Basic trading strategies & portfolio management

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https://github.com/sghoshusc/stratandport

What are we talking about

- Trend Following
- Mean Reversion
- Pairs Trading - collinearity
- Relative value trading - correlation

Trend following/break out - trivago/rattlesnake

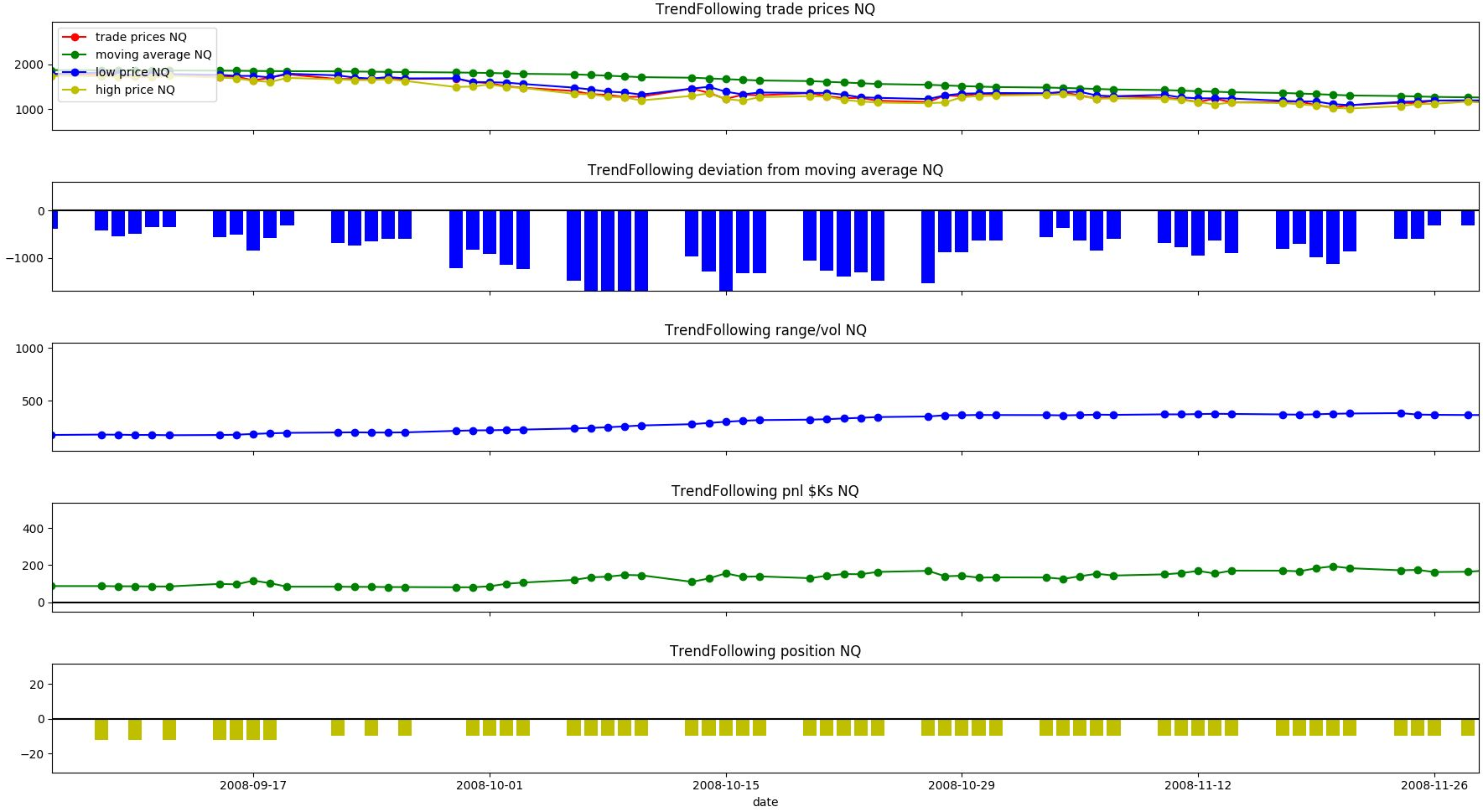
If it moves enough in one direction, my bet is that it will keep moving in same direction.

How do you define a move?

- Current price - yesterday’s price?
- Current price - slow moving average of prices over last ‘x’ samples?

When is trend ending?

- Same metrics we used to project a trend starting?


TrendFollowing trade prices NQ
trade prices NQ
moving average NQ
low price NQ
high price NQ
2000
1000
TrendFollowing deviation from moving average NQ
0
−1000
TrendFollowing range/vol NQ
1000
500
TrendFollowing pnl $Ks NQ
400
200
0
TrendFollowing position NQ
20
0
−20
2008-09-17
2008-10-01
2008-10-15
2008-10-29
2008-11-12
2008-11-26
date


TrendFollowing pnl $Ks CL
TrendFollowing pnl $Ks SI
TrendFollowing pnl $Ks GC
TrendFollowing pnl $Ks NQ
TrendFollowing pnl $Ks ZB
TrendFollowing pnl $Ks HO
TrendFollowing pnl $Ks ZC
TrendFollowing pnl $Ks ZN
TrendFollowing pnl $Ks ZW
TrendFollowing pnl $Ks ES
TrendFollowing pnl $Ks 6E
TrendFollowing pnl $Ks 6B
total pnl $Ks
25000
20000
15000
10000
5000
0
1975
1985
1995
2005
2015
date

Pros/Cons

Need volatility - right now super slow.

Potentially takes a lot of small losses, if you miss the winners, pnls suffer.

Ideally you want something that trades a lot (statistical significance) and makes & loses small amounts each trade.

Mean reversion

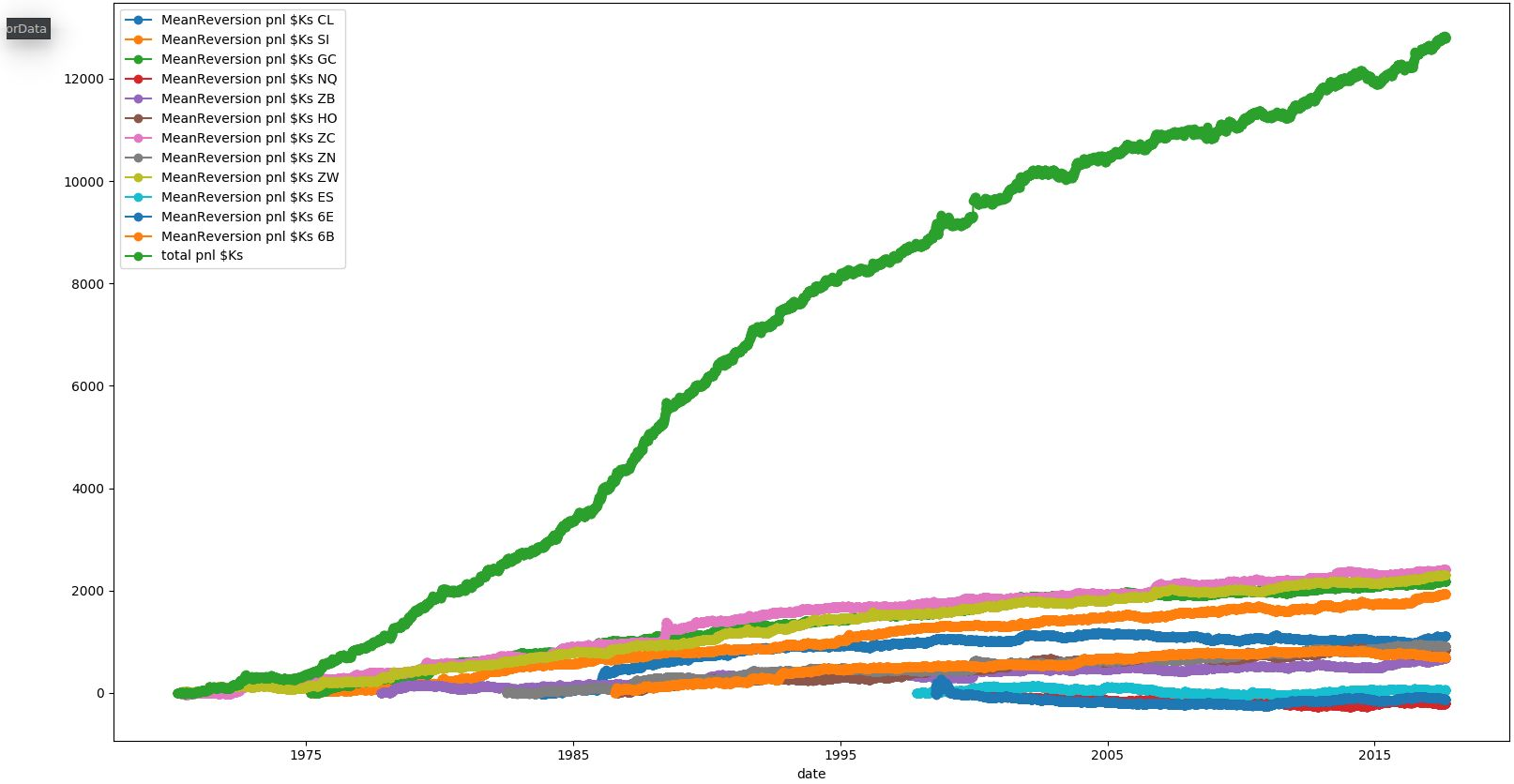
If it moves too much in one direction, my bet is that it will revert back to ‘mean’.

How do you define a move?

- Current price - yesterday’s price?
- Current price - slow moving average of prices over last ‘x’ samples?

When has it mean reverted?

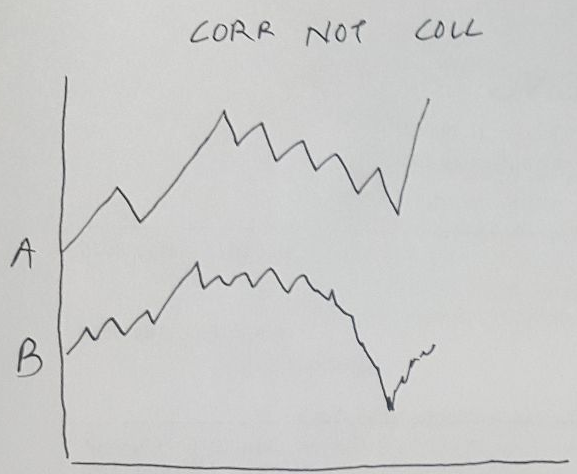
- Same metrics we used to project a deviation from mean?

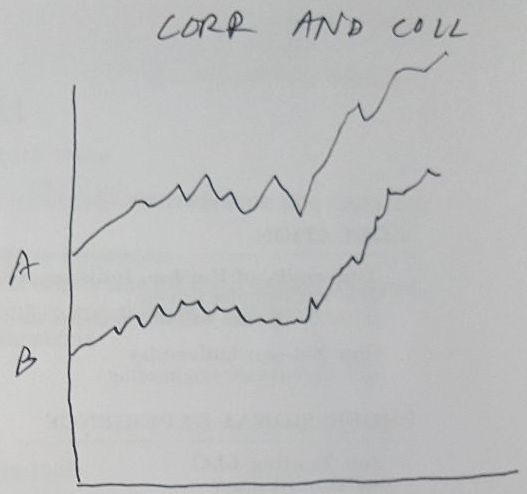

MeanReversion pnl $Ks CL
MeanReversion pnl $Ks SI
MeanReversion pnl $Ks GC
MeanReversion pnl $Ks NQ
MeanReversion pnl $Ks ZB
MeanReversion pnl $Ks HO
MeanReversion pnl $Ks ZC
MeanReversion pnl $Ks ZN
MeanReversion pnl $Ks ZW
MeanReversion pnl $Ks ES
MeanReversion pnl $Ks 6E
MeanReversion pnl $Ks 6B
total pnl $Ks
12000
10000
8000
6000
4000
2000
0
1975
1985
1995
2005
2015
date

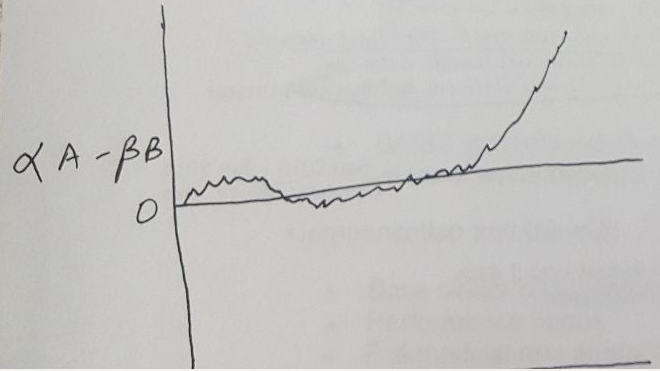
Pros/Cons

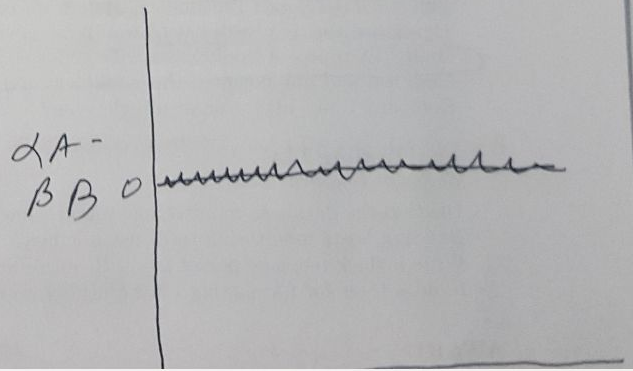
Does poorly during super volatile phases.

Losers significantly larger than winners, a few large losers can ruin a good run.









Pairs trading - lingli/brendan/seamless/admin

If A & B are known to be collinear,

(a*price-of-A - b*price-of-B) should be not moving

If that spread moves down, buy A, sell B, if spread moves up, sell A, buy B.

Projection is spread price will go back to mean.

Profits on a leg outweigh losses on other leg.


PairsTrading pnl $Ks ES VS. NQ
PairsTrading pnl $Ks ZC VS. ZW
PairsTrading pnl $Ks 6E VS. 6B
PairsTrading pnl $Ks CL VS. HO
PairsTrading pnl $Ks ZN VS. ZB
PairsTrading pnl $Ks GC VS. SI
total pnl $Ks
4000
3000
2000
1000
0
−1000
−2000
1975
1985
1995
2005
2015
date

Pros/Cons

Lots of fees.

Weights keep changing, hard to adapt.

Liquidation sometimes is a problem.

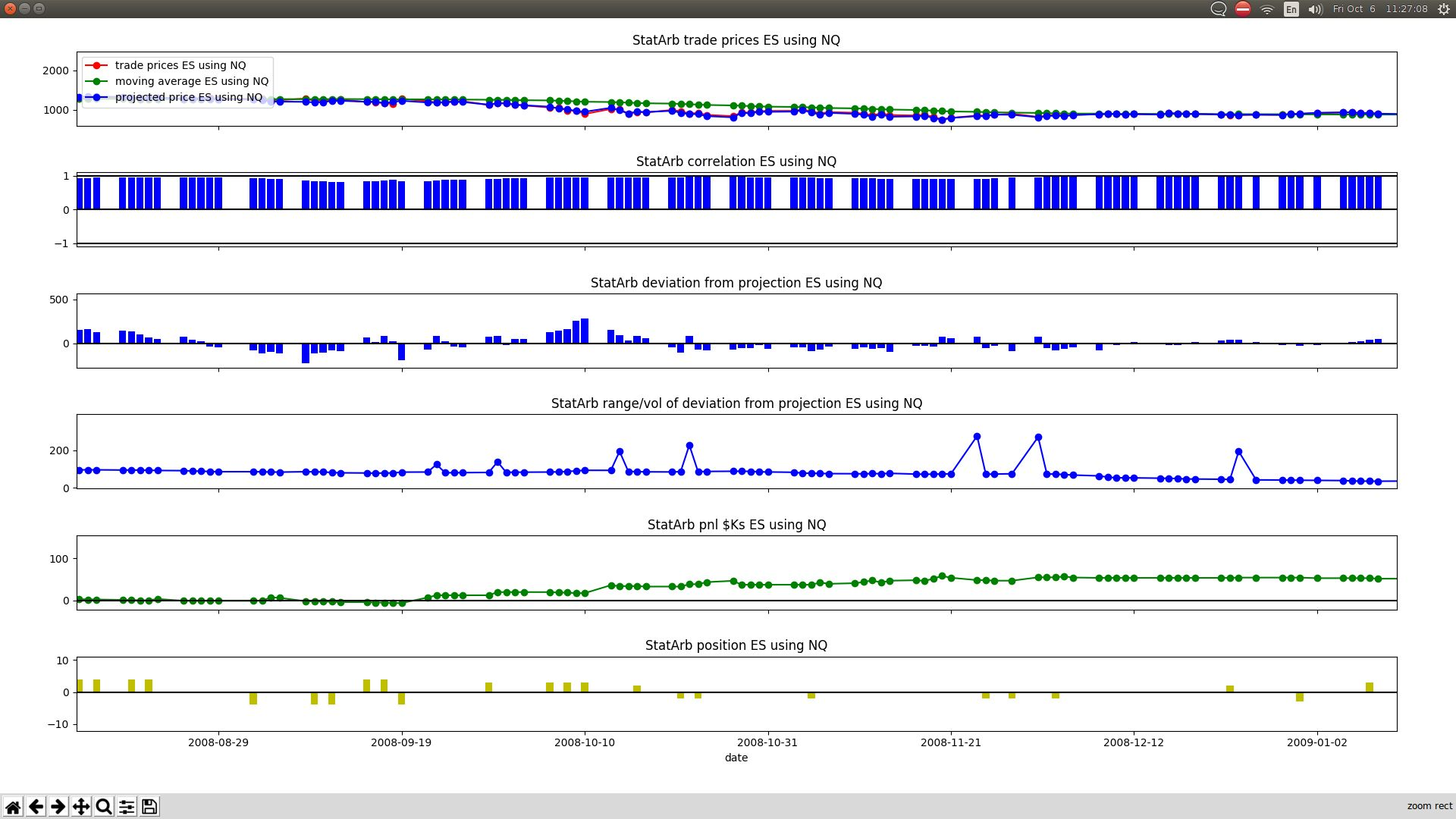
Need speed of execution.

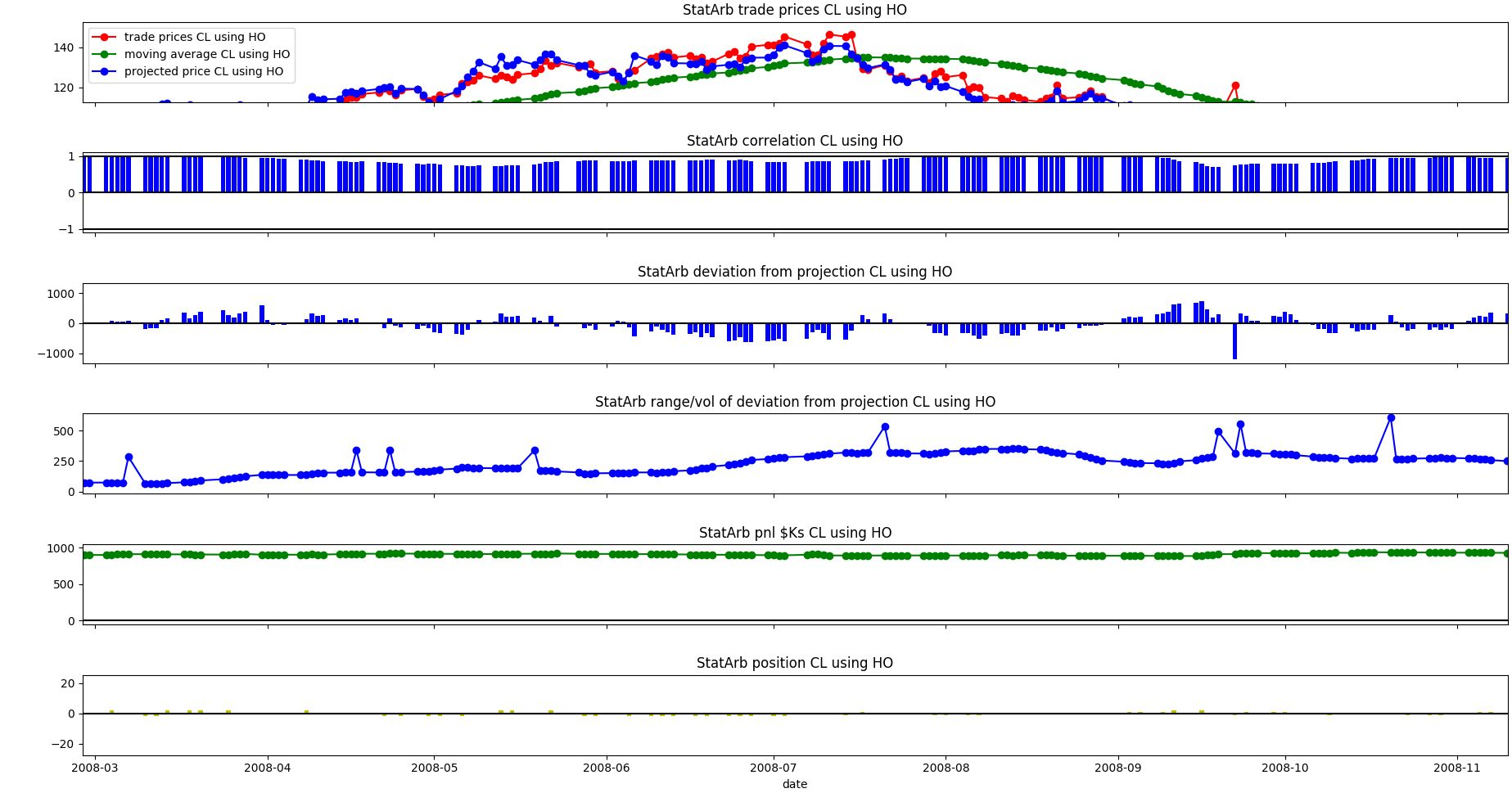
Relative value trading - levelup

If A & B are known to be correlated, and A usually leads price moves in B.

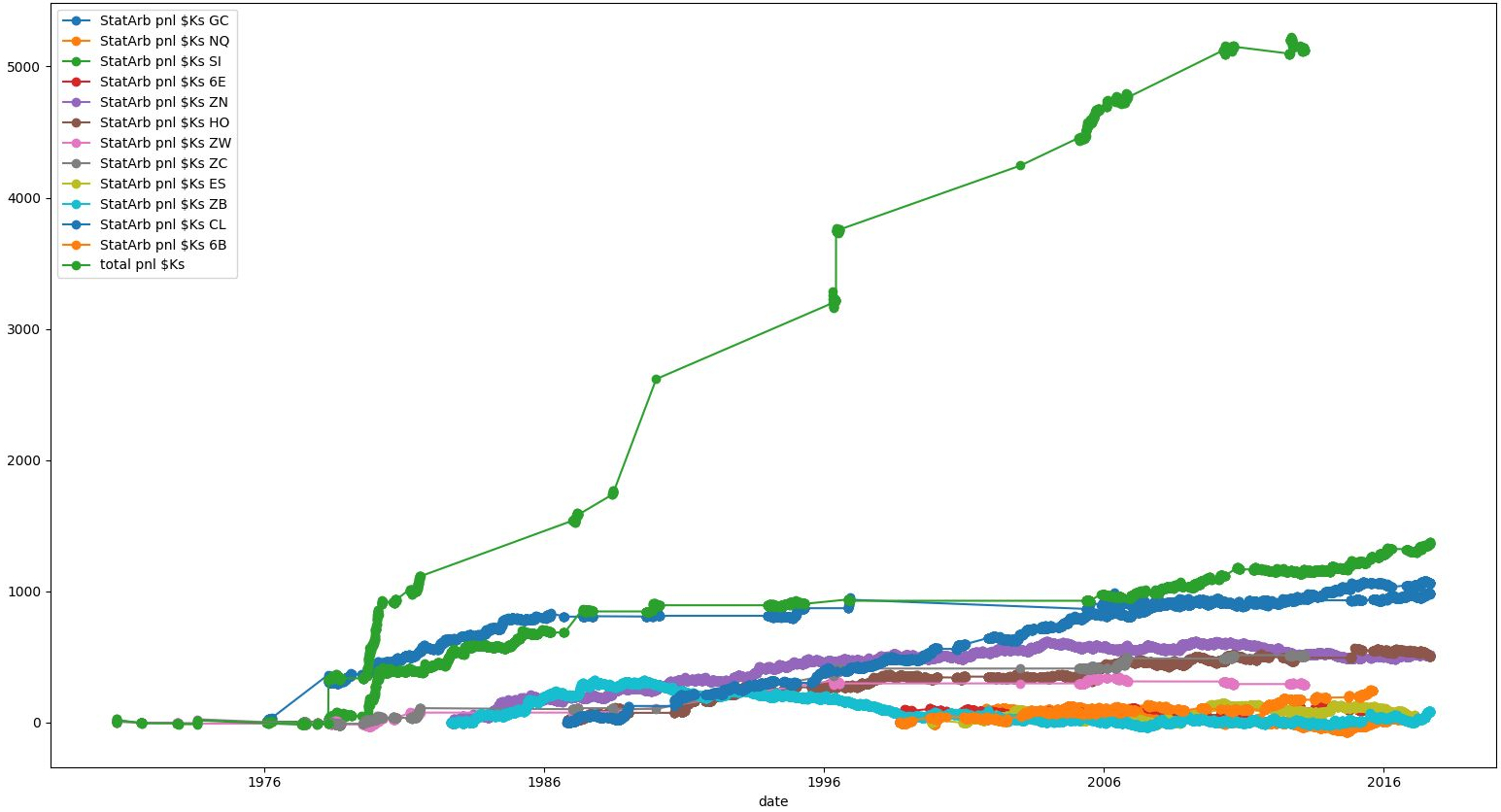
If A moves up enough, and B hasn’t moved up as much as you’d expect, buy B.

If A moves down enough, and B hasn’t moved down as much as you’d expect, sell B.


StatArb trade prices ES using NQ
trade prices ES using NQ
moving average ES using NQ
projected price ES using NQ
2000
1000
StatArb correlation ES using NQ
1
0
−1
StatArb deviation from projection ES using NQ
500
0
StatArb range/vol of deviation from projection ES using NQ
200
0
StatArb pnl $Ks ES using NQ
100
0
StatArb position ES using NQ
10
0
−10
2008-08-29
2008-09-19
2008-10-10
2008-10-31
2008-11-21
2008-12-12
2009-01-02
date


StatArb trade prices CL using HO
trade prices CL using HO
moving average CL using HO
projected price CL using HO
140
120
StatArb correlation CL using HO
1
0
−1
StatArb deviation from projection CL using HO
1000
0
−1000
StatArb range/vol of deviation from projection CL using HO
500
250
0
StatArb pnl $Ks CL using HO
1000
500
0
StatArb position CL using HO
20
0
−20
2008-03
2008-04
2008-05
2008-06
2008-07
2008-08
2008-09
2008-10
2008-11
date

zoom rect

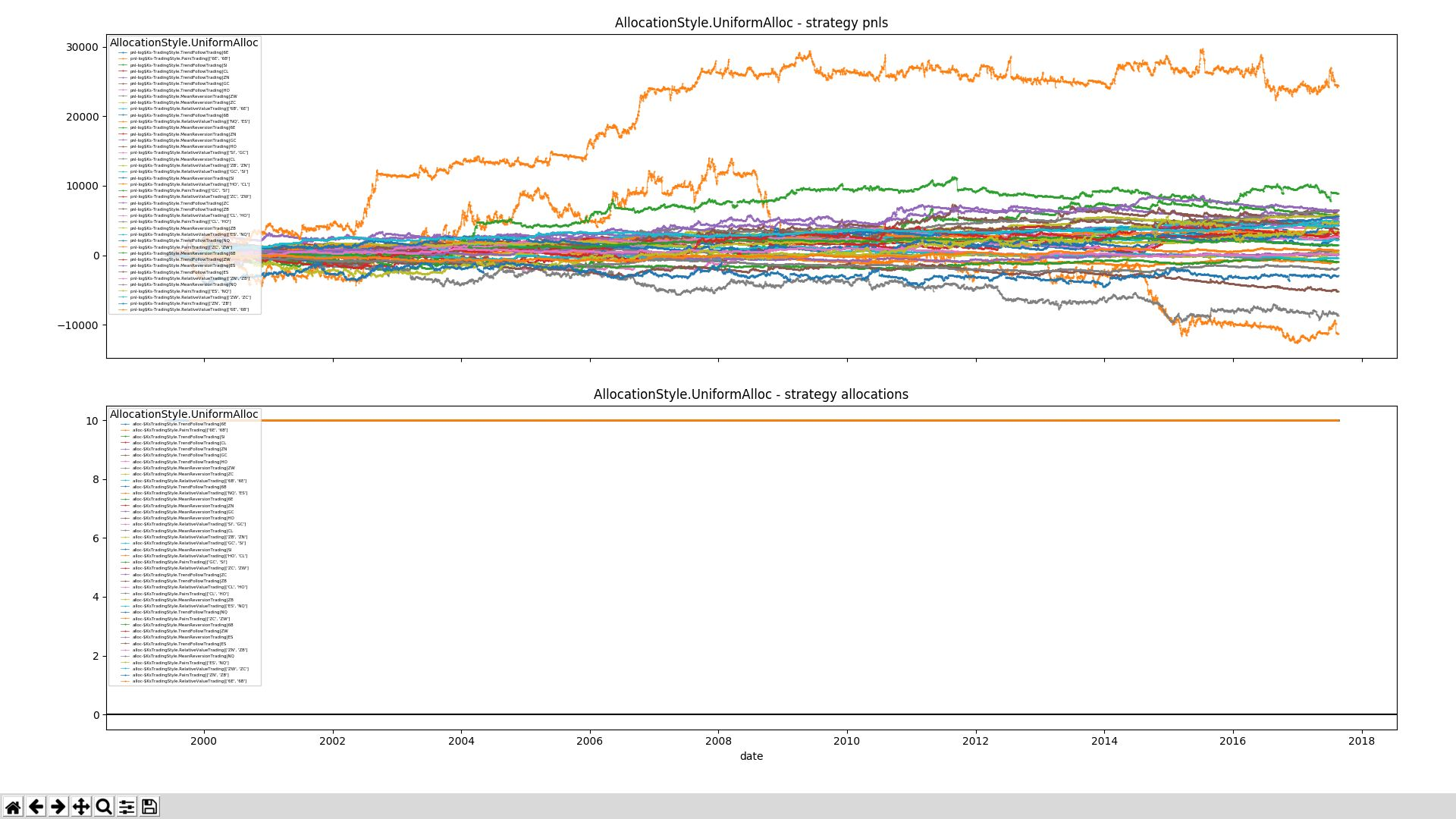

StatArb pnl $Ks GC
StatArb pnl $Ks NQ
StatArb pnl $Ks SI
StatArb pnl $Ks 6E
StatArb pnl $Ks ZN
StatArb pnl $Ks HO
StatArb pnl $Ks ZW
StatArb pnl $Ks ZC
StatArb pnl $Ks ES
StatArb pnl $Ks ZB
StatArb pnl $Ks CL
StatArb pnl $Ks 6B
total pnl $Ks
5000
4000
3000
2000
1000
0
1976
1986
1996
2006
2016
date

Pros/Cons

Relies on correlation - right now german vs us bonds correlation horrible.

Speed of getting information from one place to another.

Lead/lag relationship changes.


AllocationStyle.UniformAlloc - strategy pnls
AllocationStyle.UniformAlloc
30000
20000
10000
0
−10000
AllocationStyle.UniformAlloc - strategy allocations
AllocationStyle.UniformAlloc
10
8
6
4
2
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
date

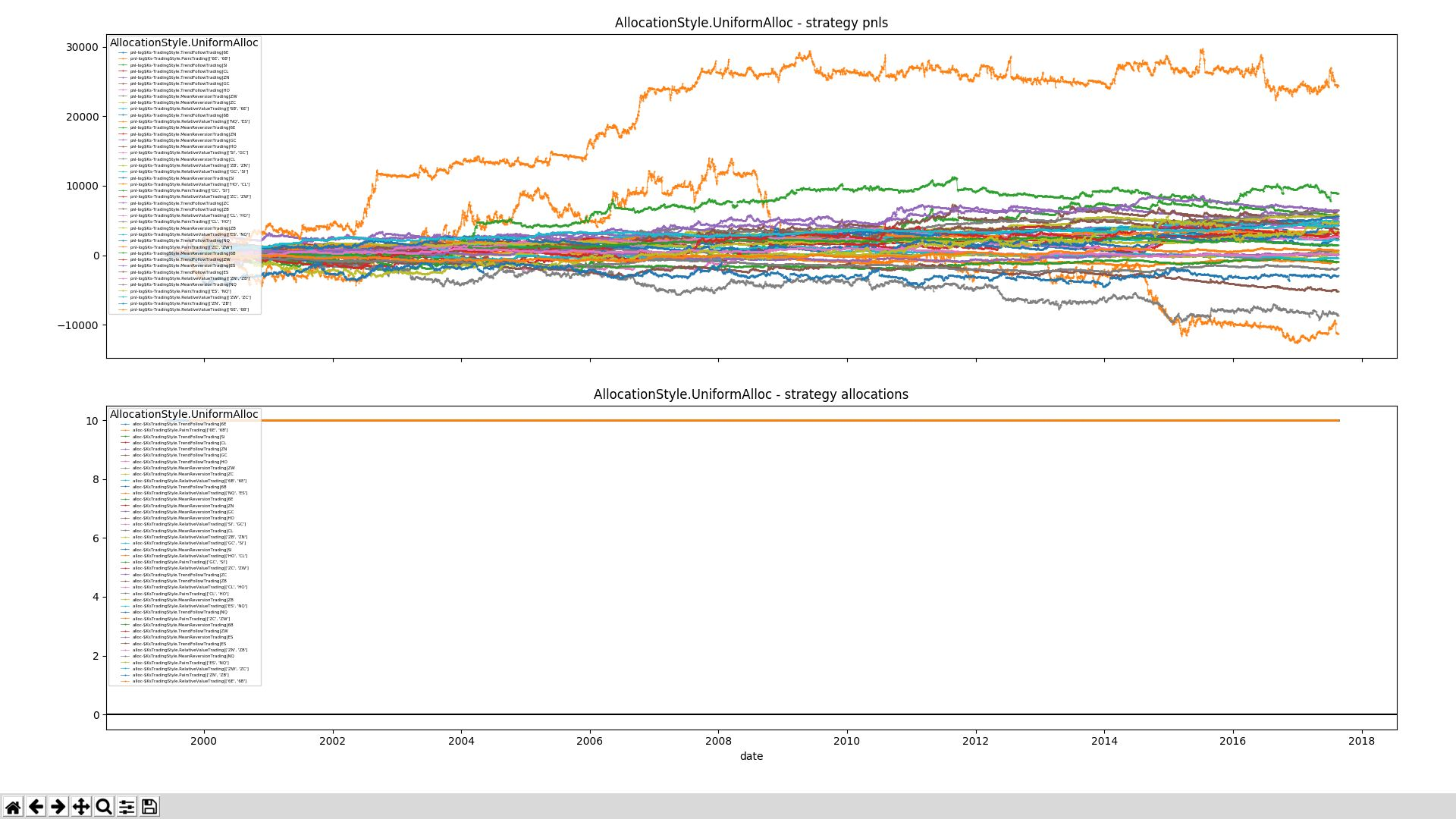
Now what?

Which strategies to run - Pick one? Weigh each of them in some way?

Uniform Allocation of risk

Give every trader/strategy 10k risk every day - go to sleep …..

This is at best a baseline to compare with other methods available.


AllocationStyle.UniformAlloc - strategy pnls
AllocationStyle.UniformAlloc
30000
20000
10000
0
−10000
AllocationStyle.UniformAlloc - strategy allocations
AllocationStyle.UniformAlloc
10
8
6
4
2
0
2000
2002
2004
2006
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2012
2014
2016
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date

Individual Pnl Allocation

Allocate risk to traders based on their average historic pnls.

Pros:

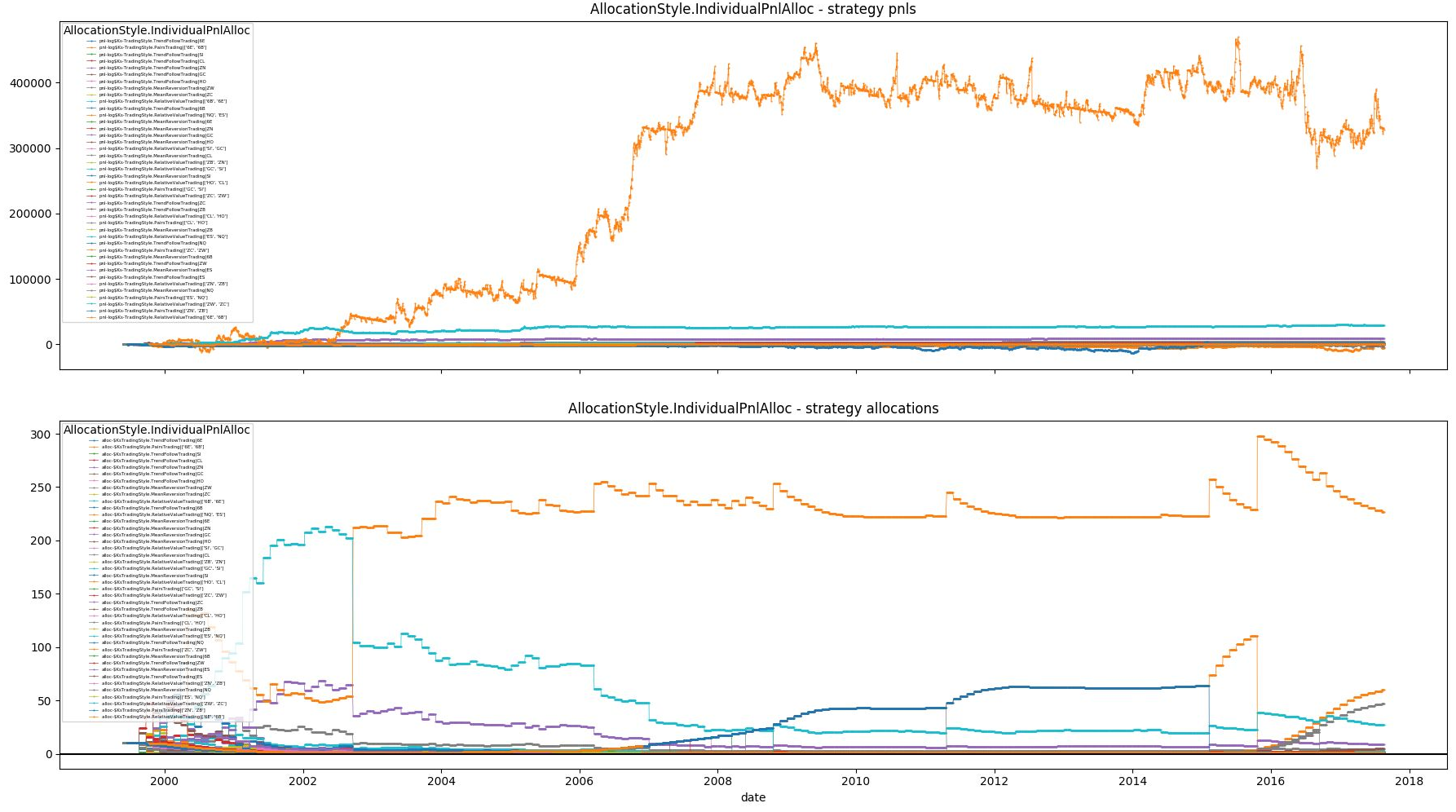
At least tries to make an effort to “predict” future performance.

Cons:

If historic returns were a guarantee for future returns, then what are we even talking about??

We use average pnl, which hurts a strategy that takes less risk than a different one.

We do not factor correlation of returns between different strategies - what if they all lose money same day or week or month?


AllocationStyle.IndividualPnlAlloc - strategy pnls
AllocationStyle.IndividualPnlAlloc
400000
300000
200000
100000
0
AllocationStyle.IndividualPnlAlloc - strategy allocations
AllocationStyle.IndividualPnlAlloc
300
250
200
150
100
50
0
2000
2002
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2006
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2014
2016
2018
date

Individual Pnl Sharpe Allocation

Allocate risk to traders based on their average historic pnls normalized by their historic pnl standard deviations.

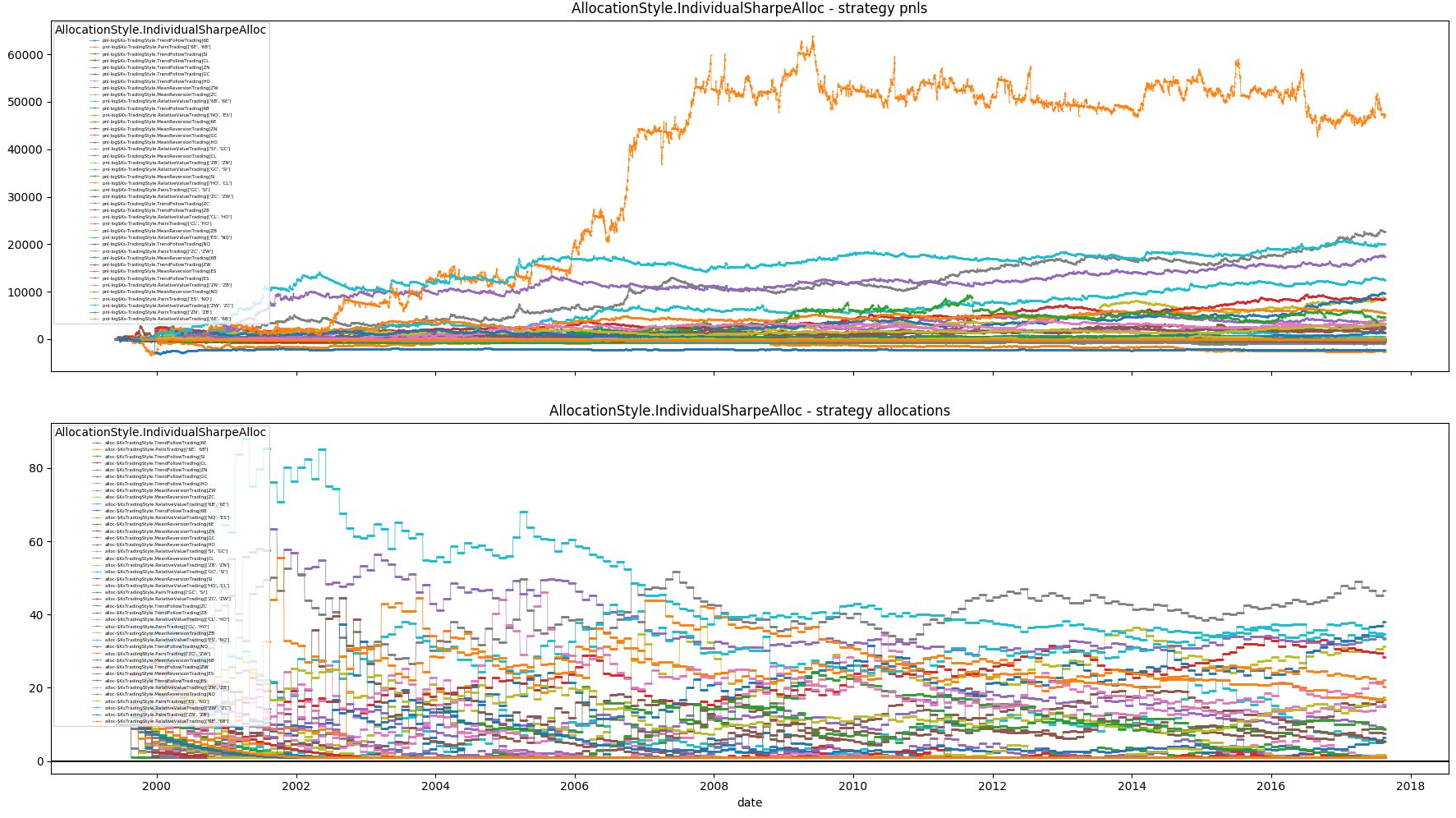
Pros:

Penalize trading strategies that have large pnl swings.

Cons:

If historic returns were a guarantee for future returns, then what are we even talking about??

We do not factor correlation of returns between different strategies - what if they all lose money same day or week or month?


AllocationStyle.IndividualSharpeAlloc - strategy pnls
AllocationStyle.IndividualSharpeAlloc
AllocationStyle.IndividualSharpeAlloc - strategy allocations
AllocationStyle.IndividualSharpeAlloc
date

Individual Pnl Sortino Allocation

Should we penalize a strategy that has large up side deviation - standard deviation penalizes upside swing and downside swing equally.

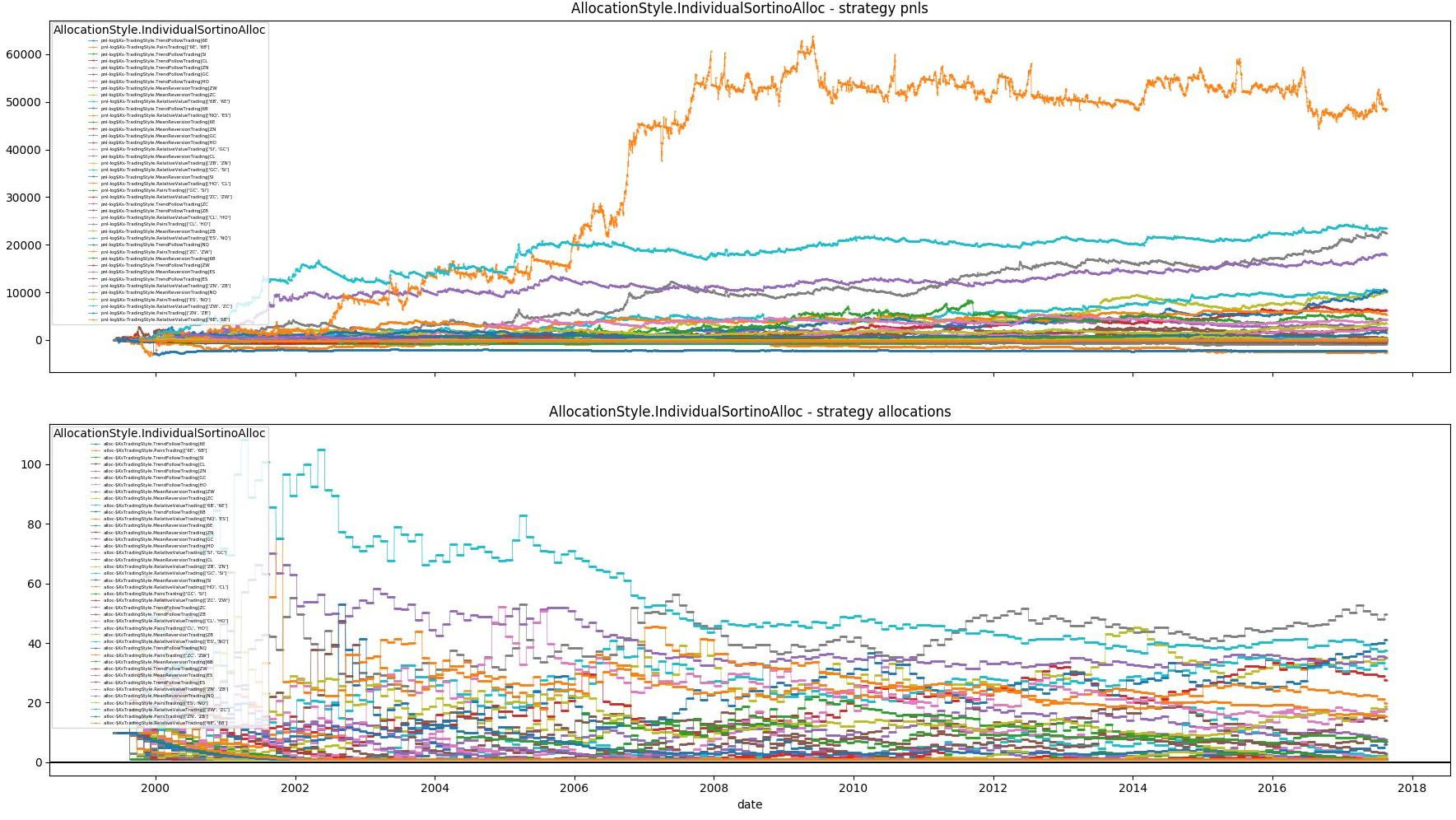
Pros:

Penalize trading strategies that have large downside pnl swings.

Cons:

If historic returns were a guarantee for future returns, then what are we even talking about??

We do not factor correlation of returns between different strategies - what if they all lose money same day or week or month?


AllocationStyle.IndividualSortinoAlloc - strategy pnls
AllocationStyle.IndividualSortinoAlloc
AllocationStyle.IndividualSortinoAlloc - strategy allocations
AllocationStyle.IndividualSortinoAlloc
date

Markowitz Allocation

Modern Portfolio Theory - basically take returns covariance into account to reduce overall portfolio variance, find the optimal weights to minimize portfolio variance.

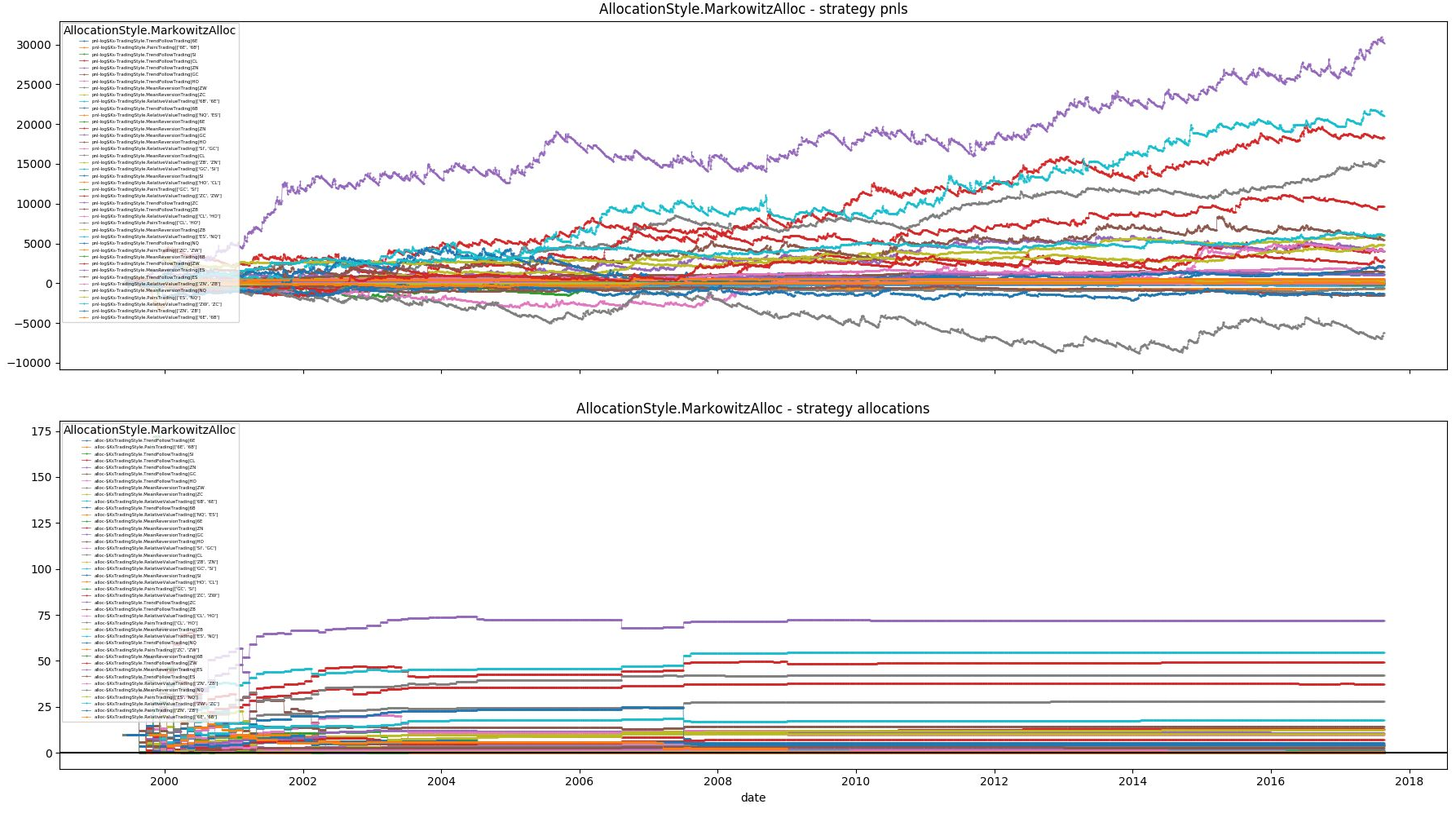
Pros:

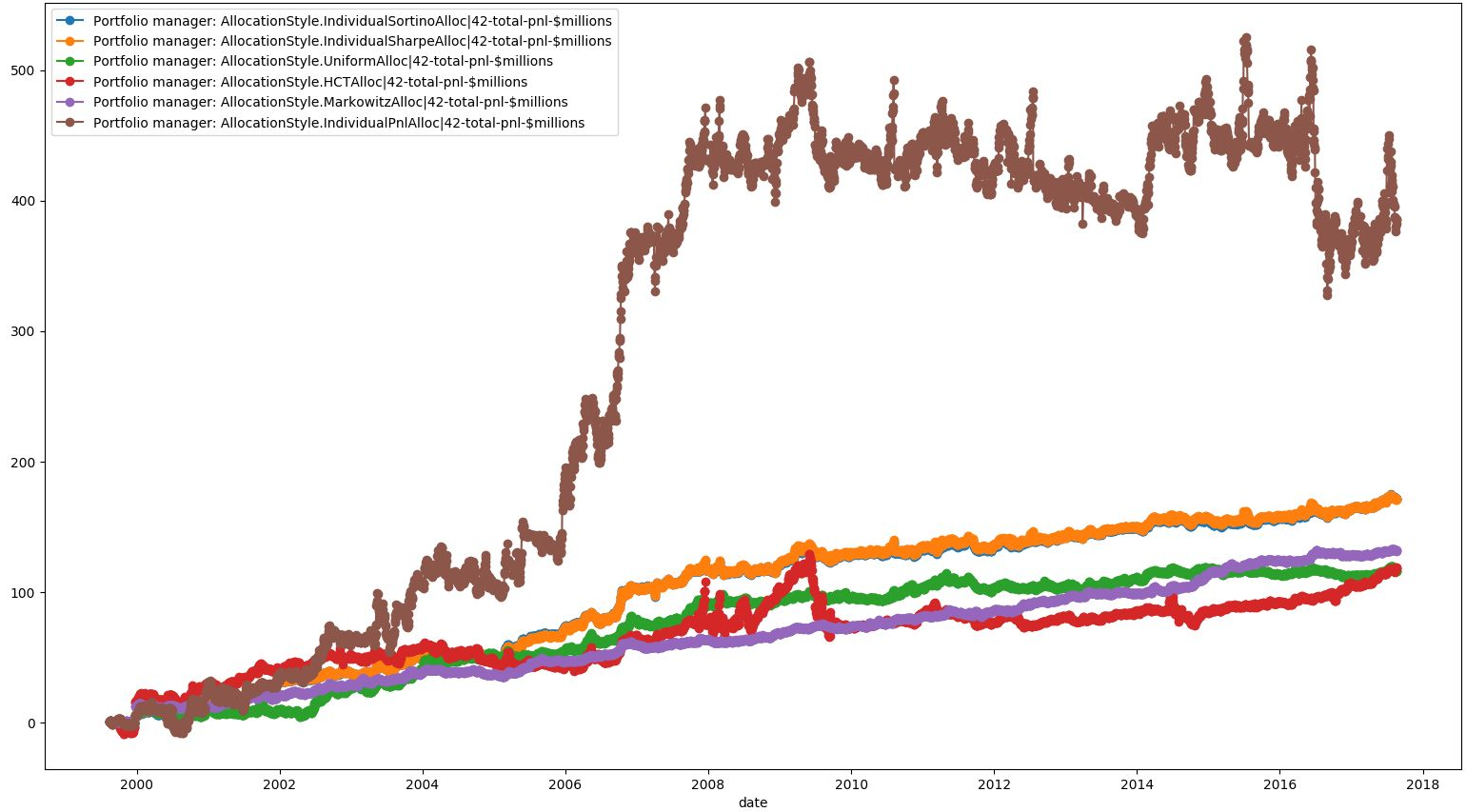
The portfolio has lower variance than individual strategies on their own - reality of trading.

Cons:

If historic returns were a guarantee for future returns, then what are we even talking about??

To get lowest portfolio variance, invest nothing, need to be careful with maintaining a level of expected return.


AllocationStyle.MarkowitzAlloc - strategy pnls
AllocationStyle.MarkowitzAlloc
AllocationStyle.MarkowitzAlloc - strategy allocations
AllocationStyle.MarkowitzAlloc
date


Portfolio manager: AllocationStyle.IndividualSortinoAlloc|42-total-pnl-$millions
Portfolio manager: AllocationStyle.IndividualSharpeAlloc|42-total-pnl-$millions
Portfolio manager: AllocationStyle.UniformAlloc|42-total-pnl-$millions
Portfolio manager: AllocationStyle.HCTAlloc|42-total-pnl-$millions
Portfolio manager: AllocationStyle.MarkowitzAlloc|42-total-pnl-$millions
Portfolio manager: AllocationStyle.IndividualPnlAlloc|42-total-pnl-$millions
500
400
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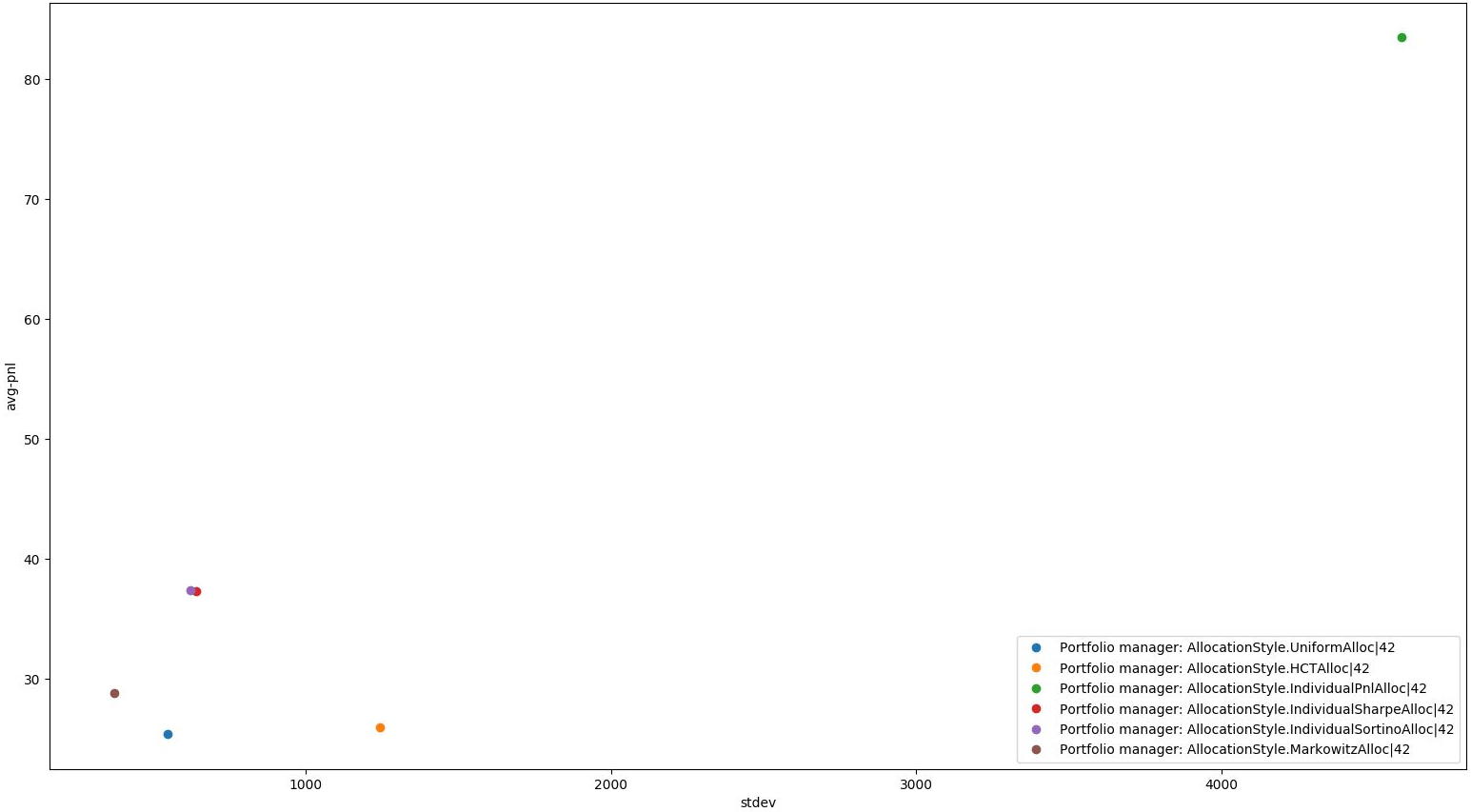

80
70
60
50
40
30
avg-pnl
1000
2000
3000
4000
stdev
Portfolio manager: AllocationStyle.UniformAlloc|42
Portfolio manager: AllocationStyle.HCTAlloc|42
Portfolio manager: AllocationStyle.IndividualPnlAlloc|42
Portfolio manager: AllocationStyle.IndividualSharpeAlloc|42
Portfolio manager: AllocationStyle.IndividualSortinoAlloc|42
Portfolio manager: AllocationStyle.MarkowitzAlloc|42

So what now?

Can we predict future returns of strategies based on past returns or market regimes or movement of elephants in Africa?

You still take into account the past, but try to predict the future based on patterns in the past - is that a pro or a con? Not sure.

JPM Big data and AI Strategies - Pg 67.

This can be a regression problem - how much will a strategy make in the next month?

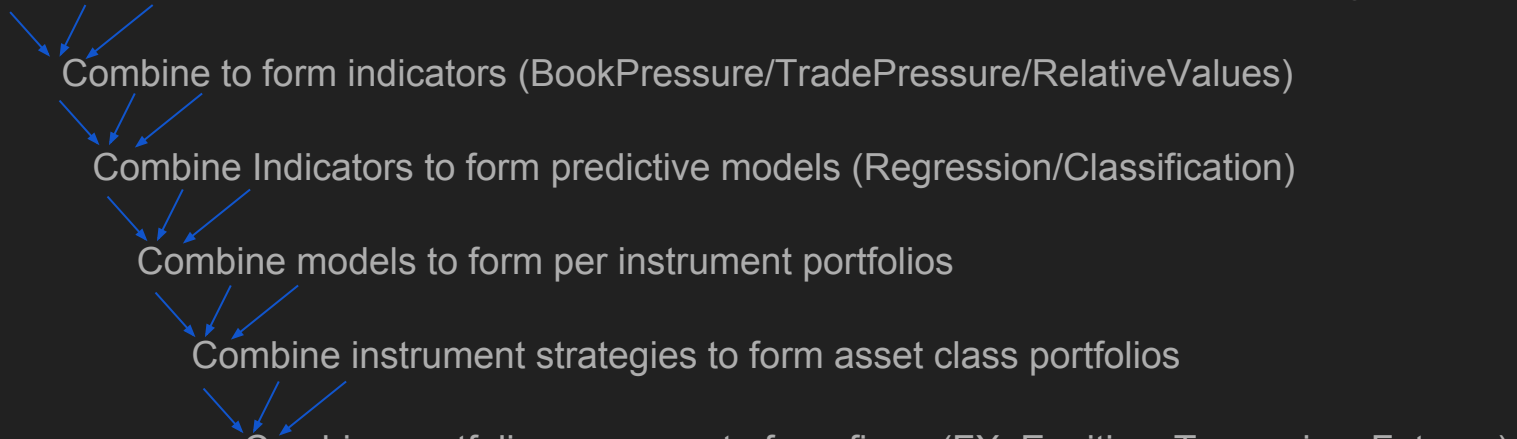
This can be a classification/clustering problem - which group does current market regime fall into and what strategies do well in this market regime?

Or a classification/logit regression - will this strategy make or lose money in the next month?

So what now?

Final thought

Market data updates: prices, sizes, orders, trades, economic indicators, market regimes



EVERYTHING IS AN OPTIMIZATION PROBLEM.