YORK UNIVERSITY

Atkinson College

Department of Economics

ECON 2450 - Midterm Examination

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Suggested Solutions to Part C (C3(d) and C4)

C3 (d). Derive and graph an equation for the aggregate demand curve, expressing *Y* as a function of *P* alone. What happens to this aggregate demand curve if monetary policy changes as in part (c)?

The aggregate demand curve is a relationship between the price level and the level of Income. To derive the aggregate demand curve, we want to solve the *IS* and the *LM* equations for *Y* as a function of *P*. That is, we want to substitute out for the interest rate. We can do this by solving the *IS* and the *LM* equations for the interest rate:

Recall from part (a) the IS equation, equation (1),

$$Y = 3000-50r$$
$$\text{or, } 50r = 3000-Y \qquad (4)$$

Recall from part (b) the money market equilibrium condition, from which the LM equation is derived,

$$(M/P)^s = (M/P)^d$$
$$\text{or, } M/P = 0.5Y-50r$$
$$\text{or, } 50r = 0.5Y-M/P \qquad (5)$$

Combining equation (4) and (5), we find

$$3000-Y = 0.5Y-M/P$$
$$\text{or, } 1.5Y = 3000+M/P$$
$$\text{or, } Y = 2000+(M/1.5P) \qquad (6)$$

So, equation (6) shows the AD curve as a function of M and P.

Since the nominal money supply is 1200, equation (6) becomes

$$Y = 2000+(1200/1.5P)$$
$$\text{or, } Y = 2000+800/P \qquad (7).$$

So, equation (7) shows the AD curve as a function of P only.

To plot the AD curve, we need to find the values of Y for different values of P.

When P = 4, the equation (7) implies that Y = 2000 +800/4 = 2200.
When P = 2, the equation (7) implies that Y = 2000 +800/4 = 2400.
When P =1, the equation (7) implies that Y = 2000 +800/4 = 2800.
When P = 0.5, the equation (7) implies that Y = 2000+800/4 = 3600.

The AD curve does not have any vertical or horizontal intercepts because when P = 0, Y becomes infinity and when Y = 0, P becomes infinity. The curve AD_1 in Figure C3-2 shows the aggregate demand curve, Y = 2000+800/P.

What happens to this aggregate demand curve if monetary policy changes as in part (c)? From equation (6) we know that the AD curve is Y = 2000+(M/1.5P). The increase in the money supply from 1200 to 1400 causes it to become

$$Y = 2000+(1400/1.5P)$$
$$Y = 2000+933.33 /P \qquad (8)$$

By comparing this new aggregate demand curve (equation (8)) to the one originally derived (equation(7)), we see that the increase in the money supply shifts the aggregate demand curve to the right. The curve AD_2 in Figure C3-2 shows the new aggregate demand curve, Y = 2000+933.33/P.

C4. Use the Mundell-Fleming model to predict what would happen to aggregate income, the exchange rate, and the trade balance under both floating and fixed exchange rates in response to each of the following circumstances:

a. The central bank decreases money supply.

b. A stock market boom.

c. A wave of credit-card fraud increases the frequency with which people make transactions in cash.

Use graphs to illustrate your answers.

The following three equations describe the Mundell–Fleming model:

$$Y = C(Y - T) + I(r) + G + NX(e). \qquad (IS)$$
$$M/P = L(r, Y). \qquad (LM)$$
$$r = r^*.$$

In addition, we assume that the price level is fixed in the short run, both at home and abroad. This means that the nominal exchange rate *e* equals the real exchange rate .

a. The central bank decreases money supply.

i) Floating Exchange Rates:

The central bank decreases money supply. We know that equilibrium in the money market requires that the supply of real balances *M/P* must equal demand:

$$(M/P)^s = L(r^*, Y).$$

A fall in money supply means that for unchanged income and interest rates, the left-hand side of this equation decreases. Since *P* is fixed at the initial level and *M* is fixed at the new level, we know that the left-hand side of this equation cannot adjust to restore equilibrium. We also know that the interest rate is fixed at the level of the world interest rate. This means that income—the only variable that can adjust—must fall in order to decrease the demand for money. That is, the *LM** curve shifts to the left, resulting into an increase in the equilibrium exchange rate and a decrease in the equilibrium trade balance and income. An intuitive explanation of the underlying mechanism is the following.

In a small open economy, the interest rate is fixed by the world interest rate. As soon as a decrease in money supply puts upward pressure on the domestic interest rate, capital flows into the economy, as foreign investors seek a higher return at home. This capital inflow prevents the domestic interest rate from rising. In addition, because the capital inflow increases the demand of domestic currency in the market for foreign-currency exchange, the exchange rate appreciates. The rise in the exchange rate makes domestic goods expensive relative to foreign goods and there by, decreases net exports. This, in turn, decreases the aggregate planned spending and thereby, decreases the equilibrium income.

Figure C4-1 shows the case with floating exchange rates where the initial equilibrium is at E_1 and the final equilibrium is at E_2. Income falls, the exchange rate rises (appreciates), and the trade balance falls.

ii) Fixed Exchange Rates

Figure C4-2 shows the case of fixed exchange rates where the economy starts at E_1. The *LM** schedule shifts to the left (explanation is same as the case of floating exchange rates); as before, this tends to push domestic interest rates up and cause the currency to appreciate. However, the central bank sells dollars and buys foreign currency in order to keep the exchange rate from rising. This increases the money supply and shifts the *LM** schedule back to the right. The *LM** curve continues to shift back until the original equilibrium is restored (An alternative explanation: Because the central bank is committed to trading foreign and domestic currency at a fixed exchange rate e_1, arbitrageurs quickly respond to the increasing exchange rate by buying the domestic currency from the central bank, causing the money supply and the LM* curve to return to their initial positions). In the end, income, the exchange rate, and the trade balance are unchanged.

b. A stock market boom.

i) Floating Exchange Rates:

A stock market boom increases the wealth of households which, in turn, increases consumption spending and thereby, increases the aggregate planned expenditures. This shifts the IS* curve to the right, as in Figure C4-3 where the initial equilibrium is at E_1. As a result, the economy moves to a new equilibrium at E_2 with an appreciated exchange rate and a lower level of trade balance, but with no change in the equilibrium income. An intuitive explanation of the underlying mechanism is the following.

In a small open economy, the interest rate is fixed by the world interest rate. An increase in aggregate planned expenditure fueled by the stock market boom tends to increase income which, in turn, tends to increase interest rate because higher income increases the demand for money. As soon as a stock market boom puts upward pressure on the domestic interest rate, capital flows into the economy, as foreign investors seek a higher return at home. This capital inflow prevents the domestic interest rate from rising. In addition, because the capital inflow increases the demand of domestic currency in the market for foreign-currency exchange, the exchange rate appreciates. The rise in the exchange rate makes domestic goods expensive relative to foreign goods and there by, decreases net exports. This fall in net exports offsets the initial expansionary effects of the stock market boom on income.

Why is the fall in net exports so great as to make a stock market boom completely powerless to influence income? To answer this question, consider the equation that describes the money market equilibrium which requires that the supply of real balances *M/P* must equal demand:

$$(M/P)^s = L(r^*, Y).$$

In a small open economy, the quantity of the real money balances supplied $(M/P)^s$ is fixed, and r is fixed at r*, so there is only one level of income that can satisfy this equation, and this level of income does not change because of a stock market boom. Thus, when a stock market boom increases the aggregate planned spending, the appreciation of the exchange rate and the fall in the net exports must be exactly large enough to offset fully the normal expansionary effect of a stock market boom on income.

Figure C4-3 shows the case with floating exchange rates where the initial equilibrium is at E_1 and the final equilibrium is at E_2. The exchange rate rises (appreciates), the trade balance falls and the equilibrium income is unchanged.

ii) Fixed Exchange Rates

Figure C4-4 shows the case of fixed exchange rates where the economy starts at E_1. The *IS** schedule shifts to the right (explanation is same as the case of floating exchange rates); as before, this tends to push domestic interest rates up and cause the currency to appreciate. However, the central bank sells dollars and buys foreign currency in order to keep the exchange rate from rising. This increases the money supply and shifts the *LM** schedule to the right. The *LM** curve continues to shift until the exchange rate returns to the fixed level e_1 (An alternative explanation: Because the central bank is committed to trading foreign and domestic currency at a fixed exchange rate e_1, arbitrageurs quickly respond to the increasing exchange rate by buying the domestic currency from the central bank, causing an increase in the money supply and a rightward shift in the LM* curve. They continue to do this until the exchange rate returns to the fixed level e_1). In the end, the equilibrium income increases with no change in the exchange rate and the trade balance. In this case, at the new equilibrium at E_3, the higher level of M allows income to rise while keeping *r* fixed at *r** and the exchange rate fixed at e_1.

c. A wave of credit-card fraud increases the frequency with which people make transactions in cash.

i) Floating Exchange Rates:

A wave of credit-card fraud increases the frequency with which people make transactions in cash. This means that the demand for money has increased. We know that equilibrium in the money market requires that the supply of real balances *M/P* must equal demand:

$$(M/P)^s = L(r^*, Y).$$

A rise in money demand means that for unchanged income and interest rates, the right-hand side of this equation increases. Since *M* and *P* are both fixed, we know that the left-hand side of this equation cannot adjust to restore equilibrium. We also know that the interest rate is fixed at the level of the world interest rate. This means that income—the only variable that can adjust—must fall in order to decrease the demand for money. That is, the *LM** curve shifts to the left, resulting into an increase in the equilibrium exchange rate and a decrease in the equilibrium trade balance and income. An intuitive explanation of the underlying mechanism is the following.

In a small open economy, the interest rate is fixed by the world interest rate. As soon as an increase in money demand puts upward pressure on the domestic interest rate, capital flows into the economy, as foreign investors seek a higher return at home. This capital inflow prevents the domestic interest rate from rising. In addition, because the capital inflow increases the demand of domestic currency in the market for foreign-currency exchange, the exchange rate appreciates. The rise in the exchange rate makes domestic goods expensive relative to foreign goods and there by, decreases net exports. This, in turn, decreases the aggregate planned spending and thereby, decreases the equilibrium income.

Figure C4-5 shows the case with floating exchange rates where the initial equilibrium is at E_1 and the final equilibrium is at E_2. Income falls, the exchange rate rises (appreciates), and the trade balance falls.

ii) Fixed Exchange Rates

Figure C4-6 shows the case of fixed exchange rates where the economy starts at E_1. The *LM** schedule shifts to the left (explanation is same as the case of floating exchange rates); as before, this tends to push domestic interest rates up and cause the currency to appreciate. However, the central bank sells dollars and buys foreign currency in order to keep the exchange rate from falling. This increases the money supply and shifts the *LM** schedule back to the right. The *LM** curve continues to shift back until the original equilibrium is restored (An alternative explanation: Because the central bank is committed to trading foreign and domestic currency at a fixed exchange rate e_1, arbitrageurs quickly respond to the increasing exchange rate by buying the domestic currency from the central bank, causing the money supply and the LM* curve to return to their initial positions). In the end, income, the exchange rate, and the trade balance are unchanged.