

Class Outlines
October 30 and November 1, 2001

October 30, 2001

- I. Exam 1

November 1, 2001

- I. Passed back quiz 2.
- II. Review.
 - a. For the first exam, we concentrated heavily on the Phillips curve, the relationship between either inflation and unemployment or inflation growth and unemployment. Let's think about how this relationship came about.
 - i. From AD/AS an increase in the money supply caused output to increase (in the short run) and prices to increase. This suggested that there may be a relationship between an increase in prices and an increase in output. Since an increase in output is directly connected to a decrease in unemployment the bridge is gapped.
 - b. We now want to be more explicit. By giving just the Phillips curve relationship, we have left out movement between a change in the money supply and a change in output. In addition, we have left out a discussion between the change in output and the change in unemployment.
- III. Bridging the gap (part 1): Aggregate demand and monetary policy:
 - a. We know that an increase in the money supply increases aggregate demand and leads to an increase in output (in the short run). We have written the relationship describing equilibrium in the goods market as follows:
 - i. $Y_t = Y(M_t/P_t, T_t, G_t)$ where this notation implies that equilibrium output from the aggregate demand side is a positive function of the real money supply, a negative function of taxes, and a positive function of government spending. For now, we want to concentrate on the role of monetary policy. Thus we will ignore taxes and government spending. We can do this by using Milton Friedman's famous equation of exchange:
 - 1. *equation of exchange:* $Y_t = v^*(M_t/P_t)$, where v is the *velocity of money*. This equation can be rewritten as follows: $P_t Y_t = v^* M_t$

- a. The velocity of money, very roughly speaking, determines the number of times a given dollar purchases a dollar worth of output. For example, consider an economy which only has cans of coca cola. Suppose 10 cans of Coca Cola (in this lame example Y_t) are sold at \$.50 a piece. Thus $P_t Y_t = \$5$. Suppose that there is only \$1 in the money supply. It must be the case that this dollar was used 5 times to purchase \$5 worth of coke.
2. We want to express this equation in terms of the growth rate of GDP. In other words we want ΔY_t not Y_t . The equation of exchange can be rewritten in “change form as follows”: (These variables are all expressed as percentage changes not just level changes).
 - a. $\Delta Y_t = \Delta M_t - \Delta P_t$. Since the percentage change in the price level is also known as the inflation rate (π_t) we can rewrite this equation as: $\Delta Y_t = \Delta M_t - \pi_t$.
 - b. The aggregate demand relationship depicted above implies that an increase in the growth rate of the nominal stock of money (holding inflation constant) leads to an increase in the growth rate of output. This is precisely what we learned about monetary policy in chapter 7. Note that if the money supply grows at the same rate as prices (as would be the case in the medium run) then output is not impacted.

IV. Bridging the gap (part II): Okun’s law.

- a. We have already discussed the basic idea behind Okun’s law. As output growth increases, unemployment growth declines. We will base on our analysis on the following general form of Okun’s law:
 - i. $u_t - u_{t-1} = -\beta(\Delta y_t - \Delta Y^*)$.
 1. ΔY^* is known as the *normal growth rate of output*. This is the minimal growth rate in output necessary to keep unemployment today from being a number larger than unemployment the period before (the growth rate necessary to keep unemployment from growing).
 - a. We expect that the normal growth rate of output is positive for two reasons. First, the labor force is growing over time. If the labor force increases, to keep unemployment from

increasing, we must hire a large portion of the new labor force. To be able to include more workers firms must have growing production. Secondly, over time workers become more productive. Thus, growth today will generally exceed growth in the past.

2. In the United States, we have estimated the normal growth rate of output to be roughly 3%. Further, we have estimated β to be about .4. This yields the following version of Okun's Law:
 - a. $u_t - u_{t-1} = -.4(\Delta y_t - .03)$.
 - b. What does it mean for $\beta < 1$. Well, if the growth rate in output exceeds the normal growth rate in output by 1%, then the above equation tells us that unemployment falls by .4%. Why is this less than one?
 - i. The main reason we don't get a one-to-one trade off between GDP growth and unemployment growth is because of *labor hoarding*. When unemployment growth exceeds the normal rate, the economy is expanding. Firms will not necessarily run out and hire more workers. Some firms may, but many firms will simply ask their existing employees to work more. Conversely, because it is expensive to train new workers, when GDP growth is less than the normal rate, firms will not fire or layoff as many workers in percentage terms as the slow down in growth. They will weather the storm to avoid costly attempts to rehire workers in the future.
 - ii. As GDP growth increases, the number of participants in the labor force increases. Someone who was unwilling to look for a job because of poor prospects would not have been considered to have been part of the labor force before. When the economy improves many workers will leave the "out of the labor force status" to join the labor force. Thus, some of the workers that are hired were not part of the labor force, and the impact of an increase in the growth rate of GDP

impacts the change in the unemployment rate less.

V. Bridging the gap (part III): Our version of the Phillips curve.

- a. There are several versions of the Phillips curve that we could use. We choose the following:
 - i. $\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$. This Phillips curve says that an increase in the unemployment rate above the natural rate by 1% ($\Delta\pi_t = -.01$) leads to a decline in the change in the inflation rate of $\alpha\%$.

VI. Putting it all together: Our goal, disinflation.

- a. Our goal for this section is a policy that decreases the inflation rate. We have discussed many reasons why such a policy may be desired. In our country, we have a recent history of fighting inflation with monetary policy. We will describe how this works using the three equations above. In review:
 - i. Aggregate demand relationship: $\Delta Y_t = \Delta M_t - \pi_t$
 - ii. Okun's Law: $u_t - u_{t-1} = -\beta(\Delta y_t - \Delta Y^*)$
 - iii. Phillip's curve: $\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$.
- b. Again our goal is to decrease inflation. This will occur as follows:
 - i. Step 1. Slow down the growth rate in the money supply. From the aggregate demand relationship this causes ΔY_t to fall (holding prices constant in the short run).
 - ii. Step 2. As ΔY_t falls, from Okun's law (pay to attention to the negative sign in front of beta), output growth is less than the normal growth rate of output (which has not changed). This causes unemployment today to rise above unemployment yesterday. (Beta is assumed to be positive, so if the growth rate of unemployment is larger than the normal growth rate, the right hand side of Okun's law becomes a positive number).
 - iii. If unemployment at time t increases, then from the Phillips curve, inflation at time t must be less than inflation at time t-1. Thus we have accomplished our goal using contractionary monetary policy.