Answers to Problem Set #7

1. Strategy: plug the LM equation into the IS equation and solve for AD in terms of P.

$$AD = \frac{a + e + G - d*[(k/n)*AD - M/h + P/h]}{1 - b*(1-t)}$$

$$AD*[1 - b*(1-t) + d*(k/n)] = a + e + G + (d/h)*M - (d/h)*P$$

Now solve for AD to yield:
$$AD = \frac{a + e + G + (d/h)*M - (d/h)*P}{1 - b*(1-t) + d*k/h}$$

This is the AD curve; it has slope $\Delta P/ \Delta AD = - \frac{1 - b*(1-t) + d*k/h}{d/h}$

b. Strategy: plug the LD curve into the production function & solve for Y in terms of P.

$Y = s1*[d0 - d1*(W/P) + d2*K] + s2*K$
  $= s1*d0 - s1*d1*(W/P) + [s1*d2 + s2]*K$

This is the AS equation. Note: As P increases, W/P falls so Y increases.

c. Consider the case where tax rates (t) increase. Analysis of the tax decrease case follows the same process, but all shifts are in the opposition direction.

Begin with two primary shifts:
     1. The LS curve shifts toward the vertical axis and
     2. The AD curve shifts towards the origin and becomes steeper, since the IS curve shifts in and becomes steeper.
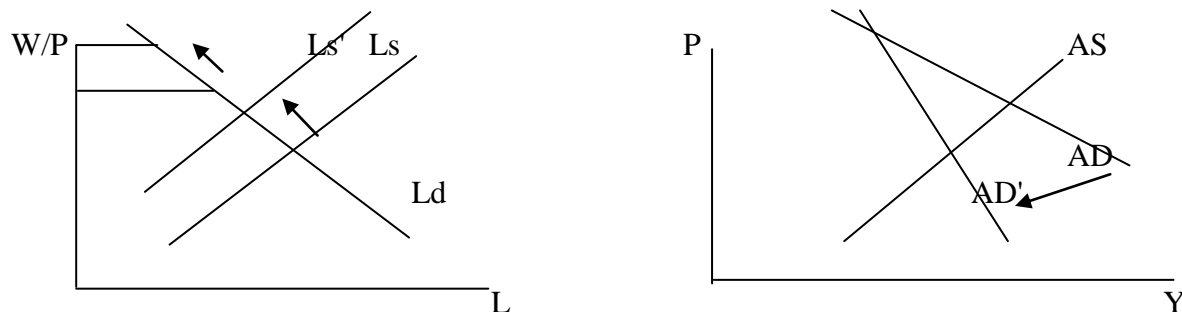

The first shift affects the calculation of the unemployment rate, the market clearing level in the labor market, as well as the long run position of the AS curve. The second shift affects both the goods market and the position along the labor demand curve.

Results: Prices, output, and the quantity of labor demanded fall while unemployment rises.

Since the IS curve shifts in (as t rises) and the LM curve shifts away from the vertical axis (as P falls), with Y falling, r must fall.

2. An increase in defense expenditures can be modeled as a rise in G. As a consequence AD shifts out, and P and Y rise. In the labor market, an increased price level leads to a decreased real wage; thus, the quantity of labor demanded rises. Since the rise in G also represents an outward shift of the IS curve, initially r must rise. Since prices rise, the LM curve shifts up, so r rises for a second reason.   Summary: output, prices and interest rates rise while real wages fall.

P | AS   W/P | Ls   r | LM
  AD   Ld   IS
Y   L   Y
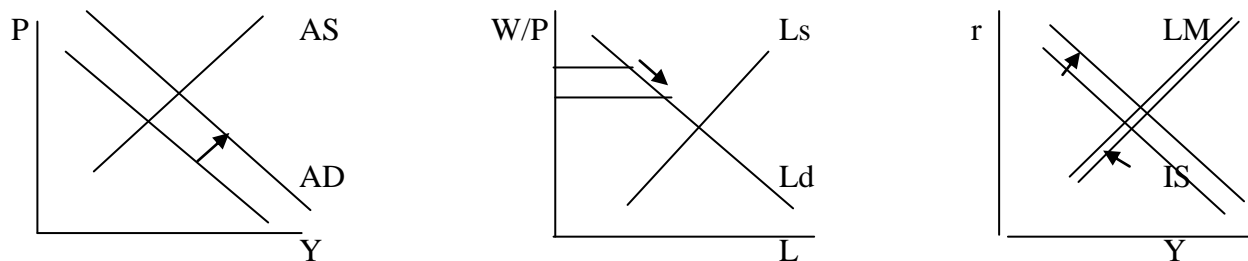
3. A fall in oil prices leads to a rise in raw materials (RM), a positive supply shock. This translates into two shifts:
   1. Upward shift in the production function and
        2. Outward shift in the labor demand curve.

When we re-derive the AS curve, we find that it has shifted to the right.

Y | W/P | Ls   P | AS
          Ld   AD
L   L   Y
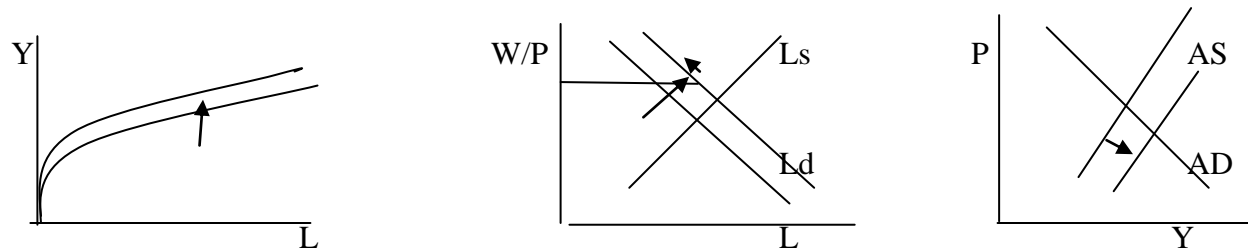
Result: Output, employment, and real wages rise while prices fall. Be sure to align the position in the labor market with that in the goods market. Since the IS curve is unaffected but the LM shifts right (as P falls), r must fall.

4. If the Federal Reserve reduces M, the LM curve would shift back. In the goods market, the Aggregate Demand curve would shift down (and become steeper). As a result, both output and prices would fall. In the labor market, W/P would rise; therefore, the quantity of labor demanded would fall. Since the LM has shifted back, along a given IS curve, r would rise.

W/P | Ls   P | AS
      Ld   AD
L   Y
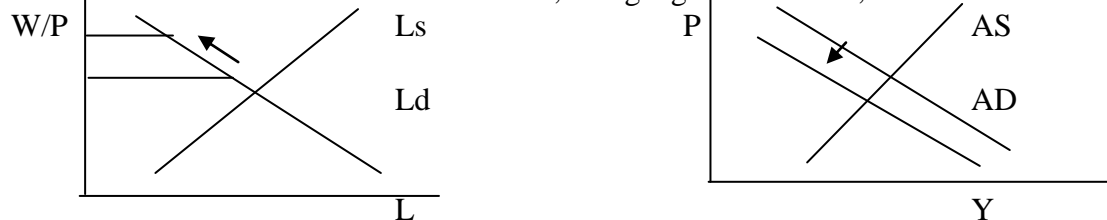
5.   If money (nominal) wages are fully indexed to the price level, then changes in prices will not affect real wages; thus, changes in Aggregate Demand will have no effect on the quantity of labor demanded or on output. In such an economic environment, monetary or fiscal policy cannot be used to moderate cycles.

Essentially, nominal wages adjust with changes in the cost of living; so W becomes endogenous. The results of changes in AD parallel those generated from Model 1 despite the different stopping point in the labor market. Graphically, changes in P lead to changes in W that leave the labor market unchanged; AD and AS shifts counter each other in output terms in the goods market, but stimulated monetary or fiscal policy would yield higher prices.