# ECON 634 Homework 7

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**Question 1**

Transition function is:

$$\left[X_t, X_{t-1}, X_{t-2}, \epsilon_{t-1}, \epsilon_{t-2}\right] = \left[\rho_1 X_{t-1} + \rho_2 X_{t-2} + \phi_1 \epsilon_{t-1} + \phi_2 \epsilon_{t-2} + \epsilon_t, X_{t-1}, X_{t-2}, \epsilon_{t-1}, \epsilon_{t-2}\right]. \quad (1)$$

The observation equation is

$$\begin{bmatrix} A_t \\ B_t \end{bmatrix} = \begin{bmatrix} exp(X_t + \upsilon_t^A) \\ \beta X_t^2 + \upsilon_t^B \end{bmatrix}. \quad (2)$$

The state is $S_t = \left[X_t, X_{t-1}, X_{t-2}, \epsilon_{t-1}, \epsilon_{t-2}\right]$, the obserables is $Y_t = \begin{bmatrix} A_t \\ B_t \end{bmatrix}$, the shock is $W_t = \epsilon_t$, and $V_t = \begin{bmatrix} \upsilon_t^A \\ \upsilon_t^B \end{bmatrix}$.

**Question 2 and 3**

The posterior distribution for parameters are shown in the following graph.

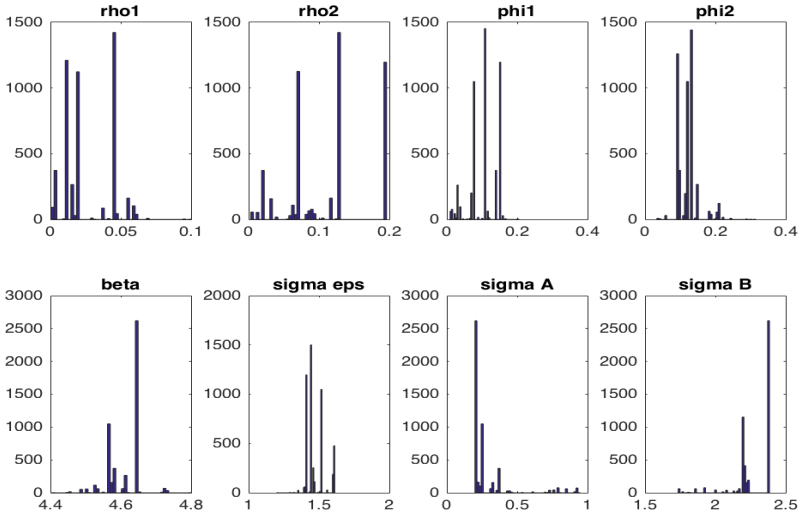


Figure 1: Posterior distribution