Homework 7

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Question 1

The transition function is:

$$g((X_{t-1}, X_{t-2}, \epsilon_{t-1}, \epsilon_{t-2}), \epsilon_t, \theta) = \rho_1 X_{t-1} + \rho_2 X_{t-2} + \phi_1 \epsilon_{t-1} + \phi_2 \epsilon_{t-2} + \epsilon_t$$

The observation function is:

$$h(X_t, v_t^A, v_t^B, \beta) = \begin{cases} exp(X_t + v_t^A) \\ \beta X_t^2 + v_t^B \end{cases}$$

The states in this setting is: $X_{t-1}, X_{t-2}, \epsilon_{t-1}, \epsilon_{t-2}$.

And observables:$Y_t = (A_t, B_t)$, $W_t = \epsilon_t$, $V_t = \{v_t^A, v_t^B\}$.

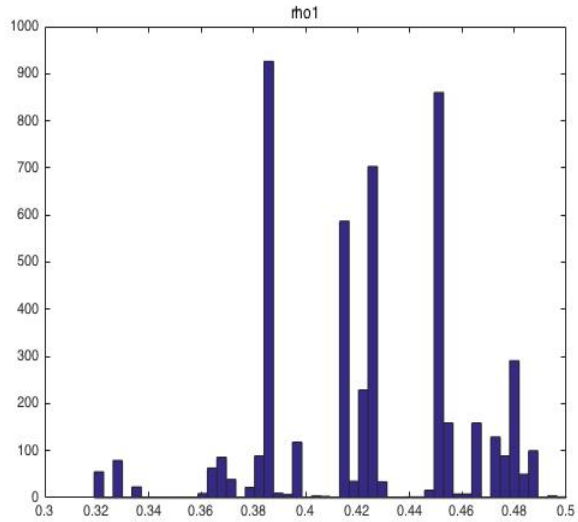
We need to estimate $\theta = (\beta, \rho_1, \rho_2, \phi_1, \phi_2, \sigma^2, \sigma_A, \sigma_B)$.

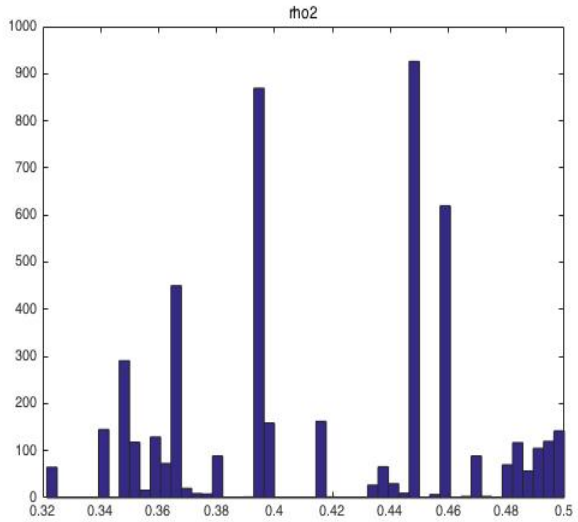
Question 2

Use the particle filter to approximate the likelihood function $p(Y_t|\theta)$ for a given set of parameters θ.

Question 3

Using MH algorithm to find the posterior distributions for all parameters, and the results are as below:





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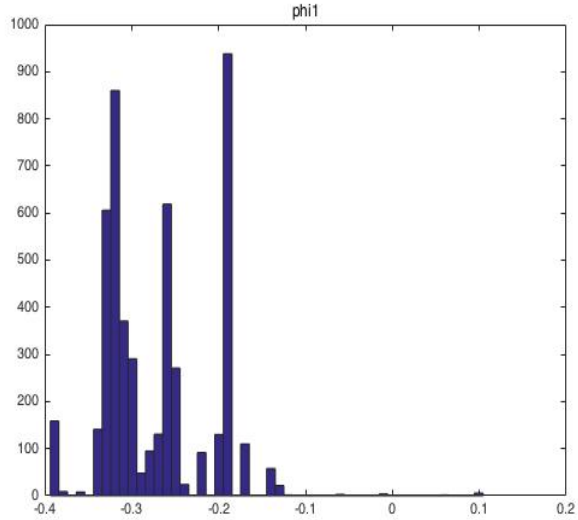

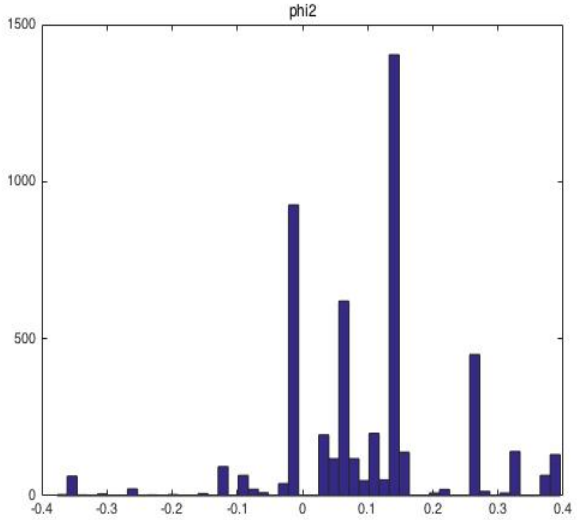

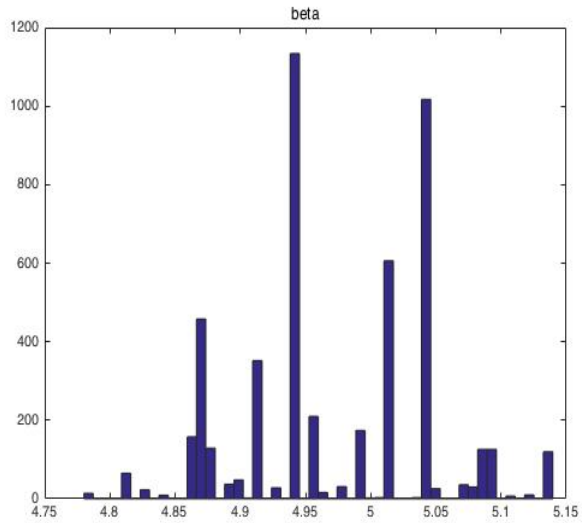

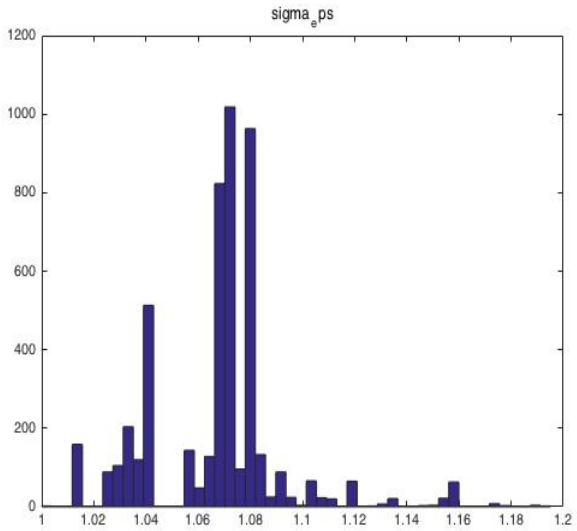

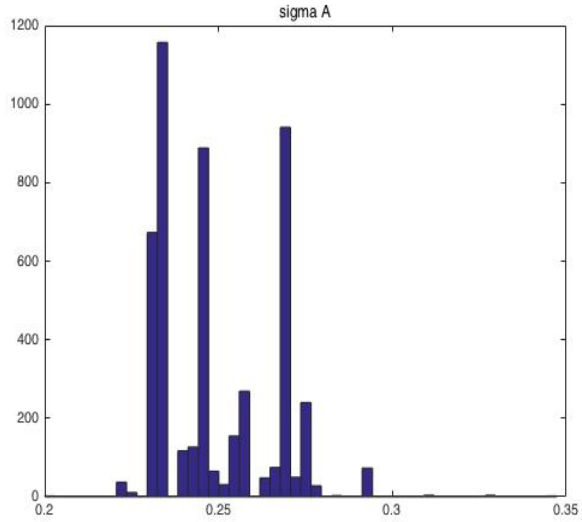

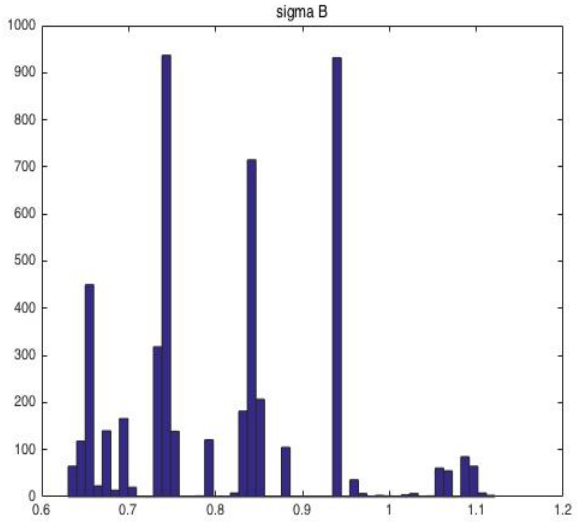

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