Pairs Trading

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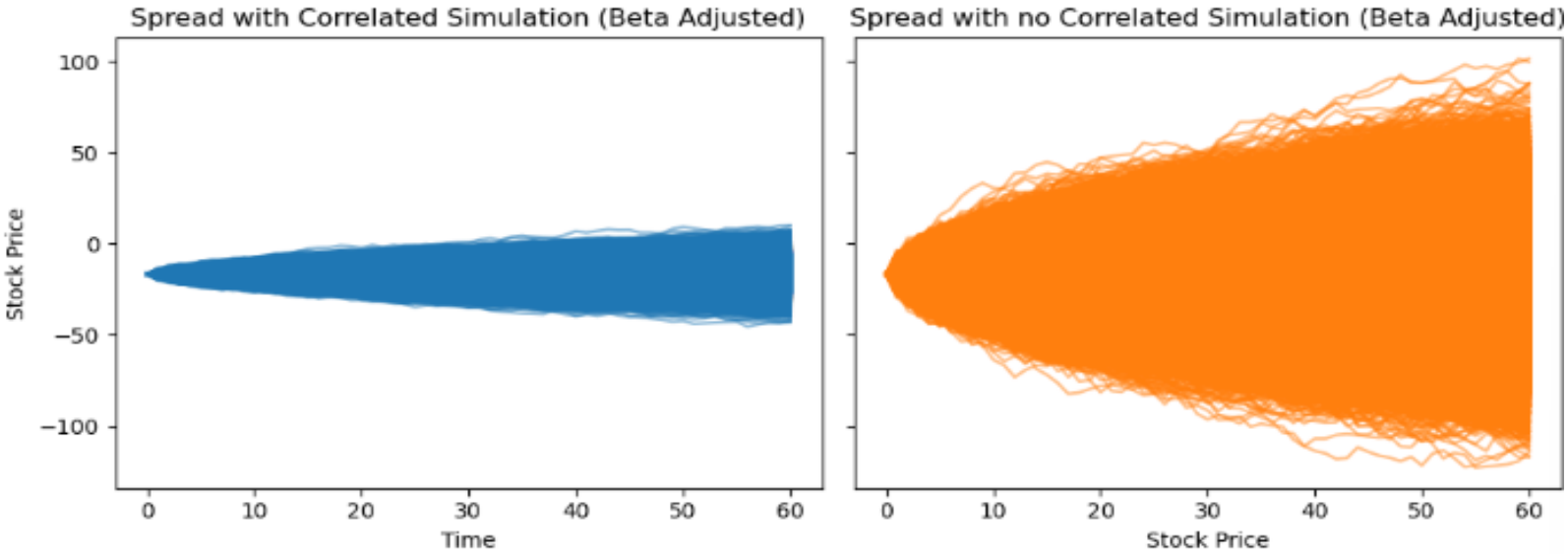
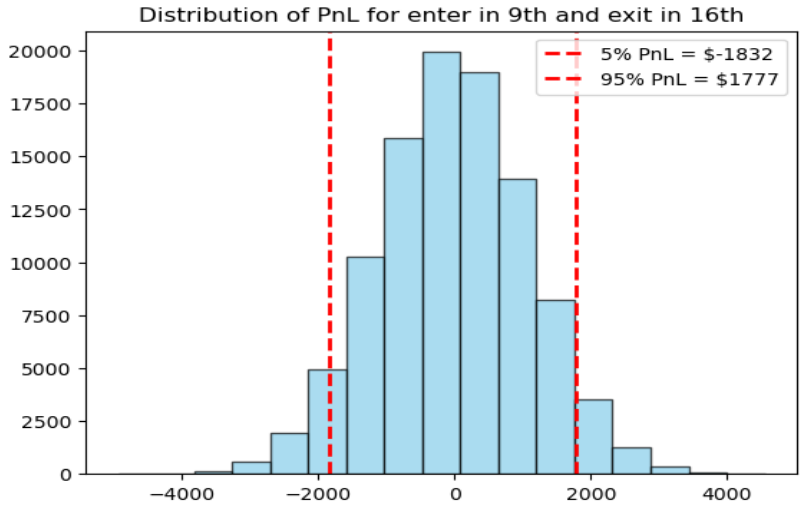
Methodology

Project Step:

1. Grab 10 years PEP and KO adjusted prices.
2. Regression: PEP = KO * **beta** + spread, calculate correlation matrix between PEP and KO
3. Simulate the PEP and KO by the Cholesky Decomposition
4. Spread = PEP_Simulated – KO_Simulated * **beta 1** 5D
5. Calculate PnL 5^{TH} and 95^{th}, determine the pairs trading in and out condition

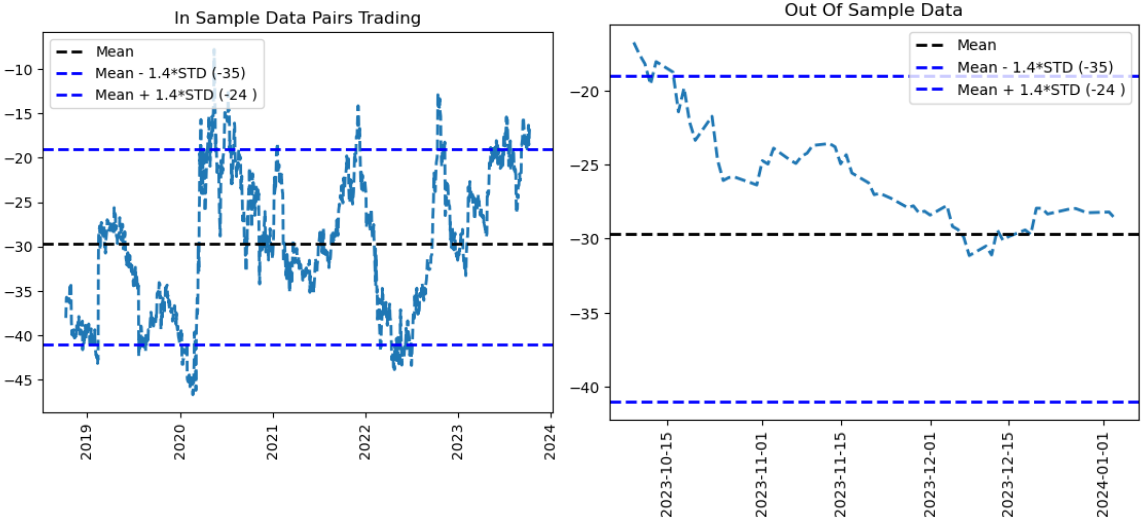
Simulation Result

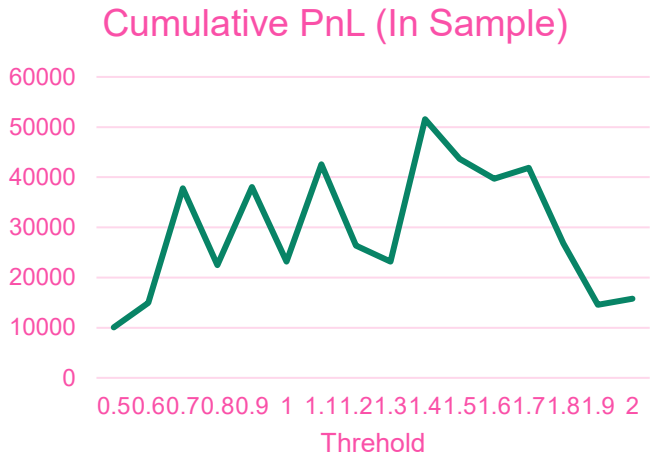




Expected Return for this trade: $-19
5% PnL = $ -1832
95% PnL = $ +1777

Pairs Trading Strategy





Exit and In Condition:

Upper Bound = mean_spread + 1.4 std(Spread); Lower Bound = mean_spread - 1.4 std(Spread)

1. When spread hit above the upper bound, long KO short PEP, close the position when spread hit the median
2. When the spread hit below the lower bound, long PEP short KO.

Assumption:

1. Could buy any (float) number of share.
2. The trading Cost is 15 bps per trade.

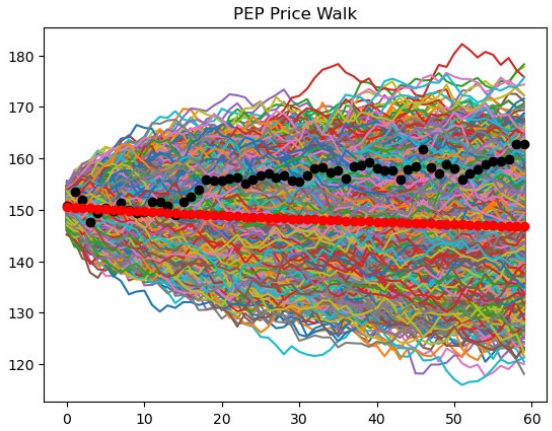
Threshold (1.4) Determination Process:

Boundary = mean – a * std, choose a from 0.5 to 2, brute force per each a to do the back testing and check for the performance in in-sample and out of sample. With the a = 1.5, the 60 days cumulative PnL by executing the trade has return with **$5884**.

	Cumulative PnL	
In Sample	$	51,573
Out of Sample	$	5,884

Thank you!

Appendix 1: Different Approach



Project Step:

1. Pull data, PEP, KO, spread = PEP-KO
2. Detrend the spread to stationary: spread = t* beta + detrend spread, then do Stationary Test
3. Use Brownien motion to simulate KO, use OU mean reversion process to simulate spread.
4. Predict the PEP = simulated KO + reverse detrended simulated OU.
5. The black line in the plot is the realized PEP price for next 60 days, changed to another approach due to the trend was not captured.