**Macro II – PS 2**

**Problem 1**: and , such that .

* Set such that . This implies that .
* From we know that 0.316

Q1:

Using the Tauchen method to specify the transition probability, also using 10000-time simulation of the 5-state Markov chain. (# of states specify the line space in the state grid of transition matrix)

Results: mean of the process is 0.3302, standard deviation 0.1018, and autocorrelation 0.9923.

Q2:

Now using 10-state Markov Chain, the mean is -0.0042, standard deviation 0.1758, and autocorrelation is 0.9301. This result returns better approximation of the true process.

Reason: with more states in the state grid, the transition matrix allows more refined probability among different states, thus returning finner approximation of the true process.

Q3:

Now use the Rouwenhorst method instead, with a 5-state Markov Chain, 10000-time simulation.

Results: mean of the process is 0.0010, standard deviation 0.1363, and autocorrelation 0.8960.

Comments: compared with Tauchen method with 5-state Markov chain, the result from the Rouwenhorst method is better, with mean, std deviation and autocorrelation nearer to the true AR(1) process.

Q4:

From Q3, the standard deviation of is 0.1363, so 0.025897

Plug-in these values into the Rouwenhorst algorithm with 5-state markov chain:

Results: mean 0.0064, standard deviation 0.1228, and autocorrelation 0.9752.

The approximation is pretty good.

**Problem 2:**

Q1&Q2: The consumption and saving under different can be seen from the graph.

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| ../II%20Chris%20PS%202/hw_gamma_consumption.jpg |
| ../II%20Chris%20PS%202/hw_gamma_saving.jpg |

* As can be seen from the graph, as Gamma increases, the consumption becomes less and saving becomes more; this shows that as agents become more RA, they accumulate more savings.
* Also from the following table, as Gamma increases, the standard deviation of the consumption process becomes less. This shows that as agents are more RA, they engage more in consumption smoothing.

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| ../../../../../Desktop/屏幕快照%202019-04-21%20下午11.04.46.pn |

Q3. The household saving under different variance of the income shocks.

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| hw_se_saving.jpg |

* As the variance of income shocks increases, agents tend to save more. This is because agents engage in more precautionary saving in face of greater income uncertainty.

Q4: The graph shows consumption under no borrowing constraint and natural borrowing constraint

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| hw_borrowing_constraint_consumption.jpg |
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* The average consumption under natural borrowing constrain is higher than with a 0 borrowing constraint. This result shows that if we loose the borrowing constraint, people will consume more and borrow more. (The natural limit is the maximum that they can borrow.)
* This result also implies that under a 0 borrowing constraint, the constraint is binding.

Q5: The insurance coefficient under different debt limit is as follow:

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* Thus under the natural borrowing limit (which is looser), the agents will seek more consumption insurance. From the formula of the insurance coefficient, higher correlation between consumption and income shock will increase insurance coefficient. Under looser borrowing limit, the correlation between consumption and income shock increase, lifting the insurance coeff.