Aug 21 Update

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Topics

1) Updates to simulation

2) Weight vs Variance

3) Cascades

New Thresholding

Normalized Sharpe Ratios--No price Change--w/ Thresholding

(sharpe ratios)ᵢ/max(sharpe ratio)ᵢ of 100 portfolios over 1000 time steps
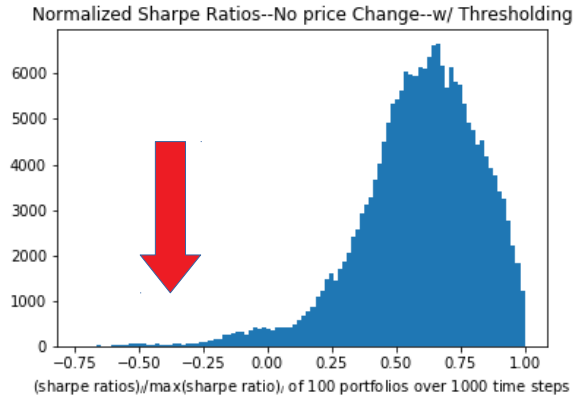
- Many portfolios would get stuck with negative Sharpe ratios and decrease value dramatically with old thresholding technique

- New threshold takes 1.05 x the current Sharpe ratio as the threshold in the equation so probability of rebalancing is based on the current Sharpe ratio
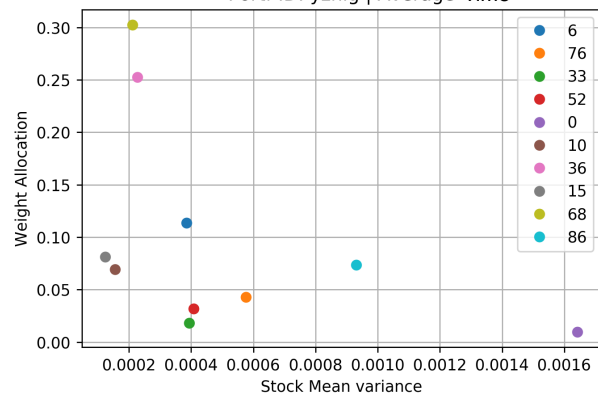
Price Change

- Divided Hurst Index and stock price changing into two seperate functions which decreased simulation time dramatically

- 100 stocks, 500 portfolios, 1000 timesteps ~2.5 days simtime
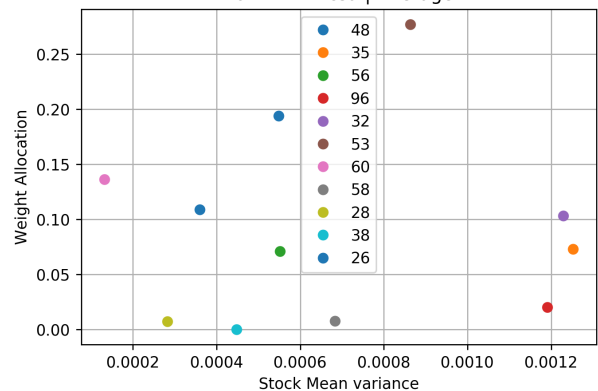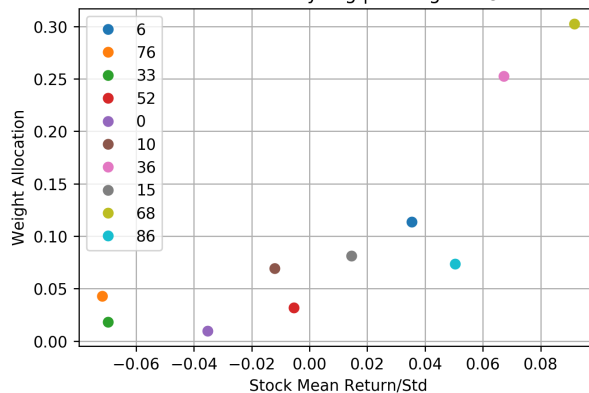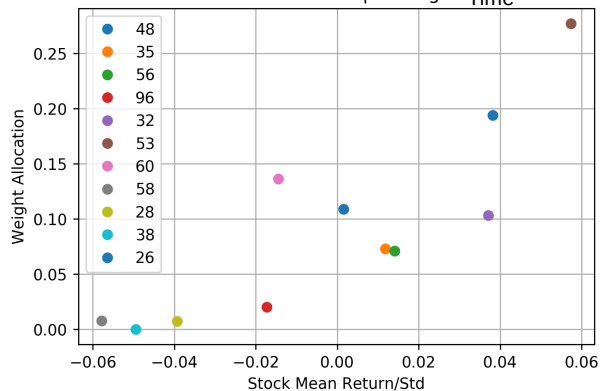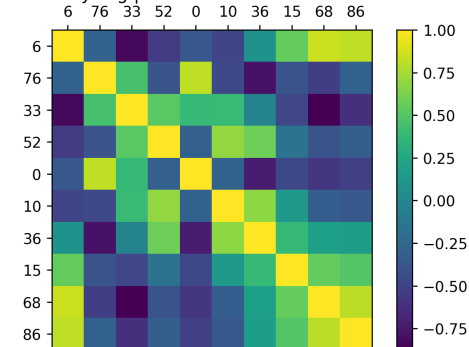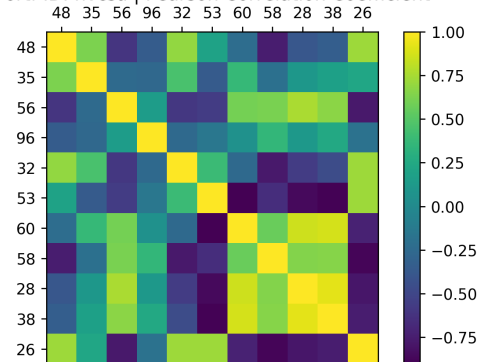
Cascades

```python
cascades = {}
numCascade = 0
cascadeStocks = {}
cascadePortfs = {}
cascadeTime = {}
cascadeTf = {}
cascades = {}
while len(TtotalOrders) > 0:
#     totalTimeOrders = TtotalOrders[TtotalOrders['time']==t]
    # seed with first portfolio
    print("OG Orders left: ", len(TtotalOrders))
    seed = (TtotalOrders.iloc[0]['portfolio'])
    t0 = TtotalOrders.iloc[0]['time']
    seedCascade = findPortfOrderCascades(TtotalOrders, seed, t0, maxSep = 1)
    cascadeStocks[numCascade] = np.asarray(seedCascade['stock'])
    cascadePortfs[numCascade] = np.asarray(seed)
    cascadeTime[numCascade] = t0
    cascades[numCascade] = seedCascade
    assert len(seedCascade) > 0
    TtotalOrders = TtotalOrders[~TtotalOrders.isin(seedCascade)].dropna()
    # NEW VERSION (PORTFOLIO PERSPECTIVE)
    for childPortf in list(TtotalOrders['portfolio'].unique()):
        if any(np.isin(cascadeStocks[numCascade],traderIDs[childPortf].stocks)):
#             print("match: ", childPortf)
            if childPortf not in cascadePortfs[numCascade]:
                cascadePortfs[numCascade] = np.append(cascadePortfs[numCascade], childPortf)
                childPortfCascade = findPortfOrderCascades(TtotalOrders,childPortf,t0, maxSep = 1)
                cascades[numCascade] = pd.concat([cascades[numCascade],childPortfCascade])
                TtotalOrders = TtotalOrders[~TtotalOrders.isin(childPortfCascade)].dropna()
                for childStock in list(childPortfCascade['stock'].unique()):
                    if childStock not in cascadeStocks[numCascade]:
                        cascadeStocks[numCascade] = np.append(cascadeStocks[numCascade], childStock)
    print("Cascade length: ",len(cascades[numCascade]))
    print("New Orders left: ", len(TtotalOrders))
    cascadeTf[numCascade] = cascades[numCascade]['time'].max()
    print("making new cascade")
    numCascade += 1
```

1.
2.
3.

1. Take the first row of the orders list as the cascade seed

	time	portfolio	stock	order
0	993	taukg	6	-1.0

Identify seedCascade as all portoflio activity that occurs at or after t0 and terminates after maxSep time duration of quiessence

Add all associated stocks in the seedCascade to cascadeStocks dictionary associated with the cascade ID

Add the seed portfolio to CascadePortfs dictionary associated with the cascade ID

Move all rows associated with seedCascade to cascades dictionary

2. Go through each portfolio and see if it holds any stocks traded in this cascade

If match is found, above steps are repeated with this portfolio

3. Identify the cascade end time, and extend number of cascades

Identifying Cascades

Transactions List

	time	portfolio	stock	order
0	993	taukg	6	-1.0
1	993	taukg	10	1.0
2	993	taukg	11	-1.0
3	993	pbqeg	10	1.0
4	993	pbqeg	13	-1.0
5	993	glwjd	10	2.0
6	993	glwjd	11	1.0
7	993	glwjd	14	-2.0
8	993	oinxb	10	11.0
9	993	oinxb	11	8.0
10	993	oinxb	13	-5.0
11	993	oinxb	14	-11.0
12	993	oinxb	15	8.0

Seed Portfolio

CascadeStocks = { 0 : [6, 10, 11] }
CascadePortfs = { 0 : [taukg] }
CascadeTime = { 0 : 993 }
CascadeTf = { 0 : TBD }

CascadeStocks = { 0 : [6, 10, 11, 13] }
CascadePortfs = { 0 : [taukg, pbqeg] }

CascadeStocks = { 0 : [6, 10, 11, 13, 14] }
CascadePortfs = { 0 : [taukg, pbqeg, glwjd] }

CascadeStocks = { 0 : [6, 10, 11, 13, 14, 15] }
CascadePortfs = { 0 : [taukg, pbqeg, oinxb] }

Cascades = { 0 : (table of transactions), 1 : (table of transactions), ...}

Cascades Merging?

- Currently, my cascades involve each portfolio undergoing max 1 rebalance cascade (all portfolio activity from first transaction to last determined by maxSep time duration)

  Cascades = { 0 : (table of unique transactions), 1 : (table of unique transactions), ...}

- How long ago can a transaction have taken place for it to be considered a candidate for merging?

- Due to the high level of overlap, misidentifying overlap may lead to all cascades merging into 1 neverending cascade, which may or may not be correct