FINM331/STAT339 Financial Data Analysis – Hanson – Winter 2010

Lecture 8 Homework:

(due by Lecture 9 in Chalk FINM331 Assignments submenu)

- **You must show your work, code and/or worksheet for full credit.**
- **Justifying each non-trivial step with a reason is part of showing your work.**
- **There are 10 or more points per question if correct and best answer.**
- **Report numerical values in at least 4 significant digits (e.g., for errors use format like `%8.3e`).**

1. (20 points) **Bayesian Normal Likelihood with Proper Normal-Gamma Prior**

Test the Bayesian estimate on pp. 50-51 of Lecture 8. Assume reasonable ***guestimates*** for the prior parameters $\boldsymbol{\mu_0, \gamma, \lambda, \alpha}$. Use the data of the 2009 S&P 500 Index log-returns for the data likelihood specification, which also might help with the guestimates.

(a) Using the posterior density, find the maximum likelihood or mode estimates for each of the two normal likelihood parameters $\boldsymbol{(\mu, \xi = 1/\sigma^2)}$ analytically in terms of critical point formulas. Then find numerical evaluations of the estimates $\boldsymbol{(\widehat{\mu}, \widehat{\xi} = 1/\widehat{\sigma^2})}$.

(b) Plot the marginal distributions for the desired parameters $\boldsymbol{(\mu, \xi)}$. Also, give the standard errors for each.

Hint: For $\boldsymbol{\mu}$-marginal, the $\boldsymbol{\xi}$ is distributed as a Gamma variate and for the $\boldsymbol{\xi}$-marginal, the $\boldsymbol{\mu}$ is distributed as a Normal variate.