

## Homework 4

Due November 12, 2015

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

Q1a.

Refer to Dai Min's 2011 paper.

[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1762118](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1762118)

Provide estimators for the model parameters,  $\mu(1)$ ,  $\mu(2)$ ,  $\sigma$ ,  $\lambda_1$ ,  $\lambda_2$ . How do we estimate them from data?

Q1b.

Prove equations 3 and 13.

Q1c.

Derive

$$p_r = P(\alpha_r = 2|S_r)$$

Q2a.

Refer to "Optimal trend-following trading rules under a three-state regime switching model"

<http://aims sciences.org/journals/displayArticlesnew.jsp?paperID=6964>

Provide estimators for all the model parameters in equations 1 and 2. How do we estimate them from data?

Q2b.

Derive the conditional probability of being in the UP state for this 3-state model using Wonham filter.

$$p_r = P(\alpha_r = 1|S_r)$$

Q2c.

Derive

$$p_r = P(\alpha_r = 2|S_r)$$

Q2d.

Derive

$$p_r = P(\alpha_r = 3|S_r)$$