Econ 102
Aggregate Supply and Demand

1. As on previous homework assignments, turn in a news article together with your summary and explanation of why it is relevant to this week's topic, "Aggregate Supply and Demand."

2. Consider an economy that starts in a long-run equilibrium with all real and nominal variables both remaining constant over time. The central bank then increases the money supply by 10%, and after that holds it constant at the new higher level.

   a. First, use what you've learned in this course about the long-run behavior of the economy (including the long-run open-economy model and the quantity theory of money) to determine, once a new long-run equilibrium is reached, how the following variables will compare to what they were in the initial long-run equilibrium? Explain how you get your answers.

        i. The price level
       ii. Real GDP
      iii. The real interest rate
       iv. The nominal interest rate
        v. The real exchange rate
       vi. The nominal exchange rate
   vii. The trade balance

From the Classical Dichotomy we know that this change in the money supply will not, in the long run, change any real variables. Therefore real GDP, the real interest rate, and the real exchange rate will be unchanged in the long run, remaining at the levels determined in the open-economy model that clear the markets for loanable funds and foreign currency exchange. Because the level of real income is unchanged, from the quantity theory of money it must also be the case that the price level rises by the same amount as the money supply, that is by 10%. Since it stays at that new higher level, the rate of inflation continues to be zero and the nominal interest rate (equal to the real interest rate plus the rate of inflation, according to the Fisher equation) is also unchanged.

The trade balance depends on the real exchange rate (and is actually a real variable itself), so it too is unchanged. But in order for the real exchange rate to remain constant when the price level goes up, the nominal exchange rate must change. That is, the nominal exchange rate must depreciate by 10% to offset the 10% rise in the domestic price level.

   b. Now use the aggregate supply and demand model to determine what it says about the effects of this same increase in the money supply, in both the short run and the

long run. Show how you get your answers. Does the AS-AD model disagree, in its implications for the long run, with what you found in part (a)?

According to the AD-AS Model, the increase in the money supply shifts the AD curve to the right and up, from AD_1 to AD_2. (The reason is that, at any given P and Y, there is now excess supply of money, causing the interest rate to fall in the short-run money market and thus stimulating investment, which is a component of aggregate demand.) The shift to the right in AD causes the equilibrium to move, in the short run, to the right and up along the $SRAS_1$ curve, thus raising both real income and the price level to Y_2 and P_2. In the long run, however, (because the price level is now above the expected price level given by the intersection of SRAS and LRAS at P_1) the expected price level rises shifting the SRAS curve upward and moving the equilibrium along the AD curve until it reaches LRAS. At the new long-run equilibrium on LRAS, real income is back to its initial level, Y_1, and the price level has risen more than it did in the short run, to P_3.
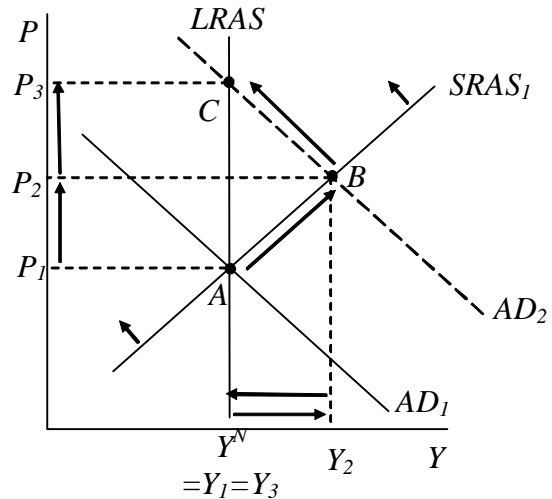
*   Thus for the variables that we can see in the AD-AS model – Y and P – it does not disagree with our earlier long-run models. Here, in the long run, the money supply increase leaves real income unaffected (at Y_1) and raises the price level (to P_3). We can't tell from this the size of the increase in the price level, but the model is consistent with the 10% increase implied by the quantity theory of money. (On the surface, it is hard to tell about any other variables. However, underlying this is the model of the money market, in which if the price level does rise by 10% with Y unchanged, demand for money will increase by exactly the same amount as supply and there will not, after all, be any change in the interest rate.)*

3. Suppose that the US economy is initially in long-run equilibrium. For each of the changes listed below, analyze short-run and long-run effects on:
       i)   the equilibrium level of real GDP;
       ii)   the equilibrium level of nominal GDP; and
       iii)   the equilibrium level of unemployment.
   In each case, draw a diagram and include an explanation as to why the curves shift as they do.

   a) Consumers, coming to fear that the government will not provide for them in their old age, increase their saving.

   This will cause a decrease in consumption, which will shift the AD curve to the left as shown below, from AD_1 to AD_2. In the short run, this means that both the equilibrium level of real GDP (Y) and the price level decrease along the initial

short-run aggregate supply curve, SRAS₁. This is the movement from A to B on the diagram.

    i) Real GDP, Y, falls from its initial (natural) rate Y^N to Y_2.

    ii) We know that nominal GDP is just real GDP (Y) multiplied by the price level, so when both Y and P fall, then nominal GDP must fall as well.

    iii) We also know that if the level of output has fallen, and nothing has happened to productivity (which it hasn't in this case) then it must be true that we are employing fewer factors of production, of which labor is the one that varies most readily. If we are employing less labor, then unemployment must have increased.

In the long run, the fact that GDP is below its natural rate $(Y_2 < Y^N)$ means that expected prices and therefore wages fall, causing the short-run aggregate supply curve to shift down over time and the equilibrium to move along its intersection with AD_2. This continues until long-run equilibrium is restored at point C, where a new short-run aggregate supply curve, $SRAS_2$ crosses AD_2 along the (unchanged) long-run aggregate supply curve LRAS. The price level has fallen still further, to P_3, while real GDP has risen back to its natural rate, $Y_3 = Y^N$. Thus in the long run, compared to the initial equilibrium before all this happened,
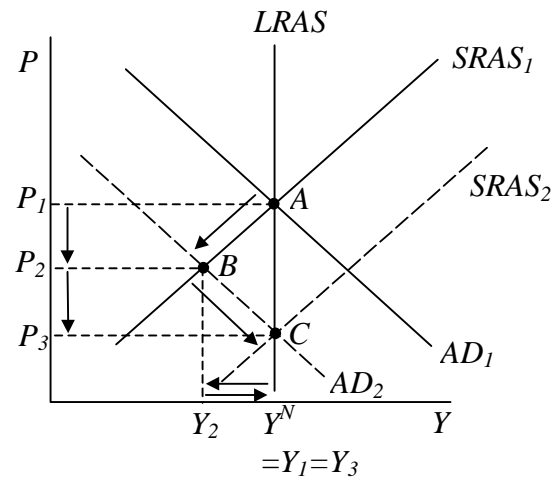
    i)   Real GDP is unchanged at Y^N (having first fallen and then risen);

    ii)   Nominal GDP is reduced, since Y is unchanged but P has fallen (we can't tell whether nominal GDP rises or falls from point B to point C, since Y rises but P falls); and

    iii) Unemployment is unchanged at its natural rate u^N (having first risen and then fallen).

b) Optimism about future economic performance causes businesses to increase domestic fixed investment.

This is an increase in investment, a component of aggregate demand, which we know causes the AD curve to shift to the right. An increase in investment also adds over time to the economy's capital stock, which expands the output that can be produced at the natural rate of unemployment and therefore increases the natural rate of output as well. It is customary in using

3
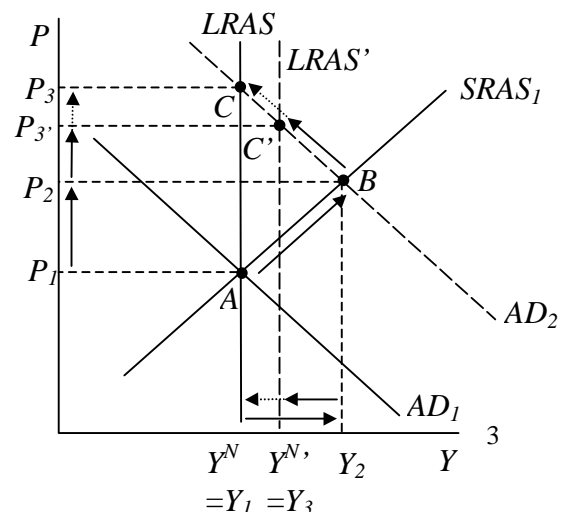
the AD-AS model not to consider such even longer-run effects, but it would not be incorrect to include them here since the question did not explicitly rule them out. Therefore the diagram above shows both cases. (It does not show any position for the SRAS curve after its initial position, even though over time it presumably shifts up as expectations change and also to the right as the natural rate of output changes.)

Thus, in the short run aggregate demand shifts to the right, to AD$_2$, and the economy moves from point A to point B, with the price level and real GDP rising to P$_2$ and Y$_2$ respectively:
   i) *Real GDP rises;*
   ii) *Nominal GDP also rises, since P and Y both rise;*
   iii) *Unemployment falls, as more workers are needed to produce the higher output.*

Over time, since output is now above its natural rate, expected prices and therefore wages rise, shifting the short-run aggregate supply curve upward. This shift is not shown in the diagram, to reduce clutter, but it moves the equilibrium along the new aggregate demand curve AD$_2$, eventually to point C' or C, depending on whether or not we allow for the rightward shift of long-run aggregate supply to LRAS', due to the increased capital stock. Real GDP therefore falls back toward its original level, reaching it if we ignore the increased capital stock, or settling above it at Y$_3$ if we do not ignore this. Thus in the long run
   i) *Real GDP either remains unchanged if we consider only the effect of investment as aggregate demand, or it rises if we allow for its very long run effect on the capital stock (having first risen and then fallen over time in both cases);*
   ii) *Nominal GDP rises either way, since the price level rises; and*
   iii) *The unemployment rate returns to its natural rate (having first fallen, and then risen).*

c) In a quest for re-election, the president pushes for more tax cuts.

A reduction in taxes increases households' disposable income. Therefore, we'd expect consumption to increase. Because C is a component of aggregate demand, the increase in C shifts the AD curve to the right. (For simplicity we ignore the long run effects of an induced increase in the real interest rate: C, I, and NX would decrease – shifting AD to the left –, and the LRAS would shift to the left.):

That is, in the short run:
   i) *Real output rises;*
   ii) *Nominal GDP also rises, since P and Y both rise*
   iii) *Unemployment falls.*

In the long run:
i) *Real output falls back to its natural rate;*
ii) *Nominal GDP remains above its initial level, since P has risen; and*
iii) *Unemployment rises back to its natural rate.*
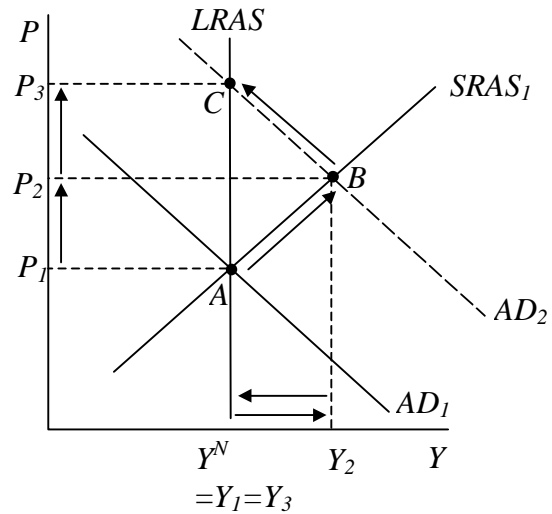
d) An increase in the price of oil used in production.
   When the price of oil goes up, the expected price level will change. Since oil is an important input in production of almost all goods, the expected price level would increase. As a result, the SRAS curve will shift up. This shift in SRAS would force Y_1 below Y_N.

   The economy starts in long run equilibrium at the intersection of LRAS, $SRAS_0$ and AD_0. Higher oil prices cause higher costs of energy and raw materials in many industries, and therefore increase the marginal costs of many firms. This shifts the SRAS curve up (and therefore to the left) to $SRAS_1$, and results in a decrease in output and an increase in the price level and unemployment. In the long run producers and employees adjust their expectations of prices and wages and aggregate supply adjusts to $SRAS_2$, the same as $SRAS_0$, and the economy returns to its original long run equilibrium.