

**EC202C1 – Intermediate Macroeconomic Analysis
Spring 2012, Boston University**

Instructor: Jeremy Smith

First Mid-term Exam

Wednesday, February 29, 2012

This is a 50-minute exam. There is a total of 50 points allocated across two questions. Use the number of points allocated to each part as a suggestion for how long to spend on that part. I recommend that you attempt all parts before using more time than is suggested for any one part. If you complete some parts in less than the suggested time, use your extra time to revisit parts you may have had trouble with the first time through and to check your work.

Please read the questions carefully and write your answers in the space provided. You can use the backs of the sheets for scrap paper, but to get full credit you must show all relevant work in the space provided.

Please follow my instructions at all times.

Concentrate and think carefully, but try to relax too!

Student Number: Solutions

(Please do not include your name.)

1. [32 points total, 4 parts] Consider the following behavioral equations and exogenous variables describing the economy:

$$C = 210 + 0.3Y_D$$

$$I = 325 + 0.5Y - 1200i$$

$$(M/P)^d = 2Y - 4000i$$

$$G = 400$$

$$T = 200$$

$$(M/P)^s = 7790.$$

a) [11 points] Derive the *IS* relation. Derive the *LM* relation. Find the output level and interest rate corresponding with short run equilibrium in the goods and financial markets.

answer:

goods market

$$Y = Z$$

$$Y = C + I + G$$

$$Y = (210 + 0.3(Y - 200)) + (325 + 0.5Y - 1200i) + 400$$

$$Y - 0.3Y - 0.5Y = 210 - 0.3(200) + 325 - 1200i + 400$$

$$0.2Y = 875 - 1200i$$

$$Y = 4375 - 6000i \quad (IS \text{ curve})$$

financial market

$$(M/P)^s = (M/P)^d$$

$$7790 = 2Y - 4000i$$

$$4000i = 2Y - 7790$$

$$i = 0.0005Y - 1.9475 \quad (LM \text{ curve})$$

equilibrium

Substitute *LM* into *IS*:

$$Y = 4375 - 6000(0.0005Y - 1.9475)$$

$$Y + 3Y = 4375 + 11685$$

$$4Y = 16060$$

$$Y^* = 16060/4 = 4015.$$

Substitute *Y** into *LM*:

$$i = 0.0005(4015) - 1.9475$$

$$i^* = 2.0075 - 1.9475 = 0.06 = 6\%.$$

b) [5 points] Verify that total (national) saving is equal to Investment in this equilibrium.

answer:

$$\begin{aligned}\text{private saving} &= Y_D - C \\ &= (4015 - 200) - (210 + 0.3(4015 - 200)) \\ &= 3815 - 210 - 0.3(3815) \\ &= 0.7(3815) - 210 \\ &= 2460.5\end{aligned}$$

$$\begin{aligned}\text{public saving} &= T - G \\ &= 200 - 400 \\ &= -200\end{aligned}$$

$$\begin{aligned}\text{Total saving} &= \text{private saving} + \text{public saving} \\ &= 2460.5 - 200 \\ &= 2260.5.\end{aligned}$$

$$\begin{aligned}I &= 325 + 0.5Y - 1200i \\ &= 325 + 0.5(4015) - 1200(0.06) \\ &= 325 + 2007.5 - 72 \\ &= 2260.5.\end{aligned}$$

So, saving equals investment, as required (and as implied by equilibrium in the goods market).

c) [11 points] Now suppose that there is a drop in business confidence. Specifically, suppose that the autonomous component of Investment falls from 325 to 293.

i. Calculate the new short run equilibrium output level and interest rate.

ii. Calculate the value of the multiplier in this economy.

answer:

i.

$$\begin{aligned}
 Y &= Z \\
 Y &= C + I + G \\
 Y &= (210 + 0.3(Y - 200)) + (293 + 0.5Y - 1200i) + 400 \\
 Y - 0.3Y - 0.5Y &= 210 - 0.3(200) + 293 - 1200i + 400 \\
 0.2Y &= 843 - 1200i \\
 Y &= 4215 - 6000i \quad (IS')
 \end{aligned}$$

$$\begin{aligned}
 Y &= 4215 - 6000(0.0005Y - 1.9475) \\
 Y + 3Y &= 4215 + 11685 \\
 4Y &= 16060 \\
 Y^{**} &= 15900/4 = 3975.
 \end{aligned}$$

$$\begin{aligned}
 i &= 0.0005(3975) - 1.9475 \\
 i^{**} &= 1.9875 - 1.9475 = 0.04 = 4\%.
 \end{aligned}$$

ii.

The multiplier tells us the amount by which equilibrium output changes when exogenous spending increases by one unit. If we just reverse that calculation, the multiplier must be given by the change in output divided by the change in exogenous expenditure. Business confidence is a straightforward component of exogenous expenditure, just like government spending; so exogenous spending has changed by $(293 - 325) = -32$. Therefore,

$$\text{multiplier} = \Delta Y / \Delta b_0 = (3975 - 4015) / (293 - 325) = -40 / -32 = 5/4 = 1.25.$$

This problem could have been done in reverse by using a memorized symbolic formula for the multiplier, plugging in appropriate parameter values from the behavioral equations, using the multiplier thus calculated and the change in business confidence to calculate the change in output, and so on. But the part certainly did not require a memorized formula. Using this method led to a very small penalty, but the larger point is that it's a less general and more error-prone way to proceed.

d) [5 points] Suppose that newspapers report that business confidence is trending downwards. In response to this news, consumers become pessimistic about the future, and desire to save more for precautionary reasons. How would this be reflected in the *IS-LM* model? What would the implications be for output and the interest rate?

answer:

A desire to increase saving is reflected in the standard model as a drop in autonomous consumption, or in other words, is equivalent to a decline in consumer confidence. This leads to a leftward shift in the *IS* curve. This will lead to a movement along the *LM* curve as the goods and financial markets adjust and react to one another, and the new equilibrium will involve lower output and a lower interest rate. In the context of this example, the drop in business confidence leads to a leftward shift in *IS*, then the consumer pessimism that follows induces a further leftward shift in *IS*, deepening the recession.

(Interestingly, consumer pessimism can turn out to be a self-fulfilling prophecy regardless of whether or not business confidence actually falls. Suppose that newspapers are completely incorrect in their speculation that business confidence is falling, but lots of people read this speculation and believe it anyway. The *IS* curve will not shift at first because we're supposing that business confidence doesn't actually change. But it will shift when the false speculation scares consumers into saving more. And, there you have it, worries of a looming recession push the economy into recession even if there was no recession looming to begin with. What does this mean in the context of the hour-by-hour reports we get of this or that encouraging data and this or that discouraging trend in the real world? I'm not sure. A better question: would some news outlets have an incentive to exaggerate certain reports and downplay others in an attempt to artificially sustain good or bad times?)

2. [18 points total, 2 parts] Assume that the economy begins in medium run equilibrium. The central bank decides to expand the nominal money supply.

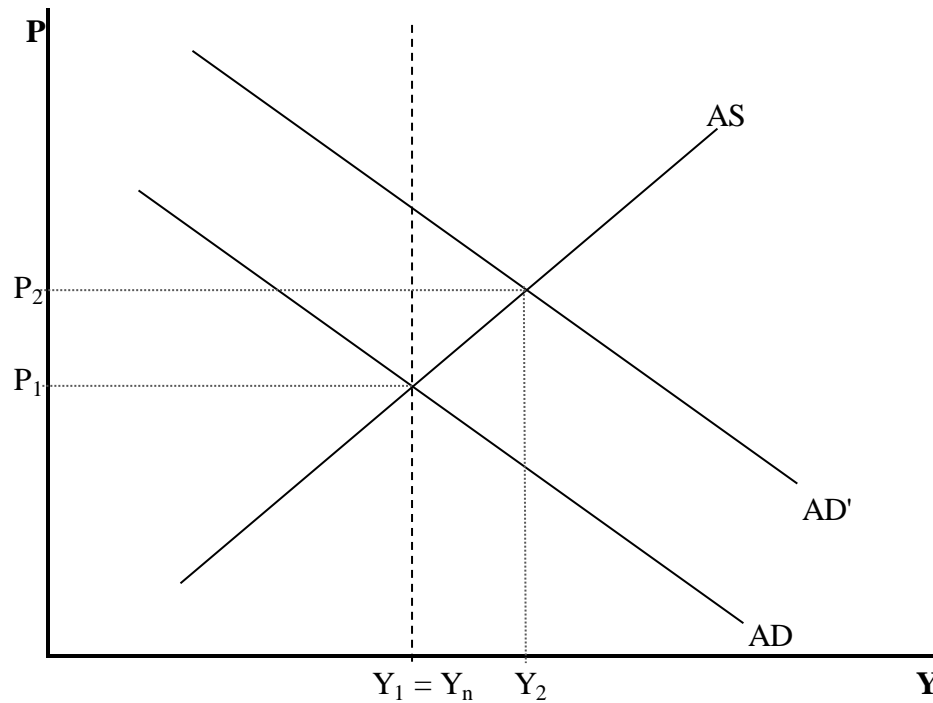
a) [8 points] Illustrate this situation in the *AS-AD* framework. On your graph, make sure to identify:

i. the output level and price level at which the economy starts;

ii. the natural level of output;

iii. the output level and price level corresponding with short run equilibrium in the goods, financial, and labor markets following the monetary policy.

answer:



This is a pretty straightforward scenario that is examined in detail in the textbook and that we have discussed in detail in class. A monetary expansion shifts the aggregate demand curve out. The short run equilibrium after all three markets have adjusted to this change is where the new aggregate demand curve intersects the aggregate supply curve, at a higher output level and price level. The aggregate supply curve does not shift in the short run, and this part is only asking about the short run.

b) [10 points] Now suppose that there are no further policy interventions or other exogenous changes.

i. How does the price level in the original medium run equilibrium compare with the price level in the short run equilibrium that you identified in the previous part directly following the monetary policy? Why?

ii. What happens to investment in the short run? Why?

iii. What will happen to the price level as the economy converges to its new medium run equilibrium? Why?

iv. What happens to investment in the medium run? Why?

answer:

i. The price level clearly rises in the short run, as seen in the graph. The underlying mechanism operates through the labor market. In the instant that the nominal money supply increases, there is downward pressure on the interest rate, because there is suddenly more cash around than people were holding before. This exerts upward pressure on Investment, leading to higher output. To produce more output, firms need to hire more workers, which pushes unemployment down. Lower unemployment increases the bargaining position of workers, leading to higher nominal wage demands, in turn leading firms to set higher prices.

ii. Investment must be higher in the short run. The increase in the nominal money supply pushes the LM curve down, and the price response leads the LM curve to shift only partially back up. On net, output is higher and the interest rate is lower. Both effects serve to increase Investment.

iii. At this short run equilibrium, price expectations are still at the (low) level of the actual price level in the original medium run equilibrium. But the actual price has risen (as explained above). We would therefore expect price expectations to increase eventually. This will lead to higher nominal wage demands and hence higher prices set by firms (and to some workers leaving employment, leading to lower output), and is manifested as an upward shift in AS . This adjustment will continue over the medium run until price expectations converge to the actual price level, at which point AS will have shifted up to where it intersects AD' at the natural level of output. So the price level continues to rise above not only the original medium run equilibrium level but also the short run equilibrium level directly following the monetary policy.

iv. Investment goes back to its original level in the medium run. As price rises due to increasing price expectations over the medium run, the real value of the money supply deteriorates, leading to upward shifts in LM . And since output returns to its natural level when the new medium run equilibrium is reached (and IS has not changed throughout), LM must therefore have shifted back to its original position exactly. Relative to the short run equilibrium directly following the monetary expansion, investment falls over the medium run, because output falls and the interest rate rises as LM shifts. Relative to the original medium run equilibrium, output and the interest rate are the same in the new medium run equilibrium, so Investment must also be the same.