Economics 14.02
Problem Set 4
Due Date: 3/31/04
Please STAPLE all sheets together.

Answer each as True, False or Uncertain. Give a two or three sentence explanation for your answer.

1. Indexing salaries to inflation results in a flatter Phillips Curve because part of the inflation change is absorbed within the year rather than keeping adjustment bottled-up until the following year. *False – Wage indexation increases the effect of unemployment on inflation, resulting in a steeper Phillip's Curve. Without wage indexation, lower unemployment increases wages, which in turn increases prices. But because, wages do not respond to prices right away, there is no further effect within the year. With wage indexation, however, an increase in prices leads to a further increase in wages within the year, which leads to a further increase in prices, and so on, so that the effect of unemployment on inflation within the year is higher.*

2. The Phillip's Curve shows that the natural rate of unemployment depends on the natural rate of inflation (set by long-term commitments of the Federal Reserve Board). *False – The natural unemployment rate is defined where inflation rate is equal to expected inflation rate; it is the rate of unemployment that keeps the inflation rate constant. Note, however, that the natural unemployment rate is independent of the actual value of the expected inflation rate; its level instead is determined by the mark-up of firms, the structure of the labor market, and the sensitivity of changes in the inflation rate to the unemployment level (see equation 8-8).*

3. The natural unemployment rate decreased in both Europe and the United States over the last thirty years because of the competitive pressures to which globalization exposed firms. *False – The facts are wrong, but the theoretical contribution of globalization is correct. First, while the United States saw a decrease in the natural unemployment rate in the 1990s (perhaps in part due to globalization) the natural unemployment rate was higher in the late 1970s and 1980s than in the 1950s and 1960s (not a thirty-year decline). The natural unemployment rate in Europe is now 5% higher than it was in the 1960s. However, globalization should foster stronger competition between firms internationally (a decrease in the mark-up) and strengthen firm bargaining power due to outsourcing (a decrease in our labor market variable z); both of these forces should push down the natural unemployment rate.*

4. The impact of output fluctuations for employment levels are diminished because some of the new workers are drawn from individuals previously classified as out-of-the-labor-force. *False – Our fully specified Okun's law estimates growth above normal growth (i.e., growth in excess of population expansion and productivity increases) results in a 0.4 decrease in unemployment rate. One reason for the smaller coefficient comes from our definition of unemployment. An employment increase due to output growth partially draws from the unemployed as well as those not previously looking for work. Thus, a 0.6% increase in employment only leads to a*

0.4% decrease in unemployment as some workers are pulled from those outside of the labor force, and some discouraged workers may resume the job search process and thus be counted again as unemployed. [Other reasons for the 0.4 coefficient are labor hoarding by firms and that some workers' jobs are not output linked – see page 184.] So the effect in the question can lead to a diminished effect on the unemployment rate (compared to the case where all hired workers come from within the labor force).

5. The speed at which the Federal Reserve Board undertakes dis-inflation affects the cumulative unemployment response the economy experiences. *Uncertain – Theoretically, this depend on how expectations are formed. The basic model of expected inflation being equal to last year's inflation suggests the cumulative unemployment effects are independent of whether the dis-inflation is undertaken in one year or spread out over several years. But in the models of Lucas and Sargent, a fully-credible central bank could change the inflation rate with no adverse response. In fact, a faster dis-inflation might be better for maintaining credibility. Fisher and Taylor argued, however, that the presence of nominal rigidities and contracts (i.e., staggering of wage decisions) make it important for dis-inflation to be managed over several years even if expectations did adjust. Empirically, some evidence does suggest that faster dis-inflations result in smaller sacrifice ratios.*

Longer Problems:

1. (Chapter 8) Please use the table below to organize your responses for parts b and e. You should show your work however so that partial credit can be given.

Year	T	T+1	T+2	T+3	T+4	T+5	T+6	T+7
Π_t	4%	4%	4%	4%	4%	8%	12%	16%

Suppose the Phillips Curve is given by [Π_t is the inflation rate, $E\Pi_t$ is the expected inflation rate, and u_t is the unemployment rate]:

$$\Pi_t = E\Pi_t + 0.1 - 2u_t$$

Where

$$E\Pi_t = \Theta\Pi_{t-1}$$

Also, suppose Θ is initially equal to zero.

a. What is the natural rate of unemployment? *The natural rate is where $\Pi_t = E\Pi_t$ so that $u_t=0.1/2=5\%$.*

Suppose that the actual rate of unemployment is initially equal to the natural rate. In year T, the authorities decide to bring the unemployment rate down to 3% and hold it there forever.

b. Determine the inflation rate in years T, T+1, T+2, T+3, and T+4. *As $E\Pi_t=0$, a 3% unemployment rate would require inflation of $\Pi_t = 0.1 - 2(.03) = 4\%$ in every year beginning in T.*

c. How long does it take the natural rate of unemployment to decline to 3%? *The natural rate of unemployment never declines to 3%! It is defined to be where $\Pi_t = E\Pi_t$ and thus remains at 5%.*

d. Do you believe your answer to part b? Why or why not? Think about how people are likely to form their expectations of inflation. *$E\Pi_t=0$ and $\Pi_t=4\%$ in every year. People will not be wrong forever (the Friedman criticism).*

Suppose now that in year T+5 the value of Θ increases from 0 to 1. Suppose that the government is still determined to keep u at 3% forever.

e. What expectations formation does $\Theta=1$ represent? Why might   increase this way? *When $\Theta=1$, people expect inflation this year to be what it was last year. These expectations are likely to form when inflation shows a strong correlation between years (e.g., the United States' recent experience).*

f. What will be the inflation rates in years T+5, T+6, T+7? *The inflation rate must continually rise to keep unemployment at 3%:*

T+5: $\Pi_5 = \Pi_4 + 0.1 - 2(0.03) = 8\%$

T+6: $\Pi_6 = \Pi_5 + 0.1 - 2(0.03) = 12\%$

T+7: $\Pi_7 = \Pi_6 + 0.1 - 2(0.03) = 16\%$

g. How does the natural rate of unemployment depend on Θ? *Again, the natural rate of unemployment is when $E\Pi_t = \Pi_t$ so that the natural rate is independent of Θ.*

h. Do you believe the answer in e? Why or why not. *The scenario described is unlikely. With $\Theta = 1$ inflation expectations are again forever wrong.*

2. (Chapter 9) Suppose the economy can be described by the following three equations:

$$u_t - u_{t-1} = -0.4*(g_{yt} - 3\%) \qquad \text{Okun's Law}$$

$$\Pi_t - \Pi_{t-1} = - (u_t - 5\%) \qquad \text{Phillip's Curve}$$

$$g_{yt} = g_{mt} - \Pi_t \qquad \text{Aggregate Demand}$$

a. What is the natural rate of unemployment? *The natural rate is where $\Pi_t = \Pi_{t-1}$ (i.e., inflation is not increasing) so that $u_t=5\%$.*

b. Suppose the unemployment rate has been equal to the natural rate for the last two periods, and the inflation rate is 8%. What is the growth rate of output? What is the growth rate of the money supply? *When unemployment remains constant, the Okun's Law relationship demonstrates output growth must be at its natural level, or $g_{yt}=3\%$. Rearranging the aggregate demand relationship shows that monetary growth must be 11%, as $g_{mt}=g_{yt}+ \Pi_t=3\%+8\%=11\%$.*

c. Suppose that the conditions are as in b), when in year T the authorities use monetary policy to reduce the inflation rate to 4% in year T and keep it there forever. What must happen to the unemployment rate in year T and thereafter? What must happen to the rate of grow of output in year T and thereafter? What must be the rate of nominal money growth in year T and thereafter? Use the following table to organize your answers.

	Π_t	u_t	g_{yt}	g_{mt}
Year T-1	8%	5%	3%	11%
Year T	4%	9%	-7%	-3%
Year T+1	4%	5%	13%	17%
Year T+2	4%	5%	3%	7%

The first column is determined by the authorities. The Phillip's Curve relationship determines the second column – when the inflation is reduced in year T, unemployment must rise. Thereafter, the inflation rate is constant so that unemployment returns to and remains at its natural rate. Re-arranging Okun's Law relationship translates the unemployment fluctuations into output growth rate fluctuations

$$g_{yt} = 3\% + (u_{t-1} - u_t)/0.4$$

A deep, one-year recession followed by a strong recovery is experienced. Finally, the Aggregate Demand relationship determines the money supply growth. Note the surprising result that money growth is actually at its highest in Year T+1.