Homework 4

ECON 8050: Macroeconomics II
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The process for $y = log(income)$ is:

$$y_{t+1} = \mu + \rho y_t + \sigma \varepsilon_{t+1}$$

where $\varepsilon \sim N(0,1)$

(1) Set $\mu = 0$, $\rho = 0.9$ and $\sigma = 0.0242$. Discretize the process for y with 9 points. Download the Matlab code ghquad.m to compute Gauss-Hermit grids and weights. Use $10,000$ as maxit input. As an output, print out the vector of discretized y and the transition matrix.

(2) Simulate the Markov chain and compute the implied autocorrelation coefficient ($\hat{\rho}$). Note: use 1 million observations to simulate a persistent AR process. Disregard first 1000 observations. Report both $\hat{\rho}$ and $\hat{\sigma}$ computed from the simulated data.

Solution 1

y - vector:

$$\begin{pmatrix} -0.1092 & -0.776 & -0.503 & -0.0248 & 0.0000 & 0.0248 & 0.0503 & 0.0776 & 0.1092 \end{pmatrix}$$

Transition Matrix:

$$\begin{bmatrix}
0.5755 & 0.3551 & 0.0649 & 0.0044 & 0.0001 & 0.0000 & 0.000 & 0.0000 & 0.0000 \\
0.1572 & 0.4517 & 0.3116 & 0.0729 & 0.0063 & 0.0002 & 0.0000 & 0.0000 & 0.0000 \\
0.0179 & 0.1945 & 0.4222 & 0.2881 & 0.0708 & 0.0063 & 0.0002 & 0.0000 & 0.0000 \\
0.0009 & 0.0349 & 0.2212 & 0.4099 & 0.2669 & 0.0623 & 0.0048 & 0.0001 & 0.0000 \\
0.0000 & 0.0028 & 0.0499 & 0.2441 & 0.4063 & 0.2441 & 0.0499 & 0.0028 & 0.0000 \\
0.0000 & 0.0001 & 0.0048 & 0.0623 & 0.2659 & 0.4099 & 0.2212 & 0.0349 & 0.0009 \\
0.0000 & 0.0000 & 0.0002 & 0.0063 & 0.0708 & 0.2881 & 0.4222 & 0.1945 & 0.0179 \\
0.0000 & 0.0000 & 0.0000 & 0.0002 & 0.0063 & 0.0729 & 0.3116 & 0.4517 & 0.1572 \\
0.0000 & 0.0000 & 0.0000 & 0.0000 & 0.0001 & 0.0044 & 0.0649 & 0.3551 & 0.5755
\end{bmatrix}$$

Solution 2

$$\hat{\rho} = 0.8857$$
$$\hat{\sigma} = 0.0239$$