IAS 107: Spring 2011: Problem Set 9 with Answers

Final Exam: Thursday May 12, 2011: 8 AM: VLSB 2060

IDENTIFICATIONS (45 minutes):

1. What are the four parts of macroeconomics? **Depression economics, inflation economics, budget economics, and growth economics.**

2. Why are real GDP per capita and the unemployment variables important quantities to look at? **Real GDP per capita is the most-used measure of the overall prosperity of an economy; the unemployment is was the most-used measure of how far production is falling below potential output.**

3. Roughly, what was the highest that the inflation rate reached in the twentieth century? **In the United States, 25%/year or so during wars. Outside the United States inflation has reached truly astronomical levels—prices doubling every day— during hyperinflations.**

4. Jean Baptiste Say in 1803 claimed that because nobody makes anything without intending to use it or sell it, and nobody sells anything without intending to buy something else, that there could be no general shortage of demand in an economy--that there could be a planned excess of supply of some commodities, but it would be balanced by a planned excess of demand of some other commodities. Was he wrong? Why was he wrong? **Yes. An excess demand for financial assets will produce deficient demand for currently-produced goods and services and for labor.**

5. About how many people are unemployed now? **About fourteen million.**

6. If a quantity shrinks at about 4% per year, how long will it take it to halve itself? **About eighteen years.**

7. Roughly, how large is global real GDP today? **About $50 trillion/year.**

B. PROBLEMS

1. Suppose that an economy's production function is $Y=K^\alpha(EL)^{(1-\alpha)}$ with $\alpha=0.5$; suppose further that the savings rate s is 40% of GDP, that the depreciation rate δ is 4% per year, the population growth rate n is 2% per year, and the rate of growth g of the efficiency of the labor force is 4% per year.
a. What is the steady-state balanced-growth capital-output ratio? **4**
b. How fast does output per worker grow along the steady-state balanced-growth path? **4%/year**
c. How fast does total output grow along the steady-state balanced-growth path? **6%/year**

2. Italy: Since 1946 Italian population growth (including illegal immigration) has been constant at about 1% per year and Italy has had a savings share of 25% of GDP. Today Italy has a GDP per capita level of about $25,000 per year. The rate of growth of the efficiency of labor in Italy since the end of World War II has been constant at about 2% per year. Assume that Italy is today on its steady-state balanced-growth path.
a. If Italy remains on its current steady-state balanced-growth path, what will GDP per capita be in Italy in 2050? **25000 x 1.02^40 = 55000**
b. If Italy remains on its current steady-state balanced-growth path, what will GDP per capita be in Italy in 2100? **25000 x 1.02^90 = 149000**

3. Italy: Since 1946 Italian population growth (including illegal immigration) has been constant at about 1% per year and Italy has had a savings share of 25% of GDP. Today Italy has a GDP per capita level of about $25,000 per year. The rate of growth of the efficiency of labor in Italy since the end of World War II has been constant at about 2% per year. Assume that Italy is today on its steady-state balanced-growth path.
a. What would Italy's level of GDP per capita have been back in 1946 if it had then been on today's steady-state balanced-growth path? **7000**
b. In fact, Italy level of GDP per capita back in 1946 was about $2,500 per year even though its efficiency of labor has grown at 2% per year since the end of World War II. Why do you think its level back then was so low? **Wartime destruction and disorganization.**

4. 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 responsiveness of exports to the exchange rate $X_\varepsilon = 500$, the responsiveness of the exchange rate to interest rates $\varepsilon_r=10$, and the responsiveness of investment to the interest rate $I_r = 1000$. And suppose t=0.2, $c_y =0.8$ $im_y=0.14$:
a. What happens to Y if the real interest rate r goes up by 2%—by 0.02—and if speculator confidence in the currency goes down by 30%? **Multiplier of 2. An increase of interest rates by 2% pushes down autonomous spending by $120.**

A 30% decrease in confidence in the currency pushes autonomous spending up by 150. Net effect is to raise GDP by 60.
b. What happens to Y if the real interest rate r goes up by 1%—by 0.01—and if baseline investment spending goes down by 300? **Multiplier of 2. An increase of interest rates by 1% pushes down autonomous spending by $60. Decrease in investment pushes autonomous spending down by 300. Net effect is to lower GDP by 720.**

5. 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 = $1.8 trillion, G = $3 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? **The multiplier is 1.54. Autonomous spending is 9.5. Real GDP is 14.61**
   b. Suppose I = $1.8 trillion, G = $3.5 trillion, GX = $1.7 trillion, c_o = $2 trillion, c_y = 1.0, the tax rate t=0.85, and im_y = .15. What is GDP Y? **The multiplier is 1. Autonomous spending is 9. Real GDP is 9.**
   c. Suppose I = $1.7 trillion, G = $2 trillion, GX = $1.8 trillion, c_o = $3 trillion, c_y = 0.65, the tax rate t=0, and im_y = .15. What is GDP Y? **The multiplier is 2. Autonomous spending is 8.5. Real GDP is 17**

7. Quantity Theory of Money: Suppose that the rate of labor force growth is 3% per year, the efficiency of labor is constant, and the economy is on its steady state growth path. Suppose also that the rate of growth of the nominal money stock is 10% per year. Do you think that it is likely that the inflation rate is less than 5% per year? Why or why not? **Potential GDP is growing at 3% per year. The money stock is growing at 10% per year. If velocity were constant, that would produce inflation at 7% per year. Without some good reason for velocity to be falling at 2% per year or more, it is unlikely that inflation is less than 5% per year.**

8. Phillips Curve: In the Phillips Curve framework in which $\pi = E(\pi) + \beta(u^* - u)$—the inflation rate π equals the previously-expected inflation rate $E(\pi)$ plus the Phillips Curve slope parameter β times the difference between the economy's natural rate of unemployment u^* and the current rate of unemployment u...
   a. If $E(\pi)$ = 9% per year, u^* = 6%, and u = 8%, what is the inflation rate π going to be if the Phillips Curve slope parameter β = 1/2? **Unemployment is 2% above the natural rate, so inflation is 1% below expected inflation: 8%**
   b. If $E(\pi)$ = 3% per year, u^* = 4%, and u = 4%, what is the inflation rate π going to be if the Phillips Curve slope parameter β = 1/2? **Unemployment is at the natural rate, so inflation at expected inflation: 3%**
   c. If $E(\pi)$ = 1% per year, u^* = 7%, and u = 3%, what is the inflation rate π going to be if the Phillips Curve slope parameter β = 1/3? **Unemployment is 4% below the natural rate, so inflation is 4/3% above expected inflation: 2 1/3%**

9. Phillips Curve: In the Phillips Curve framework in which $\pi = E(\pi) + \beta(u^* - u)$—the inflation rate π equals the previously-expected inflation rate $E(\pi)$ plus the Phillips Curve slope parameter β times the difference between the economy's natural rate of unemployment u^* and the current rate of unemployment u...

      a. If $E(\pi)$ = 1% per year, u^* = 7%, and u = 3%, what is the inflation rate π going to be if the Phillips Curve slope parameter β = 2/3? **Unemployment is 4% below the natural rate, so inflation is 8/3% above expected inflation: 3 2/3%**

      b. If $E(\pi)$ = 1% per year, u^* = 7%, and u = 3%, what is the inflation rate π going to be if the Phillips Curve slope parameter β = 1? **Unemployment is 4% below the natural rate, so inflation is 4% above expected inflation: 5%**

16. Monetary Policy: Suppose we have an economy with a natural rate of unemployment of 6%, current expected inflation of 2%, and a Phillips Curve slope parameter of 1/2. Suppose that the Federal Reserve has a target u^t for the unemployment rate and a target π^t for the inflation rate, and suppose that for each percentage point inflation is above its target level the Federal Reserve raises unemployment by an extra percentage point above its target level.

      a. If the target for the inflation rate is 2% and the target for the unemployment rate is 6%, what will inflation and unemployment be? **2%**

      b. If the target for the inflation rate is 3% and the target for the unemployment rate is 4%, what will inflation and unemployment be? **3.67%**

      c. If the target for the inflation rate is 6% and the target for the unemployment rate is 8%, what will inflation and unemployment be? **2%**

      d. If the target for the inflation rate is 4% and the target for the unemployment rate is 4%, what will inflation and unemployment be? **4%**

17. Monetary Policy: Suppose we have an economy with a natural rate of unemployment of 4%, current expected inflation of 15%, and a Phillips Curve slope parameter of 1/2. Suppose that the Federal Reserve has a target u0 for the unemployment rate and a target πt for the inflation rate, and suppose that for each percentage point inflation is above its target level the Federal Reserve raises unemployment by an extra two percentage points above its target level.

      a. Suppose that from this year forward the Federal Reserve sets its target for the inflation rate at 3% and its target for the unemployment rate at 5%, what will inflation and unemployment be this year? **8.75% for inflation; 16.5% for unemployment**

      b. Suppose expected inflation is adaptive in that each year's expected inflation is the previous year's actual inflation. What will inflation and unemployment be next year? **4.875% for inflation, 11.75% for unemployment**

      c. Suppose expected inflation is adaptive in that each year's expected inflation is the previous year's actual inflation. What will inflation and unemployment be two years from now? **2.9375%% for inflation, 7.875% for unemployment**

      d. Suppose expected inflation is adaptive in that each year's expected inflation is the previous year's actual inflation. What will inflation and unemployment be five years from now? **1.24% for inflation; 4.48% for unemployment**

e. Suppose expected inflation is adaptive in that each year's expected inflation is the previous year's actual inflation. What will inflation and unemployment be ten years from now? **1.01% for inflation; 4.02% for unemployment**

18. Monetary Policy: Suppose we have an economy with a natural rate of unemployment of 4%, and a Phillips Curve slope parameter of 1. Suppose that the Federal Reserve has a target u0 for the unemployment rate and a target πt for the inflation rate, and suppose that for each percentage point inflation is above its target level the Federal Reserve raises unemployment by an extra two percentage points above its target level.

a. If the Federal Reserve's target for the inflation rate is 2% and its target for the unemployment rate is 4%, what will the long run rate of inflation be? **2%**
b. If the Federal Reserve's target for the inflation rate is 2% and its target for the unemployment rate is 6%, what will the long run rate of inflation be? **1%**
c. If the Federal Reserve's target for the inflation rate is 4% and its target for the unemployment rate is 4%, what will the long run rate of inflation be? **4%**
d. If the Federal Reserve's target for the inflation rate is 4% and its target for the unemployment rate is 8%, what will the long run rate of inflation be? **2%**