Problem set: PHILLIPS CURVE

1. In a certain economy the expectations-augmented Philips curve is: 
   \[ \Pi = \Pi^e - 2(u-u^*) \quad u^* = 0.06 \]  (natural rate of unemployment) 
   A. Graph the Phillips curve of this economy for an expected inflation rate of 0.1. If the central bank 
      chooses to keep the actual inflation at 0.1%, what will be the unemployment rate?. If the central bank 
      unexpectedly increases inflation, what will happen to unemployment and why 
   B. A demand shock raises expected inflation to 0.12. Graph the new Phillips curve. What happens to 
      unemployment rate if the central bank holds inflation at 0.1% after the demand shock? 
   c. Suppose a supply shock raises the expected inflation to 0.12 and natural rate of unemployment to 
      0.08. Repeat part B. 

2. Suppose that the government institutes a new program to help unemployed workers learn new skills 
   and find jobs. 
   - If this program reduces structural unemployment, what is the effect on expectations-augmented Phillips curve? What is the effect on long-run inflation? 
   - The program is expensive, and critics argue that a cheaper way to cut unemployment would be 
     by monetary expansion. Comment. 

3. Suppose the Phillips curve is given by: 
   \[ \Pi = \Pi^e + 0.1 - 2u, \]  where u is unemployment 
   Suppose also that \( \Pi^e = \Theta \Pi_{t-1} \) and \( \Theta = 1 \) 
   Initial inflation is equal to zero. 
   - Calculate the natural rate of unemployment. 
   - Suppose the government is determined to keep u at 3%. What will the inflation rate be in years 
     t+1, t+2? 

4. In a given economy the long run equilibrium growth of output is equal to 3%, the velocity of money 
   is constant, the rate of growth of nominal money supply is constant and equal to 8%. Natural rate of 
   unemployment is 6%; an increase in inflation rate equal to one percentage point will cause the 
   unemployment rate to fall by 1/3 percentage point. An increase in unemployment rate by 1 percentage 
   point will decrease the rate of growth of output by 3 percentage points. Expectations are rational. 
   Calculate the short and long run inflation and unemployment rate when: 
   - There is an unanticipated increase in the rate of money growth to 14% 
   - Expected inflation rises to 8%, due to expansionary fiscal policies; however the actual fiscal 
     policy remains unchanged 
   - As a result of supply shock, the natural unemployment rate rises to 7%. 

5. In a representative economy, the Phillips curve is given by: 
   \( \pi^e = \pi^e + 2(4-u) \). 
   In long run equilibrium, inflation rate has been equal to 10%, but the Central Bank wants to reduce it. 
   Calculate the short and long run unemployment rate and the sacrifice ratio, if: 
   - \( \pi^e - \pi_{t-1} \) and the Central Bank lowers inflation to 6% in the first period and then keep is at this 
     level 
   - \( \pi^e - \pi_{t-1} \) and the Central Bank, in the first period lowers inflation to 8%, and in the second 
     period to 6%. 
   - Expectations are rational and the Central Bank announces that it will reduce inflation to 8% in 
     the first period and to 6% in the second period. The public however doesn’t trust this 
     announcement and believes that in the first period inflation rate will be 7%. In the second 
     period expected inflation is 6% (when people see that the central bank is determined to fight 
     inflation) 
   - Does the sacrifice ratio depend on expectations? 

6. Suppose that the Phillips curve is given by: 
   \( \Pi_e = \Pi^e + 0.1 - 2u_e \), where \( \Pi^e = \Theta \Pi_{e-1} \).
What is the natural rate of unemployment?
Suppose that $\theta=0$ and the unemployment is equal to the natural rate. In year $t$, the authorities decide to bring the unemployment rate down to 3% and keep it there forever.

Determine the rate of inflation in year $t+1$ and $t+20$
Now suppose that in year $t+5$, $\theta$ increases from 0 to 1. The government still keeps $u = 3$

What will the inflation rate be in $t+5$, $t+10$, $t+15$?

9. Central Bank wants to reduce inflation.
   - If expectations are adaptive is there any way to reduce inflation without provoking unemployment?
   - Assume that the catchall variable $z$ is reduced (for example the government reduces unemployment benefits). Will this reduce unemployment or long run inflation?