

**Cooleconomics.com**  
**Macroeconomics**

Answers to Supplemental Study Questions: Long Run Models

1. A closed economy is characterized as follows:

$$C = 100 + .9(Y-T) - 5r$$

$$I = 1000 - 10r$$

$$G = 300$$

$$T = .2Y$$

$$Y_{FE} = 2000$$

a) Derive the equations for national savings and investment. Graph them.

b) Calculate equilibrium values for:

- consumption
- national income
- private savings
- government savings
- gross domestic product
- private disposable income
- budget deficit or surplus
- investment
- interest rate

Now government increases  $G$  to 390

c) Derive the equations for national savings and investment. Graph them on the same graph that you drew in (a) above. Do not draw another graph.

d) Calculate equilibrium values for:

- consumption
- national income
- private savings
- government savings
- gross domestic product
- private disposable income
- budget deficit or surplus
- investment
- interest rate

e) How have long term prospects for economic growth been affected by the change in  $G$ ?

2. A small open economy is characterized as follows:

$$C = 100 + .9(Y-T) - 5r$$

$$I = 1000 - 10r$$

$$G = 300$$

$$T = .2Y$$

$$Y_{FE} = 2000$$

$$r_W = 50$$

a) Derive the equations for national savings and investment. Graph them.

b) Calculate equilibrium values for:

- consumption
- national income
- private savings
- government savings
- gross domestic product
- private disposable income
- budget deficit or surplus
- investment
- net exports
- capital account surplus or deficit
- current account surplus or deficit
- world interest rate

Now government increases  $G$  to 390

c) Derive the equations for national savings and investment. Graph them on the same graph that you drew in (a) above. Do not draw another graph.

d) Calculate equilibrium values for:

- consumption
- national income
- private savings
- government savings
- gross domestic product
- private disposable income
- budget deficit or surplus
- investment
- capital account surplus or deficit
- current account surplus or deficit
- world interest rate

e) How have long term prospects for economic growth been affected by the change in  $G$ ?

3. A world economy in which only two countries exist and trade freely is characterized as follows:

Country 1

$$C = 100 + .9(Y-T) - 5r$$

$$I = 1000 - 10r$$

$$G = 300$$

$$T = .2Y$$

$$Y_{FE} = 2000$$

Country 2

$$C = 100 + .9(Y-T) - 5r$$

$$I = 1000 - 10r$$

$$G = 120$$

$$T = .2Y$$

$$Y_{FE} = 2000$$

a) Derive the equations for national savings and investment in both countries. Graph them.

b) Calculate equilibrium values (for each country):

- consumption
- national income
- private savings
- government savings
- gross domestic product
- private disposable income
- budget deficit or surplus
- investment
- net exports
- capital account surplus or deficit
- current account surplus or deficit
- world interest rate

Now government in country 1 increases  $G$  to 390

c) Derive the equations for national savings and investment. Graph them on the same graphs that you drew in (a) above. Do not draw other graphs.

d) Calculate equilibrium values (for each country):

- consumption
- national income
- private savings
- government savings
- gross domestic product
- private disposable income
- budget deficit or surplus
- investment
- capital account surplus or deficit
- current account surplus or deficit
- world interest rate

e) How have long term prospects for economic growth in each country been affected by the change in  $G$ ?

1. A closed economy is characterized as follows:

$$C = 100 + .9(Y-T) - 5r$$

$$I = 1000 - 10r$$

$$G = 300$$

$$T = .2Y$$

$$Y_{FE} = 2000$$

a) Derive the equations for national savings and investment. Graph them.

b) Calculate equilibrium values for:

consumption	national income
private savings	government savings
gross domestic product	private disposable income
budget deficit or surplus	investment
interest rate	

Now government increases G to 390

c) Derive the equations for national savings and investment. Graph them on the same graph that you drew in (a) above. Do not draw another graph.

d) Calculate equilibrium values for:

consumption	national income
private savings	government savings
gross domestic product	private disposable income
budget deficit or surplus	investment
interest rate	

e) How have long term prospects for economic growth been affected by the change in G?

$$a) S = Y - C - G = 2000 - [100 + .9(2000 - 400) - 5r] - 300 = 160 + 5r$$

$$I = 1000 - 10r$$

$$b) S = I \rightarrow 160 + 5r = 1000 - 10r \rightarrow 15r = 840 \rightarrow r = 56$$

$$\text{Consumption} = 100 + .9(2000 - 400) - 5(56) = 1260$$

$$\text{National income} = 2000$$

$$\text{Private savings} = Y - T - C = 2000 - 400 - 1260 = 340$$

$$\text{Government savings} = T - G = .2(2000) - 300 = 100$$

$$\text{Gross domestic product} = 2000$$

$$\text{Private disposable income} = Y - T = 2000 - .2(2000) = 1600$$

$$T \text{ exceeds } G \text{ by } 100 \rightarrow \text{budget surplus of } 100$$

$$\text{Investment} = 1000 - 10(56) = 440 \quad (\text{note: } S=I!)$$

$$\text{Interest rate} = 56$$

$$c) S = Y - C - G = 2000 - [100 + .9(2000 - 400) - 5r] - 390 = 70 + 5r$$

$$I = 1000 - 10r$$

$$d) S = I \rightarrow 70 + 5r = 1000 - 10r \rightarrow 15r = 930 \rightarrow r = 62$$

$$\text{Consumption} = 100 + .9(2000 - 400) - 5(62) = 1230$$

$$\text{National income} = 2000$$

$$\text{Private savings} = Y - T - C = 2000 - 400 - 1230 = 370$$

$$\text{Government savings} = T - G = .2(2000) - 390 = 10$$

$$\text{Gross domestic product} = 2000$$

$$\text{Private disposable income} = Y - T = 2000 - .2(2000) = 1600$$

$$T \text{ exceeds } G \text{ by } 10 \rightarrow \text{budget surplus of } 10$$

$$\text{Investment} = 1000 - 10(62) = 380 \quad (\text{note: } S=I!)$$

$$\text{Interest rate} = 62$$

e) Prospects are diminished because investment is reduced, meaning that the long term capital stock cannot be sustained at as high of a level. This will reduce the long term level of consumption per household that can be achieved.

2. A small open economy is characterized as follows:

$$C = 100 + .9(Y-T) - 5r \quad I = 1000 - 10r$$

$$G = 300 \quad T = .2Y$$

$$Y_{FE} = 2000 \quad r_w = 50$$

a) Derive the equations for national savings and investment. Graph them.

b) Calculate equilibrium values for:

consumption	national income
private savings	government savings
gross domestic product	private disposable income
budget deficit or surplus	investment
net exports	capital account surplus or deficit
current account surplus or deficit	world interest rate

Now government increases G to 390

c) Derive the equations for national savings and investment. Graph them on the same graph that you drew in (a) above. Do not draw another graph.

d) Calculate equilibrium values for:

consumption	national income
private savings	government savings
gross domestic product	private disposable income
budget deficit or surplus	investment
capital account surplus or deficit	current account surplus or deficit
world interest rate	net exports

e) How have long term prospects for economic growth been affected by the change in G?

$$a) S = Y - C - G = 2000 - [100 + .9(2000 - 400) - 5r] - 300 = 160 + 5r \quad I = 1000 - 10r$$

$$b) \text{Consumption} = 100 + .9(2000 - 400) - 5(50) = 1290$$

$$\text{National income} = 2000$$

$$\text{Private savings} = Y - T - C = 2000 - 400 - 1290 = 310$$

$$\text{Government savings} = T - G = .2(2000) - 300 = 100$$

$$\text{Gross domestic product} = 2000$$

$$\text{Private disposable income} = Y - T = 2000 - .2(2000) = 1600$$

$$T \text{ exceeds } G \text{ by } 100 \rightarrow \text{budget surplus of } 100$$

$$\text{Investment} = 1000 - 10(50) = 500$$

$$\text{Net exports} = Y - C - I - G = 2000 - 1290 - 500 - 300 = -90 \rightarrow \text{trade deficit of } 90$$

$$\text{Capital account balance} = I - S = 500 - (310 + 100) = 90 \rightarrow \text{capital account surplus of } 90$$

$$\text{Current account balance} = -1 \times \text{capital account balance} = -90 \rightarrow \text{current account deficit}$$

$$\text{World interest rate} = 50$$

$$c) S = Y - C - G = 2000 - [100 + .9(2000 - 400) - 5r] - 390 = 70 + 5r \quad I = 1000 - 10r$$

$$d) \text{Consumption} = 100 + .9(2000 - 400) - 5(50) = 1290$$

$$\text{National income} = 2000$$

$$\text{Private savings} = Y - T - C = 2000 - 400 - 1290 = 310$$

$$\text{Government savings} = T - G = .2(2000) - 390 = 10$$

$$\text{Gross domestic product} = 2000$$

$$\text{Private disposable income} = Y - T = 2000 - .2(2000) = 1600$$

$$T \text{ exceeds } G \text{ by } 10 \rightarrow \text{budget surplus of } 10$$

$$\text{Investment} = 1000 - 10(50) = 500$$

$$\text{Net exports} = Y - C - I - G = 2000 - 1290 - 500 - 390 = -180 \rightarrow \text{trade deficit of } 180$$

$$\text{Capital account balance} = I - S = 500 - (310 + 10) = 180 \rightarrow \text{capital account surplus of } 180$$

$$\text{Current account balance} = -1 \times \text{capital account balance} = -180 \rightarrow \text{current account deficit}$$

$$\text{World interest rate} = 50$$

e) Prospects are not diminished because investment is not changed, meaning that the long term capital stock can be sustained at its prior level. (However, the country's external debt has increased, making it more difficult to afford the interest payments on that debt. This is a drain on the country's citizens.)

3. A world economy in which only two countries exist and trade freely is characterized as follows:

Country 1

$$C = 100 + .9(Y-T) - 5rI = 1000 - 10r \quad G = 300 \quad T = .2Y \quad Y_{FE} = 2000$$

Country 2

$$C = 100 + .9(Y-T) - 5rI = 1000 - 10r \quad G = 120 \quad T = .2Y \quad Y_{FE} = 2000$$

a) Derive the equations for national savings and investment in both countries. Graph them.

b) Calculate equilibrium values (for each country):

consumption	national income	private savings
government savings	gross domestic product	private disposable income
budget deficit or surplus	investment	net exports
capital account surplus or deficit	current account surplus or deficit	world interest rate

Now government in country 1 increases G to 390

c) Derive the equations for national savings and investment. Graph them on the same graphs that you drew in (a) above. Do not draw other graphs.

d) Calculate equilibrium values (for each country):

consumption	national income	private savings
government savings	gross domestic product	private disposable income
budget deficit or surplus	investment	capital account surplus or deficit
current account surplus or deficit	net exports	world interest rate

e) How have long term prospects for economic growth in each country been affected by the change in G?

a) country 1:  $S = Y - C - G = 2000 - [100 + .9(2000 - 400) - 5r] - 300 = 160 + 5r$        $I = 1000 - 10r$   
 country 2:  $S = Y - C - G = 2000 - [100 + .9(2000 - 400) - 5r] - 120 = 340 + 5r$        $I = 1000 - 10r$

b) world savings = world investment  $\rightarrow 500 + 10r = 2000 - 20r \rightarrow r = 50$

country 1:

Consumption =  $100 + .9(2000 - 400) - 5(50) = 1290$   
 National income = 2000  
 Private savings =  $Y - T - C = 2000 - 400 - 1290 = 310$   
 Government savings =  $T - G = .2(2000) - 300 = 100$   
 Gross domestic product = 2000  
 Private disposable income =  $Y - T = 2000 - .2(2000) = 1600$   
 T exceeds G by 100  $\rightarrow$  budget surplus of 100  
 Investment =  $1000 - 10(50) = 500$   
 Net exports =  $Y - C - I - G = 2000 - 1290 - 500 - 300 = -90 \rightarrow$  trade deficit of 90  
 Capital account balance =  $I - S = 500 - (310 + 100) = 90 \rightarrow$  capital account surplus of 90  
 Current account balance =  $-1 \times$  capital account balance =  $-90 \rightarrow$  current account deficit  
 World interest rate = 50

Country 2:

Consumption =  $100 + .9(2000 - 400) - 5(50) = 1290$   
 National income = 2000  
 Private savings =  $Y - T - C = 2000 - 400 - 1290 = 310$   
 Government savings =  $T - G = .2(2000) - 120 = 280$   
 Gross domestic product = 2000  
 Private disposable income =  $Y - T = 2000 - .2(2000) = 1600$   
 T exceeds G by 280  $\rightarrow$  budget surplus of 280  
 Investment =  $1000 - 10(50) = 500$   
 Net exports =  $Y - C - I - G = 2000 - 1290 - 500 - 120 = 90 \rightarrow$  trade surplus of 90  
 Capital account balance =  $I - S = 500 - (310 + 280) = -90 \rightarrow$  capital account deficit of 90  
 Current account balance =  $-1 \times$  capital account balance =  $90 \rightarrow$  current account surplus  
 World interest rate = 50

c) country 1:  $S = Y - C - G = 2000 - [100 + .9(2000 - 400) - 5r] - 390 = 70 + 5r$        $I = 1000 - 10r$   
 country 2:  $S = Y - C - G = 2000 - [100 + .9(2000 - 400) - 5r] - 120 = 340 + 5r$        $I = 1000 - 10r$

d) world savings = world investment  $\rightarrow 410 + 10r = 2000 - 20r \rightarrow r = 53$

country 1:

$$\text{Consumption} = 100 + .9(2000-400) - 5(53) = 1275$$

$$\text{National income} = 2000$$

$$\text{Private savings} = Y - T - C = 2000 - 400 - 1275 = 325$$

$$\text{Government savings} = T - G = .2(2000) - 390 = 10$$

$$\text{Gross domestic product} = 2000$$

$$\text{Private disposable income} = Y - T = 2000 - .2(2000) = 1600$$

$$T \text{ exceeds } G \text{ by } 10 \rightarrow \text{budget surplus of } 10$$

$$\text{Investment} = 1000 - 10(53) = 470$$

$$\text{Net exports} = Y - C - I - G = 2000 - 1275 - 470 - 390 = -135 \rightarrow \text{trade deficit of } 135$$

$$\text{Capital account balance} = I - S = 470 - (325 + 10) = 135 \rightarrow \text{capital account surplus of } 135$$

$$\text{Current account balance} = -1 \times \text{capital account balance} = -135 \rightarrow \text{current account deficit}$$

$$\text{World interest rate} = 53$$

Country 2:

$$\text{Consumption} = 100 + .9(2000-400) - 5(53) = 1275$$

$$\text{National income} = 2000$$

$$\text{Private savings} = Y - T - C = 2000 - 400 - 1275 = 325$$

$$\text{Government savings} = T - G = .2(2000) - 120 = 280$$

$$\text{Gross domestic product} = 2000$$

$$\text{Private disposable income} = Y - T = 2000 - .2(2000) = 1600$$

$$T \text{ exceeds } G \text{ by } 280 \rightarrow \text{budget surplus of } 280$$

$$\text{Investment} = 1000 - 10(53) = 470$$

$$\text{Net exports} = Y - C - I - G = 2000 - 1275 - 470 - 120 = 135 \rightarrow \text{trade surplus of } 135$$

$$\text{Capital account balance} = I - S = 470 - (325 + 280) = -135 \rightarrow \text{capital account deficit of } 135$$

$$\text{Current account balance} = -1 \times \text{capital account balance} = 135 \rightarrow \text{current account surplus}$$

$$\text{World interest rate} = 53$$

e) Investment falls in both countries, reducing long term prospects in both countries, since neither can sustain as high of a capital stock, resulting in lower consumption per person in the long term.