ANSWER SHEET FOR ASSIGNMENT 4

(Answers shown in bold)

Question 1: (25 marks)

Part (a) (**10 marks**)

Derive the IS, LM and AD curves given information on C^d, I^d and M^d.

From the definition of the IS curve we have:

I = S and with T = 200

150 – 50r = Y – 180 +0.7(Y-T) + 150r -250

– 200r = – 440 + 0.3Y

r = 2.2 – 0.0015Y **(IS)**

Setting $M^d = M = P[0.6Y – 200(r + \pi^e)]$ we have:

200r = – 4 + 0.6Y – (M/P)

r = –0.02 + 0.003Y – 0.005(M/P) **(LM)**

Setting the IS curve equal to the LM curve we have:

2.2 – 0.0015Y = –0.02 + 0.003Y – 0.005(M/P)

Y = 493.333 + 1.111(M/P) **(AD)**

Part (b) (**5 Marks**)

Given M = 1260 and P = 1.5 use the AD curve to determine the level of Y. Thus

Y = 493.333 + 1.1111(1260/1.5)

Y = 1426.666

Using this value of Y in the IS curve we find r as:

r = 2.2 -0.0015(1426.666)

r = 0.06

From the consumption function, these values of r and Y imply:

C^d = 180 + 0.7(1426.667 -200) – 150(0.06)

C^d = 1029.666

From the investment function we get:

$I^d = 150 - 50(0.06)$

I^d = 147

From the definition of aggregate demand, $Y = C^d + I^d + G$, we have:

Y = 1029.666 + 147 + 250 = 1426.666

Part (c) (**5 Marks**)

If the new level $\overline{Y} = 1440$, then there has been a **positive productivity shock**. The diagram should show the new $\overline{Y}$ to the right of where the old IS-LM curves intersected.

Given that we know the new level of output, we can use the IS curve from above to solve for r as:

$r = 2.2 - 0.0015(1440)$

r = 0.04

The positive shock has lowered the equilibrium real interest rate.

To move the economy to its new equilibrium, the LM curve has to shift to the right. Absent any policy actions, this can only occur if the price level falls, increasing real money balances. Using the LM curve and the equilibrium r , while hold nominal M constant we have:

$0.04 = -0.02 + .0.003(1440) - 0.005(1260)/P$

P = 1.4789

Part (d) (**5 Marks**)

If the price level were to fall to **1.4789** then the real money supply would rise to 852 (approximately). To ensure a constant price level, the central bank would have to increase the money supply to **1278** (852 in real terms) or by the same percentage that the price level would have fallen.

Question 2: (25 marks)

Part (a) (**10 marks**)

The effect and response to deficient demand can be measured with the model. With the constant terms of both the consumption and investment functions shifting down (to 175 and 147, respectively) we need to derive a new IS curve as:

$147 - 50r = -175 + 0.7(200) + 0.3Y + 150r - 250$

$r = 2.16 - 0.0015Y$ **new IS**

The LM curve remains unchanged as:

$r = -0.02 + 0.003Y - 0.005(M/P)$ **unchanged LM**

Setting the two equal yields:

$2.16 - 0.0015Y = -0.02 + 0.003Y - 0.005(M/P)$

$Y = 484.444 + 1.111(M/P)$ **new AD**

Show the IS-LM intersecting to the left of full-employment output.

Use the new AD equation to get Y as:

$Y = 484.444 + 1.111(1260/1.5)$

Y = 1417.777, which is about 0.6% below equilibrium.

With this new, lower level of output, use the new IS curve to show that the interest rate falls to:

$r = 2.16 - 0.0015Y$

r = 0.033

Part (b) (**5 marks**)

Yes the economy would return to full employment in the absence of actions. With actual output below potential, the price level would fall, raising the level of real M and shifting the LM curve back to equilibrium. Show this shift in the diagram. Use the new AD function and solve for P as follows, where we have substituted in the level of full-employment output:

$1426.666 = 484.444 + 1.111(1260/P)$

P = 1.4858

To get the new lower interest rate, we use the LM curve with the new higher real money supply (due to the lower price level) and the original equilibrium output level.

r = – 0.02 + 0.003(1426.666) – 0.005(1260/1.4858) = .01985 (or 0.02)

Part (c) (**5 marks**)

If the central bank increased nominal M in order to keep P at 1.5, M would have to rise by the same amount P would have fallen. Using the same equation as above we get:

1426.666 = 484.444 + 1.111(M/1.5)

M = 1272 (approximately)

This has the effect of shifting the LM curve moves back towards full-employment. While the old level of full employment output would be restored, the real interest would be lower still.

r = 2.16 – 0.0015(1426.666) = 0.02

On the diagram, show the LM shifting down to the right intersecting the shifted IS curve at the lower interest rate.

Part (d) (**5 marks**)

In the model used here, changes in G show up in the constant term of the IS curve. Starting with the original derivation, **G has to rise by 8 to offset the confidence effects**. Going back to the derivation in part (a) in this question, we have:

147 – 50r = - 175 + 0.7(200) + 0.3Y + 150r – **258**

Where the new level of G is bolded.

If taxes were to be used then T would have to fall by 8/0.7 = 11.4285 to 188.5715 to have the same effect on shifting demand.

147 – 50r = - 175 + 0.7(**188.5715**) + 0.3Y + 150r – 250

Either way, the IS curve becomes identical to the original one and according shifts back:

r = 2.2 – 0.0015Y. With this IS curves, the old AD curve, Y= 484.444 + 0.1111(M/P), is restored and with M and P unchanged, r would rise back to 0.06.

The diagram should show the IS curve shifting back to its original position.

With increase in G, the deficit increases from 50 to 58, with reduction in taxes, the deficit rise from 50 to 61.43. The tax cuts is the more expensive fiscal option.

Question 3: (25 marks)

Part (a) (**10 marks**)

We now need to derive a new IS curve based on the following relationship:

$S - I = NX$

In deriving the new IS curve it is helpful to have two versions, one that explicitly recognises the exchange rate and one where it is implicit. From Eq 1 and 2 and using the definition of national saving we have:

$Y - 180 + 0.7(Y-T) + 150r - 250 - 150 + 50r = NX$

$-440 + 200r + 0.3Y = 150 - 0.1Y - 0.5e$

$r = 2.95 - 0.002Y - 0.0025e$ **1st open economy IS**

Or using $e = 20 + 400r$, we get

$r = 1.45 - 0.001Y$ **2nd open economy IS**

The LM curve remains unchanged as:

$r = -0.02 + 0.003Y - 0.005(M/P)$ **unchanged LM**

The new AD curve uses the 2nd version of the IS relationship and is:

$Y = 367.5 + 1.25(M/P)$ **open economy AD**

Then, from the AD curve, with M/P = 1260/1.5, we get Y = 1417.5.

From the 2nd version of the IS curve we have r = 0.0325.

From the exchange rate equation we have e = 33 and from the net exports equation, NX = – 8.25.

Finally from the definition of the real exchange rate ($e = e_{nom}P/P^{for}$), we have $e_{nom} = 22$, given $P^{for} = 1$ and $P = 1.5$.

Part (b) (**15 marks**)

We start from a position where the economy was in long run equilibrium (with the values of Y, r, e above) and expand the money supply. The process works as follows, the LM curve initially shifts intersecting the IS curve at a lower interest rate, which in turn puts downward pressure on the exchange rate, since $r < r^w$ (= 0.0325). This later effect shifts the IS curve up. The short-run equilibrium is determined by the intersection of the IS and LM curve. Accordingly we can use the AD relationship to get the level of Y consistent with the higher level of M. Thus:

$Y = 367.5 + 1.25(M/P) = 367.5 + 1.25(1269/1.5)$

$Y = 1425.$

From the IS curve we can get r. Thus:

$r = 1.45 – 0.001Y = 1.45 – 0.001(1425)$

$r = 0.025$

Note that this rate is below the world rate because we have less than perfectly elastic capital flows.

From the exchange rate equation we have:

$e = 20 + 400r = 20 + 400(0.025)$

$e = 30$

From the net exports equation we have:

$NX = 150 – 0.01Y – 0.5e = 150 – 0.01(1425) – 0.5(30)$

$NX = – 7.5$ (an improvement of 0.75)

Since $Y > Y^{FE}$, prices will start to rise and the LM curve will shift back to its original long-run equilibrium as will the IS curve (r starts to rise and NX will fall).

In the long run, P must rise by enough to push the LM curve back. We can find this new price level from the AD curve as:

$Y = 367.5 + 1.25(M/P)$

$1417.5 = 367.5 + 1.25(1269/P)$

$P = 1.511$

Since the real exchange rate will also be unchanged in equilibrium but the price level is higher, then the nominal rate has to change. In particular:

$e = e_{nom}P/P^{for}$ implies

$e_{nom} = 21.844$

NB there is potentially another way to answer the question:

Some students may follow the text and assume that the short run equilibrium is characterised by the IS curve shifting until $r = r^w$. In this case, they would have to in effect ignore the exchange rate equation and then use the LM curve as follows to get Y consistent with both r = 0.0325 and the higher level of M. Thus:

$r = -0.02 + 0.003Y - 0.005(M/P)$

$0.0325 = -0.02 + 0.003Y - 0.005(1269/1.5)$

Y = 1427.5

We can find the exchange rate consistent with this level of output from the first version of the IS curve:

$r = 2.95 - 0.002Y - 0.0025e$

$0.0325 = 2.95 - 0.002(1427.5) - 0.0025e$

e = 25

Use this result in the NX equation to get:

$NX = 150 - 0.1Y - 0.5e$

NX = – 5.25 which is a much larger improvement of 3 due to the larger fall in e.

In this short-run equilibrium Y is also greater than full-employment output, which will cause prices to rise and the process now unwinds itself as it did above. In the new equilibrium, the price level will have risen by enough to ensure that the real money supply is consistent with the original full-employment output. We can find this price level from the AD curve using the increased money supply (1269) and the equilibrium output (1417.5)

Y = 367.5 + 1.25(M/P)

1417.5 = 367.5 + 1.25(1269/P)

P = 1.511 (approximately)

The implications for the nominal exchange rate are the same; that is, e_{nom} will fall to 21.844 because of the increase in the price level.

Question 4: (25 marks)

Part (a) (**5 marks**)

With the nominal exchange rate fixed at 22 and the price level constant at 1.5, the real exchange is also fixed at 33. The new IS curve, starting with the 1st version in Question 3, part (a), becomes:

r = 2.95 – 0.002Y – 0.0025e

r = 2.8675 – 0.002Y

Importantly, the exchange rate equation now disappears into the constant term.

The LM curve remains unaffected.

An increase in the money supply has no effect since the central bank would have to offset these changes to maintain the currency fixed immediately.

Part (b) (**15 marks**)

Adding in the new level of government spending (G = 260) changes the constant term in the IS curve. The result is:

r = 2.9175 – 0.002Y

The LM curve is the same:

r = – 0.02 + 0.003Y – 0.005(M/P)

The initial effect of the increase in G is to shift the IS curve outward which puts upward pressure on interest rates in response to the rise in output. This in turn puts upward pressure on the exchange rate and the central bank must expand the money supply to relieve the upward pressure on interest rates. This process continues until the bank has supplied enough money to accommodate the shift in the IS curve, which gets r = 0.0325. This new position, where both curves have shifted out, is the new short-run equilibrium.

From the IS curve above we can solve for the short-run level of output as:

0.0325 = 2.9175 – 0.002Y

Y = 1442.50

Use this level of output, in conjunction with the equilibrium real interest rate (r = 0.0325) in the LM curve to get the new money supply that accommodates the shift in the IS curve, assuming that the price level (P) remains at 1.5 for the moment:

$r = -0.02 + 0.003Y - 0.005(M/P)$,

$0.0325 = -0.02 + 0.003(1442.50) - 0.005(M/1.5)$

$M = 1282.50$

This equilibrium is not sustainable as $Y > \overline{Y}$ so prices will start to rise. In the new, long-run equilibrium, prices will rise by enough to return the real money supply to a level consistent with r = 0.0325 and Y = 1417.5. With government expenditures unchanged, the real exchange rate rises by enough to crowd out net exports. The central bank will accommodate the resulting increase in the price level.

Part (c) (**5 marks**)

Begin by setting out the interest parity condition as:

$(1 + i^{can}) = (1 + i^{euro})\ (e_{nom}/\ e^{f}_{nom})$ and solve for the forward rate as:

$e^{f}_{nom} = 0.65(1.03)/(1.032) = 0.64874$

Assuming that the forward rate represents the expected future exchange rate, then the Canadian dollar is expected to depreciate. If the forward rate were 0.66, then using the interest parity conditions we would have:

$(1.032) > 0.65(1.03)/0.66\ (= 1.0144)$

With gross yields in Canada now much higher there would be upward pressure on the dollar until interest parity was restored, which would occur at **$e_{nom} = 0.6613$** (approximate). We get this result by manipulating the interest parity condition to solve for the spot rate assuming that the other values remain unchanged.