Economics 102
Introduction to Macroeconomics
Prof. Alan Deardorff
Final Exam - Answers

April 27, 1999

PART A: Multiple Choice
2.5 points each: 45 points total)

1. **d**
2. **b**
3. **e**
4. **d**
5. **c**
6. **d**
7. **b**
8. **a**
9. **d**
10. **a**
11. **e**
12. **e**
13. **d**
14. **c**
15. **c**
16. **b**
17. **b**
18. **e**

PART B: Written Answer
(53 points total)

B1. (16 points) Use the information below about a hypothetical economy to answer the following questions.

- The money supply has been growing by 10% each year for the past ten years.
- The annual rate of inflation has been 10% for the past ten years.
- Nominal wages have been increasing by 10% each year for the past ten years.
- The economy has experienced no growth in productivity for the past ten years.
- The required reserve ratio in this economy is equal to 20%.
- No individuals in this economy hold any money as cash.
- Banks never hold excess reserves.
- The real interest rate is 5%.
- At the beginning of the year 2000, the total money supply was $20,000.

(a) What is the nominal rate of interest in this economy? (1 point)

Ans: nominal = real + inflation = 5 + 10 = 15%

(b) Do you think that this economy is producing at the natural rate (or full employment level) of GDP? Carefully explain your reasoning. Draw a diagram if you think it will help your explanation. (3 points)

Ans: Yes. The rate of inflation has been constant for a long time (10 years), so that people surely expect it. Yet only at the natural rate of unemployment do prices rise just as fast as expected.

(c) What are the levels of (3 points)

(i) Total Reserves;
(ii) Total Loans; and
(iii) Total Demand Deposits (i.e. the total amount of money in checking accounts in this economy)?

Ans: Total Reserves = reserve requirement × money supply = 0.2 × 20,000 = $4,000

Total Loans = money supply – reserves = 20,000 – 4,000 = $16,000

Total Demand Deposits = money supply (since nobody holds cash) = $20,000

(d) At the beginning of the year 2001, the central bank in this economy (i.e. the Fed) increases the required reserve ratio to 25%. By how much, and in what direction, does the money supply change? (4 points)

Ans: Before we had \$4000 = reserves = 0.20 × money supply = 0.20 × 20,000
Now must have \$4000 = reserves = 0.25 × money supply, which means money supply = \$4000 / 0.25 = \$16,000. Therefore, the money supply falls from \$20,000 to \$16,000, for a fall of \$4000.

(e) If the economy moves *immediately* to a long run equilibrium following this decrease in the required reserve ratio (that is, do *not* assume we have an upward sloping Short Run Aggregate Supply curve), what will the rate of inflation be for the year 2001? (2 points)

Ans: This (obviously) should have read "increase" in the required reserve ratio. From part (d) we know that the money supply has fallen from \$20,000 to \$16,000, a drop of 20%. In a long-run equilibrium, the price level must also drop by 20%, and since it does that here in just one year, that is a negative rate of inflation of –20%.

(f) Suppose that this change does *not* affect the nominal rate of interest. That is, assume that the nominal interest rate remains at the level you calculated in part (a). Suppose you had taken out a loan at the beginning of the year 2001 at this fixed interest rate, prior to the change in monetary policy. After the increase in the required reserve ratio, would you be better off or worse off than you had anticipated? Explain! (3 points)

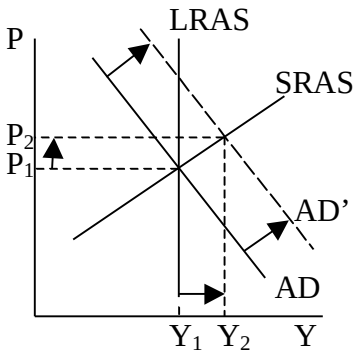
Ans: You'd be worse off. The nominal amount that you must pay back is fixed at the beginning of 2001 based on the old interest rate, but the real value of this nominal amount now rises by 20% due to the falling price level.

B2. (19 points) Imagine that the economy of Michigan (think of Michigan as a country) is initially in a long-run equilibrium. Then the Michigan State Legislature announces a new program of road construction that will cost an extra \$500 million dollars each year. All Michigan residents were under the impression that their State representatives cared nothing for the quality of their roads, and so were initially taken by surprise at the announcement of this new expenditure.

(a) Draw an AS/AD diagram in the space below illustrating the *short-run* effects of this new road construction policy on
- the price level,
- equilibrium GDP, and
- the level of unemployment

in Michigan. You must also provide a brief explanation of your diagram. Your explanation must include reasons why you shift any curves in your diagram! (4 points)

Ans: The increased government purchases (of construction services) constitutes an increase in aggregate demand, shifting the AD curve to the right. This causes, as shown in the diagram, both an increase in the level of GDP, from Y_1 to Y_2, and an increase in the price level, from P_1 to P_2. The increase in output also requires additional labor to produce it, and therefore the rate of employment rises and the rate of unemployment falls.

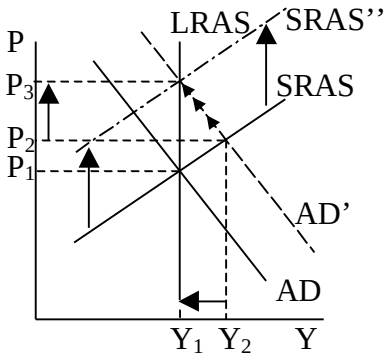


Now use words and a diagram to analyze the *long-run* effects of this policy on

- the price level,
- equilibrium GDP, and
- unemployment.

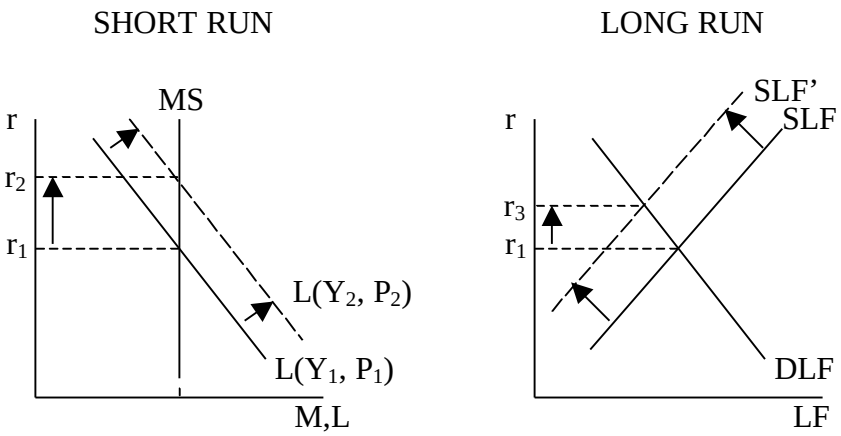
Your diagram and your explanation must make clear how the economy moves from a short-run equilibrium to a long-run equilibrium. Again, any curve shifts must be fully explained! (5 points)

Ans: After the short-run move to Y_2 and P_2, the price level is above what had been expected (P_1). Over time, therefore, price expectations are revised upward, and as the expected price rises, the SRAS curve also move vertically upward (and to the left). This moves the equilibrium along the AD' curve as shown by the small arrows, continuing until the economy has moved back tot he long-run aggregate supply curve, LRAS. The new long-run equilibrium is at the old level of output, GDP=Y_1, and at a still higher price level, P_3. Since output returns to its old level, so does the unemployment rate, therefore rising from the lower value that it reached in the short run.



(b) Now draw two diagrams below, one illustrating what will happen to the interest rate in the short run as a result of this policy, the other illustrating the long-run effects of this policy on the interest rate. Again, your diagrams *must* be accompanied by an explanation. (5 points)

Ans: In the short run, both Y and P rise, increasing the demand for money and shifting the demand for money curve (L) to the right. This causes the equilibrium interest rate to increase. The long run effects of the increased government purchases can be seen in the loanable funds market, where the increase spending reduces the government budget surplus and thus shifts to the left the supply of loanable funds curve. This also increases the (long-run) equilibrium real interest rate.

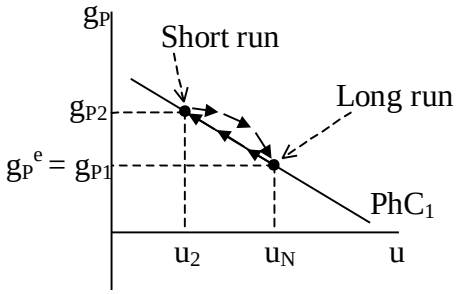


In the space below draw a Phillips Curve diagram and use it to illustrate the effects of this policy. Show *both*

- the short-run equilibrium and
- the long-run equilibrium

corresponding to parts (a) and (b). You do *not* need to worry about showing the transition from the short-run equilibrium to the long-run equilibrium. You may assume either that the money supply is constant throughout, or that it grows over time at a constant annual rate. Briefly explain what is going on in your diagram. Once more, fully explain any curve shifts! (5 points)

Ans: We start in a long-run equilibrium at the natural rate of unemployment, u_N, and with an actual rate of inflation, g_{P1}, equal to the expected rate of inflation, g_P^e. (If the money supply is growing over time, then these are positive, as shown. If not, then (with zero productivity growth) both would be zero and the initial equilibrium and the initial Phillips Curve PhC_1 would both be shifted down to the horizontal axis.) In the short run, now, the fiscal expansion increases Y and reduces u below u_N. The economy moves to the left and up along the Phillips curve, to the lower unemployment rate u_2 and the higher rate of inflation g_{P2}. Over time, the higher rate of inflation reduces the real money supply, contracting the economy, while at the same time it is possible that expectations of inflation also adjust. So the path that will be followed by the economy is hard to know. But we do know that since the rate of monetary expansion is unchanged, ultimately in the new long equilibrium there must be the same rate of inflation as before. And to be a long-run equilibrium, unemployment must also return



to its natural rate, since anywhere else prices will be changing at an unexpected rate. Together these facts tell us that the economy must return in the long run to the same equilibrium it was at before all this happened, at $u=u_N$ and $g_P=g_{P1}$.

B3. (18 points) This question is comprised of four statements. You must say whether these are true, false or uncertain and EXPLAIN WHY. Your explanation alone will determine the grade you receive. *If you simply write true, false, or uncertain without an explanation you will receive* ***NO CREDIT.***

(a) In a closed economy National Savings must always be equal to domestic Investment, while in an open economy, National Savings is always greater than domestic Investment, with the difference between the two being Net Foreign Investment. (4 points)

Ans: FALSE. It is true that NFI = National Savings – Domestic Investment, but NFI can be positive or negative. If it is negative (that is, if foreigners are acquiring more of our assets than we are acquiring of theirs), then domestic investment will be larger than national savings, the difference financed by foreigners.

(b) The Aggregate Demand curve will be steeper if the demand for money does not depend upon the price level than if it does depend upon the price level. (5 points)

Ans: True. There were three reasons for the AD curve to slope down instead of being vertical – that is, for a fall in the price level to increase GDP. One reason had to do with an effect on real wealth, and that still works here. But the other two reasons stemmed from the fall in the interest rate that would be caused, if demand for money depends on the price level, when a fall in P reduces L and requires a drop in r to restore equality of supply and demand for money. If demand for money does not after all depend on P, then demand for money does not decrease when P falls, the interest rate therefore does not fall, and neither investment nor net exports (via the exchange rate) increase to contribute to any resulting increase in income. With only the wealth effect working, a fall in P therefore causes a small increase in Y, meaning a steeper AD curve.

(c) If government spending increases by $100, then the Aggregate Demand curve shifts horizontally by *more* than $100, but the short-run change in equilibrium output will be *less* than $100. (5 points)

Ans: FALSE. The multiplier effect of this increase in government spending does tend to lead to a shift in AD that is more than $100, as production for the

government stimulates income and therefore consumption. And it is also true that if the SRAS curve slopes up, this will cause a rise in the price level that has a dampening effect on the increase in income, so that the actual change in Y is smaller than the horizontal shift in AD. But the dampening effect of P need not be large enough to reduce the change in income below $100. If the AD curve is very steep (or the SRAS curve almost flat), then Y will rise almost as much as this shift, and therefore the change could easily be greater than $100.

(d) If the US restricts imports from Europe, then this will cause an increase in Net Exports at every Real Exchange Rate, but the Real Exchange Rate will appreciate so that in the long run Net Exports do not change in equilibrium. (4 points)

Ans: TRUE. In equilibrium Net Exports must equal Net Foreign Investment (NFI) in order for the market for foreign currency exchange to clear. That is, whatever net dollars people are demanding in order to buy our net exports must be supplied by somebody wanting to invest abroad. But NFI does not depend upon the real exchange rate, E, which also does not matter in the long run for other things (like the interest rate) upon which NFI does depend. So import restrictions, which would increase net exports if the exchange rate didn't change, simply cause an excess demand for dollars that in turn requires the dollar to rise in value until the market is cleared. Since the appreciation does not matter for FDI, the entire adjustment to equilibrium must occur in trade, where the higher dollar reduces exports and increases imports after all until net exports are pushed back to their original level. All this is illustrated in the graph below.