

Problem Set 2: **Explorations of the Simple Framework for Monetary Policy**

For this problem set I will ask you to refer to the exercises posted on the course website at: <http://web.mit.edu/14.461/www/part1/lecturesandex.htm>

Problem 1: Comovements vs. Structural Relationships [optional]

Section 1 exercises, Question 3.

Hint: Relate the simultaneous equation system to what you are studying in 14.383.

Problem 2: Introducing Government Purchases in the Simple Framework

Section 2 exercises, Question 2.

Problem 3: Alternative Interest Rate Rules for the Classical Economy

Section 3 exercises, Question 1.

Hint: Part (a) (i) The coefficient on the inflation term in the rule must be chosen appropriately.

Problem 4: Optimal Monetary Policy in a Classical Economy

Section 3 exercises, Question 3.

Hint: Part (b) Show that the solution is consistent with constant velocity $V = P_t Y_t / M_t$.

Problem 5: Capital in the Simple Framework

In the lecture, it was mentioned that the simple framework could be extended to allow for capital accumulation. This question looks at one way to do this.

The representative consumer seeks to maximize the objective function:

$$E_0 \sum_{t=0}^{\infty} \beta^t U(C_t, N_t) \quad (1)$$

where C_t denotes consumption and N_t denotes hours of work.

Maximization of (1) is subject to a sequence of flow budget constraints which take into account the possibility of investment in capital.

$$P_t C_t + P_t K_{t+1} + R_t^{-1} B_t \leq B_{t-1} + NX_{t-1}^k P_{t-1} K_t + W_t N_t \quad (2)$$

Consumption and capital goods can be exchanged one for one in this formulation and so they have the same price. Firms rent capital services from households. NX_{t-1}^k is a gross nominal return.

- Give an economic meaning to the terms in equation (2).
- Derive the intratemporal optimality condition found in the lecture notes for chapter 2, equation (10).
- Derive the Euler equation corresponding to equation (11) of the lecture notes.
- Derive the no-arbitrage condition. Interpret this condition. What is the difference between bonds and capital for the consumer?
- Log-linearize the optimality conditions for the utility function in the lecture notes. Show your working.

There is a continuum of firms in the economy indexed by $i \in [0, 1]$. Each firm produces a differentiated good with production function:

$$Y_t(i) = A_t N_t(i)^{1-\alpha} K_t(i)^\alpha \quad (3)$$

- Derive the log-linearization of the real marginal cost and the average markup in the economy. Show your working. Will all firms in the economy charge the same markup?