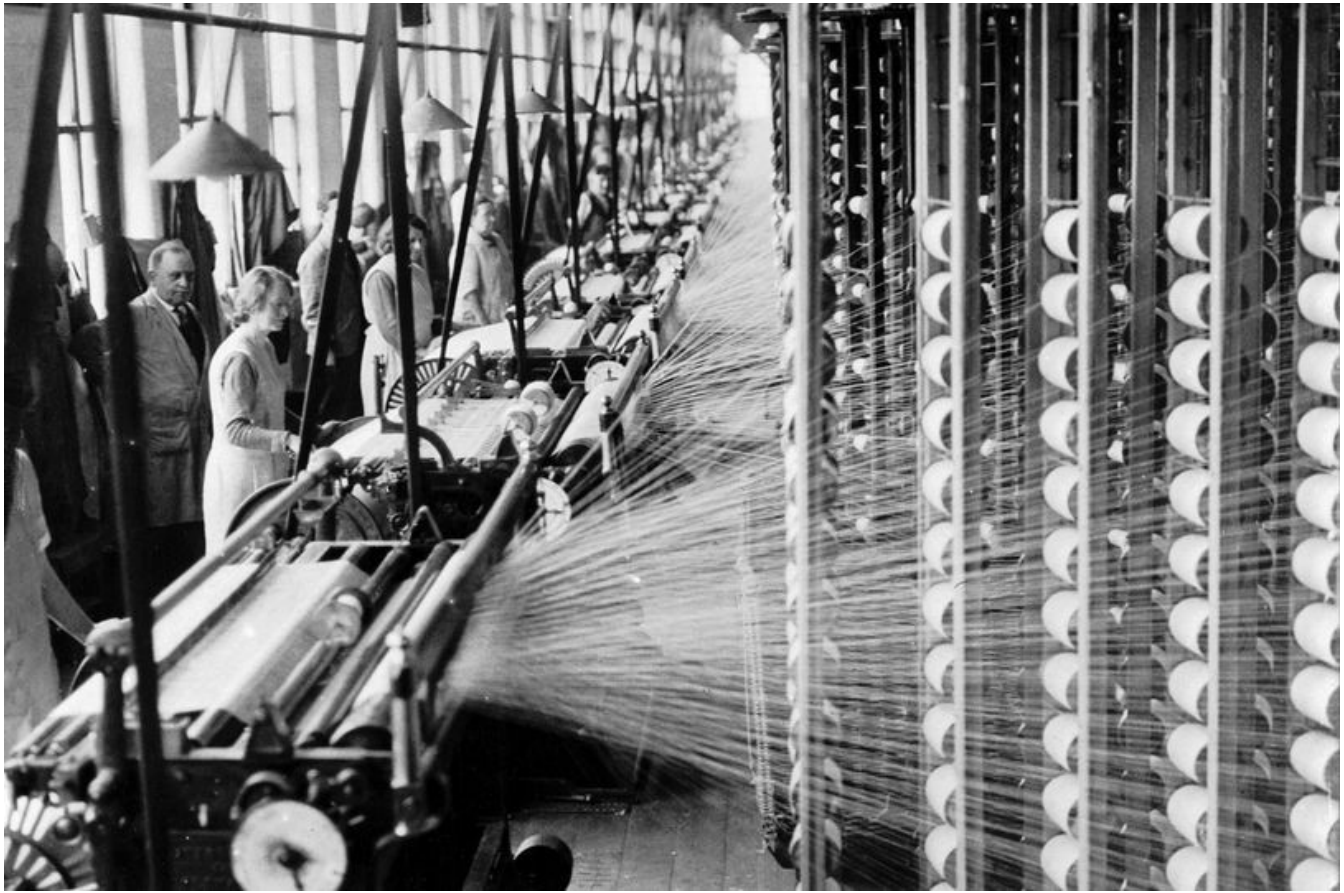


http://eh.net/encyclopedia/women-workers-in-the-british-industrial-revolution/



http://eh.net/encyclopedia/women-workers-in-the-british-industrial-revolution/

https://thelibrary.org/lochist/frisco/friscoline/steam10.cfm

Automation Benefits

Cheaper and More Reliable

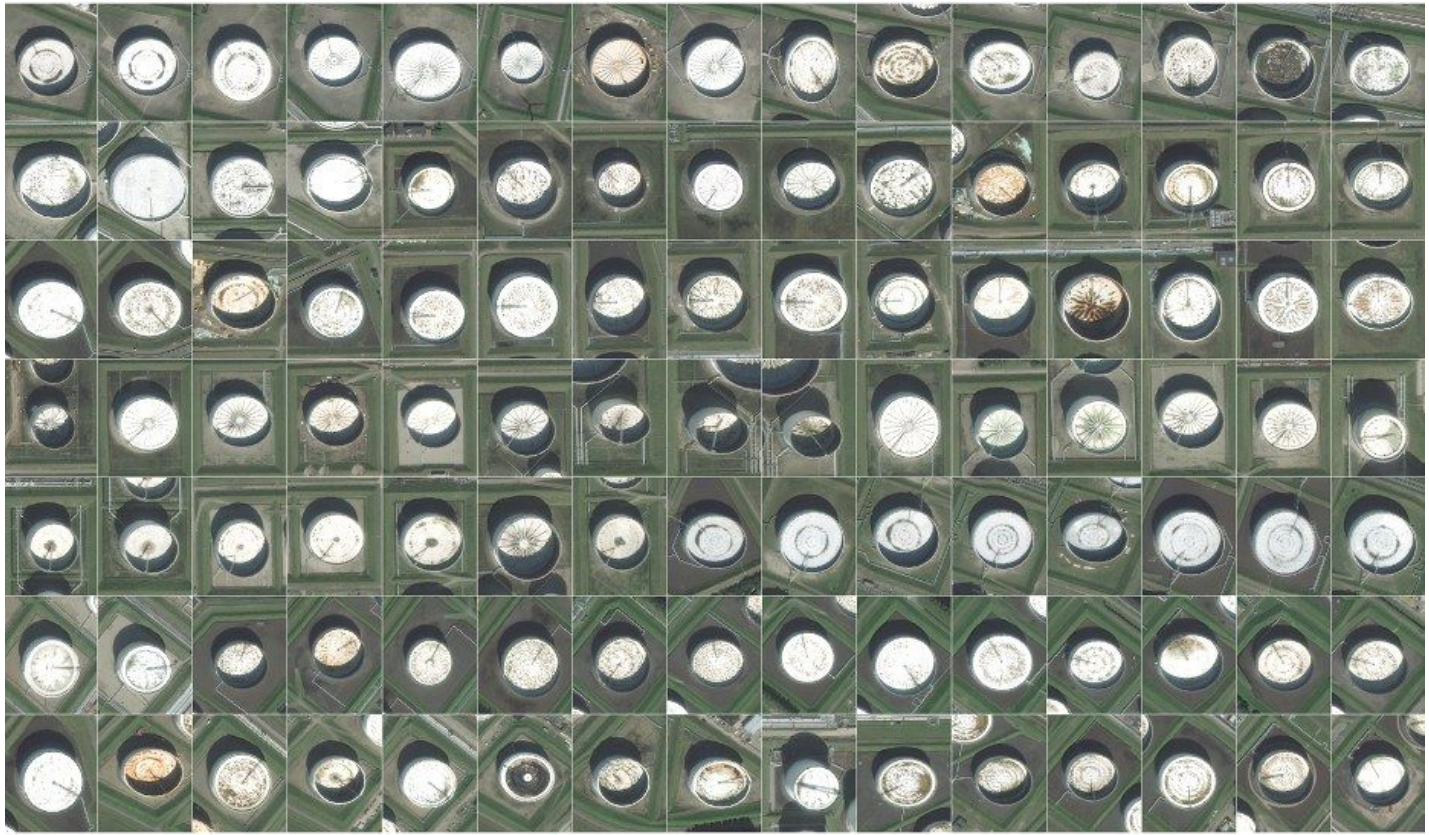
- Lower cost
- Higher quality
- Higher production capacity

More Sophistication

- New tech enables entirely new products

Cheaper and More Reliable

- BARN
- COW
- CUT
- FOIL
- PBJ



https://www.wired.com/2015/03/orbital-insight/

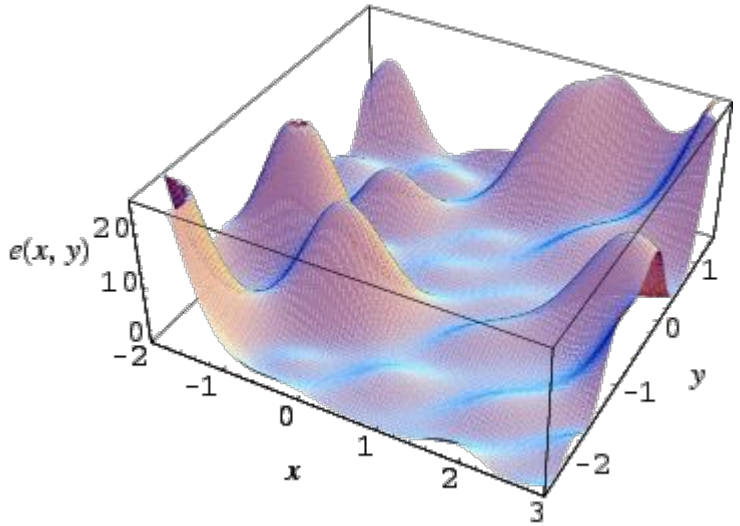
Background: Mathematical Optimization

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.



https://gnom.upc.edu/en/about-gnom/optimization

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.

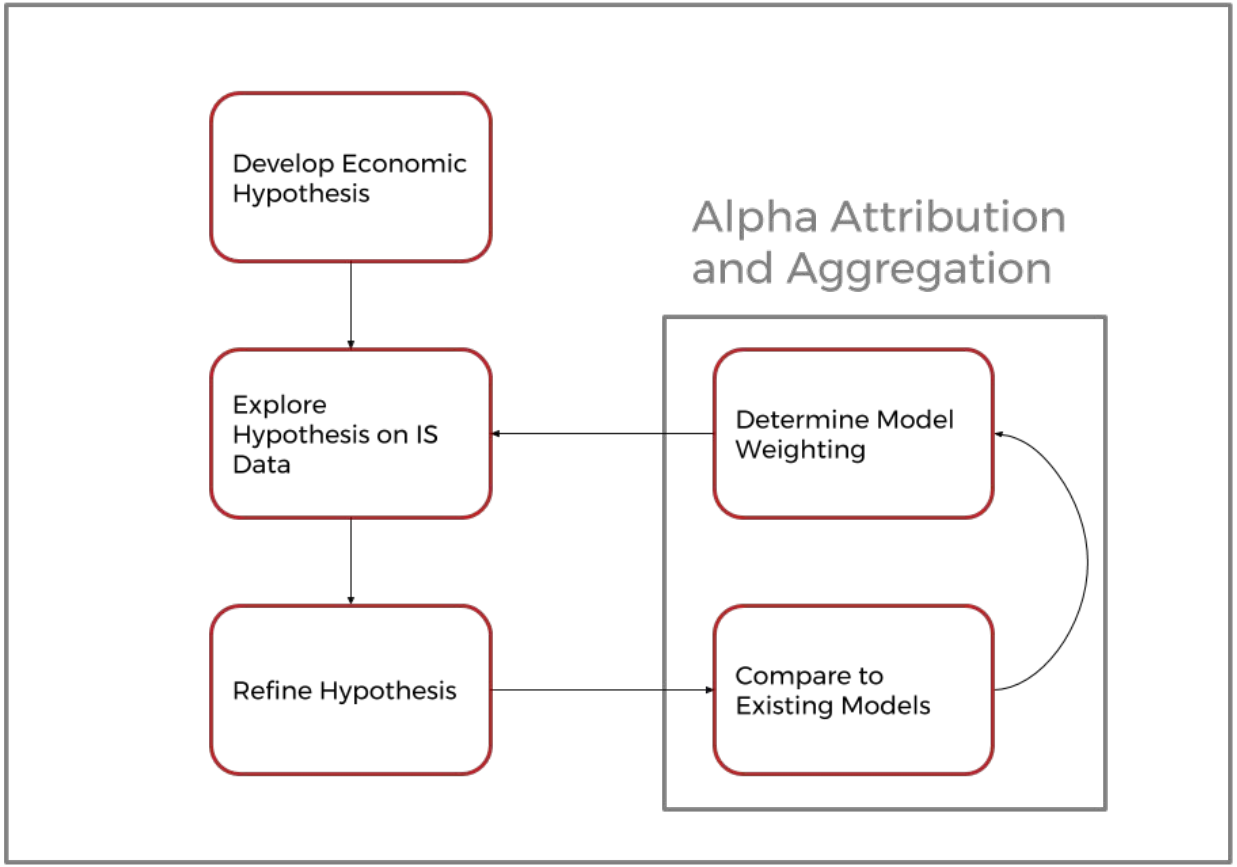
Lots more info

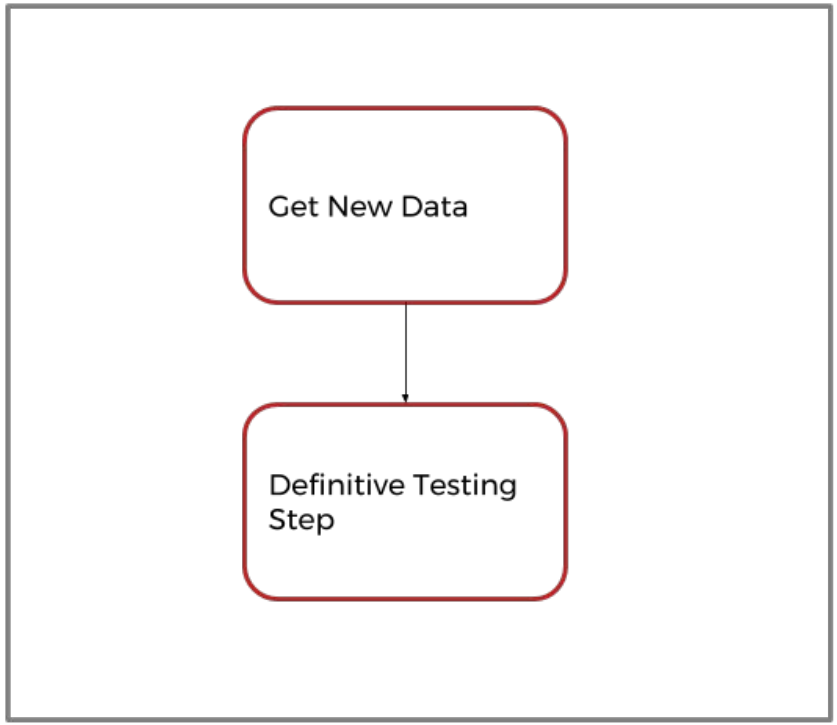
https://www.quantopian.com/lectures/risk-constrained-portfolio-optimization

Three Perspectives on The Quant Workflow

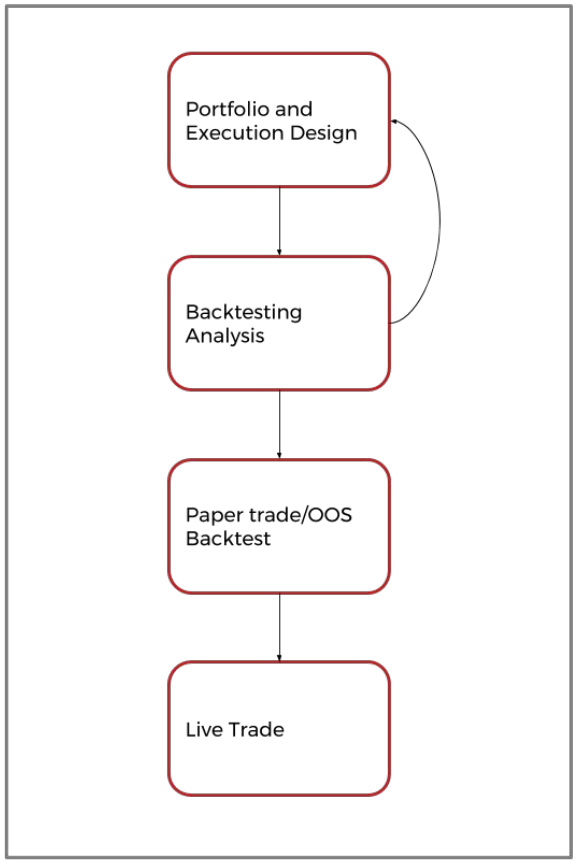
Perspective 1

Exploratory (In-Sample) Analysis



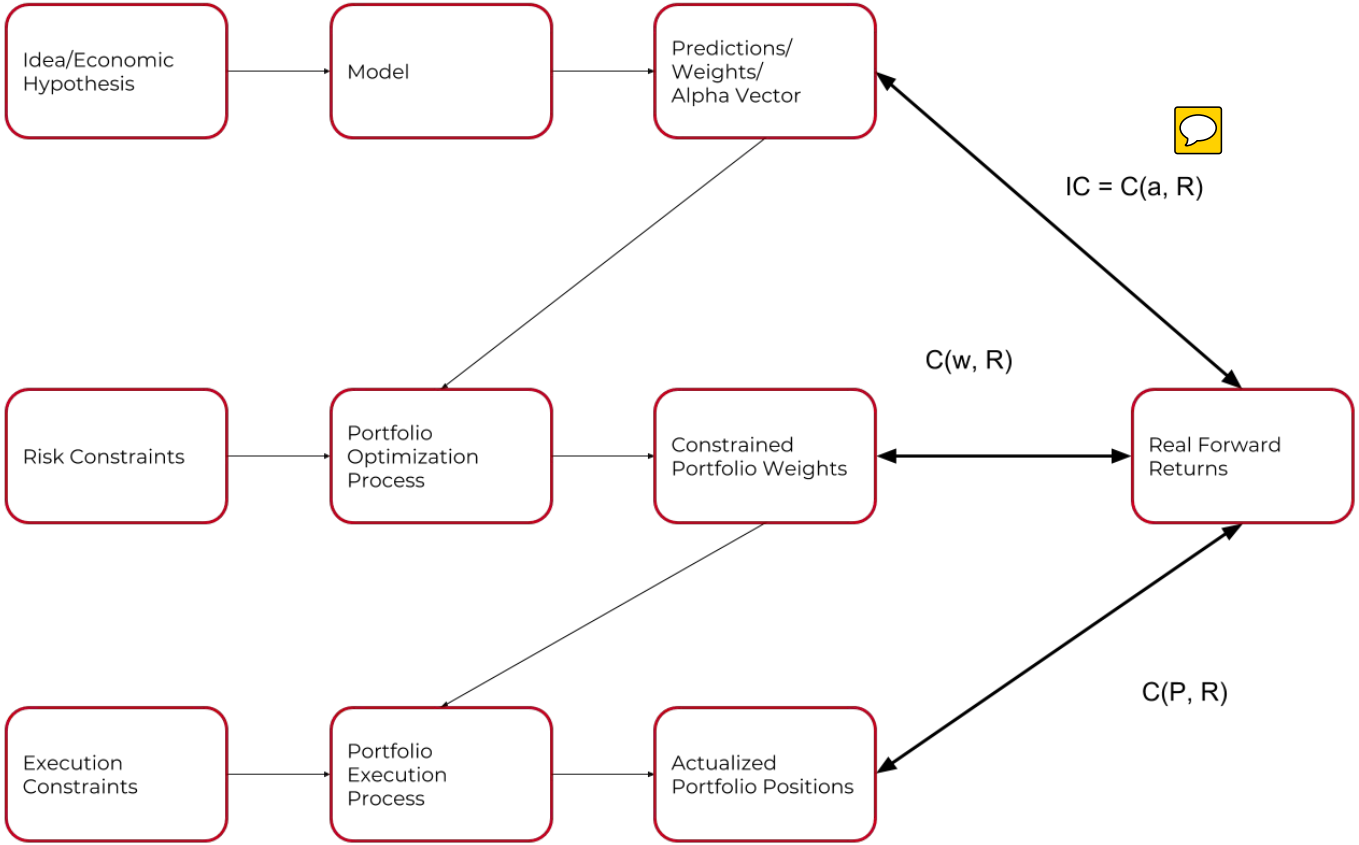


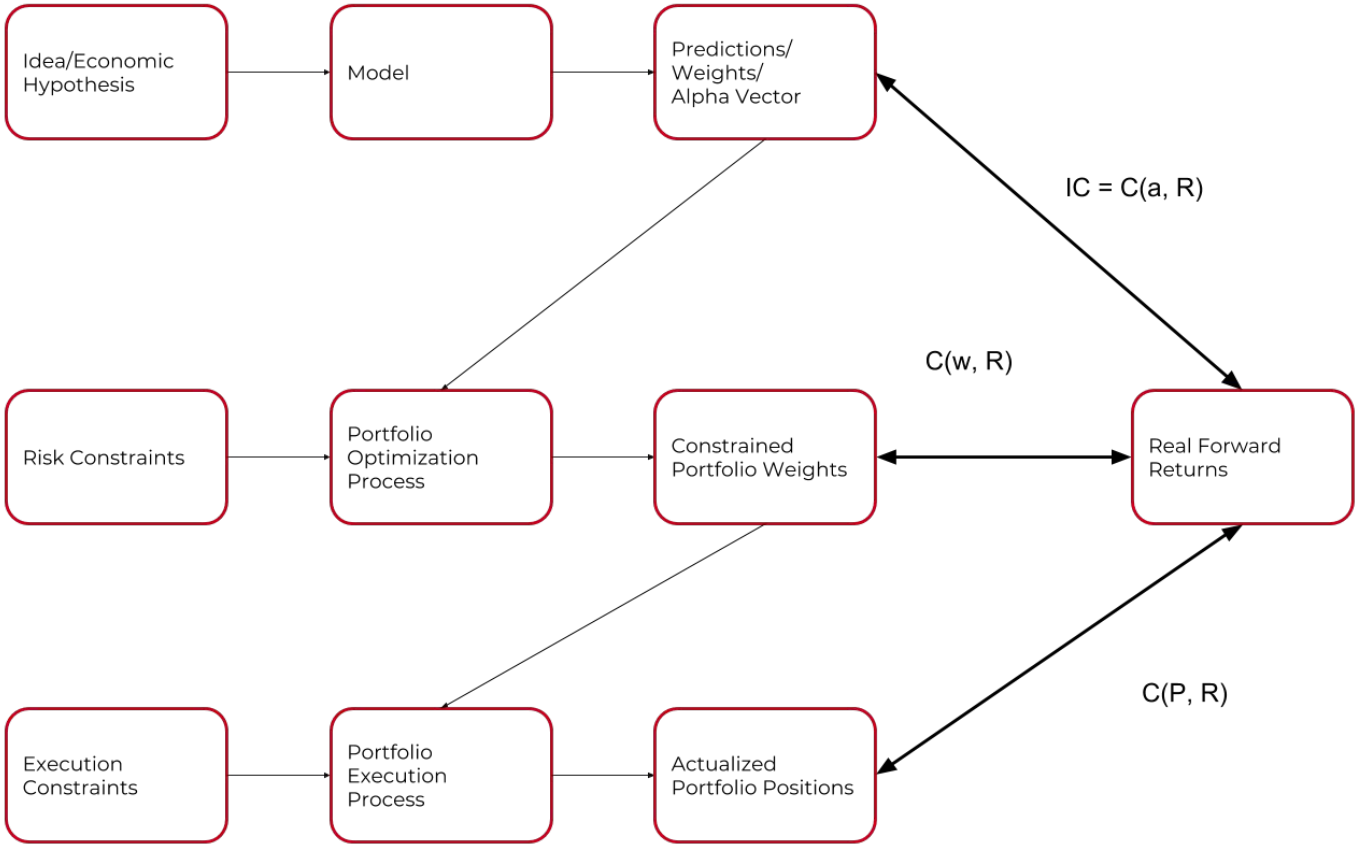
Definitive Testing
(Out of Sample)



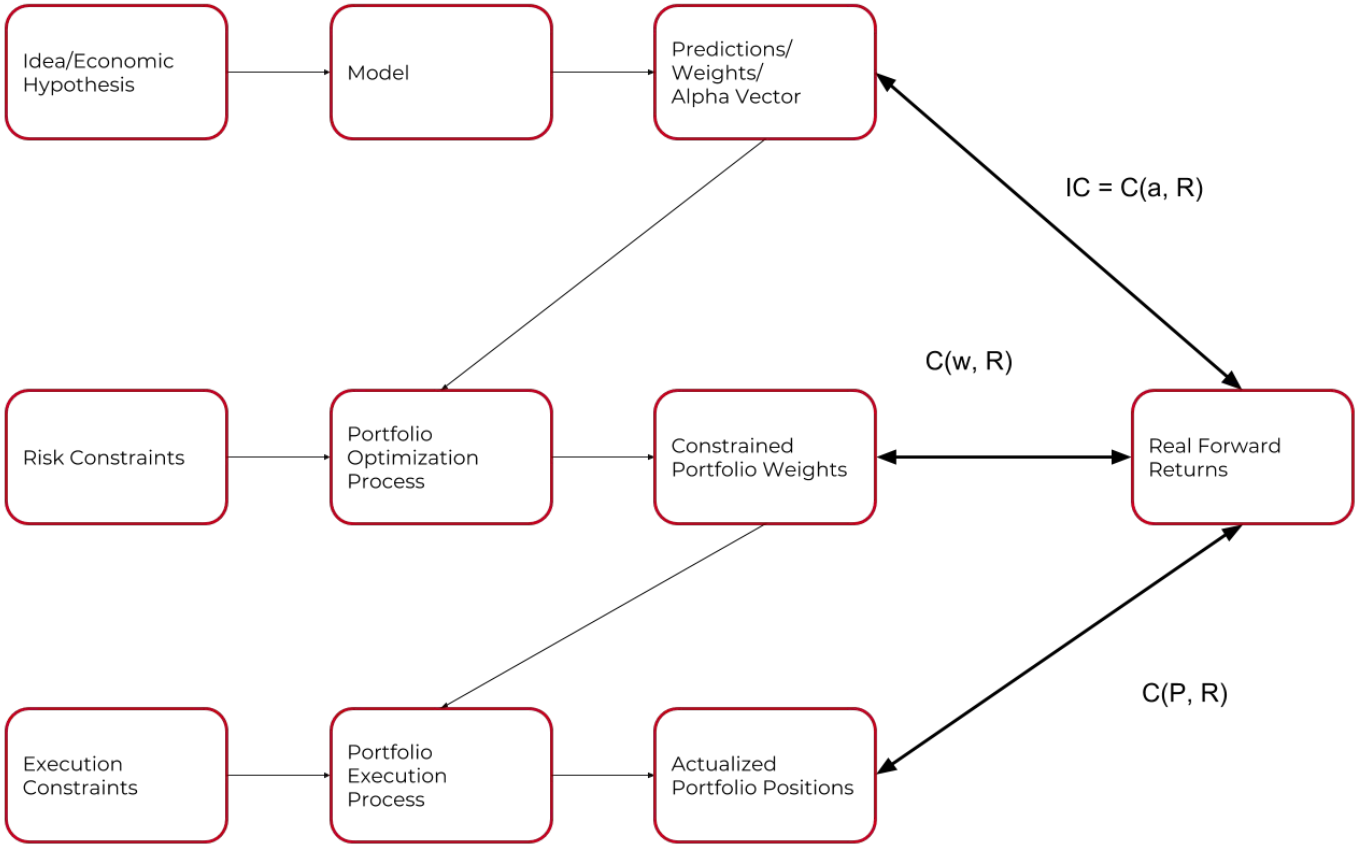
Real Market
Testing

Perspective 2


Idea/Economic Hypothesis
Model
Predictions/ Weights/ Alpha Vector
IC = C(a, R)
C(w, R)
Risk Constraints
Portfolio Optimization Process
Constrained Portfolio Weights
Real Forward Returns
C(P, R)
Execution Constraints
Portfolio Execution Process
Actualized Portfolio Positions



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

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

Each constraining step is effectively a discount

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

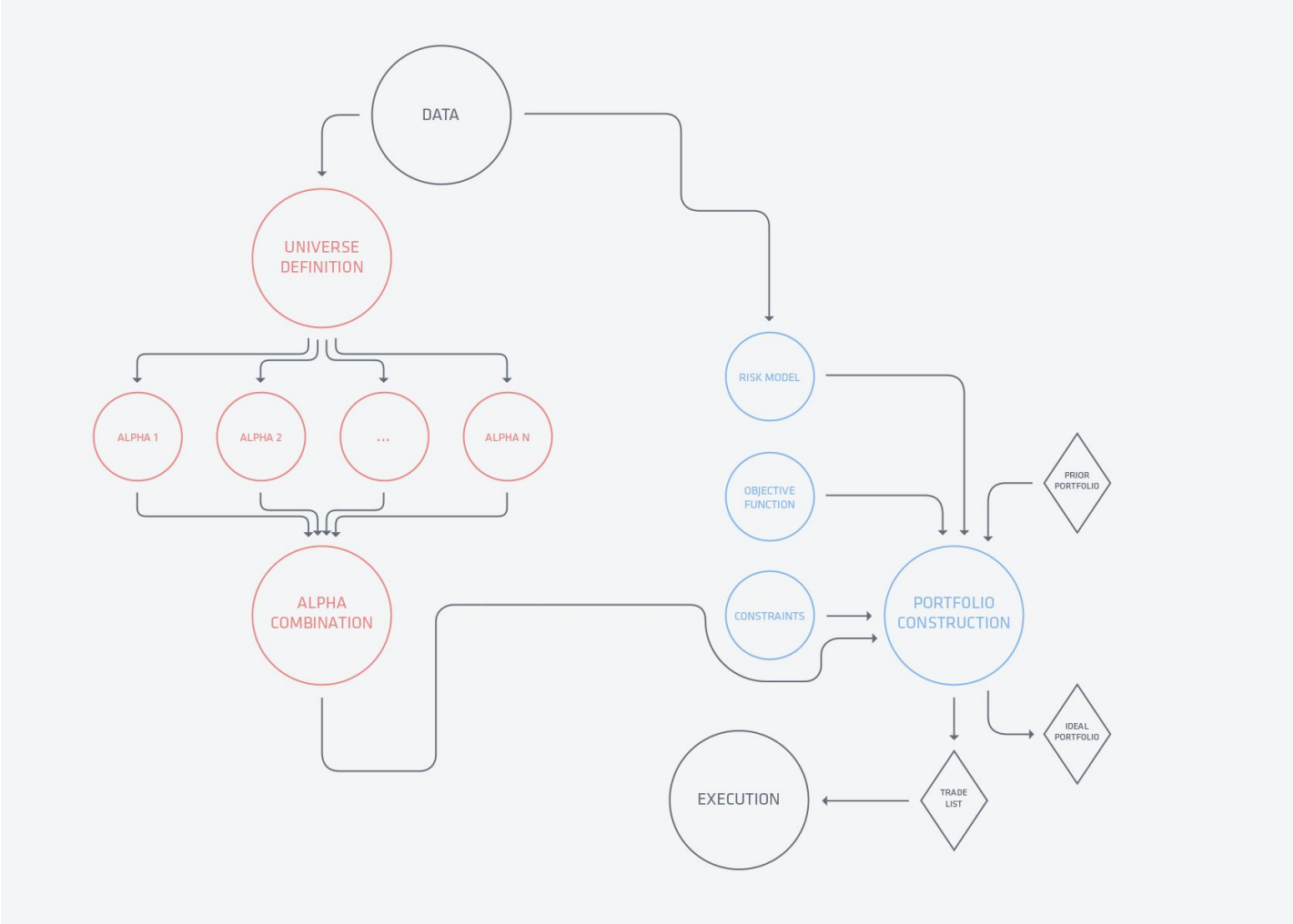
Portfolio optimization will distort a to get to w, likely reducing C(a, R).

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


DATA
UNIVERSE DEFINITION
ALPHA 1
ALPHA 2
...
ALPHA N
ALPHA COMBINATION
RISK MODEL
OBJECTIVE FUNCTION
CONSTRAINTS
PRIOR PORTFOLIO
PORTFOLIO CONSTRUCTION
IDEAL PORTFOLIO
TRADE LIST
EXECUTION

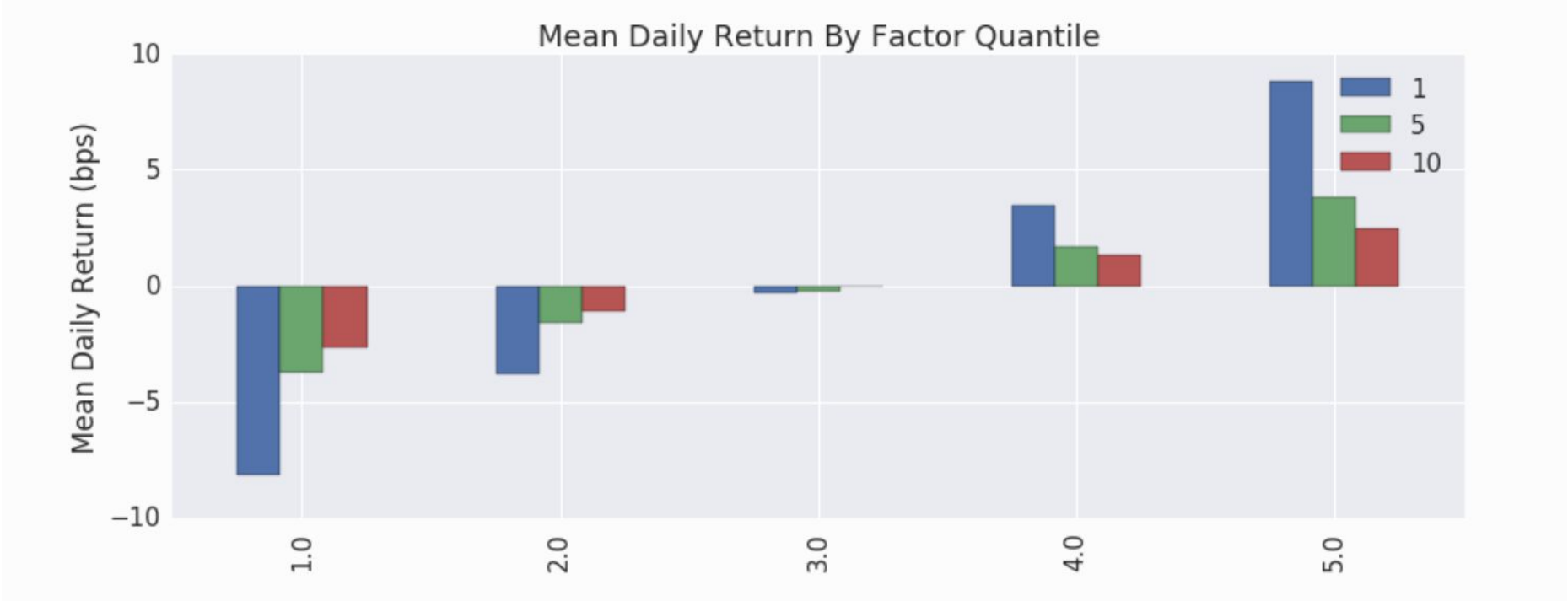
Free Open Source Tools

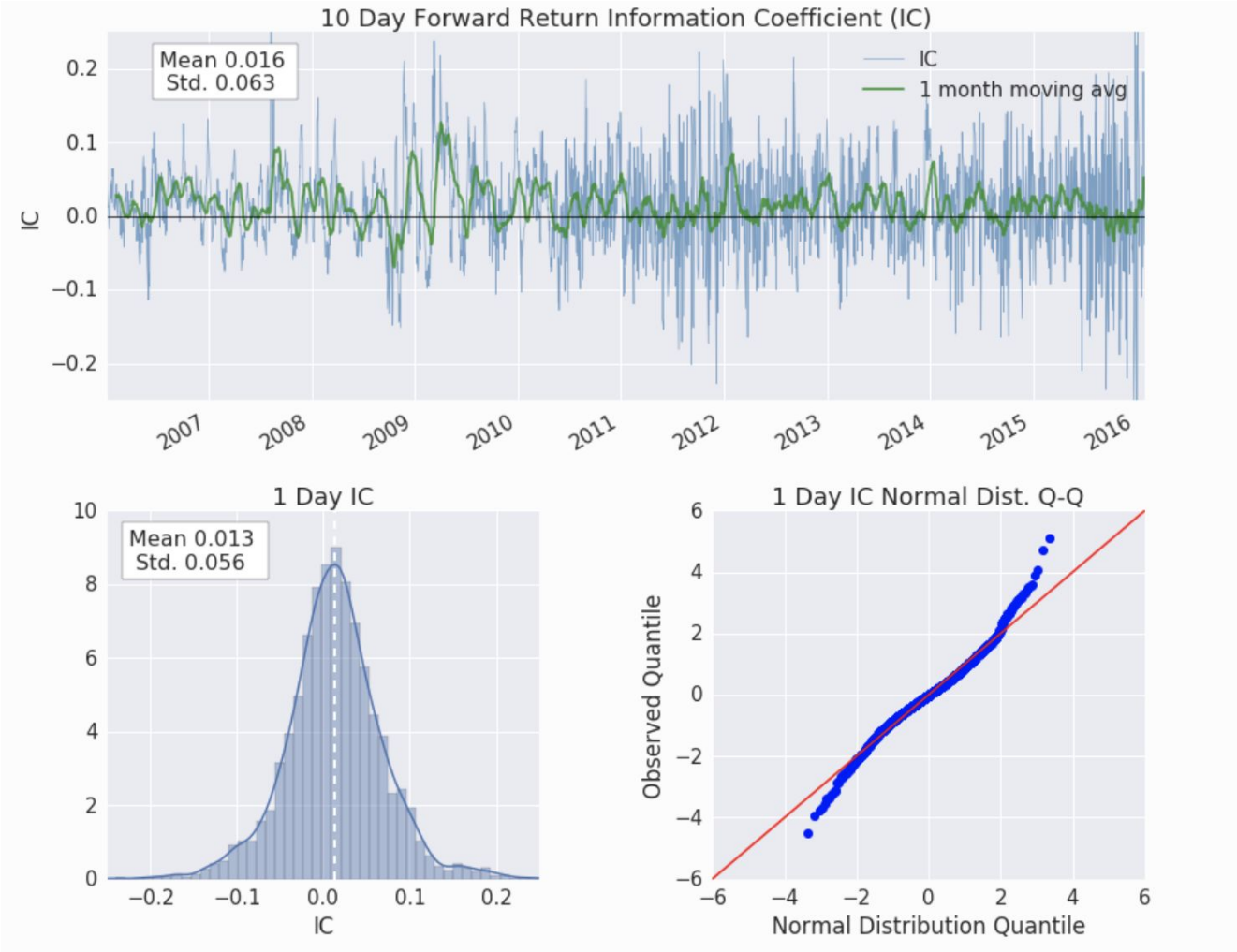
Checking C(a, R): http://quantopian.github.io/alphalens/

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

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

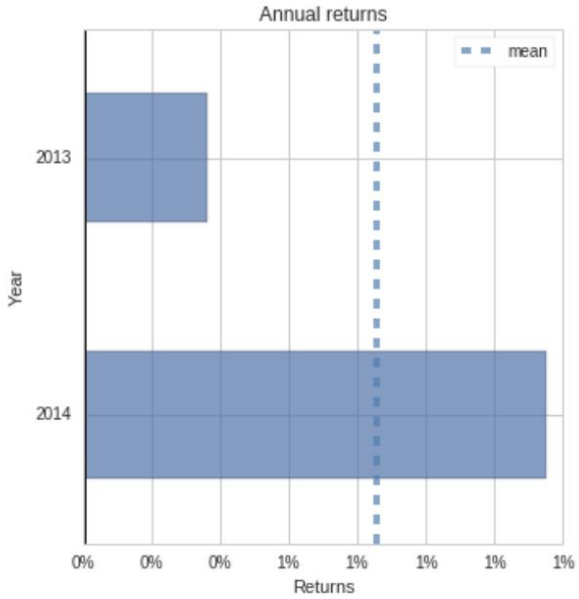
Alphalens - C(a, R)

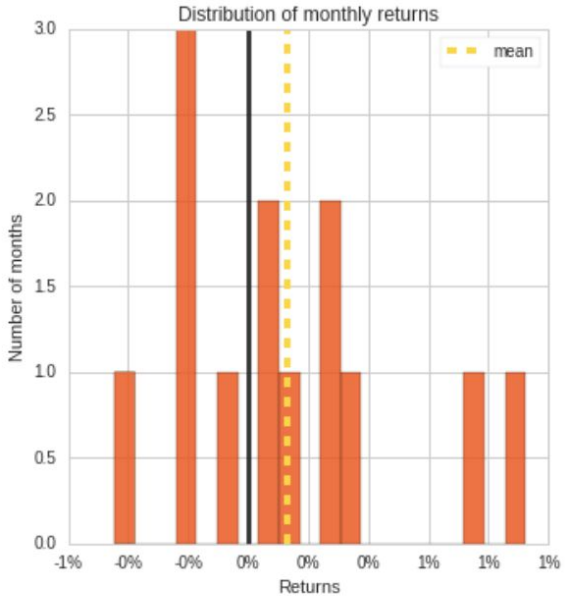

Mean Daily Return By Factor Quantile
Mean Daily Return (bps)
10
5
0
−5
−10
1.0
2.0
3.0
4.0
5.0
1
5
10

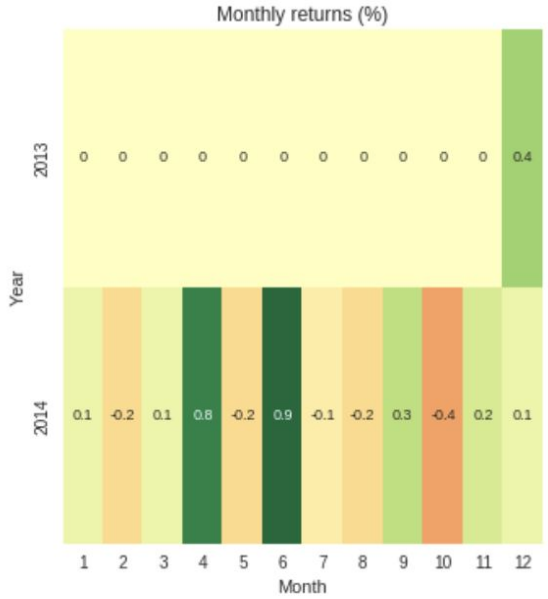

10 Day Forward Return Information Coefficient (IC)
Mean 0.016
Std. 0.063
IC
1 month moving avg
IC
0.2
0.1
0.0
−0.1
−0.2
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
1 Day IC
Mean 0.013
Std. 0.056
10
8
6
4
2
0
−0.2
−0.1
0.0
0.1
0.2
IC
1 Day IC Normal Dist. Q-Q
Observed Quantile
6
4
2
0
−2
−4
−6
−6
−4
−2
0
2
4
6
Normal Distribution Quantile

Pyfolio C(w, R)

Rolling Sharpe ratio (6-month)
Sharpe
Average
Sharpe ratio
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
Jan 2014
Feb 2014
Mar 2014
Apr 2014
May 2014
Jun 2014
Jul 2014
Aug 2014
Sep 2014
Oct 2014
Nov 2014
Dec 2014


Annual returns
mean
2013
2014
Year
0%
0%
0%
1%
1%
1%
1%
1%
Returns


Distribution of monthly returns
mean
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Number of months
-1%
-0%
-0%
0%
0%
0%
1%
1%
1%
Returns


Monthly returns (%)
2013
2014
Year
0 0 0 0 0 0 0 0 0 0 0 0.4
0.1 -0.2 0.1 0.8 -0.2 0.9 -0.1 -0.2 0.3 -0.4 0.2 0.1
1 2 3 4 5 6 7 8 9 10 11 12
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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