Monetary Economics and Asset Pricing
Module II
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Homework 1

Please collect your answers into a single pdf file and send it by email. You need to turn in your homework no later than Monday November 7, 2022.

1. Consider the consumption(dividend) growth rate statistics of the following five hypothetical countries (the notation is the same used in the lectures notes):

Country	$\mu = \mathbb{E}(d_{t+1} - 1)$	$\eta = \sigma(d_{t+1} - 1)$	$\rho(d_{t+1} - 1, d_t - 1)$
A	0.023	0.041	0.2
B	0.015	0.030	0.9
C	0.030	0.050	-0.2
D	0.018	0.036	0.0
C	0.025	0.040	-0.9

   (a) For each country compute the symmetric transition matrix of the two-state Markov process where the two states are $d_t \in \{h, l\}$ and the transition matrix is:

$$\Pi = \begin{bmatrix} \phi & 1-\phi \\ 1-\phi & \phi \end{bmatrix}$$

   (b) Comment on the nature of the transition matrix in each country and explain for each country what the effects on the dynamics of the risk-free rates are. To show the effects on the risk-free rates you are encouraged to solve for them in each state $d_t \in \{h, l\}$ and comment on the results (set the relative risk aversion parameter to $\gamma = 2$ and the discount factor $\beta = 0.96$).

2. Consider a modified version of the Mehra-Prescott (1985) economy and introduce a third state, m. The economy has now three states: $d_t \in \{h, m, l\}$. The transition across states is now governed by the following 3×3 matrix Π:

$$\Pi = \begin{bmatrix} \phi & \epsilon & 1-\phi-\epsilon \\ 1/2 & 0 & 1/2 \\ 1-\phi-\epsilon & \epsilon & \phi \end{bmatrix} \text{ with stationary probabilities } \begin{cases} \pi_h = 1/(2(1+\epsilon)) \\ \pi_m = \epsilon/(1+\epsilon) \\ \pi_l = 1/(2(1+\epsilon)) \end{cases}$$

   which says that with probability ϵ the economy can make a transition into state m when being in states h and l. However, once the economy makes a transition in state m, this will not last more than one period and with probability $1/2$ it will go back to h or l.

   (a) Let $\beta = 0.96$, $\gamma = 2$, $\phi = 0.43$, $h = 1.054$, $l = 0.982$ and $\epsilon = 0.012$. Find a suitable value for state $m > 0$ such that the equilibrium equity premium is greater than 4% and the mean risk-free rate is around 1%. To solve the problem you need to write a routine in *R*, *Matlab* or any other suitable coding language to solve for the equilibrium prices and asset returns. Run the routine under different values for $m > 0$ until you identify the one that generates an equity premium greater than 4% and a risk-free rate around 1% (**attach the routine you have written to your homework solution**).

   (b) Comment on the results you have obtained and compare them to the solutions of the two-state economy of Mehra-Prescott (1985) we have discussed in class.