Theoretical seminar #9
7th December 2010
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Incomplete nominal adjustment

Problem 1 (Romer 6.1.)

Consider the problem facing an individual in the Lucas model when $\frac{P_i}{P}$ is unknown. The individual chooses L_i to maximize the expectation of U_i; U_i is given by the equation:

$$U_i = \frac{P_i}{P} L_i - \frac{1}{\gamma} L_i^{\gamma}$$

(a) Find the first-order condition for L_i, and rearrange it to obtain an expression for L_i in terms of $E\left[\frac{P_i}{P}\right]$. Take logs of this expression to obtain an expression for l_i.

(b) How does the amount of labor the individual supplies if he or she follows the certainty-equivalence rule compare with the optimal amount derived in part (a)? (Hint: how does $E\left[\ln\left(\frac{P_i}{P}\right)\right]$ compare with $\ln\left(E\left[\frac{P_i}{P}\right]\right)$)?

(c) Suppose that (as in the Lucas model) $\ln\left[\frac{P_i}{P}\right] = E\left(\ln\left[\frac{P_i}{P}\right] \ |P_i\right) + u_i$, where u_i is normal with a mean of zero and a variance that is independent of P_i. Show that this implies that $\ln E\left\{\left[\left(\frac{P_i}{P}\right) \ |P_i\right]\right\} = E\left[\ln\left(\frac{P_i}{P}\right) \ |P_i\right] + C$, where C is a constant whose value is independent of P_i. (Hint: note that $\frac{P_i}{P} = \exp\left\{E\left[\ln\left(\frac{P_i}{P}\right) \ |P_i\right]\right\}\exp(u_i)$), and show that this implies that the l_i that maximizes expected utility differs from the certainty-equivalence rule only by a constant.)

Problem 2 (Romer 6.13.)

Consider an economy consisting of some firms with flexible prices and some with rigid prices. Let p^f denote the price set by a representative flexible-price firm and p^r the price set by a representative rigid-price firm. Flexible-price firms set their price after m is known; rigid-price firms set their prices before m is known. Thus flexible-price firms set $p^f = (1-\Phi)\, p + \Phi m$, and rigid-price firms set $p^r = (1-\Phi)\, Ep + \Phi Em$, where E denotes the expectation of a variable as of when the rigid-price firms set their prices.

Assume that fraction q of firms have rigid prices, so that $p = qp^r + (1-q)\, p^f$.

(a) Find p^f in terms of p^r, m and the parameters of the model (Φ and q).

(b) Find p^r in terms of Em and the parameters of the model.

(c) (i) Do anticipated changes in m (that is, changes that are expected as of when rigid-price firms set their prices) affect y?

(ii) Do unanticipated changes in m affect y? Why or why not?