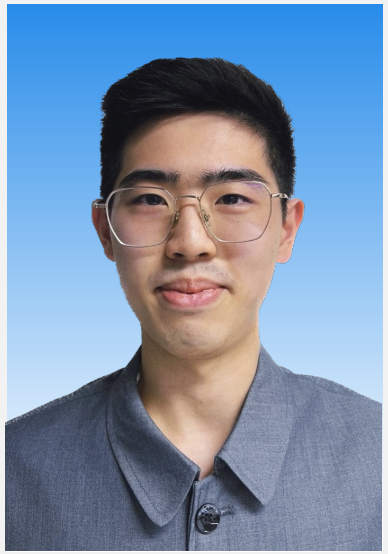
TRADING ALGORITHM PRESENTATION

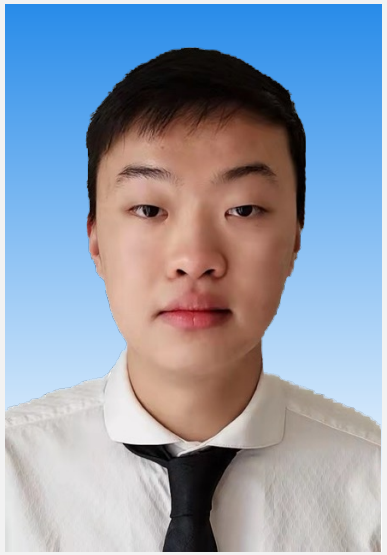
Lang (Ron) Chen, Yihang (Eric) Lu, Zetian (Jacky) Lyu, Di Wu

TEAM



Lang (Ron) Chen

- UniMelb – Penultimate Year Master of Data Science
- Supervised Machine Learning, Hyperparameter Tuning, Finance



Yihang (Eric) Lu

- UniMelb – Penultimate Year Master of Mathematics and Statistics
- Research in Bayesian Variable Selection Methods

Zetian (Jacky) Lyu

- UNSW – Honours Year in Statistics
- Statistical Methods, Quantitative Analysis, Financial Markets

Di Wu

- UniMelb – Final Year Bachelor of Science majoring in Data Science
- Machine Learning, Data Structures, Algorithmic Trading

THE ALGORITHM

Algorithm 1: GetPositionToday(PriceHistory, Stocks, CurrentPosition, HYPERPARAMETERS)

Data: PriceHistory: 2D array of price data for all stocks
Stocks: List of stocks to consider
CurrentPosition: Array of current positions for each stock
HYPERPARAMETERS: Parameters for trading strategy
Result: Updated array of current positions

```
for Stock in Stocks do
    Amplitude ← range(Stock's PriceHistory[previous AMP_WINDOW days]);
    LongMean ← average(Stock's PriceHistory[previous LONG_TERM days]);
    ShortMean ← average(Stock's PriceHistory[previous SHORT_TERM days]);
    TodaySign ← sign(ShortMean - LongMean);
    NDayDiff ← Stock's PriceHistory[previous PRICE_RANGE days] - Stock's PriceHistory[today];
    NDayRange ← max(Stock's PriceHistory[previous PRICE_RANGE days]) - min(Stock's PriceHistory[previous
     PRICE_RANGE days]);
    NDayGap ← difference(Stock's daily PriceHistory)[previous PRICE_RANGE days];
    coef ← slope(LinearInterpolation(NDayGap));
    NDayMSE ← meanSquaredError(NDayGap, LinearInterpolation(NDayGap));
    if CurrentPosition * NDayRange * sign(NDayDiff) > abs(CurrentPos * CurrentPrice) *
     PRICE_CHANGE_THRESHOLD and NDayMSE > abs(NDayDiff * MSE_THESHOLD_2) or (coef * CurrentPosition <
     0 and abs(coef) > SLOPETHRESHOLD2) then
        CurrentPosition = 0 ;                                              // Close position
    else if abs(NDayDiff) <= Amplitude / AMP_LO_THRESHOLD or (NDayMSE > abs(NDayDiff *
     MSE_THRESHOLD_1) and abs(coef) < SLOPE_THRESHOLD_1) then
        CurrentPosition = CurrentPosition ;                                // No action
    else if abs(NDayDiff) >= AMPLLITUDE / AMP_HI_THRESHOLD then
        Value ← TodaySign * CHANGE_HOLDING;
        CurrentPosition -= floor(Value / Stock's PriceHistory of today) ;  // Open/Adjust position
    else
        Value ← TodaySign * CHANGE_HOLDING;
        CurrentPosition += floor(Value / Stock's PriceHistory of today) ;  // Open/Adjust position
return CurrentPosition;
```

Close Position Module

Open/Adjust Position Module

BACKTESTING RESULTS

- Best Hyperparameter Set (Prioritising Temporal Generalisability)

	Average(D100-D350, D200-D450, … , D400-D650)	D250-D500	D500-D750
Score	30.69	27.45	17.51
Mean	43.95	41.4	29.8
Std	132.58	139.27	123.23
Return	0.34%	0.32%	0.22%
AnnualisedSharpe	5.24	4.7	3.83

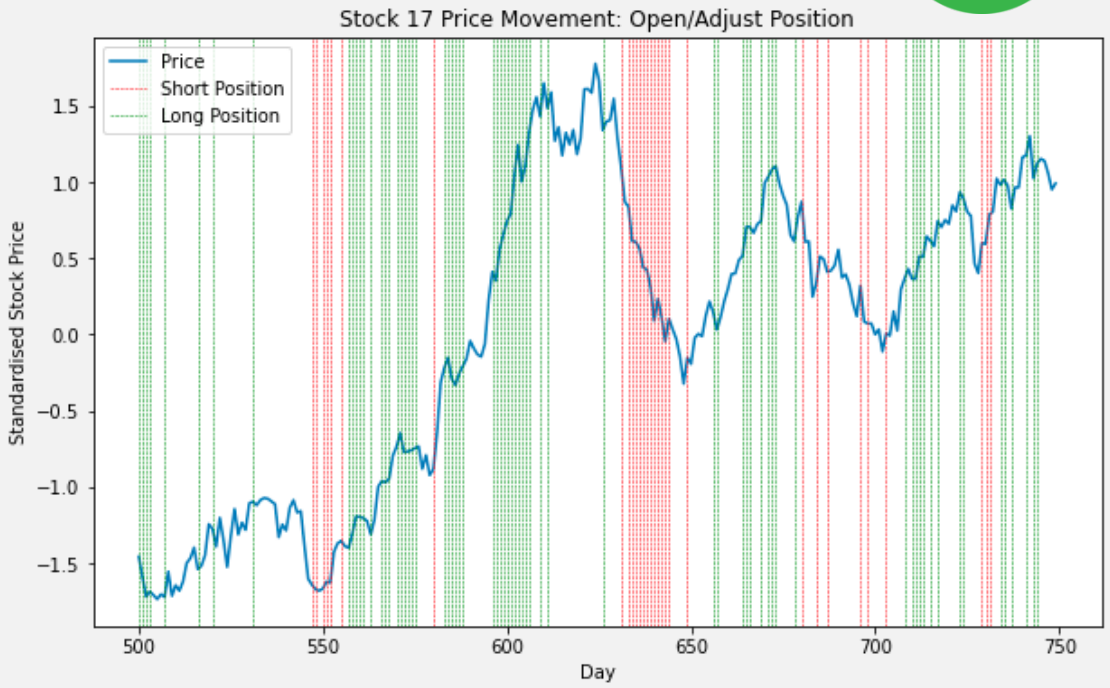
- Ablation Study (without Close Position Mechanism)

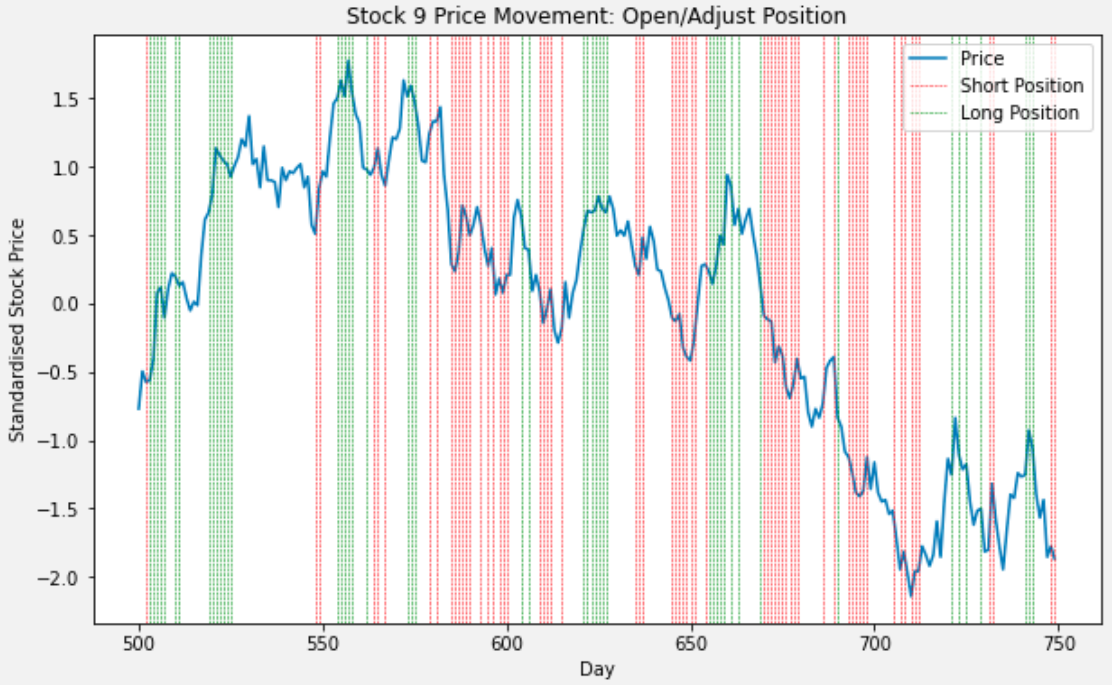
Score	24.54	4.06	18.01

- Best of Each Period

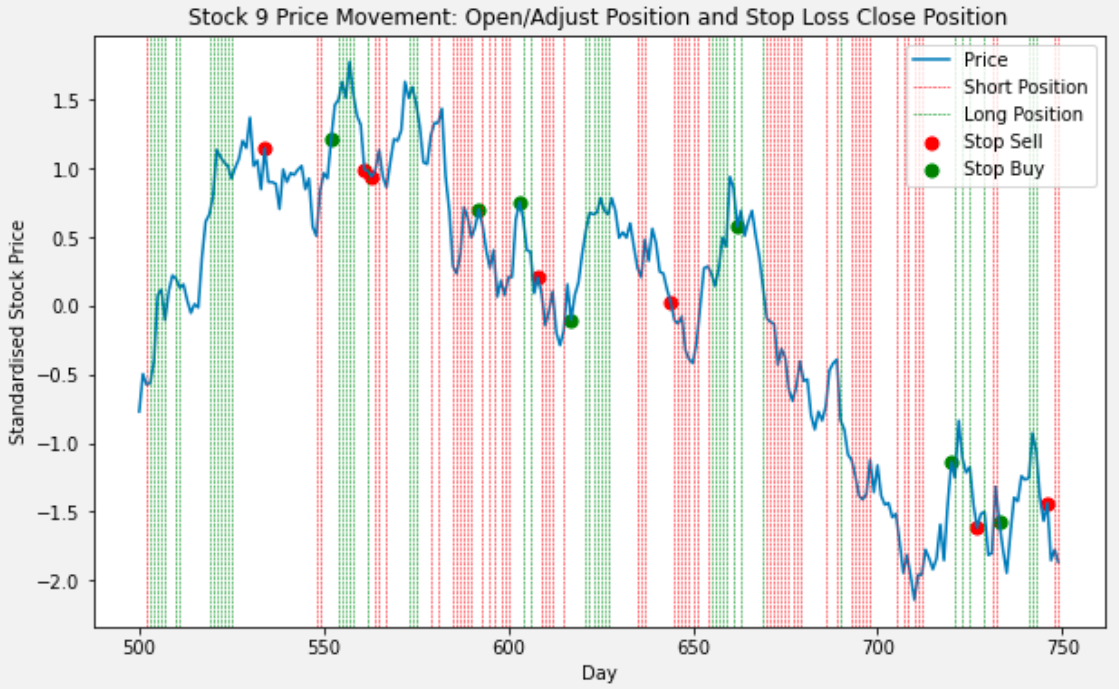
Score	30.69	29.62	49.57

DISCUSSION: OPEN/ADJUST POSITION MODULE

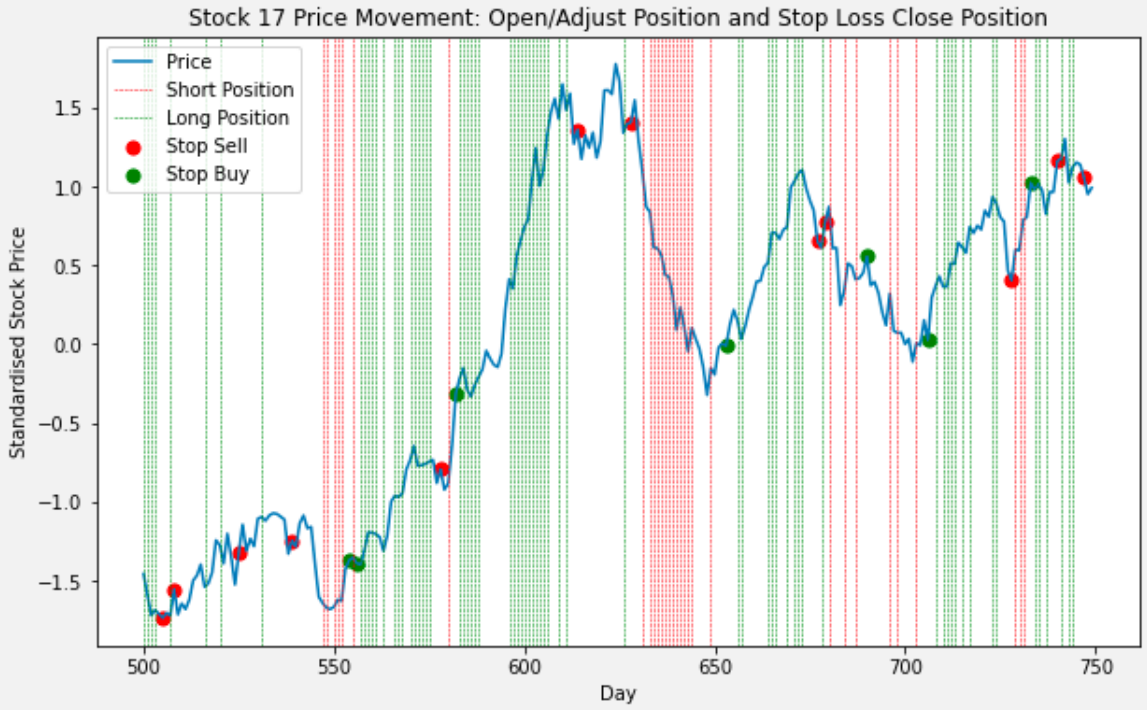


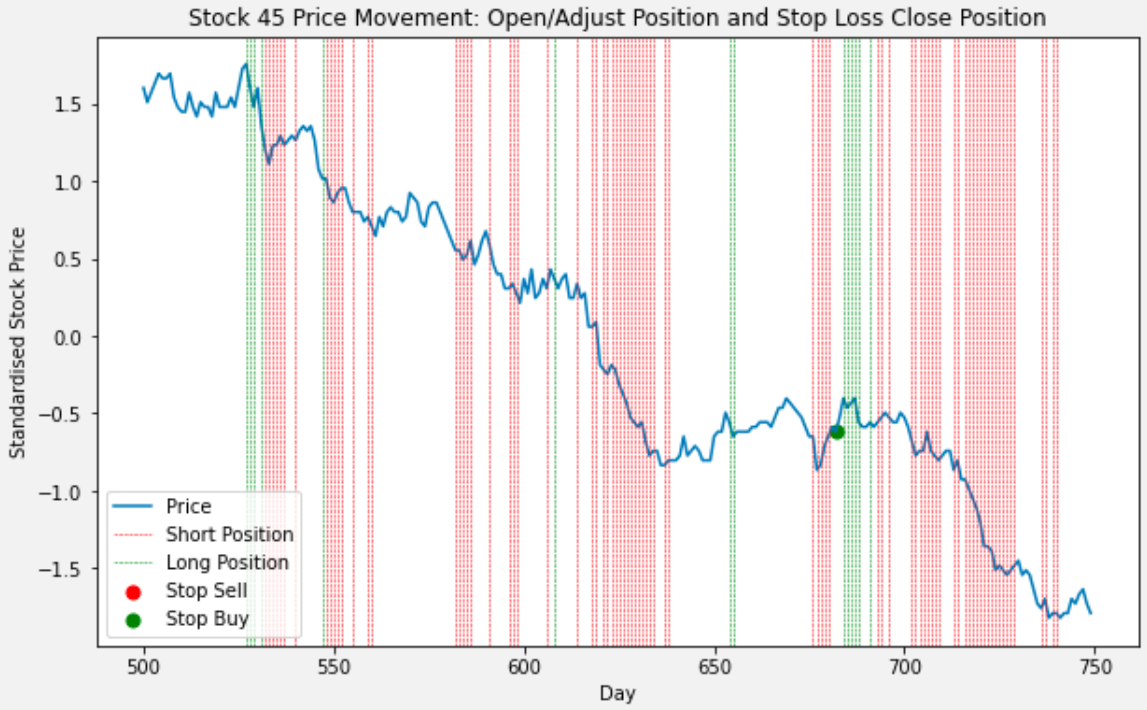


DISCUSSION: CLOSE POSITION MODULE



DISCUSSION: COMPLETE SYSTEM





OTHER ATTEMPTS

Strategy	Details	Reason of Failure
Trade on Predicted Log Return = $log(P_{t+1}/P_t)$	Regression model trained on engineered features *(i.e.* ***Long Short Term Memory, Dense Neural Network, Light Gradient Boost*** *…)*	R^2 of models never statistically significantly positive
Trade on Predicted Binary Trend = $I(P_{t+1}>P_t)$	Classifier model trained on engineered features *(i.e. Same as above +* ***Support Vector Machine, Logistic Regression****)*	Near 50% accuracy for most models; LSTM achieved 60% accuracy but trading still made loss
Pairs Trading	Perform Mean Reversion on Cointegrated Pairs	Made Loss
Bollinger Bands	Short if $P_t \geq$ UpperBound, Long if $P_t \leq$ LowerBound	Made Loss
Bollinger Bands – Moving Average	Same as above, and close position if price crossed MA	Made Loss
Short Long MA Crossover	Long if Short Term MA cuts Long Term MA from below, etc	Made Loss

APPENDIX: HYPERPARAMETERS OF ALGORITHM

HYPERPARAMETER	Value	HYPERPARAMETER	Value
SHORT_TERM	*4*	AMP_HI_THRESHOLD	*1*
LONG_TERM	*15*	MSE_THRESHOLD_1	*0.05*
PRICE_RANGE	*7*	SLOPE_THRESHOLD_1	*0.05*
AMP_WINDOW	*75*	MSE_THRESHOLD_2	*0.04*
CHANGE_HOLDING	*500*	SLOPE_THRESHOLD_2	*2*
AMP_LO_THRESHOLD	*7.5*	PRICE_CHANGE_THRESHOLD	*0.01*