ECON 1010C
Principles of Macroeconomics
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# Suggested Solutions to Assignment 4

## Part A Multiple-Choice Questions

1. C
2. C
3. B
4. D
5. A
6. B
7. A
8. B
9. A
10. D
11. C
12. A
13. B
14. B
15. D
16. A
17. C
18. B
19. B
20. D
21. D
22. A
23. B
24. C
25. A
26. C
27. C
28. D
29. A
30. D
31. A
32. C
33. C
34. C
35. C

## Part B True/ False/ Uncertain Questions

*Explain why the following statement is True, False, or Uncertain according to economic principles. Use diagrams and / or numerical examples where appropriate. Unsupported answers will receive no marks. It is the explanation that is important.*

**B-1. The net export effect strengthens the effects of an expansionary fiscal policy.**

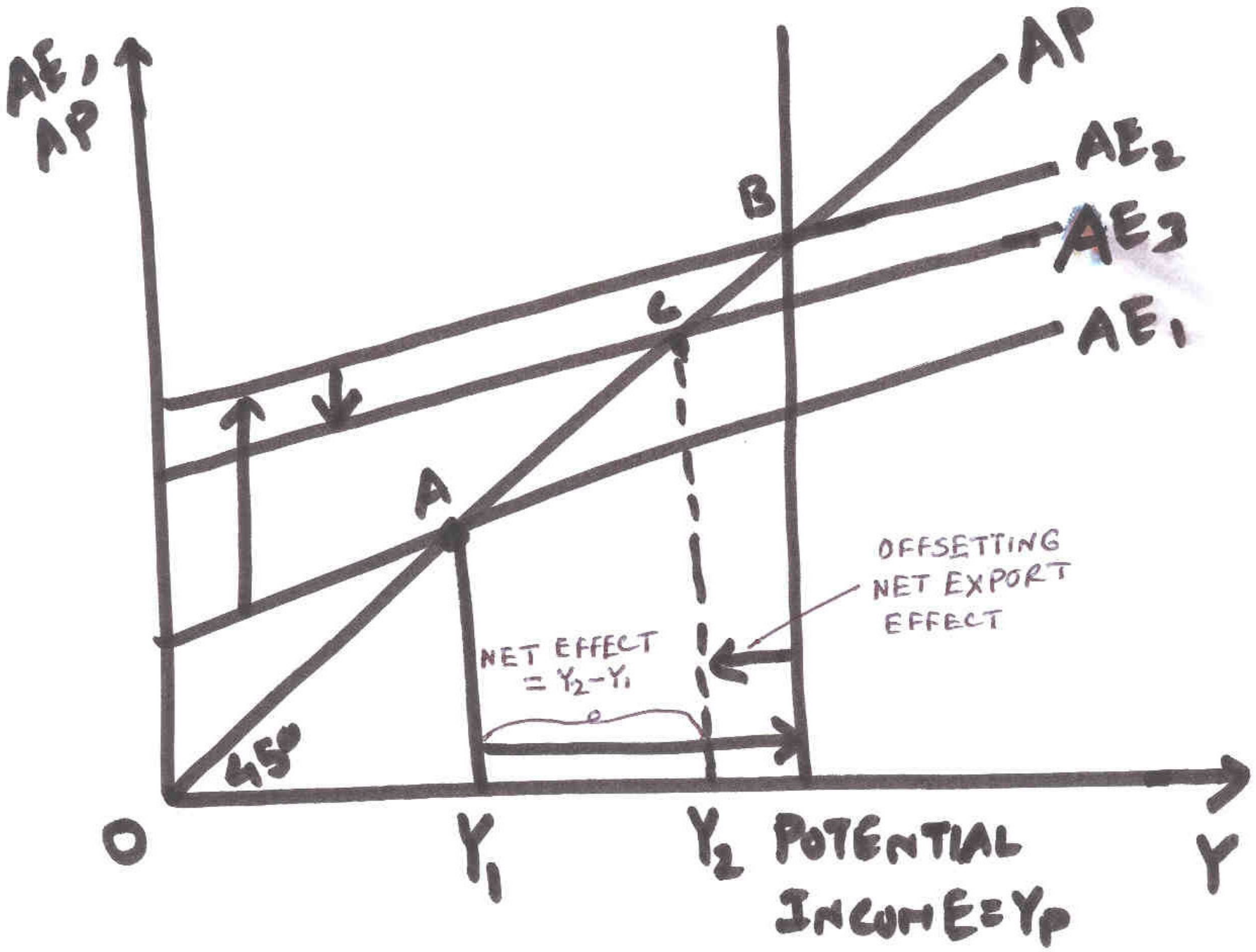
**False**

The net export effect (international effect) can partially offset the effects of an expansionary fiscal policy.

Assume that an economy currently operates at a recessionary equilibrium A with $Y_1$ level of real output. The government adopts an expansionary fiscal policy by increasing its spending G in order to remove the existing recessionary gap. This policy aims to shift the AE curve from $AE_1$ to $AE_2$ and thus move the economy from A to B. Without any net export effect the government could have achieved its target and increase real output to the potential level. However, to increase its spending G, the government has to run a deficit budget. And to finance its budget deficit, the government has to borrow from domestic loanable funds market. A rise in government borrowing increases the demand for loanable funds, which would drive the price of loanable funds upward. The price of loanable funds is nothing but domestic interest rate. As domestic interest rate increases, foreigners would like to invest more in domestic currency denominated assets. This means the demand for domestic currency would increase, which would led to an appreciation (an increase in the value of domestic currency) domestic currency. Consequently, domestic exports would become relatively more expensive. This would lead to a decline in domestic exports and an increase in domestic imports. This means domestic net exports would fall resulting into a decrease in domestic aggregate expenditures. So, aggregate expenditure function would shift downward from $AE_2$ to $AE_3$ and the economy would move back from B to C.

Thus, because of the offsetting net export effect the aggregate expenditure function would ultimately shift from $AE_1$ to $AE_3$ and equilibrium output would increase to only $Y_2$, not to potential real income.

# FIGURE B-1 : EXPANSIONARY FISCAL POLICY



**B-2. The crowding in of private investment makes a contractionary fiscal policy less effective.**

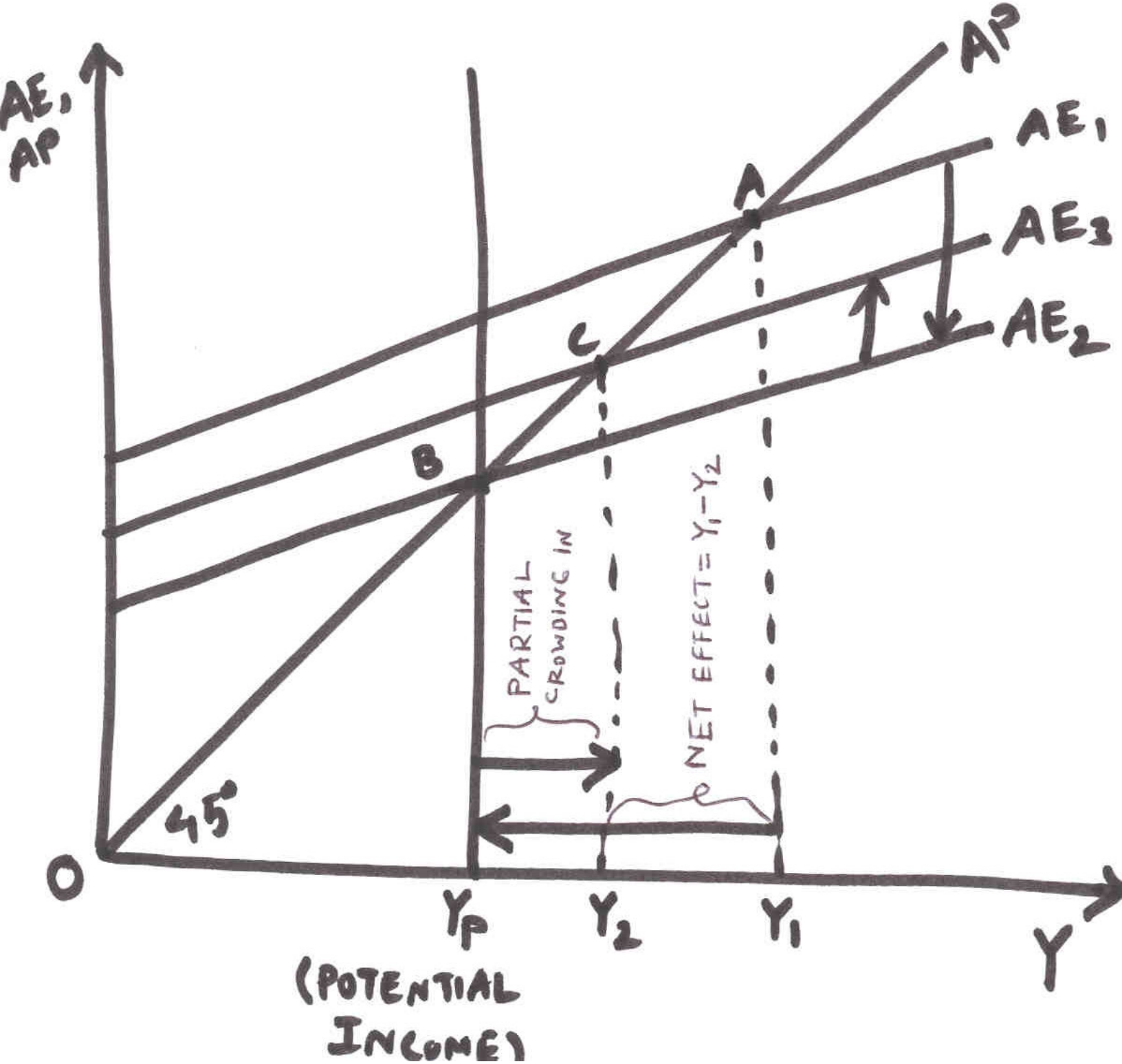
**True**

The crowding in of private investment can partially offset the effects of a contractionary fiscal policy.

Assume that an economy currently operates at an inflationary equilibrium A with $Y_1$ level of real output. The government adopts a contractionary fiscal policy by decreasing its spending G in order to remove the existing inflationary gap. This policy aims to shift the AE curve from $AE_1$ to $AE_2$ and thus move the economy from A to B. Without any crowding in of private investment the government could have achieved its target and decrease real output to the potential level. However, to decrease its spending G, the government has to run a surplus budget. This means government does not need to borrow from domestic loanable funds market. A fall in government borrowing decreases the demand for loanable funds, which would drive the price of loanable funds downward. The price of loanable funds is nothing but interest rate. As interest rate decreases, business firms would like to borrow to invest more. This means private investment would increase resulting into a rise in aggregate expenditures. So, aggregate expenditure function would shift upward from $AE_2$ to $AE_3$ and the economy would move upward from B to C.

Thus, because of the crowding in of private investment the aggregate expenditure function would ultimately shift from $AE_1$ to $AE_3$ and equilibrium output would decrease to only $Y_2$, not to potential real income.

# FIGURE 13-2: CONTRACTIONARY FISCAL POLICY



**B-3. An increase in real growth rate of a country reduces the debt to nominal GDP ratio.**

**Uncertain**

It depends on the existing real interest rate relative to the real GDP growth rate and the ratio of the budget deficit (net of debt service payments) to GDP.

We know that the change in the debt to nominal GDP ratio is calculated as,

Change in Debt to Nominal GDP ratio

= (Budget Deficit net of debt service payments/ Nominal GDP) +
(Real interest rate – Real GDP growth rate)* (Debt to Nominal GDP ratio)

There are two factors affecting the change in debt to nominal GDP ratio. The first is the ratio of the budget balance (net of interest payments on the debt) to GDP; the second is the inflation-adjusted interest rate (real interest rate) relative to the real GDP growth rate. If the real growth rate, even after an increase, is lower than the real interest rate and the government runs a balanced budget (net of interest payments on the debt), then a country's the debt to nominal GDP ratio would rise. For example, assume that because of the balanced budget (net of interest payments on the debt) the first factor is zero and real interest rate is 3%, real GDP growth rate is 2% and debt to nominal GDP ratio is 0.6. With this information, we can find, using the above mentioned formula, that the change in debt to nominal GDP ratio is 0.006. If other things remaining constant, if real GDP growth rate increases to 2.5%, then the change in debt to nominal GDP ratio would be 0.003. This shows that the debt to nominal GDP ratio can increase following an increase in the real growth rate of a country.

However, if the real growth rate, after an increase, is higher than the real interest rate and if the negative second factor offsets a positive first factor (when government runs a budget deficit (net of interest payments on the debt), then a country's the debt to nominal GDP ratio would fall. Answers to part **(d)** and **(e)** of Question **C-2** in this assignment provide an example of this case.

## Part C Problem Solving Questions

*Answer all parts of the following question.*

**C-1**

**Consider the same simple, fixed price, open economy model of Canadian economy with excess capacity as given in Assignment 3 Part C:**

$C = 60 + .6Y_d$

$T = 40 + 0.25Y$

$R = 20$

$I = 60$

$G = 70$

$X = 44$

$IM = 10 + 0.15Y$

**where, *C* is consumption, $Y_d$ is disposable income, *T* is taxes, *R* is government transfers, *Y* is real GDP, *I* is investment, *G* is government expenditures on goods and services, *X* is exports and *IM* is imports.**

**In addition, assume that the potential income is 350.**

**(a)** Calculate the equilibrium level of real GDP, actual budget deficit, structural budget deficit and passive or cyclical budget deficit. [Hint: Budget Deficit = G+R-T].

The equilibrium level of real GDP is 302.86 (refer to the calculation shown in Part (a) of Question **C-1** in Assignment 3).

Actual Budget Deficit = G + R - T
= G + R – (40 + 0.25Y) [Note: Y here is the equilibrium real GDP]
= 70 + 20 – (40+0.25*302.86)
= 90- 115.72
= -25.72

This means the government has an actual budget surplus of 25.72 at the equilibrium.

Structural budget deficit is the budget deficit prevailing at potential real income.

Structural Budget Deficit = G + R - T
= G + R – (40 + 0.25$Y_p$) [Note: $Y_p$ here is potential real income]
= 70 + 20 – (40+0.25*350)
= 90- 127.5
= -37.5
This means the government has a structural budget surplus of 37.5.

Passive or Cyclical Budget Deficit = Actual Budget Deficit – Structural Budget Deficit
= -25.72 – (-37.5)
= -25.72 + 37.5
= 11.78

This means the government has a cyclical budget deficit of 11.78 at the equilibrium. This cyclical deficit is arising from the fact that the economy is currently operating below potential income.

**(b) Calculate the inflationary or recessionary gap, if any, at the equilibrium level of real GDP you found in part (a). How should the government adjust its spending (G) to completely remove this gap?**

Since the equilibrium output is below potential income, there is a recessionary gap in this economy. Recessionary Gap = Potential Income – Equilibrium Output
= 350 – 302.86
= 47. 14

The multiplier of this economy is 1.43 (refer to the calculation shown in Part (a) of Question **C-1** in Assignment 3).

To reduce this recessionary gap, the government has to increase its spending (G). The amount of the change in G can be calculated as,

Change in G = Recessionary Gap / Multiplier
= 47. 14/ 1.43
= 32.97
This means the government has to increase G by 32.97.

**(c) Assume that government successfully changed its spending (G). What is the new equilibrium level of real GDP with this new level of G? Find the new actual budget deficit, structural budget deficit and passive or cyclical budget deficit.**

The initial expenditure function (refer to the calculation shown in Part (a) of Question **C-1** in Assignment 3):

$AE = 212 + 0.30Y$

If *G* increases by 32.97, the total autonomous aggregate expenditures will increase from 212 to 244.97. This means the new aggregate expenditure function will be,

$AE = 244.97 + 0.30Y$ (1)

We know that the equilibrium condition is $Y = AE$ (2)

Substituting (2) into (1),

$Y = 244.97 + 0.30Y$
or, $Y - 0.30Y = 244.97$ (By subtracting 0.30Y from both sides)
or, $0.7Y = 244.97$
or, $Y = \frac{244.97}{0.7}$ (By dividing both sides by 0.7)
$\therefore Y = 349.96$
$\cong 350$

So, the new equilibrium level of real GDP is 350, which is equal to potential income. It shows that the increased government spending achieved its target to remove the recessionary gap.

[You can also calculate the new equilibrium level of real GDP by following either of the two alternative methods.

**Alternative Method1:**

We know the multiplier equation,

Y = Multiplier * Autonomous Expenditures (Note: use new autonomous expenditures)
$\therefore$ Y = 1.43 * 244.97
= 350.31
$\cong$ 350

**Alternative Method 2:**

We know the multiplier equation,

Y = Multiplier * Autonomous Expenditures
So, Change in Y = Multiplier * Change in Autonomous Expenditures
∴ Change in Y = 1.43 * 32.97
= 47.15
This means the new equilibrium real output = 302.86+ 47.15
= 350.01
≅ 350]

The new equilibrium level of real GDP is equal to potential real income of 350. So, the new actual budget deficit should be equal to new structural budget deficit.

Actual or Structural Budget Deficit = G + R - T
= G + R – (40 + 0.25$Y_p$) [Note: G here is new higher level of G]
= 102.97 + 20 – (40+0.25*350)
= 122.97- 127.5
= -4.53
This means the government has an actual or a structural budget surplus of 4.53

Passive or Cyclical Budget Deficit = Actual Budget Deficit – Structural Budget Deficit
= -4.53 – (-4.53)
= -4.53 + 4.53
= 0
This means the government has no cyclical budget deficit at the new equilibrium. Zero cyclical budget deficit is resulting from the fact that the economy is currently operating at potential income.

**(d) Solve for the initial budget surplus function (BS = T-G-R) and plot it in a diagram. Show the actual budget deficit and structural budget deficit you found in part (a). Show how the initial budget surplus function would response to the change you prescribed in part (b). Show the new actual budget deficit and structural budget deficit you found in part (c).**

The initial budget surplus function ($BS_1$):

$BS_1$= T-G-R
or, $BS_1 = 40 + 0.25Y - 70 - 20$
or, $BS_1$=-50 + 0.25Y

So, the initial budget surplus function is, $BS_1$=-50 + 0.25Y. This function is plotted in

Figure C-1(d). To plot this function we need two points. One point is the negative vertical intercept (-50) which is obvious from the function. The other point can be the horizontal intercept (200). To find the horizontal intercept, set $BS_1$=0 in the budget surplus function and solve for Y. That is,

0=-50+0.25Y
or, 0.25Y=50
or, Y= $\frac{50}{0.25}$ (Dividing both sides by 0.25)
or, Y = 200

If you connect the vertical intercept (-50) and the horizontal intercept (200) and extend it upward, you will get the budget surplus function $BS_1$ as shown in Figure C-1(d). The initial actual budget surplus of 25.72 (found in part (a)) is shown as the vertical distance between $BS_1$ and the horizontal axis at initial equilibrium level of real GDP of 302.86. The initial structural budget surplus of 37.5 (found in part (a)) is shown as the vertical distance between $BS_1$ and the horizontal axis at potential real income of 350.

New budget surplus function ($BS_2$) with the higher level of government spending:

$BS_2$= T-G-R
or, $BS_2 = 40 + 0.25Y - 102.97 - 20$
or, $BS_2$=-82.97 + 0.25Y

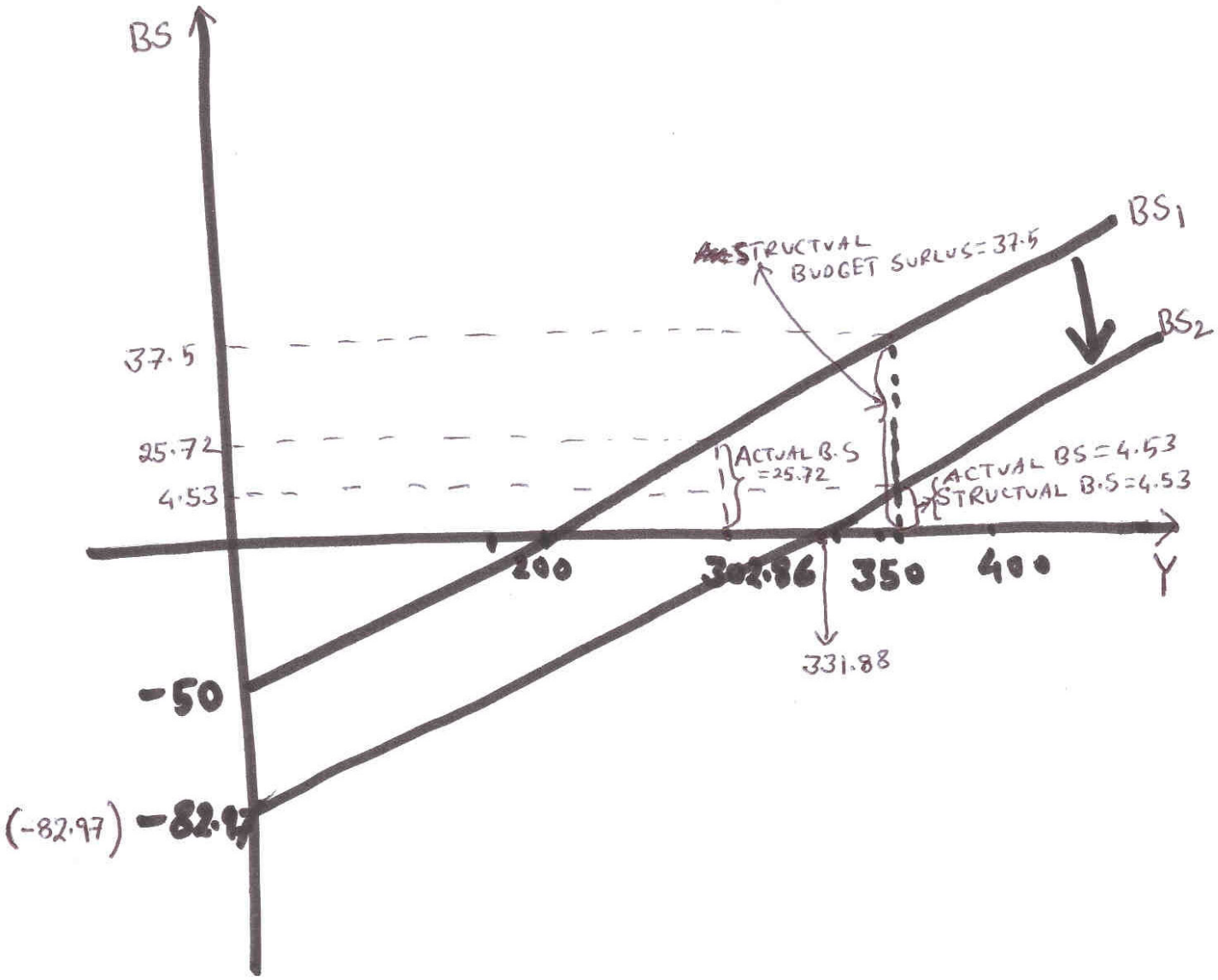
So, the new budget surplus function is, $BS_2$=-82.97 + 0.25Y. This function is plotted in Figure C-1(d). To plot this function we also need two points. One point is the negative vertical intercept (-82.97) which is obvious from the function. The other point can be the horizontal intercept (331.88). To find the horizontal intercept, set $BS_2$=0 in the new budget surplus function and solve for Y. That is,

0=-82.97+0.25Y
or, 0.25Y=82.97
or, Y= $\frac{82.97}{0.25}$ (Dividing both sides by 0.25)
or, Y = 331.88

If you connect the vertical intercept (-82.97) and the horizontal intercept (331.88) and extend it upward, you will get the budget surplus function $BS_2$ as shown in Figure C-1(d). Since the new equilibrium level of real GDP is equal to potential income, the new actual budget surplus is equal to new structural budget surplus. Both surpluses, which are equal to 4.53, are shown as the vertical distance between $BS_2$ and the horizontal axis at potential income of 350.

By comparing these two budget surplus functions, we find that the initial budget surplus function shifted downward by the vertical distance of 32.97 in response to the increase in G by 32.97.

# FIGURE C-1(d): BUDGET SURLUS FUNCTION



**(e) In this model, which budget deficit concept is a good measure of the stance of fiscal policy and why?**

The structural budget deficit or surplus is a good measure of the stance of fiscal policy. Because this measure of budget deficit changes only if there is any change in government fiscal policy variables $T_0$ (autonomous tax), $G_0$ (autonomous government spending), or t (the tax rate). A decrease in structural budget surplus reflects an expansionary fiscal policy and an increase in structural budget surplus shows a contractionary fiscal policy. In this model the decrease in structural budget surplus from 37.5 to 4.53 correctly signals the adoption of expansionary fiscal policy by the government.

The actual budget deficit is not a good measure of the stance of fiscal policy. Because it changes with a change in equilibrium output, even if there is no change in government fiscal policy variables.

**C-2.**

**Assume a country's nominal GDP is $600 billion, government expenditures (including transfer payments) less debt service (G*) are $145 billion, and tax revenue is $160 billion. The nominal debt is $360 billion. Inflation is 3 percent, interest rates are 6 percent and the real GDP growth rate is 3 percent.**

**(a) Calculate the debt service payments.**
**(b) Calculate the nominal deficit.**
**(c) Calculate the real deficit.**
**(d) Calculate the debt to nominal GDP ratio. Calculate the percentage change in this ratio.**
**(e) Other things remaining constant, if the real GDP growth increases to 4% what will happen to the percentage change in the debt to nominal GDP ratio?**

. **(a)** Debt service payments (iD) = Nominal Debt (D) * Interest Rate (i)
= $360 billion * 0.06
= $21.6 billion.

**(b)** Nominal Deficit
= Government Expenditures including transfer payments + Interest on Debt - Revenues
= G* + iD- R
=$145 + 21.6 -160
= $6.6 billion.

So, the government has a nominal budget deficit of $6.6 billion.

**(c)** Real deficit = Nominal Deficit – (Inflation * Total Nominal Debt)
= \$6.6 – (0.03 * \$360)
= 6.6 – 10.8
= - \$4.2 billion

This means the government has a real budget surplus of \$4.2 billion.

**(d)** Assume that the nominal GDP and Debt data is from year 2003 and other information is from year 2004.

The debt to nominal GDP ratio (δ) in 2003, $\frac{Debt}{GDP} = \frac{360}{600} = 0.60$

We know the proportionate change in the debt to nominal GDP ratio (which we will denote as $\frac{\Delta\delta}{\delta}$) can be calculated by following formula:

$$\frac{\Delta\delta}{\delta} = \frac{G^* + iD - T}{D} - (\text{Inflation Rate + Real GDP Growth Rate})$$

= (Nominal Deficit/ Nominal Debt) – (Inflation Rate + Real GDP Growth rate)
$= \left(\frac{6.6}{360}\right) - (0.03 + 0.03)$
= 0.018-0.06
= -0.042

So, the percentage change in debt to nominal GDP ratio in 2004 was -4.2%. This means the debt to nominal GDP ratio decreased by 4.2% from 0.6 in 2003 to 0.57 in 2004.

**(e)** Other things remaining constant, the real GDP growth rate in 2004 changed to 4%. So, can recalculate the proportionate change in the debt to nominal GDP ratio (which we will denote as $\frac{\Delta\delta}{\delta}$) by following formula:

$$\frac{\Delta\delta}{\delta} = \frac{G^* + iD - T}{D} - (\text{Inflation Rate + Real GDP Growth Rate})$$

= (Nominal Deficit/ Nominal Debt) – (Inflation Rate + Real GDP Growth rate)
$= \left(\frac{6.6}{360}\right) - (0.03 + 0.04)$
= 0.018-0.07
= -0.052

So, the percentage change in debt to nominal GDP ratio in 2004 would now change to -5.2%. This means higher real GDP growth, other things remaining constant, led to a decline in the debt of nominal GDP ratio at a faster rate.

## C-3. Chapter 13 Problems and Exercises Question No. 2

. For a deposit of $100 and a reserve ratio of 5%,

**(a)** At the initial transaction, bank can lend out $95 (100- 0.05*100).

**(b)** After this initial transaction, the money in the economy changed by $195 (100 demand deposits + 95 circulated as loan).

**(c)** The Money multiplier = 1/ Reserve Ratio = $\frac{1}{0.05} = 20.$

**(d)** At the end of the process, total money creation = Money Multiplier * Initial Deposits
= 20 * 100
= 2000

So, eventually Bill's 100 would create $2000 of money.