

# ECONOMICS 110/112\*

## Assignment #6/#3 – Suggested Solutions

2011/2012

### Due Dates and Notes:

- **DUE:** By **Friday March 23, 2:00 PM**. Completed assignments should be placed in the slot marked for your section in the white assignment collection box on the 2<sup>nd</sup> floor of Dunning Hall. Late assignments will not be accepted.
- Use the **Cover Page** when submitting assignments.
- **Group Work:** Maximum **four** per group, all students must be registered in the **same section of the same course**. Names must be in **alphabetical order** on the cover page.
- Graded work will be available for pick-up beginning on the afternoon of Friday April 6 in the Econ Distribution Center, Dunning Hall Room 334. You will require your **student card**.
- This assignment covers material from Chapters 24-29 of the text.

### True, False, or Uncertain

[48 marks - 6 marks each]

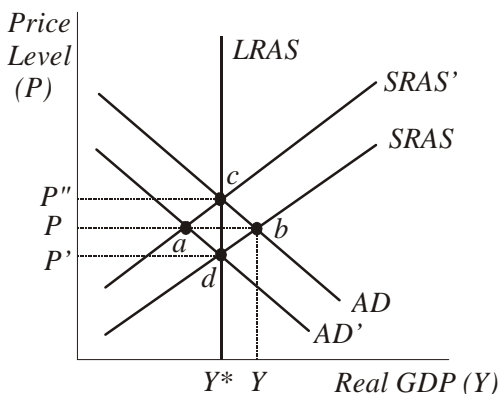
Explain why each of the following statements is True, False, or Uncertain according to economic principles. Use **diagrams where appropriate**. Unsupported answers will receive no marks. It is the explanation that is important.

- A6-1.** Suppose an economy originally in long run equilibrium experiences a positive aggregate demand shock. Without government intervention, the economy will never return to long run equilibrium.

**False.**

As shown in the diagram below, the positive aggregate demand shock ( $AD'$  to  $AD$ ) moves the economy from a short (and long) run equilibrium at point  $d$  to a new short run equilibrium at point  $b$ .

At  $b$ , the economy has an inflationary gap. That is, output is above that which produces full employment so unemployment is very low (factor usage is above normal). This excess demand in the labour market causes upward pressure on real (and nominal) wages. As wages (and other factor prices) rise,  $SRAS$  shifts to the left to  $SRAS'$  until output is restored to  $Y^*$  and unemployment is again at the natural rate. The new long-run equilibrium is at point  $c$  in the diagram below.



**A6-2.** Over the next several decades, the labour force in Japan is predicted to shrink as the population ages. If there is no change in labour productivity over this time period, then long run GDP can be predicted to decline.

**True.**

Start off with the definitional equation:

$$GDP = GDP$$

If we multiply and divide the RHS by both  $L$  (the labour force) and  $E$  (the number of employed workers) and rearrange, we obtain:

$$GDP = L \times (E/L) \times (GDP/E)$$

In the long run however, GDP tends to its potential which is associated with a “normal” employment rate. Therefore, if labour productivity is constant, then a decrease in the labour force will result in a decrease in GDP.

**A6-3.** If an aggregate production function exhibits constant returns to scale then a doubling of the labour force leads to a doubling of aggregate output.

**False.**

Constant returns to scale (CRS) means that if all inputs are doubled, output will double. Using the aggregate production function in the text this means that:

$$\text{If } Y = F_T(L, K, H) \text{ then, if } F(\dots) \text{ exhibits CRS, } 2Y = F_T(2L, 2K, 2H),$$

where  $F_T$  is production with average technology  $T$ ,  $L$  is the labour force,  $K$  is the capital stock and  $H$  is the stock of human capital. In terms of the aggregate production function discussed in some classes, this means that:

$$\text{If } Y = F_{TH}(L, K) \text{ then, if } F(\dots) \text{ exhibits CRS, } 2Y = F_{TH}(2L, 2K),$$

where  $F_{TH}$  is production with average technology  $T$  and average level of human capital  $H$ ,  $L$  is the labour force, and  $K$  is the capital stock.

Diminishing marginal product tells us that, using either production function, if only labour ( $L$ ) is doubled, output will increase, but will not double. That is:

$$2Y > F_T(2L, K, H) > F_T(L, K, H) = Y \quad \text{or} \quad 2Y > F_{TH}(2L, K) > F_{TH}(L, K) = Y$$

Intuitively, this is because each worker has less capital to work with. In the first case this means less physical and human capital per worker, while in the second, it means less physical capital per worker.

- A6-4.** If the public holds all of their money in the bank and the target (desired) reserve ratio of commercial banks is 10%, then an increase in reserves of \$100 leads to an increase in the money supply of \$90 in the second round of money multiplier process, and an increase in the money supply of \$1000 once the money multiplier process is concluded.

**True.**

*The initial increase in reserves leaves the banking system with excess reserves equal to \$100. So banks increase loans by \$100. When the loan is spent the recipient deposits the money in the bank. Therefore reserves are again \$100 higher than the original level, but deposits (the money supply) have also increased by \$100. This is the first round of the money multiplier process. Now, in order to have a prudent reserve for the new \$100 worth of deposits, banks will wish to hold  $\$100 \cdot 0.10 = 10$  higher reserves than the initial level, leaving \$90 as excess reserves, which are loaned out. When the recipient of the spending deposits the money in the bank, the money supply has increased by a further \$90. This is the second round of the money multiplier process. When the process is concluded, the money supply (deposits) will grow by  $1/0.10 = 10$  times the increase in reserves, or \$1000.*

- A6-5.** The increased availability of credit cards over the last 20 years has resulted in an increase in the money supply.

**False.**

*Credit cards are considered to be a “money substitute”. They serve as a medium of exchange, but not as a store of value. Even their role as a medium of exchange is only temporary, since consumers must use true money balances to make payments on their credit card loans. Credit cards are therefore not best thought of as money, but rather pre-approved loans available to consumers on request.*

- A6-6.** Suppose a \$1000 bond pays annual “coupon interest” equal to 10% and matures in two years time. If the yield on bonds with similar risk characteristics is 3%, the price of this bond today is greater than \$1000.

**True.**

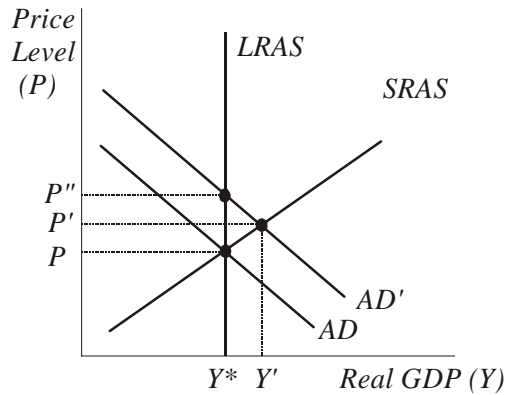
*The price of a bond is the present discounted value of the future cash payments from the bond where the required yield is rate of interest used in discounting. Therefore the price of this bond will be equal to:*

$$P_B = PV = 100/(1.03) + 1100/(1.03)^2 = 97.09 + 1036.86 = 1133.95$$

**A6-7.** In the long-run, the money supply is neutral with respect to (does not affect) real GDP.

**True.**

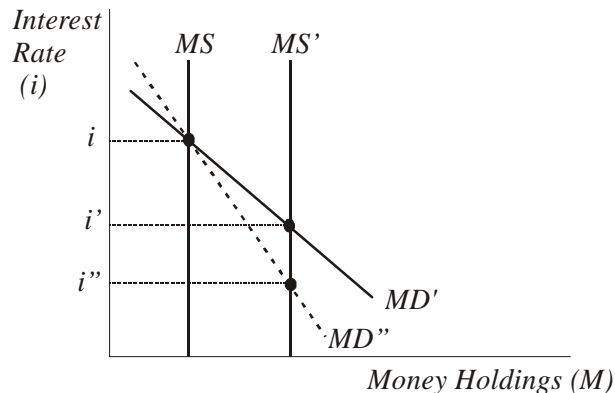
The money supply affects the aggregate demand curve. This is explained in some detail below in problem A6-10. However, in the long-run, real output is “supply determined” at  $Y^*$ . As shown in the diagram below, an increase in the money supply would shift AD to  $AD'$ . Therefore the economy would move from one long-run equilibrium at  $\{P, Y^*\}$  to a new long-run equilibrium at  $\{P'', Y^*\}$ . So, while the increase in the money supply causes the price level to rise, there is no effect on real GDP ( $Y^*$ ).



**A6-8.** A given increase in the money supply is more effective at shifting the aggregate demand curve the more interest rate responsive (elastic) is the money demand curve.

**False.**

Increases in the money supply are designed to lower the interest rate and shift aggregate demand. In a closed economy the decrease in interest rates increases investment spending, while in an open economy, the decrease in interest rates leads to a depreciation of the domestic currency and an increase in net exports. In either case, it is the decrease in interest rates that is responsible for the increase in aggregate expenditures and thus the shift in AD. As shown below, if money demand is very responsive (elastic) to interest rate changes, like  $MD'$ , the change in interest rates ( $i$  to  $i'$ ) is small compared to the case of an interest rate inelastic money demand like  $MD''$  ( $i$  to  $i''$ ). Since the change in interest rates will be smaller, so too will be the shift of AD.



**Problems** [52 marks - marks for each part as shown]

**A6-9.** Suppose the long-run investment demand and *private* saving supply curves in the market for loanable funds are given by the following equations:

$$I = 2000 - 100r \quad S = 500 + 100r$$

where  $r$  represents the real interest rate in percentage points (eg. 10% is represented by 10), and quantities are in billions of dollars. Assume a closed economy and that initially the government is running a balanced budget (ie. government saving initially equals 0).

(a) What is the equation for national saving? Calculate the equilibrium interest rate, aggregate level of investment in the economy, and the aggregate level of national saving. Illustrate in a diagram. [5]

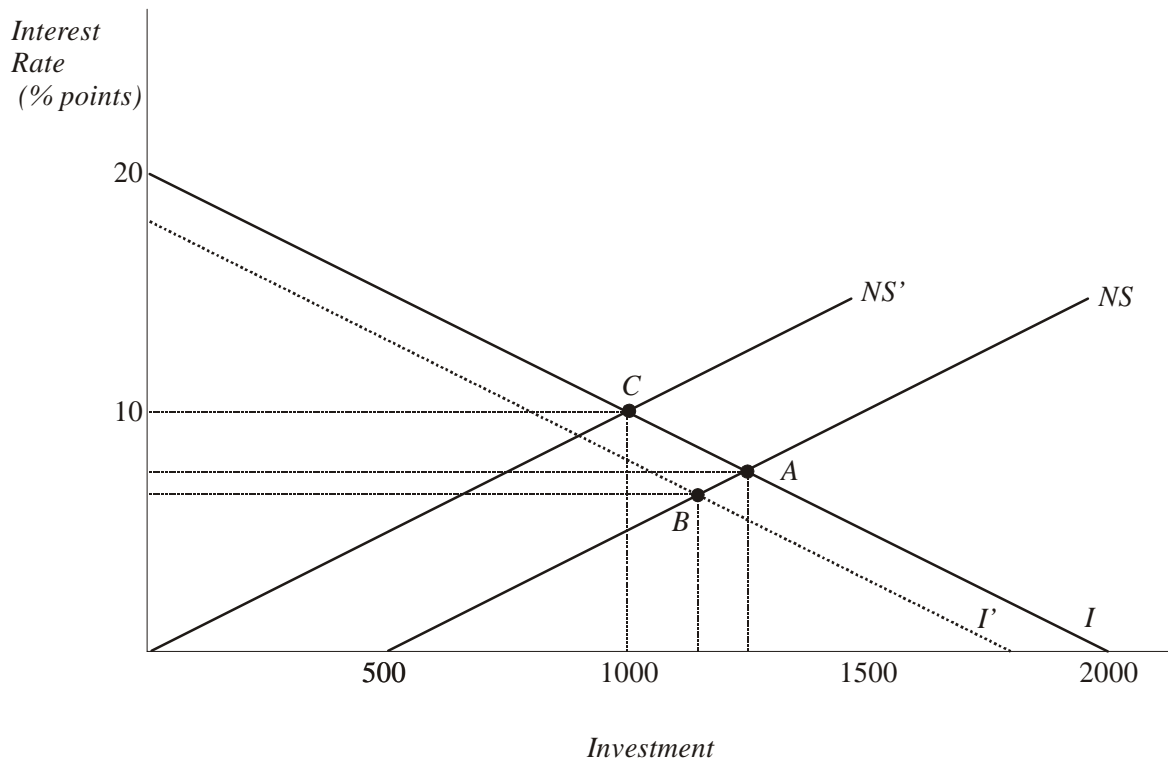
*With a balanced government budget, national saving is equal to private saving as given in the question.*

*Equilibrium requires national saving equals investment:*

$$2000 - 100r = 500 + 100r \quad \Rightarrow \quad 200r = 1500 \quad \Rightarrow \quad r = 7.5$$

*Therefore national saving =  $500 + 100(7.5) = 1250$  and investment =  $2000 - 100(7.5) = 1250$ .*

*See the equilibrium point A in the diagram below.*



- (b) Now suppose that firms revise downward their expectations of the future cash flows from investment projects. Explain why this would lead to a reduction in the demand for loanable funds. [5]

*If firms expect lower future cash flows from their potential projects, they will want to undertake fewer projects, because fewer of these projects can be expected to be profitable. Therefore they will demand fewer loans to finance projects, regardless of the interest rate.*

*The easiest way to show this is by considering the net present value of a project (although it is not necessary to do so formally). The net present discounted value of a project is given by:*

$$NPV = \sum_t \frac{x_t}{(1+r)^t} - C = \frac{x_1}{(1+r)} + \frac{x_2}{(1+r)^2} + \frac{x_3}{(1+r)^3} + \dots - C$$

*where  $x_t$  is the expected value of the cash flows due at time  $t$ ,  $r$  is the rate of interest, and  $C$  is today's cost. If all of the  $x_t$ 's decrease, then all of the numerators decrease. So NPV falls. Thus, fewer projects have a positive net present value so **fewer** loans are demanded to finance these projects. This is a shift to the left of the demand curve for loans – fewer loans demanded at any interest rate.*

- (c) Suppose the event described above results in demand being decreased by 200 at any interest rate. What is the new demand equation? Calculate the new equilibrium. Illustrate in your diagram. [5]

*The new demand for loans is  $2000 - 100r - 200 = 1800 - 100r$ . Equilibrium requires national saving equals investment:*

$$1800 - 100r = 500 + 100r \quad \Rightarrow \quad 200r = 1300 \quad \Rightarrow \quad r = 6.5$$

*Therefore national saving =  $500 + 100(6.5) = 1150$  and investment =  $1800 - 100(6.5) = 1150$ .*

*See the equilibrium point B in the diagram.*

- (d) Return to the original supply and demand conditions. Suppose that the government changes its policy so that in the long-run it will run deficits of 500. How does this affect the level of national saving? Calculate the new equilibrium. What is private saving in the new equilibrium? [5]

*The new supply of loans is  $500 + 100r - 500 = 100r$ . Equilibrium requires national saving equals investment:*

$$2000 - 100r = 100r \quad \Rightarrow \quad 200r = 2000 \quad \Rightarrow \quad r = 10$$

*Therefore national saving =  $100(10) = 1000$ , investment =  $2000 - 100(10) = 1000$ , and private saving is  $500 + 100(10) = 1500$ .*

*See the equilibrium point C in the diagram.*

- (e) Explain why the deficit described above might affect future economic growth in GDP, labour productivity, and GDP/capita. [6]

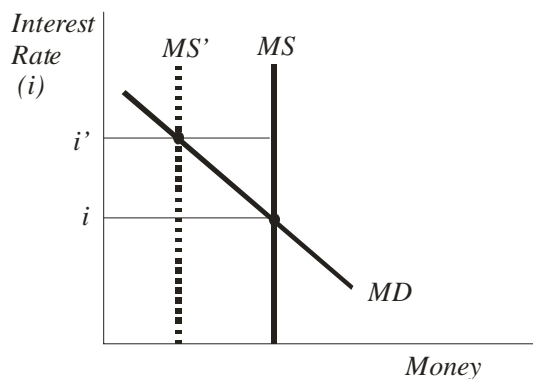
*Since investment falls from 1250 (part a) to 1000 (part d) as a result of the deficit, the future capital stock will be lower than it would otherwise be. This leads to lower output in the long-run (ie. a lower future  $Y^*$ ). This reduction in the capital stock also means lower labour productivity or output per worker or per hour ( $GDP/E$ ) since each worker now uses less capital than they would have had investment not been decreased. Provided the overall population does not deviate from its previous long-run path this also means lower output per capita.*

**A6-10.** Recently the Brazilian central bank decreased its target overnight interest rate. In doing so it is trying to decrease interest rates in the money market

- (a) Explain why the central bank must be willing to increase the money supply to support lower interest rates in the money market. [Hint: Include a diagram of the money market in your answer.] [5]

*As shown in the diagram below, if the money demand function is given by MD, then if the central bank targets a decrease in the interest rate from  $i'$  to  $i$ , then it must accommodate this change by increasing the money supply from  $MS'$  to  $MS$ . If it does not, then the public would be holding less money than it desires at the new interest rate. People would then try to sell bonds to increase their money holdings. However when everyone does this, the price of bonds will fall. Since the price of bonds is the present value of the stream of payments from the bonds, as shown in the formula below, then a decrease in the price of bonds is an increase in the yield (interest rate) on the bonds. So to keep interest rates at  $i$  the central bank must increase the supply of money.*

$$BP = \sum_t \frac{x_t}{(1+i)^t}$$



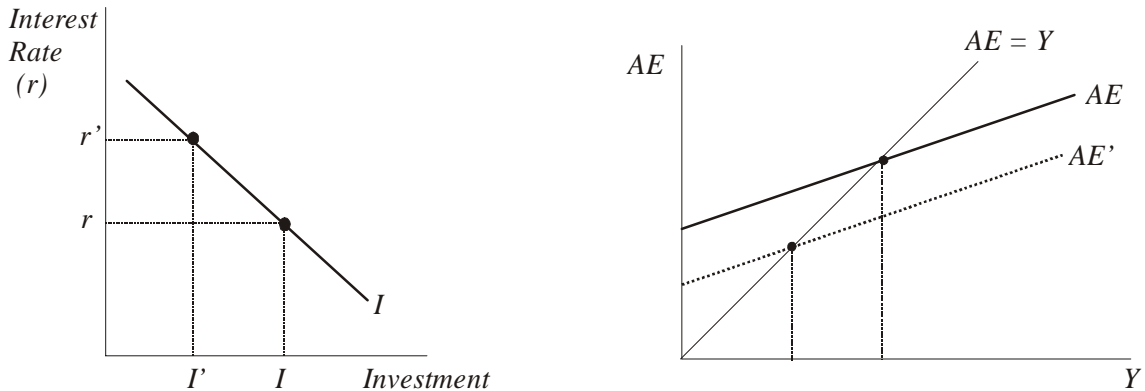
- (b) The central bank can change the money supply is through an open market operation. In this case, should it buy bonds from, or sell bonds to, the banking system? How would the transaction affect the amount of reserves in the banking system? How does the change in reserves lead to the required change in the money supply (measured by deposits in the banking system)? [5]

*In this case, the central bank will engage in an open market purchase of bonds. This leaves the banking system with fewer bonds, but with a higher level of reserves.*

*Given the increase in reserves and since deposits are initially unchanged, this will leave the banking system with excess reserves (a reserve ratio above the desired level). Therefore banks will loan out the excess. The money is deposited back into the banking system allowing loans to expand further until the desired reserve ratio is again reached. In this way, deposits are expanded.*

- (c) Suppose we could treat the Brazilian economy as a closed one. What effect will the results of the policy have on investment, on aggregate expenditure? Include diagrams in your answer. [5]

*The decrease in interest rates will cause a increase in investment spending. This in turn causes aggregate expenditures to rise. In the diagrams below, the decrease in interest rates from  $r'$  to  $r$  causes investment to increase from  $I'$  to  $I$ . This causes aggregate expenditure to shift up by  $I-I'$ , as shown by the move from  $AE'$  to  $AE$ .*

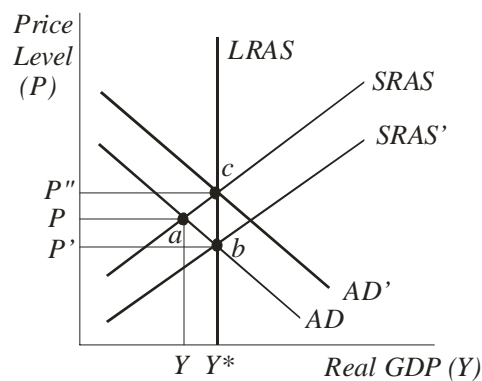


- (d) Similar to Canada, Brazil is an open economy. What additional effect will the policy have on aggregate expenditure? [5]

*With an open economy, the decrease in interest rates will also cause an outflow of capital as “investors” pursue the higher rates of return available elsewhere. In order to move their financial wealth out of Brazil, they must sell Brazilian assets and use the proceeds to purchase other currencies and use these other currencies to purchase other financial assets. The increased supply of the Brazilian currency causes it to depreciate ( $e$  for Brazil rises). This in turn will cause an increase in net exports (exports are now cheaper for foreigners to buy while imports are now expensive for Brazilians to buy). The increase in net exports causes aggregate expenditures to increase, similar to the shift shown above.*

- (e) How will aggregate demand be affected, whether we treat the economy as closed or open? [2]

*In either the closed or open economy, the increase in aggregate expenditures causes aggregate demand to shift to the right. This is shown below as the shift from  $AD$  to  $AD'$*



(f) Under what conditions would this be a stabilizing policy? Explain. [4]

*If the central bank became convinced that the economy was facing a recessionary gap, this increase in the money supply and subsequent shift of AD would be stabilizing. This situation is shown in the diagram above, where the economy is operating at the short-run equilibrium point “a”  $\{P, Y\}$ . Rather than waiting for the economy to adjust naturally to a new long-run equilibrium at point “b”  $\{P', Y^*\}$ , the policy shifts AD to establish a new long-run equilibrium at point “c”  $\{P, Y^*\}$ .*

The material in this assignment is copyrighted and is for the sole use of students registered in Economics 110, 111 and 112. The material in this assignment may be downloaded for a registered student's personal use, but shall not be distributed or disseminated to anyone other than students registered in Economics 110, 111 and 112. Failure to abide by these conditions is a breach of copyright, and may also constitute a breach of academic integrity under the University Senate's [Academic Integrity](#) Policy Statement.