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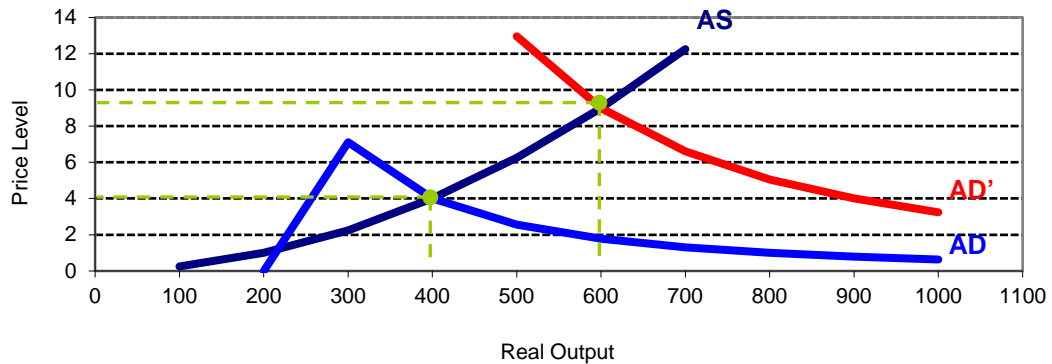Department of Economics
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ECO 209Y
MACROECONOMIC THEORY
Solution to Problem Set 13
(Odd numbers only)

1. a) $Y = AE = C + I + G$

   $Y = 100 + 0.8 (Y - 10 - 0.3 Y) + 100 - 10 i + 0.04 Y + 8$

   $Y = 200 + 0.6 Y - 10 i$

   Then the IS curve is given by the expression: $i = 20 - 0.04Y$

   b) $M / P = 200 + 0.6 Y - 10 i$

   $120 / P = 200 + 0.6Y - 10 i$

   Then the LM curve is given by the expression: $i = 20 + 0.06 Y - 12 / P$

   c) To get the AD curve, we need to make sure that there is equilibrium in the goods and money markets simultaneously, remembering that this equilibrium depends on the price level.

   $20 - 0.04 Y = 20 + 0.06 Y - 12 / P$

   Then the AD curve is given by: $P = 120 / Y$

   d) In this model, neither workers nor firms suffer from money illusion because both labour supply and demand depend on prices —the decisions of both workers and firms as to how much labour to supply or demand are based on the value of the real wage rate. In other words, this exercise refers to the classical model.

   e) In the short-run, labour market equilibrium determines employment and thus output. That is

   $0.75 N^{\frac{1}{2}} = 12 / N^{\frac{1}{2}}$

   So the equilibrium in the labour market implies that $N = 16$.

   Plugging this value for N in the production function, we obtain $Y = 96$, which essentially is the classical (vertical) AS curve.

   Finding the intersection of AS and AD curves we find the prices are $P = 120 / 96 = 1.25$.

   Using either labour demand or supply the nominal wages are equal to $3.75.

   Finally, the interest rate can be obtained from the IS (or LM) curve by plugging in $Y = 96$ (or $Y = 96$ and $P = 3.75$):

   IS → $i = 20 - 0.04 Y = 20 - 0.04 (96) = 20 - 3.84 = 16.16$

   LM → $i = 20 + 0.06 Y - 12 / P = 20 + 0.06 (96) - 12 / 1.25 = 20 + 5.76 - 9.6 = 16.16$

   f) The increase in G causes AD to increase and thus the AD curve shifts to the right. A situation of excess demand arises in the economy at the price level starts to rise. As P increases, an adjustment takes place on both the supply and the demand sides of the economy.

   On the supply side, as P increases the real wage rate decreases at each level of W and thus the demand for labour increases (i.e., the labour demand curve shifts to the right) and the supply of labour decreases (i.e., the labour supply curve shifts to the left). As a result, W increases but W/P and N do not change and thus Y doesn't change either.

   On the demand side, as P increases the real supply of money decreases causing the LM curve to shift to the left and the rate of interest to increase. The increase in the rate of interest causes investment to fall. In the new equilibrium AE will be the same as before but G will be higher and I lower – complete crowding out effect.

   Therefore, only the nominal variables would change, i.e., N and Y would remain unchanged but W, P and i would increase.

3. a) To find the equation for the AS curve we must first find an expression for equilibrium level of employment (as a function of P), and then plug this expression into the production function.

   $N^D \rightarrow W/P = 10 / N^{1/2}$ or $W = 10 P / N^{1/2}$

   $N^D = N^S \rightarrow 10 P / N^{1/2} = N^{1/2} / 10 \rightarrow N^* = 100 P$

   $AS \rightarrow Y = 20 (N^*)^{1/2} \rightarrow Y = 20 (100 P)^{1/2} \rightarrow Y = 200 P^{1/2}$

   b) To find Y^* and P^* we must equate AD and AS:

   $AD = AS \rightarrow 800 / P^{1/2} = 200 P^{1/2} \rightarrow P^* = 4$

   $\rightarrow Y^* = 200 (P^*)^{1/2} \rightarrow Y^* = 200 (4)^{1/2} = 400$

   c) From before we know the expression for equilibrium employment:

   $N^* = 100 P^* = 100 (4) = 400$

   d) To find the equilibrium nominal wage rate we should plug the value for N^* into the expression for the supply of labour:

   $W^* = (N^*)^{1/2} / 10 = (400)^{1/2} / 10 = 20 / 10 = 2$

   Since $P^* = 4$, the real wage rate is:

   $W^*/P^* = 2/4 = 0.5$

   e)

Aggregate Demand and Supply

   f)

Labour Market