

Macroeconomics II

Problem Set 10

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The solution of this problem consists of a PDF with all mathematical derivations and all graphs as well as julia script that produces the results. The solution must be posted in the student's github repository.

1. Consider the discretization of the Ornstein-Uhlenbeck process in the slides.

The first and second moments are given by:

$$E[dy] = -\gamma y dt \quad V[dy] = \sigma^2 dt$$

In the discrete approximation we can compute these moments as:

$$E[y(t+dt) - y(t) | y(t)]$$

$$V[y(t+dt) - y(t) | y(t)] = E[(y(t+dt) - y(t))^2 | y(t)] - E^2[y(t+dt) - y(t)]$$

Show that the approximation is good by finding the value of the moments and comparing them to the exact moments of the continuous process.

2. Consider the model in Shimer (2005)

- (a) Reproduce the baseline calibration of the paper. The parameters are in Table 2, page 38, and the results to reproduce are in Table 3, page 39. This calibration has no separation shocks (δ is fixed).

- (b) Simulate the model and reproduce table 3 of page 39. You will need to de-trend the data simulated by the model with a HP filter.
- (c) Provide a plot of the Beveridge curve generated by a particular simulation.

You can also recast the model in discrete time and approximate the stochastic process y with an $AR(1)$ process.