Final Project Prsentation

Testing the One-sided Pairs Trading Investment Strategy

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Course:	INFSCI 2160 Data Mining

1. Motivation

- Pairs trading strategy, which belongs to the category of statistical arbitrage investment strategies. Known strategy from 1980s, widely used, so probably cannot get rich quickly.
- Requires selection of a pairs of stocks, which move similarly or are 'co-integrated'.
- Traditional trading: *a*) Invest into underprices stock and 'sell short' overpriced, *b*) close the position when both prices get together
- Institutional investors can 'sell short', but not individual investors
- Therefore, suggested 'One-sided' Trading: *a*) Invest into underprices stock, *b*) sell the stock when its price returns back

2. Data

- Yahoo Finance, 12/5/2013 - 12/5/2017 (4 years), daily frequency
- Stocks - S&P500 constituents

Ticker	Exp Return, %
ACN	18.99
ADBE	27.91
ADS	-0.05
AET	26.37
AKAM	5.58
AMZN	26.98
BAC	17.06
BSX	19.62
CAT	16.21
CSCO	17.98
MMM	7.26
T	18.99

$$\text{Exp Return} = \text{Mean}[(\log(p_t)-\log(p_{t-1})]\text{x}251\text{x}100$$

3. Method

- Separate database into: T_1 - 'testing', T_2 - 'trading'

  T_1 to find the best Pair, get Mean, SD, T_2 for 'paper trading'

- Select the 'best' pair(s) $N_{pairs} = (N^2 - N)/2$ ($N=12$, $N_{pairs}=66$)

  $Min_{\{Pair\}}$ $\left(\sum_t (\log P_{1,t} - \log P_{2,t})^2 \right)^{0.5}$

- Trading exercise:

  Key dates: D_1 = 0.5 SD, D_2 = 0.1 SD

  Rules: when $D > D_1$ -> Buy underprices stock (spend all cash)

  when $D<D_2$ -> Sell the possessed stock (and get cash)

- Assessment metrics:

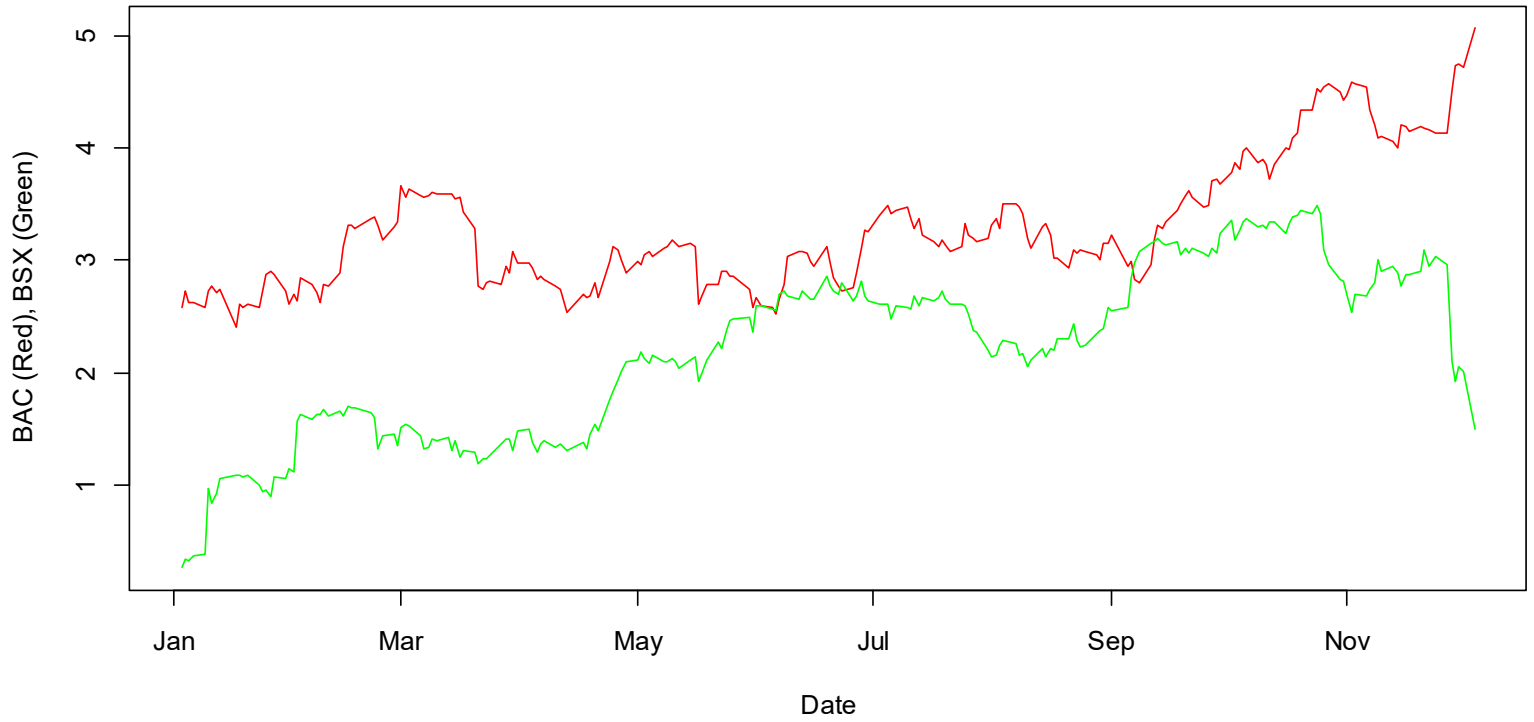
  * FV of $1,000 * Annualized Return * Jensen's Alpha *Sharpe ratio

4. Results - select pair

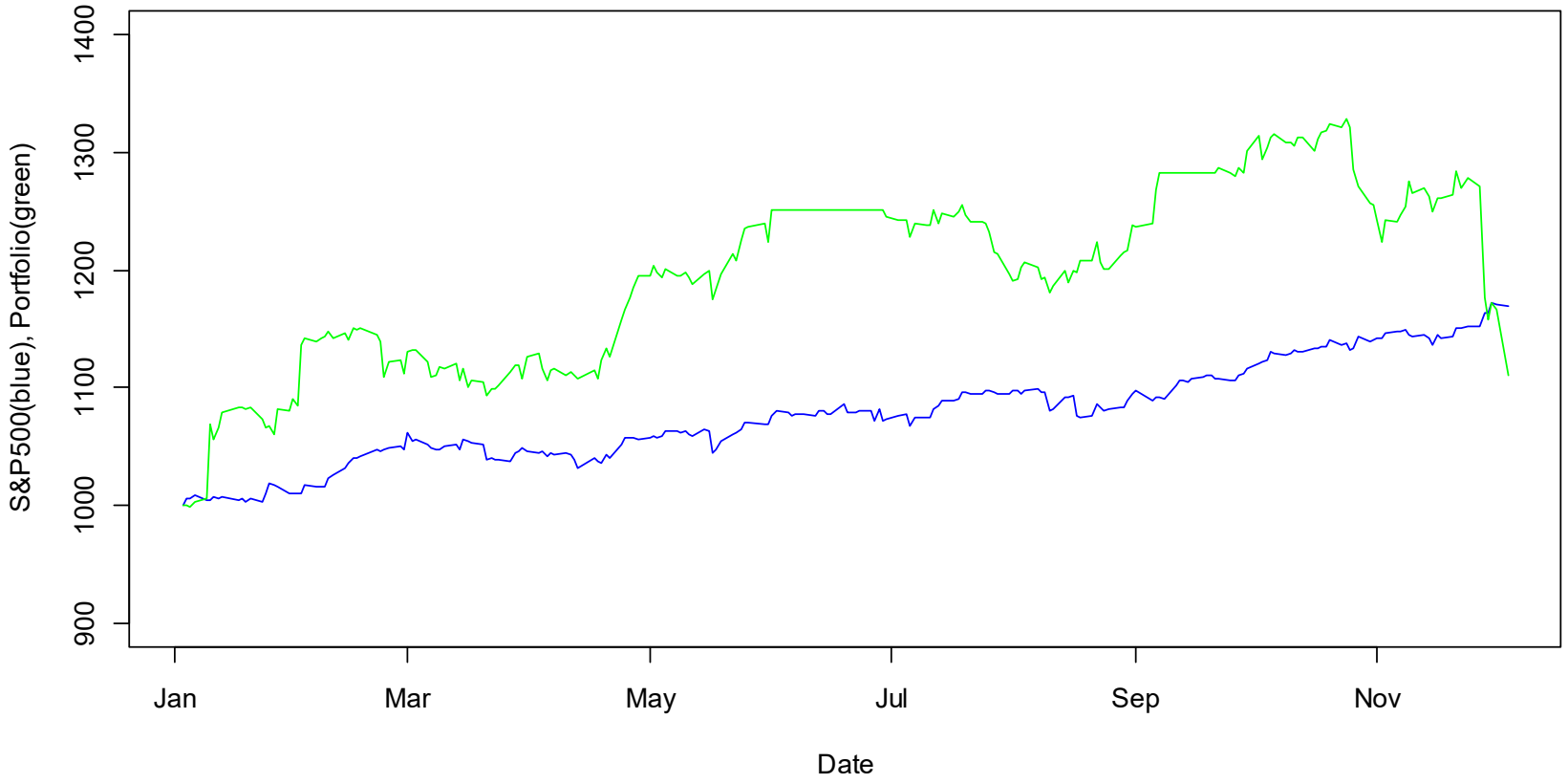
Considered stocks: *ACN*, *ADBE, ADS, AET, AKAM, AMZN, BAC, BSX, CAT, CSCO, MMM, T*

Selected pair: *BAC* and *BSX* Benchmark: S&P500

Plot of normalized prices*:*

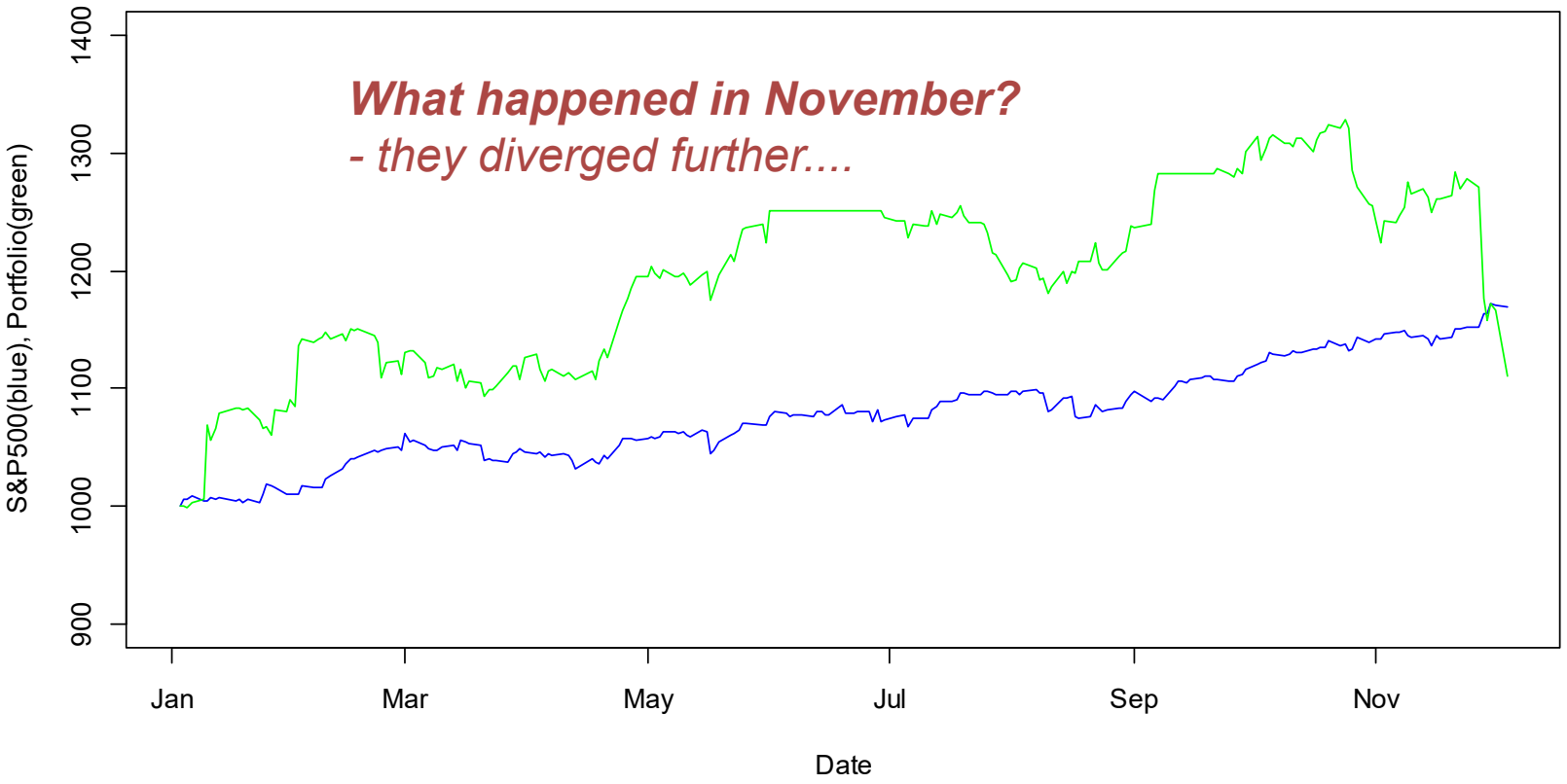


4. Results - performance



	Pair	S&P500
FV of $1000	1,110.64	1,169.02
Return	11.35%	16.9%
Sharpe ratio	0.56	2.33
Jensen's Alpha	-380	0.0
Beta	1.46	1.00

4. Results - performance



5. Further steps

- Increase number of stocks: from N=12 to N=500 (later maybe ... 1,000)

  ($N_{pairs} = (N^2 - N)/2$, for N=500, N_{pairs}=124,750

- Consider simultaneous trading with K pairs:
  - For K=2 pairs: 50%/ 50% of portfolio in each
  - For K=3 pairs: 33%/ 33%/ 34% of portfolio in each
- Alternative pairs selection methods: *Co-integration test*, *Cluster analysis*
- Optimization of parameters: D_1, D_2, T_1, T_2
- Include risk managent (e.g. sell when D gets too high)
- Test whether profitability of strategy declines over time

Thank you for attention!