14.02 Quiz #2 SOLUTION

Spring 2014

Time Allowed: 90 minutes

Name:

MIT ID:

Friday Recitation (time):

Lecturer (who teaches you on Monday/Wednesday):

Same format as previous quiz. Ten multiple choice questions with 3 points each, totaling 30 points. 2 Long questions with 35 points each.

Grader Table:

Question	1	2	3	Total
Score				

1. Multiple Choice: 10 Questions, 3 Points each.

1) Assume that the economy is closed (i.e. no import or export). There is an increase in real money supply. What happens to consumption in the Short Run?
   (*Recall that expected price is fixed in the Short Run)
   a. Increase
   b. Decrease
   c. Unchanged
   d. Indeterminate

   [Solution: (A)]

   [Explanation: An increase in real money supply shifts the LM outwards. This correspond to an outward shift of AD. Although price does increase, hence partially reducing real money supply towards the original level, this does not completely counter-balance the initial effect. As such LM intersect IS at higher output level. Higher output lead to higher consumption.]

2) Assume that the economy is closed (i.e. no import or export). There is a decrease in taxes. What happens to interest rate in the Medium Run?
   a. Increase
   b. Decrease
   c. Unchanged
   d. Indeterminate

   [Solution: (A)]

   [Explanation: A decrease in tax shifts IS outward, increasing interest rate. This correspond to an outward shift in the AD, increasing price and output. Expected price changes in the medium run, and in particular, workers revise expected price upward following the price rise; this leads AS to contract over time, eventually intersecting AD at the natural level of output. As AS contracts, price increases, resulting in lower real money supply. As such, LM also contract over time, eventually intersecting IS at natural level of output. IS expanding + LM contracting both results in an increase in interest rate.]

3) The economy has a total population of 100; 25 of which are unemployed, and 20 of which are out of the labor force. What is the unemployment rate?
   a. 20%
   b. 25%
   c. 45%
   d. None of the Above

   [Solution: (D)]

   [Explanation: The information not explicitly stated is the number employed. To get this number, you should subtract total population by the 25 unemployed and 20 out of labor force to get 55. Total labor force is the sum of those employed (55) and unemployed (25), which totals to 80. Alternatively you can calculate total labor force by subtracting total population (100) by the 20 out of the labor force to also arrive at 80. By definition unemployment rate is the fraction of the labor force unemployed. Dividing 25 by 80 gives 0.235, or 23.5%, which is not one of the choices given above.]

4) Which of the following event increases natural rate of unemployment?
   a. Decrease in Government Spending
   b. Increase in Real Money Supply
   c. Formation of a Business Cartel
   d. Weakening of Labor Union

[Solution: (C)]

[Explanation: Business Cartel allows firms to exercise greater market power by the nature of collusion, and thus increase markup. This shifts down the price setting curve, causing it to intersect the wage setting curve at a higher unemployment level. Obviously, a. and b. are not correct because they only affects unemployment in the short run. Note that D is also not correct. It is important to understand that in the context of the model covered in class, Labor Union cannot affect real wage, and this is by the nature of the price setting curve. No matter how hard labor union try to negotiate a higher nominal wage; firm can just respond by setting the price at (1+m) multiple of the wage. Higher nominal wage do benefit workers as long as price is fixed; but as soon as we allow price to change, this gain disappears. On the other, hand labor union does affect the wage setting curve. By holding out, less are working (higher unemployment), at any given real wage. Weakening labor would of course have the opposite effect, corresponding to a decrease in z, and leftward shift in wage setting curve.

5) Assume that expected inflation follows the second case covered in class ($\pi_t^e = \pi_{t-1}$). What inflation level is consistent with the government maintaining output below the natural level.
   a. Positive Inflation
   b. Negative Inflation
   c. Zero Inflation
   d. All of the above

[Solution: (D)]

[Explanation: With the given form of expected inflation, the modified (a.k.a. expectation augmented) Phillips Curve slopes downward. Recall that unlike the Phillips Curve, which has inflation on the axes, the modified Phillips Curve instead has change in inflation. Tracing along the modified Phillips Curve, when output below natural level, inflation is decreasing. However, this has no implication on the actual level of inflation. Inflation could have been decreasing from 10 to 8, from 2 to 0, or from 0 to -2. Hence a,b,c are all possible levels of inflation.]

6) Which of the following would result in a real appreciation of the United States Dollar with respect to the British Pound?
   a. Increase in Dollar per Pound nominal exchange rate
   b. Increase in Price Index of United Kingdom (Britain)
   c. Increase in Price Index of United States
   d. None of the Above

[Solution: C]

[Explanation: Recall the definition of the real exchange rate $\epsilon = \frac{PE}{P^*}$, with P the domestic price, P* the foreign price, and E the nominal exchange rate. First note, that domestic here correspond to United States (because the currency we care about is United States Dollar). Increasing P result in increase in ϵ per the equation. It is clear that increase P* will have the opposite effect. A little tricky is that 'Dollar per Pound nominal exchange rate' is not E but 1/E. If I give you more dollar per pound, the USD faces a nominal deprecation]

7) Country A is a small open economy. An external shock led to the immediate appreciation of its currency with respect to the United States Dollar. Investor's expectations are not affected. What happens to interest rate in Country A.
   a. Increase
   b. Decrease
   c. Unchanged
   d. Uncertain

[Solution: A]

[Explanation: Recall the interest parity condition $(1 + i_t) = (1 + i_t^*)(\frac{E_t}{E_{t+1}^e})$. The situation above correspond to an increase in E_t. Note that since we assume investor expectation are not affected, thus E_{t+1}^e does not change. Since i_t^* is exogenous, i_t has to adjust for the solution to hold by increasing.]

8) Countries O and C are identical in all aspect, except that O is an open economy while C is a closed economy. The government in both countries decide to increase spending. Assume that prices are fixed. How does the resulting change in GDP differs.
   (*Answer this question based on the content of chapter 19. For those that read ahead to later chapters; you may further assume that exchange rate is not fixed)
   a. GDP increases in C but decreases in O
   b. GDP increases in both countries, but more so in O
   c. GDP increases in both countries, but more so in C
   d. GDP increases in both countries, by the same amount

[Solution: C]

[Explanation: To analyze this question, think about the goods market. The domestic demand schedule Z=I+C+G, is steeper than ZZ=I+C+G+X-IM/ϵ, the corresponding schedule in the open economy. This is because import increases with output, ultimately reducing the multiplier effect. Note that chapter 19 analysis focus solely on the goods market.

If you instead chose to analyze this question in the context of IS/LM model, you would have to take into account movement in both interest and exchange rate. If the exchange rate was fixed. Then interest rate is also fixed. Government spending shift IS outward resulting in higher interest rate. Of course, compared to closed economy, the magnitude of this shift will be smaller according to the multiplier effect argument above. However the analysis does not end here. To prevent interest rate from increasing, government would have to implement expansionary

monetary policy, further increase output; Of course from the information given, we cannot know whether this secondary adjustment pushes output further than closed economy level or not. But one could imagine a scenario where B is a valid answer.

And this is why I explicitly state that exchange rate is flexible in the asterisk note. Government spending shift IS outward resulting in higher interest rate. Again this shift is smaller than what it would have been in closed economy. IS shift lead to higher interest rate and hence exchange rate, as money flow into the country to buy high yielding bonds. With the appreciation of the currency, Net Export decreases per the Marshall-Lerner condition, thus decreasing output towards the original level. This secondary effect strengthen the conclusion that output increases less in the open economy, compared to the closed economy.

Of course it is not my intention for you to be able to go through all this analysis during the quiz, hence why I asked you to only think about the goods market]

9) Following a real appreciation, which of the following scenario is consistent with Marshall–Lerner condition holding. Assume Net Income from abroad and Net Transfer does not change.
    a. Capital Account initially deteriorate but eventually improves
    b. Current account initially deteriorate but eventually improves
    c. Capital Account not affected
    d. Current Account not affected

[Solution: A]

[Explanation: First note that current account is NX +NI+NT; and we assume the latter two are constant. By definition, capital account + current account sum to zero; so as capital account improving correspond to current account deteriorating. Marshall–Lerner condition state that an increase in real exchange rate result in decrease in NX. Decrease in NX translate to decrease in current account (i.e. deteriorating)]

10) THIS QUESTION HAS BEEN REMOVED

2. Long Question: IS/LM-AS/AD in closed economy. Total 35 points.

Consider the closed economy IS/LM-AS/AD model covered in class. You may find it useful to draw out these graphs in answering the questions, but they are not necessary for the solution.

$$IS: Y = C(Y - T) + I(Y, i) + G$$

$$LM: M^s/P = M^d(i, Y)$$

$$AS: P = P^e F(u, z)[1 + m]$$

Investment has initial value I_0. Output is initially at the natural level Y^n. Consider an increase in Government Spending $\Delta G > 0$. Assume for now that both price and expected price are fixed. Also assume throughout that government does not implement any other policy than what is stated.

   a.   Denote the resulting Investment level I_1. How does I_1 compare to I_0 ? (7 points)

[Solution: Indeterminate]

[Explanation: With an increase in government spending, IS shift outward, along the (positively sloped) LM curve. Note that since price is fixed, LM does not shift. This results in increase in both output and interest rate. Now consider $I(Y, i)$. It is increasing in Y but decreasing in i. As such the effect on investment is indeterminate. On the one hand investment increases since output increase. However it also decreases since interest rate increases. I_1 can either be higher or lower than I_0 .]

Now assume that price is flexible, but expected price is still fixed.

   b.   How does price P compare with initial value? (3 points)

[Solution: Price Increases]

[Explanation: The outward shift on IS translates to an outward shift in AD. Since AS is upward sloping, this results in a higher price. Note that AS does not shift since expected price is still fixed]

   c.   How does real money demand M^d compare with initial value? (3 points)

[Solution: M^d Decrease]

[Explanation: From b. we know that price increases. Since nominal money supply is constant, this implies that real money supply decreases. Equilibrium in the money market state that real money supply equal to real money demand, so real money demand also decreases]

   d.   Denote the resulting Investment level I_2. How does I_2 compare to I_1 ? (6 points)

[Solution: $I_2 < I_1$]

[Explanation: A decrease in real money supply shift LM inwards. This leads to a decrease in output and higher interest rate, when compare to the situation when price was fixed. Both decreasing output and higher interest rate result in lower Investment]

Now, analyze the economy in the medium run.

    e. How does Output Y compare with initial value? (6 points)

        [Solution: Same value/ No change]

        [Explanation: AS will continue to shift inward until it intersect AD at the natural level of output; By definition, this is when the medium run occurs. So Y does not change from initial value in the medium run]

    f. How does Investment I compare with initial value? (3 points)

        [Solution: Decrease]

        [Explanation: We know from part e. that output does not change, so the only thing that can affect Investment is interest rate. In both a. and d. we figured out that interest rate increases in the short run. In the medium run, AS shift inwards; and this correspond to (further) inward shift in LM. Thus, interest rate increases even further. Increase in interest rate result in lower investment. In the end government spending has displaced investment, with actual change in total output]

Instead of an increase in government spending, consider an exogenous decrease in consumption. In particular, let $C(Y - T) = c_0 + c_1(Y - T)$. So that this corresponds to $\Delta c_0 < 0$.

    g. Assume that Δc_0 is so huge that, in the short run (expected price fixed; price flexible), interest rate move to a point close to zero. Several years have gone by, but output still does not approach the natural level. What could be going on? (7 points)

    [Solution: Liquidity Trap; Note you don't need to know this word; as long as you argue that monetary policy is not effective when interest rate reaches lower bound]

        [Explanation: AS has to shift outward for output to return to natural level. This correspond to outward shift in LM. However at interest rate zero, monetary expansion is no longer effective. Despite an outward expansion, LM will still intersect IS at the same output level. The AS can continue to shift outward forever, but it will never intersect AD at the natural level of output.

This is because AD is vertical beyond a certain output (which in this case turns out to be below natural level).]

3. Long Question: Prices, Expected Inflation, and Phillips Curve. Total 35 points.

In this question, assume that the AS relationship, at any given time t, has the following function form

$$AS: P_t = P_t^e F(u_t, z)[1 + m]$$
$$\text{with } F(u, z) = e^{z - \alpha u_t}$$

Restating the AS relationship in term of inflation will help solve the following questions. For now, assume that expected inflation follows the first case covered in class ($\pi_t^e = 0$). Unless explicitly stated, assume that the government does not implement fiscal nor monetary policy.

   a. Draw the Phillips Curve. Be explicit about the intercepts and the slope. (7 points)

   [*Solution: The Phillips Curve depicts the relationship between inflation and unemployment. On the horizontal axis should be unemployment, and the vertical axis should be inflation – although points will not be taken off if you reverse this. This line should be linear with a negative slope equal with magnitude alpha. This line should cross the horizontal axis at the natural rate of unemployment: $\frac{m+z}{\alpha}$.]*

   [Explanation: To understand the Phillips Curve is linear would require you to understand the equivalency of the given AS equation with the linear inflation equation. You should realize that this AS equation is the exact one used in class; so if you remember the inflation equation, you could simply state it. Otherwise you can repeat the derivation in class by taking natural log and subtracting both sides by the natural log of last year inflation.]

   b. Suppose a new law have passed, weakening labor union. What happens to the natural rate of unemployment? (7 points)

   [*Solution: natural rate of unemployment decreases]*

   [Explanation: Same Multiple Choice #4]

   It should be noted that even though you answered incorrectly here (i.e. increase), you can still score full points in the following sections, because the concept tested below is how economy transition to new natural rate of unemployment, not particularly which direction the transition happens

c. Assume that at time zero ($t = 0$), output is at the natural level (i.e. $Y_0 = Y^n$). The labor union law in b) is passed at $t = 1$. How does price P_1 compare with initial price level P_0 . (3 points)

   [Solution: Price decreases]

   [AS/AD Explanation: First note that as natural rate of unemployment decrease, the natural level of output increases. $\pi_t^e = 0$ implies that $P_1^e = P_0$. By definition the AS curve at t=1 intersect the vertical line representing this new natural level of output $Y^{n'}$ at $P = P_1^e = P_0$. This implies that AS has shift outward, compared to AS at t=0. Since AD is downward sloping, this results in higher output and lower price. Note that output is still below natural level. At $P = P_0$, supply is at $Y^{n'}$, exceeding the demand of Y_0 so AS and AD must intersect at a level between these two values.]

   [Phillips Curve Explanation: Increase in z shift Phillips curve down/left, intersecting the X-axis at a lower natural rate of unemployment. The goal here is to figure out where on the Phillips curve is the economy at. Could we immediately reach this new (lower) natural rate of unemployment? We know that this rate implies zero inflation, so the transition would involve higher output without lowering price. This is impossible, as you cannot induce increase in demand without lowering price. The same argument rules out any unemployment rate below the new natural rate. On the other hand, could we linger at the old natural unemployment rate? Tracing the Phillips curve, we find that this unemployment rate can be achieved with negative inflation. But if prices fall, demand must have increased, a contradiction. A similar argument rules out any rate above the old natural unemployment rate. So the only range of unemployment rate feasible is the open interval between the old and new natural rate. In that inflation is negative, so price decreases. Furthermore the unemployment rate is below the old natural rate (which is where the economy starts at), so output must have increased.]

d. Now consider $t = 2$. How does output Y_2 , the output at $t = 2$, compare to Y_1 , the output at $t = 1$? (4 points)

   [Solution: Output increases]

   [Explanation: from part c, we know that economy has not reached the new natural unemployment rate yet, so again we are transitioning from an unemployment rate above the natural output towards the new natural output. All arguments above applies, so the same conclusion is reached. Price decreases and Output increases]

e. Suppose that the government is happy with output Y_2 . If the government wants to forever maintain output at this level, does this require any intervention (i.e. a fiscal or monetary policy)? If the answer is yes, outline what it has to do from $t = 3$ onwards. If answer is no, explain why not? (7 points)

[Solution: Expansionary Fiscal or Monetary policy on period t=3, <u>as well as all subsequent periods</u>.]

[Explanation: From previous section, we found out that if left alone, economy will transition towards the new natural unemployment rate, with output increasing and price decreasing each period. To keep output at Y_2 value, something must in done. We want a policy would decrease output (reversing the increase), and increase price (reversing the decrease). Any contractionary policy (fiscal/monetary) will do. This policy will must implemented indefinitely, because if we were to only implement it for, say only at t=3, the economy will continue returning towards natural output level from t=4 onwards. Also note that practically monetary policy is better solution, because you cannot continue to decrease G or increase T indefinitely as their supports are bounded.]

f. Now assume that expected inflation follows the third case covered in class ($\pi_t^e = \pi_t$). How does your answer from part c) and d) change? (7 points)

[Solution: Price would decrease as in c), but Output would not change as in d)]

[Explanation: Increase in z shift the modified (a.k.a. expectation augmented) Phillips curve leftward. $\boldsymbol{\pi_t^e = \pi_t}$ implies that $P_1^e = P_1$. This is exactly the condition required for economy to be at natural rate of unemployment. This is consistent with a vertical modified Phillips curve. Lower unemployment translate to higher output. To increase output demand, price must have decreased. Note all of this occurs at t=1. No further transition occur at t=2]

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Spring 2014

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