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Economics G6220
Advanced Macroeconomic Analysis
Problem Set 2
Due February 13

1. In chapter **??**, we showed that two empirical regularities that characterize emerging economies are the countercyclicality of the trade balance-to-output ratio and the fact that consumption growth appears to be more volatile than output growth. In this chapter, we developed a simple small open endowment economy and provided intuitive arguments suggesting that this economy fails to account for these two stylized facts. However, that model does not allow for closed form solutions of second moments of output growth, consumption growth, or the trade balance-to-output ratio. The goal of this assignment is to obtain these implied statistics numerically.

   To this end, consider the following parameterization of the model developed in the present chapter:

   $$y_t - \bar{y} = \rho(y_{t-1} - \bar{y}) + \epsilon_t,$$

   with $\rho = 0.9$, $\bar{y} = 1$, and ϵ_t is distributed normally with mean 0 and standard deviation 0.03. Note that the parameter $\bar{y}$, which earlier in this chapter was implicitly assumed to be nil, represents the deterministic steady state of the output process. Assume further that $r = 1/\beta - 1 = 0.1$, $d_{-1} = \bar{y}/2$, and $y_{-1} = \bar{y}$.

   (a) Simulate the economy for 100 years.

   (b) Through away the first 50 years of artificial data to minimize the dependence of the results on initial conditions.

   (c) Compute the growth rates of output and consumption and the trade balance-to-output ratio.

   (d) Compute the sample standard deviations of output growth and consumption growth and the correlation between output growth and the trade balance-to-output ratio. Here, we denote these three statistics σ_{gy}, σ_{gc}, and $\rho_{gy,tby}$, respectively.

   (e) Replicate steps 1 to 4 1000 times. For each replication, keep record of σ_{gy}, σ_{gc}, and $\rho_{gy,tby}$.

   (f) Report the average of σ_{gy}, σ_{gc}, and $\rho_{gy,tby}$ over the 1000 replications.

   (g) Discuss your results.

2. **Free Disposal** Consider the small, open, endowment economy with stationary endowment shocks and quadratic preferences discussed in class. An important implicit assumption in that model is the absence of free disposal of goods or assets. Consider

now a variation of the model that allows for disposal at no cost. Specifically, assume that the sequential budget constraint faced by households is of the form

$$d_t = (1 + r)d_{t-1} + y_t - c_t - x_t,$$

where x_t is an endogenous variable determined in period t and subject only to the nonnegativity constraint

$$x_t \geq 0.$$

All other aspects of the model are as discussed in class. Characterize as many differences as you can between the equilibrium dynamics of this model and those of the model studied in class.