Homework 1

Due October 8, 2015

Please submit your homework by email to haksun [dot] li {at} numericalmethod -dot- com.

Q1.

For the example of two coin tosses, write out $\mathcal{F}_2$.

For the case of three coin tosses, write out $\mathcal{F}_0$, $\mathcal{F}_1$ and $\mathcal{F}_2$.

Q2.

Can you give an example of what Zen Uncertainty means?

Q3.

Download AlgoQuant from http://numericalmethod.com/algoquant/
Setup and install it following the wiki: http://numericalmethod.com/up/algoquant/setup/
Run the SMA demos and especially the dynamically calibrated strategies:
http://redmine.numericalmethod.com/projects/public/repository/svn-algoquant/show/core/src/main/java/com/numericalmethod/algoquant/model/signal/technical/crossover/sma2

Does it work on your machine?

Q4.

Using AlgoQuant, evaluate SMA on different hypothetical prices, such as Random Walk, AR, ARMA(1,1), ARIMA(0,d,0), GARCH(1,1). You can build your own interesting price models, e.g., with Markov-switching. You must do Random Walk as a sanity check.

Make sure you include transaction costs, e.g., 0.5%.

Plot the performance measures (e.g., expected yearly returns (250 days), IR) vs. SMA parameters (e.g., the longer lag).

Write a nice report.

Ref: Emmanual Acar, Stephen Satchell. "Chapters 4, 5 & 6," Advanced Trading Rules, Second Edition.

Q5.

Design a better SMA strategy and apply it to real data. Provide justifications to your strategy.

Write a nice report. Highlight your innovations.

Ideas: short moving window, early detection of regime change, Kolmogorov–Smirnov test