

# Econ 210C Homework 2

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Due: 5/13/2022, 11:59PM PST, on your Github repository.

## 1. Complementarity of Money and Consumption

Suppose the utility function in our classical monetary model is now

$$U(X_t, L_t) = \frac{X_t^{1-\gamma} - 1}{1-\gamma} - \chi \frac{N_t^{1+\varphi}}{1+\varphi}$$

where  $X_t$  is a composite of consumption and money,

$$X_t = \left[ (1 - \vartheta) C_t^{1-\nu} + \vartheta \left( \frac{M_t}{P_t} \right)^{1-\nu} \right]^{\frac{1}{1-\nu}}$$

- (a) Derive the first order conditions for this economy.
- (b) Under what conditions does this economy predict that money is neutral? Explain why.
- (c) Solve analytically for the steady state of the model (as far as you can), assuming  $A = 1$ .
- (d) Based on your steady state equations describe an algorithm for how to solve for the steady state.
- (e) How would you calibrate  $\vartheta$  given knowledge of  $\nu$ ? (I.e., what moments of the data would you use and how?)
- (f) Given knowledge of other parameters, how would you set  $M$  such that  $P = 1$  in steady state?
- (g) Derive the log-linearized model.
- (h) Following your calibration strategy for each of  $\nu \in \{0.25, 0.5, 1, 2, 4\}$ , solve the model using sequence space methods using the following parameters:

$$\gamma = 1, \varphi = 1, \chi = 1, \beta = 0.99, \rho_m = 0.99$$

where  $\hat{m}_t = \rho_m \hat{m}_{t-1} + \epsilon_t^m$ .

Report the IRFs for consumption, prices, the nominal interest rate. Your graph for each variable should contain all five cases, appropriately labelled.

- (i) Intuitively explain your results.
- (j) If you had evidence that an increase in the money supply increases consumption, which values for  $\nu$  can you rule out? Explain why.

- (k) Make sure your code packet contains a file that produces your graphs with a single click. (It does not need to save the graphs.) Upload it to Github.