Econ 1: Spring 2012: Problem Set 9

1. 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 "slope" β times the difference between the natural rate of unemployment u^* and the actual rate of unemployment u—calculate the rate of inflation π:

a. If $E(\pi)$=3% per year, β=1⁄2,u*=5%, and u=5%

$\pi= E(\pi)+\beta(u^* -u)$=3%

b. If $E(\pi)$=9% per year, β=1⁄2,u*=5%, and u=5%

$\pi= E(\pi)+\beta(u^* -u)$=9%

c. If $E(\pi)$=6% per year, β=1⁄2,u*=5%, and u=7%

$\pi= E(\pi)+\beta(u^* -u)$=5%

d. If $E(\pi)$=10% per year, β=1⁄2,u*=7%, and u=3%

$\pi= E(\pi)+\beta(u^* -u)$=12%

2. 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 "slope" β times the difference between the natural rate of unemployment u^* and the actual rate of unemployment u—and in which this year's expected inflation $E(\pi)$ is last year's actual inflation, calculate the rate of inflation π:

a. In the first year, if the starting $E(\pi)$=10% per year, β=1⁄2,u*=5%, and u=5%

$\pi= E(\pi)+\beta(u^* -u)$=10%

b. In the second year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part a—β = 1⁄2, u* = 5%, and u = 9%

$\pi= E(\pi)+\beta(u^* -u)$=8%

c. In the third year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part b—β = 1⁄2, u* = 5%, and u = 9%

$\pi= E(\pi)+\beta(u^* -u)$=6%

d. In the fourth year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part c—$\beta = 1/2$, $u^* = 5\%$, and $u = 9\%$

$\pi = E(\pi)+\beta(u^* - u)=4\%$

e. In the fifth year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part a—$\beta = 1/2$, $u^* = 5\%$, and $u = 9\%$

$\pi = E(\pi)+\beta(u^* - u)=2\%$

3. 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 "slope" β times the difference between the natural rate of unemployment u^* and the actual rate of unemployment u—and in which this year's expected inflation $E(\pi)$ is last year's actual inflation, calculate the rate of inflation π:

a. In the first year, if the starting $E(\pi)=2\%$ per year, $\beta = 1/2, u^*=5\%$, and $u=5\%$

2%

b. In the second year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part a—$\beta = 1/2$, $u = 5\%$, but structural changes in the economy raise u^* to 7%

3%

c. In the third year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part b—$\beta = 1/2$, $u = 5\%$, but structural changes in the economy keep u^* at 7%

4%

d. In the fourth year, if $E(\pi)$ is what inflation was the previous year—that is, if $E(\pi)$ is your answer to part c—$\beta = 1/2$, $u = 5\%$, but structural changes in the economy keep u^* at 7%

5%

e. What should the government and central bank do if they want to keep inflation from rising?

Given the equation, $\pi = E(\pi) + \beta(u^* - u)$, we can tell right away there are three ways to lower inflation rate:

1) try to bring down $E(\pi)$. In order to reduce expectations of inflation, $E(\pi)$, the government may adopt contractionary fiscal policies and the Fed may adopt contractionary monetary policies.

2) try to bring down u^*. The government should lower the natural rate of unemployment and make hiring easier for businesses.

3) try to increase u. The government can increase the actual rate of unemployment. In extreme cases, the government and the Fed may induce artificially high unemployment rate.

4. Websurf your way over to the Congressional Budget Office's most recent Long-Term Budget Outlook at <http://www.cbo.gov/ftpdocs/115xx/doc11579/06-30-LTBO.pdf>. Read it.

a. What is federal health care spending currently as a percentage of GDP?

In 2010, Medicare spending is 3.6% of GDP and Medicaid spending is 1.9%.

b. What does the CBO think that federal health care spending—Medicare, Medicaid, CHIP, and Exchange Subsidies—is likely to be as a percentage of GDP in 2035?

In 2035, Medicare spending is projected to grow to 5.9% of US GDP and Medicaid spending 3.8%

c. What does the CBO say that Social Security spending currently is as a percentage of GDP?

In 2010, it is 4.8% of GDP.

d. What does the CBO think that Social Security spending is likely to be as a percentage of GDP by 2035?

In 2035, CBO projects it to be 6.2%

e. Why, in your own words, does the CBO believe that the share of GDP the federal government spends on its major "mandatory" programs is going to rise between now and 2035?

CBO notes that "Spending for health care in the United States has been growing faster than the economy for many years", and in its projection this will continue to be the case. CBO attributes this to "rising enrollment" as well as "rising costs per enrollee". The cause of the latter is the "emergence, adoption and widespread diffusion" of new and more expensive medical technology; the cause of rising enrollment is the ageing of a vast population.

5. What does the Congressional Budget Office project that the federal debt held by the public

will be, as a share of GDP, in 2035, if congress and the president either adhere to the "baseline" of current federal programs or if they hold to PAYGO— that is, cut one program or raise taxes by the amount by which they raise another program? What, in your own words, is the logic behind this projection?

In the extended current-law baseline scenario, federal spending will drop relative to GDP in the next few years, level out for the rest of the decade and then steadily grow until 2035. In the next few years, revenue will also drop due to the recession but will pick up again considerably afterwards. Annual deficit will be at 4% in 2035 and we will have accumulated federal debt amounting to 79% of GDP by 2035. In the current-law baseline graph we can see that after 2015 the size of revenue and the size of outlay (excluding interest payment on federal debt) are roughly equivalent.

6. What does the Congressional Budget Office project that the federal debt held by the public will be, as a share of GDP, in 2035, if congress and the president continue to do business more-or-less as they have done business since 1980? What, in your own words, is the logic behind this projection?

In the alternative scenario, CBO makes the assumption that the political class will not have the temerity to cut spending to health care program, which means federal spending will not drop in the next few years (as predicted in the current-law baseline). Further, CBO assumes that there is no political will to let the tax cuts enacted in the Bush years to expire in 2011. The extension of these cuts would mean smaller tax receipts up to 2020.

In this alternative scenario, therefore, we will have higher spending and lower revenue, which would result in a budget deficit of 16% of GDP each year. The accumulated debt will exceed 100% of US GDP by 2023 and 200% by 2037.

7. Let us think about very long-run economic growth in the longest possible perspective. In 8000 BC there were roughly 5 million people in the world; in 1800 there were roughly 750 million; today there are 7.5 billion. In 8000 BC GDP per capita worldwide was roughly $500 per year in today's dollars; in 1800 GDP per capita worldwide was roughly $600 per year; today GDP per capita is roughly $7,500 per year. Total worldwide GDP at any moment equals GDP per capita times the population. Ignore the fact that the Gregorian calendar does not include a year zero.

a. What was the average annual growth rate—in percent per year—of population between 8000 BC and 1800?

In 9800 years, the population grew 150-fold. That is between 7 and 8 doublings. Say 8 doublings in 10000 years. That is a doubling every 1250 years. 72/1250 = .058%/year. For 7 doublings in 10000 years it would be .051%/year

b. What was the average annual growth rate of population between 8000 BC and today?

In 10012 years, world population has grown 1500 fold. That is 10 ½ doublings—one doubling every 950 years: .076%/year

c. What was the average annual growth rate of GDP per capita between 8000 BC and 1800?

Almost zero: not even one doubling in 10000 years means that the growth rate was less than 0.01%/year

d. What was the average annual growth rate of GDP per capita between 1800 and today?

12.5 is about 3 ½ doublings—that means one doubling every 57 years, or a growth rate of 1.25%/year

e. What was the average annual growth rate of total world GDP between 8000 BC and 1800?

GDP at 8000BC = 5000000*500=2500000000
GDP at 1800 = 750000000*600=450000000000
GDP grew 180-fold—that is about 7.5 doublings—in 9800 years. That is one doubling every 1300 years, or a growth rate of 0.055%/year.

f. What was the average annual growth rate of total world GDP between 1800 and today?
GDP at 2012 = 7500000000*7500=56250000000000.

It has grown 125-fold: that is seven doublings in 212 years—for a growth rate of 2.4%/year.

g. Why do they call it the "Industrial Revolution"?

Whereas there was no noticeable change in man's productivity in the 9800 years before the Industrial Revolution, it has grown tremendously in the two centuries since 1800. This explosive increase of our economic productivity also came with a drastic human demographic growth.