IAS 107: Spring 2011: Problem Set 5

Due at the start of lecture on Th Feb 24

1. Roughly, what is the gap between real per capita GDP in the U.S. today, real per capita in South Africa, and real GDP per capita in Bangladesh?

U.S.: $41,000. South Africa: $9,100. Bangladesh: $1,500.

2. NIPA: Explain whether or not, why, and how the following items are included in the calculation of GDP:

   a. The purchase for $500 of a dishwasher produced here at home this year.
   b. The purchase for $500 of a dishwasher made abroad this year.
   c. The purchase for $500 of a used dishwasher.
   d. The manufacture of a new dishwasher here at home for $500 of a dishwasher that then nobody wants to buy.

a. Yes: $500 of consumption.
b. $500 of consumption and $500 of imports for a net of zero.
c. Not included.
d. $500 of inventory investment.

3. In 1960, Venezuela has a level of output per worker of $18,000/year. In the 1940s and 1950s it had had a savings-investment share of 20% and a labor-force growth rate of 4% per year. Since 1960 Venezuela has averaged a savings-investment share of 20% and a labor force growth rate of 2%/year. Assume that Venezuela in the 1940s and 1950s had an efficiency of labor growth rate g of 1%/year. Assume $\alpha = \frac{2}{3}$. Assume the depreciation rate δ is 5%/year. Assume that Venezuela in 1960 was on its 1940s and 1950s steady-state balanced-growth path, and that Argentina today is on its post-1960 balanced growth path.

a. What was Venezuela's capital-output ratio in 1960?
b. What was Venezuela's efficiency of labor E in 1960?
c. If the efficiency-of-labor growth rate had been 0%/year since 1960, what would Venezuela's efficiency of labor, capital-output ratio, and level of output per worker be today?
d. If the efficiency-of-labor growth rate had been 1%/year since 1960, what would Venezuela's efficiency of labor, capital-output ratio, and level of output per worker be today?
e. If the efficiency of labor growth rate had been 2%/year since 1960, what would Venezuela's efficiency of labor, capital-output ratio, and level of output per worker be today?

f. If the efficiency of labor growth rate had been 3%/year since 1960, what would Venezuela's efficiency of labor, capital-output ratio, and level of output per worker be today?

g. Venezuela's level of output per worker today is $24,000/year. What do you guess its growth rate of the efficiency of labor has been on average since 1960?

a. 20/10 = 2 for its capital-output ratio in 1960

b. With a capital output ratio of 2, output per worker is four times the efficiency of labor. So $4,500.

c. It's E=$4,500. K/Y=20/7. Y/L = (20/7)^2 * 4500 = $36,734

d. It's E=$7,400. K/Y=20/8. Y/L = (20/8)^2 * 7400 = $46,250

e. It's E=$12,100. K/Y=20/9 Y/L = (20/9)^2 * 12100 = $59,700

f. It's E=$19,700. K/Y=20/10 Y/L = 4*19700 = $78,800

g. The growth rate of the efficiency of labor has been negative since 1960.

4. In the simple income-expenditure model with real GDP Y equal to the sum of consumption spending by households C, investment spending by businesses I, government purchases G, and with net exports NX; with consumption spending C given by the equation: $C = c_o + c_y Y(1-t)$; and with imports IM given by the equation: $IM = im_y Y$...

a. Suppose I = $2 trillion, G = $2 trillion, GX = $1.7 trillion, c_o = $3 trillion, c_y = 0.5, the tax rate t=0, and im_y = .15. What is GDP Y?
b. Suppose I = $1.7 trillion, G = $3.5 trillion, GX = $2.5 trillion, c_o = $3 trillion, c_y = 0.5, the tax rate t=0, and im_y = .15. What is GDP Y?
c. Suppose I = $1.5 trillion, G = $4 trillion, GX = $1.7 trillion, c_o = $3 trillion, c_y = 0.5, the tax rate t=0, and im_y = .15. What is GDP Y?
d. Suppose I = $1.7 trillion, G = $2.5 trillion, GX = $1.7 trillion, c_o = $3.5 trillion, c_y = 0.5, the tax rate t=0, and im_y = .15. What is GDP Y?

a. $13.38 trillion

b. $16.46

c. $15.69

d. $14.46

5. Consider $\Delta Y = [\Delta A_0 + \Delta G - (I_r + X_\varepsilon \varepsilon_r)\Delta r]/(1-(1-t)c_y + im_y)$, the investment savings framework (with $\Delta A_0 = \Delta c_0 + \Delta I_0 - X_\varepsilon \Delta \varepsilon_0 + X_{y^*} \Delta Y^* + X_\varepsilon \varepsilon_r \Delta r^*$). Suppose the multiplier $1/(1-(1-t)c_y + im_y) = 1.5$ and the responsiveness of exports to the exchange rate X_ε = 500...

a. What happens to Y if government purchases G goes up by $100 billion, and nothing else changes?

b. What happens to Y if baseline investment spending I_0 goes up by $100 billion, and nothing else changes?
c. What happens to Y if baseline consumption spending c_0 goes up by $100 billion, and nothing else changes?
d. What happens to Y if speculator confidence in the currency ε_0 goes up by 20%—by 0.2—and nothing else changes?
e. Explain the similarities and the differences between your answers to (a)-(d).

a. $150 billion
b. $150 billion
c. $150 billion
d. 1.5 x 500 x .2 = $150 billion
e. All four have the same size shock to autonomous spending--just a different place

6. Consider $\Delta Y = [\Delta A_0 + \Delta G - (I_r + X_\varepsilon \varepsilon_r)\Delta r]/(1-(1-t)c_y + im_y)$, the investment savings framework (with $\Delta A_0 = \Delta c_0 + \Delta I_0 - X_\varepsilon \Delta \varepsilon_0 + X_{y^*} \Delta Y^* + X_\varepsilon \varepsilon_r \Delta r^*$). Suppose the multiplier $1/(1-(1-t)c_y + im_y) = 1.5$ and the responsiveness of exports to the exchange rate $X_\varepsilon = 500$...

a. Suppose that capital controls keep the exchange rate from responding to changes in the interest rate—suppose that $\varepsilon_r = 0$—and suppose the sensitivity of investment spending to the interest rate $I_r = 50$. If the interest rate falls by 2%—by 200 basis points, or by 0.02—what happens to Y?
b. Suppose that the responsiveness of the exchange rate to changes in the interest $\varepsilon_r = 1$, and suppose the sensitivity of investment spending to the interest rate $I_r = 50$. If the interest rate falls by 2%—by 200 basis points, or by 0.02—what happens to Y?
c. Suppose that the responsiveness of the exchange rate to changes in the interest $\varepsilon_r = 5$, and suppose the sensitivity of investment spending to the interest rate $I_r = 50$. If the interest rate falls by 2%—by 200 basis points, or by 0.02—what happens to Y?
d. Suppose that the responsiveness of the exchange rate to changes in the interest $\varepsilon_r = 20$, and suppose the sensitivity of investment spending to the interest rate $I_r = 50$. If the interest rate falls by 2%—by 200 basis points, or by 0.02—what happens to Y?
e. Explain the similarities and the differences between your answers to (a)-(d). What features of the situation besides government controls on foreign investment might influence the value of ε_r?

a. -1.5 x (50 + 500 x 0) x -.02 = +$1.5
b. -1.5 x (50 + 500 x 1) x -.02 = +$16.5
c. -1.5 x (50 + 500 x 5) x -.02 = +$76.5
d. -1.5 x (50 + 500 x 20) x -.02 = +$301.5
e. The more responsive the exchange rate is to a change in the interest rate, the bigger is the effect. The longer-lasting changes in the interest rate are

expected to be, the more likely is the effect to be larger. The more money is in the hands of speculators as opposed to importers and exporters, the more likely is the effect to be larger.

7. Consider $\Delta Y = [\Delta A_0 + \Delta G - (I_r + X_\varepsilon \varepsilon_r)\Delta r]/(1-(1-t)c_y + im_y)$, the investment savings framework (with $\Delta A_0 = \Delta c_0 + \Delta I_0 - X_\varepsilon \Delta \varepsilon_0 + X_{y^*} \Delta Y^* + X_\varepsilon \varepsilon_r \Delta r^*$). Suppose the multiplier $1/(1-(1-t)c_y + im_y) = 1.5$, the responsiveness of exports to the exchange rate $X_\varepsilon = 500$, and the responsiveness of the exchange rate to changes in the interest $\varepsilon_r = 10$...

a. What happens to Y if the real interest rate r goes up by 1%—by 100 basis points or by 0.01?
b. What happens to Y if the real interest rate r goes up by 1%—by 100 basis points or by 0.01—and if baseline investment spending goes up by 50?
c. What happens to Y if the real interest rate r goes down by 1%—by 100 basis points or 0.01—and if speculator confidence in the currency goes up by 10%?
d. What happens to Y if the real interest rate r goes up by 1%—by 100 basis points or by 0.01— and if baseline consumption spending goes down by 50?

a. You are missing the responsiveness of investment to the interest rate. You need to assume one. Assume $I_r = 50$ as in problem 6 (or make some other assumption)... -1.5 x (50 + 500 x 10) x 0.01 = -$75.75
b. 1.5 x 50 - 1.5 x (50 + 500 x 10) x +0.01 = -$0.75
c. -1.5 x 500 x .1 -1.5 x (50 + 500 x 10) x -0.01 = +$0.75
d. 1.5 x - 50 -1.5 x (50 + 500 x 10) x +0.01 = -$150.75

8. Consider $\Delta Y = [\Delta A_0 + \Delta G - (I_r + X_\varepsilon \varepsilon_r)\Delta r]/(1-(1-t)c_y + im_y)$, the investment savings framework (with $\Delta A_0 = \Delta c_0 + \Delta I_0 - X_\varepsilon \Delta \varepsilon_0 + X_{y^*} \Delta Y^* + X_\varepsilon \varepsilon_r \Delta r$). Suppose the multiplier $1/(1-(1-t)c_y + im_y) = 1.5$ and the responsiveness of exports to the exchange rate $X_\varepsilon = 500$...

a. What happens to Y if the real interest rate r goes up by 2%—by 100 basis points or by 0.01—and if speculator confidence in the currency goes down by 20%?
b. What happens to Y if the real interest rate r goes up by 1%—by 100 basis points or by 0.01—and if baseline investment spending goes down by 200?
c. What happens to Y if the real interest rate r goes down by 1%—by 100 basis points or 0.01—and if speculator confidence in the currency goes up by 5%?
d. What happens to Y if the real interest rate r goes up by 1%—by 100 basis points or by 0.01— and if baseline consumption spending goes up by 100?

a. You are missing the responsiveness of investment to the interest rate. You need to assume one. Assume $I_r = 50$ as in problem 6 (or make some other assumption)... -1.5 x 500 x -0.2 -1.5 x (50 + 500 x 10) x +0.02 = -$1.5
b. -1.5 x 200 -1.5 x (50 + 500 x 10) x +0.01 = -$375.75

c. -1.5 x 500 x .05 -1.5 x (50 + 500 x 10) x -0.01 = +$38.25
d. 1.5 x - 50 -1.5 x (50 + 500 x 10) x +0.01 = +74.25

9. Consider $\Delta Y = [\Delta A_0 + \Delta G - (I_r + X_\varepsilon \varepsilon_r)\Delta r]/(1-(1-t)c_y + im_y)$, the investment savings framework (with $\Delta A_0 = \Delta c_0 + \Delta I_0 - X_\varepsilon \Delta \varepsilon_0 + X_{y^*} \Delta Y^* + X_\varepsilon \varepsilon_r \Delta r$). Suppose the multiplier $1/(1-(1-t)c_y + im_y) = 1.5$ and the responsiveness of exports to the exchange rate $X_\varepsilon = 500$...

   How would your answers to (8) be different if instead of $1/(1-(1-t)c_y + im_y) = 1.5$, $t=0.25$, $c_y = 0.8$ $im_y = 0.1$?

You would have a multiplier of 2 rather than 1.5, so all answers would be ⅓ larger...

10. Consider $\Delta Y = [\Delta A_0 + \Delta G - (I_r + X_\varepsilon \varepsilon_r)\Delta r]/(1-(1-t)c_y + im_y)$, the investment savings framework (with $\Delta A_0 = \Delta c_0 + \Delta I_0 - X_\varepsilon \Delta \varepsilon_0 + X_{y^*} \Delta Y^* + X_\varepsilon \varepsilon_r \Delta r$). Suppose the multiplier $1/(1-(1-t)c_y + im_y) = 1.5$ and the responsiveness of exports to the exchange rate $X_\varepsilon = 500$...

    a. Why does a contractionary monetary policy abroad that raises interest rates abroad raise GDP at home?
    b. Why does an outburst of enthusiasm among foreign exchange speculators that makes them more confident about the long-run value of the home currency reduce GDP at home?
    c. When an outburst of enthusiasm among foreign exchange speculators that makes them more confident about the long-run value of the home currency reduces GDP at home, what components of GDP change and in which direction?
    d. What would be the effects on GDP at home of a stimulative fiscal policy abroad that raised real GDP abroad?

a. Well, it might not: on the one hand, a contractionary monetary policy abroad reduces the value of the home currency and so raises our exports; on the other hand a contractionary monetary policy abroad reduces foreign incomes and so reduces our exports. Which dominates is an empirical quesetion.
b. Because it pushes up the value of the home currency and so makes home goods more expensive abroad, and so reduces exports.
c. Exports fall, and consumption spending falls. Imports fall too.
d. It would boost GDP at home by raising exports