Module 7

(*a*) Find the first-order condition for Y_i, and rearrange it to obtain an expression for Y_i in terms of $E[P_i/P]$. Take logs of this expression to obtain an expression for y_i.

(*b*) How does the amount of labor the individual supplies if he or she follows the certainty-equivalence rule in (6.81) compare with the optimal amount derived in part (*a*)? (Hint: How does $E[\ln(P_i/P)]$ compare with $\ln(E[P_i/P])$?)

(*c*) Suppose that (as in the Lucas model) $\ln(P_i/P) = E[\ln(P_i/P) \mid P_i] + u_i$, where u_i is normal with a mean of 0 and a variance that is independent of P_i. Show that this implies that $\ln\{E[(P_i/P) \mid P_i]\} = E[\ln(P_i/P) \mid P_i] + C$, where C is a constant whose value is independent of P_i. (Hint: Note that $P_i/P = \exp\{E[\ln(P_i/P) \mid P_i]\}\exp(u_i)$, and show that this implies that the y_i that maximizes expected utility differs from the certainty-equivalence rule in (6.81) only by a constant.)

6.15. Observational equivalence. (Sargent, 1976.) Suppose that the money supply is determined by $m_t = c'z_{t-1} + e_t$, where c and z are vectors and e_t is an i.i.d. disturbance uncorrelated with z_{t-1}. e_t is unpredictable and unobservable. Thus the expected component of m_t is $c'z_{t-1}$, and the unexpected component is e_t. In setting the money supply, the Federal Reserve responds only to variables that matter for real activity; that is, the variables in z directly affect y.

Now consider the following two models: (*i*) Only unexpected money matters, so $y_t = a'z_{t-1} + be_t + v_t$; (*ii*) all money matters, so $y_t = \alpha' z_{t-1} + \beta m_t + \nu_t$. In each specification, the disturbance is i.i.d. and uncorrelated with z_{t-1} and e_t.

(*a*) Is it possible to distinguish between these two theories? That is, given a candidate set of parameter values under, say, model (*i*), are there parameter values under model (*ii*) that have the same predictions? Explain.

(*b*) Suppose that the Federal Reserve also responds to some variables that do not directly affect output; that is, suppose $m_t = c'z_{t-1} + \gamma' w_{t-1} + e_t$ and that models (*i*) and (*ii*) are as before (with their distubances now uncorrelated with w_{t-1} as well as with z_{t-1} and e_t). In this case, is it possible to distinguish between the two theories? Explain.

6.16. 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 prices after m is known; rigid-price firms set their prices before m is known. Thus flexible-price firms set $p^f = p_i^* = (1-\phi)p + \phi m$, and rigid-price firms set $p^r = Ep_i^* = (1-\phi)Ep + \phi Em$, 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? Why or why not?

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