

**UNIVERSITAT POMPEU FABRA**  
**APPLIED MACROECONOMICS**

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**Problem Set 7**

1. Suppose that money demand is given by the function

$$\ln(M/P) = a - bR + \ln Y$$

and real output grows at a rate  $g$ . What rate of inflation leads to the highest path of seignorage?

2. Suppose that instead of adjusting their real money holdings gradually toward the desired level, individuals adjust their expectations of inflation gradually towards actual inflation.

$$\begin{aligned} m(t) &= C e^{-b\pi^e(t)} \\ \dot{\pi}^e(t) &= \beta(\pi(t) - \pi^e(t)) \quad 0 < \beta < 1/b \end{aligned}$$

- a) Write the change in expected inflation as a function of expected inflation.
- b) Discuss the phase diagram for the case that  $G > S^*$ .
- c) Do the same for  $G < S^*$ .

**Assorted exercises (from other topics)**

3. Consider an economy consisting in many identical immortal consumers who maximize

$$E_t \left( \sum_{s=0}^{\infty} (1 + \rho)^{-s} \ln C_{t+s} \right)$$

The consumption good in this economy is a non-storable fruit, which is produced by immortal and identical trees. For simplicity, assume the number of trees equal to the number of consumers. Fruit production by any one tree,  $Y_t$ , is random; it is known at time  $t$  but not at time  $t-1$ . Let  $P_t$  denote the price of a tree (in terms of fruits).

a) Every period, each consumer must decide whether to forego some consumption in order to add another tree to his portfolio. Write down the first order condition characterizing a representative consumer's optimal program.

b) Show that in equilibrium  $C_t = Y_t$ .

c) Show that the equilibrium price of a tree is  $P_t = Y_t/\rho$ .

d) Suppose that news arrive (example good weather) that increases the expected amount of fruit the trees will produce in the future. What happens to the price of the tree today? Explain formally and intuitively.

e) What is a consumer's first order condition with respect to an asset with risk-free return,  $r_f$ . Use this condition to solve for the equilibrium risk-free interest rate in this economy. Given that the only asset that exists (the tree) is risky, what is the meaning of this equilibrium risk-free interest rate?

4. In the file *equity\_puzzle.xls* you have data on consumption, the evolution of the Dow Jones index and the US Treasury Bill rate. The data cover the period 1950-2003 (yearly data). Is there still an equity premium puzzle with this sample period? Recall that the original paper uses the period 1890-1979. Explain in detail.

5. Using the data in the file *data\_macroI\_us.xls* answer the following questions (referred to the US economy):

a) What is the correlation between labor and labor productivity ( $Y/L$ )? How about the correlation between labor and the Solow residual? Is the basic real business cycle model in the textbook consistent with these results? If you want to enlarge the capital series you can use the file *nonresidential capital.xls*. Notice that you will have to add up the capital of all the sectors.

b) Using the official dates of the cycles included in the file, What is the average growth rate of real money supply (M2) in expansions and recessions?

What is the average inflation rate, measured using the GDP deflator, in expansions and recessions?

c) Do real wages show a procyclical behavior?

d) What is the relative variability of consumption versus investment?  
What is the relative variability of employment versus real GDP?