Economics 503 Fall 1999

Problem Set I

The due date for this assignment is Tuesday, September 7, 1999 (in class).

1. Consider the following simple linearized *IS-LM* model (notation is standard, 0 subscripts indicate exogenous variables):

$$\begin{aligned}
c &= c_0 + c_1 y^d - c_2 r \\
i &= i_0 + i_1 y - i_2 r \\
g &= g_0 + g_1 y \\
y &= c + i + g \\
y^d &= y - t_1 y \\
l &= l_0 + l_1 y - l_2 r \\
\frac{M^s}{P} &= M_0 + v_1 r \\
\frac{M^s}{P} &= l
\end{aligned}$$

   (a) Derive the *IS-LM* curves for this model. How do the slopes of these curves differ from the case where government spending and the real money stock are exogenous?

   (b) Derive the expression for the equilibrium level of income.

   (c) Compute $\frac{dy}{dg_0}$ and $\frac{dy}{dM_0}$.

   (d) Suppose that money demand depended on y^d rather than y. How would the effects of a change in t_1 on equilibrium income be changed? Explain.

2. Consider the following simple model, in which the price level is exogenous, and where the government sector purchases goods, levies lump sum taxes, and finances its deficits by issuing money and bonds, which the private sector considers to be wealth. Assume that government spending is determined exogenously.

$$\begin{aligned}
c &= c(y - t, r, \frac{\Omega}{P}) \\
i &= i(y, r) \\
y &= c + i + g \\
l &= l(y, r, \frac{\Omega}{P}) \\
\frac{M^s}{P} &= \frac{M_0 + dM}{P} \\
\frac{B^s}{P} &= \frac{B_0 + dB}{P} \\
\frac{\Omega}{P} &\equiv \frac{M^s}{P} + \frac{B^s}{P} \\
P(g - t) &= dM + dB
\end{aligned}$$

   where the signs of the partial derivatives are: $c_1' > 0, c_2' < 0, c_3' > 0, i' > 0, i_2' < 0, l_1' > 0, l_2' < 0$, and $l_3' > 0$.

(a) Explain why $\frac{\Omega}{P}$ belongs as an argument of the demand functions.

(b) Write out the budget constraints for the private sector and the public sector respectively, and derive Walras Law for this model.

(c) Use Walras Law to derive the bond demand function.

(d) Assuming that a meaningful solution to the model exists, calculate the following multipliers on y:

1. $dg = dt$
2. $dg = d\left(\frac{M}{P}\right)$
3. $dg = d\left(\frac{B}{P}\right)$
4. $dM = -dB$

3. Consider the following "classical" model (all notation is standard):

$$
\begin{aligned}
y &= c[y(1-\tau), r] + i(r) + g && (1)\\
l(y,r) &= \frac{M}{P} && (2)\\
y &= F(N,K) && (3)\\
\frac{w}{P} &= F_N(N,K) && (4)\\
N^S &= \phi(\frac{w}{P}, \tau) && (5)\\
N^s &= N^d && (6)
\end{aligned}
$$

where τ is the tax rate, K is the exogenous level of the capital stock, $\phi_1' > 0, \phi_2' < 0$, and all other partial derivatives have the normal sign.

(a) Use expressions 1 and 2 to derive an aggregate demand schedule. What is the effect of $d\tau$ and dg on the aggregate demand curve?

(b) Use expressions 3, 4 and 5 to derive an expression for dy. Show that the economy is classical.

(c) What is the effect of dM on dP?

(d) Use your results to derive the effect of $d\tau$ on P. Show that your analytical results are consistent with an AD-AS diagram. Show, with an IS-LM diagram and an AD-AS diagram that if $l_2' = 0$ that $\frac{dP}{d\tau}$ is positive.

(e) Suppose that 6 was changed to:

$$N = N^d \leq N^S \qquad (7)$$

what else must change in the model so that a solution for the equilibrium level of y can be obtained? How does this change the important implications of this model (e.g., what happens to $\frac{dy}{dg}$, $\frac{dy}{dM}$, etc.)?