

Statistical Arbitrage with Limit Order Book Imbalance

My goal is to establish and solve the stochastic optimal control problem that captures the momentum and order imbalance dynamics of the Limit Order Book (LOB). The solution will yield an optimal trading strategy that will permit statistical arbitrage of the underlying stock, which will then be backtested on historical data.

Progress Timeline

DATE	THESIS	STA4505
Dec 2014	• Complete CTMC calibration	
Dec 2014	• Backtest naive strategies based on CTMC	
Jan-May	• Study stochastic controls: ECE1639, STA4505	
Jun 5	• Establish models	Exam Study
Jun 12	• Establish performance criteria	Exam Study
Jun 15	• Derive DPP/DPE	EXAM
Jun 26	• Derive continuous time equations	
Jul 3	• Derive discrete time equations	
Jul 10	• Set up MATLAB numerical integration	
Jul 17	• Integrate functions and plot dynamics	Integrate and analyze
Jul 24	• Empty promises; zero fucks given	
Jul 31	• Code for numerical solutions, calibrations, plots	Simulate results
Aug 7	• All in-sample backtests	
Aug 14	• All out-of-sample backtests	
Aug 21	• The Big Writeup Effort	
Aug 24	• Submit first draft for review by panel	
Aug 28	•	Project Report
Sep 2	•	Presentation

Whiteboard Inspirational Quote of the Week

For Our Colleagues at Duke University...

The Academic Week in Review

- out-of-sample backtest: 2014 data.
 - ~~decide WHAT to run. best performer? probably annual calib is easiest, tho. justify.~~
 - ~~also consider expanding the finite differences horizon T for more accurate results...~~
 - ~~run backtest. 0.5h per strategy.~~
 - print results table
 - plot EOD results
 - writeup
- Dynamics of δ^\pm for continuous vs discrete time
 - ~~produce plots comparing for different q, z values.~~
 - ~~mimic Seb's four plots to show mechanics of the FOUR methods~~
 - writeup something intelligible about the plots
- General writing stuff
 - ~~write introduction~~
 - ~~write algo trading section~~
 - ~~write LOB dynamics section~~
 - write ITCH data section
 - write intro to stochastic chapter
 - Link STA4505 project into dissertation with lead-in blurb.
 - re-write lead-in to continuous time section
 - re-write lead-in to discrete time section
 - write abstract
- any remaining time to proof-read the bitch
- **SUBMIT THE BITCH**
- write acknowledgement
- write dedication
- STA4505 project standalone write-up.