Problem sets 5: Medium-term adjustment and inflation dynamic

EE312: Intermediate macroeconomics

Semester 1/2019

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Question 1 Answer the following questions. True or False

a) The unemployment rate tends to be high in recessions and low in expansions.

Yes. Firms normally lay-off people during the recession, and hence resulting in an increase in unemployment rate.

b) The natural rate of unemployment is constant over time within a country.

c) The natural rate of unemployment is the same in all countries.

False.

The natural rate of unemployment is defined as the equilibrium level of unemployment rate that prevails the flexible adjustment in both wage and price. The level is determined by the labor market conditions, i.e. the variations in the factors that affect demand and supply for labor. There should be no ground that the natural level is constant over time, as well as across countries. For example, the natural rate of unemployment in Europe has been higher than that of the US. This phenomenon is attributed to the more generous provision on the social protection programs in Europe than those in the US. As European's worker are offered with longer time duration under the unemployment benefit programs, they are likely taking long term to search for job, and hence resulting higher natural rate of unemployment. Within the country, there are plenty of studies that the natural rate of unemployment has declined as the improvement in IT technology lowers the search cost of job seeker. As a result, it is evidently clear that natural rate of unemployment rate varies over time, and across countries.

d) In the late 1960s, the economists Milton Friedman and Edmund Phelps said that policy makers could achieve as low a rate of unemployment as they wanted.

No, they believed that there was no permanent trade-off between inflation and unemployment.

e) Policy makers can exploit the inflation–unemployment trade-off only temporarily.

Positively, they can. However, normatively, they should not. In the short-run, there is a room for the central bank to boost output. Central bank must trade off with an increase in the inflation rate. However, if keeping the output boosted for too long periods of time, and hence generating too high

inflation, will basically lead to an upward revision of inflation expectation; this results in an increase in the actual inflation at the end. Short-term exploitation is not sustaining, but rather resulting in higher long term inflation rate.

Question 2 Discuss the following statement

a. The Phillips curve implies that when unemployment is high, inflation is low, and vice versa. Therefore, we may experience either high inflation or high unemployment, but we will never experience both together

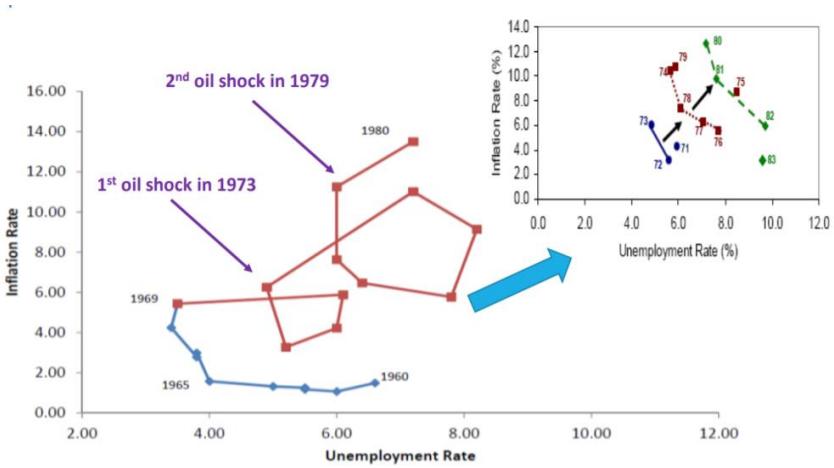
The downward-sloping Phillips curve can be rationalized under the assumption that there are no supply shocks. Intuitively, given fixed wage, an increase in demand factors lead to an increase in both inflation and output. These increases also bring the unemployment rate down. As a result, the Phillips relation statistically documents the conditional (negative) correlation between inflation and unemployment rate under the demand shocks.

Once, we incorporate the supply shocks into the consideration, the increase in both inflation and unemployment could be the case. This reflects the upward shift of the Phillips curve, i.e. the stagflation. Historically, the global economy undergone the positive correlation between inflation and unemployment rate during the oil shock in 1970s.

One other aspect that could possibly generate an increase in both inflation and unemployment rate is the increase in inflation expectation. With the increase in inflation expectation, workers would generally demand for higher wage, and hence resulting in the rise of inflation. Unemployment rate will rise as higher wage would incentivize firms to downsize the hiring. As a result, positive correlation between unemployment and inflation rate could also be driven by expectation factor.

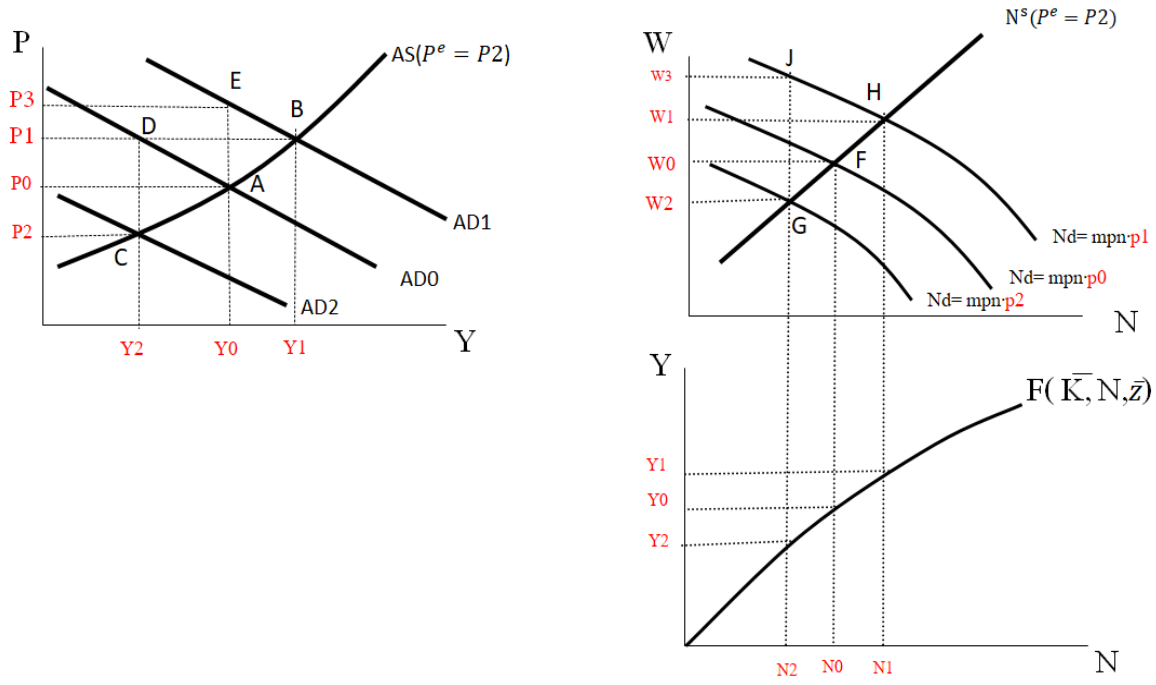
b. As long as we do not mind having high inflation, we can achieve as low a level of unemployment as we want. All we have to do is increase the demand for goods and services by using, for example, expansionary fiscal policy.

This argument would be true if Phillips curve does not move, i.e., the unemployment-inflation trade-off is permanent. However, with the two oil shocks in 1970s, economists, as well as policy makers, began to realize that the Phillips curve could be moving with respect to several factors, one of which is the inflation expectation.



The trade-off is not permanent, and therefore, we cannot exploit the relationship forever. In the short-run, an expansionary fiscal policy could generate some simulative effects on output and unemployment rate. However, this stimulus is followed by higher inflation, which generates some sided effects. Indeed, as long as the government attempts to "overly" boost the economy, inflation expectation will start to rise, and hence undo the impact of expansionary policy. Mechanically, with the upward revision of inflation expectation, workers will demand for higher wage. This results in an increase in the cost of production, and hence incentivize firms to lower their hiring. This would undo the initial effect of the expansionary policy. In the long-term, expansionary policy generates neural effect on output and unemployment rate; however, the inflation remains high.

Question 3 The diagram below illustrates three key figures discussed in class. Suppose the current level of **aggregate demand is equal to AD2**. Answer the following questions.



a) Explain the intuition behind the notation of expectation-based labor supply and aggregate supply.

In general, workers care for the "real wage" that they earn from working. However, in practice, workers basically need to preset their wage using nominal contract. That is, they must first agree upon with firms over the nominal payment scheme that they will receive, and then proceed to work. As a matter of timing, they won't know in advance what the actual level of real wage they will receive. As a result, to set the appropriate level of nominal payment, while keeping in mind that they care about the real earnings, workers usually negotiate for their pay with an expected price level. They try best to come up with the close approximate of the actual price, so that the real wage earned would come close to what would have been under a full-indexation contract – the contract that nominal wage is automatically tied to the level of observed price or inflation. The higher expected price level, the higher payment scheme workers will require from the negotiation. The notion of expectation-driven labor supply, aka nominal wage-setting scheme, is therefore to represent the amount of labor supplied or the required level of nominal way, both of which is contingent on upon the level of expected price. The concept of expected-driven output supply is similar; firms use the committed wage scheme to represent cost of the production, and hence determine the level of production accordingly. With the change in committed wage scheme, the level of production will be changed as well.

b) From the figure, indicate the point(s) that represent(s) the natural level of output and natural level of employment. Explain the underlying reason.

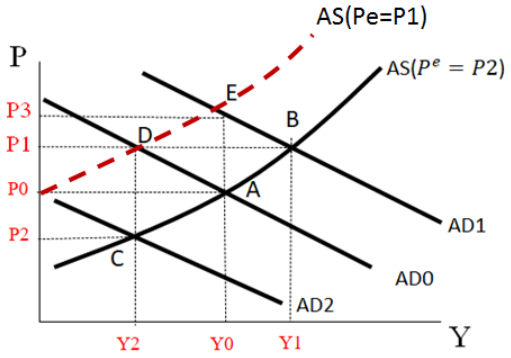
C represents the natural level of output while G represents the natural level of employment. The natural variable is referred to the equilibrium situation when market requires no further adjustment. Given the level of AD2 and expected price equal to P2, workers made a corrected expectation when they formed up their wage setting. Hence, the perceived real wage and the actual real wage turn out to be the same; workers now are in the saturated situation where they would need no further adjustment in the nominal wage.

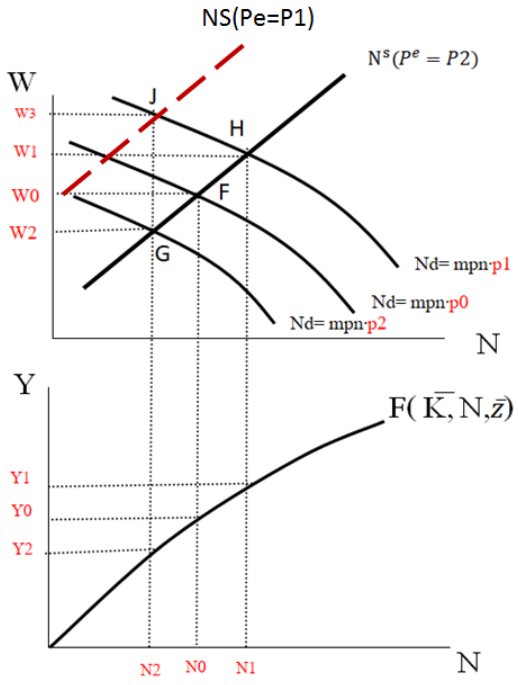
c) If the government uses an expansionary fiscal policy, **causing a shift of aggregate demand curve to AD0**, discuss what happen to the equilibrium in the short-run. Compare the value of real wage before and after the policy. Use the figures and indicate the points that represent the new short-run equilibrium. For now, consider the case when the policy is unanticipated.

If the expected price was anchored at the P2 before workers observe shocks, the committed wage scheme will be given by the NS(Pe=P2). With the surprised fiscal expansion, AD will shift to AD0; this causes an increase in output (Y=Y0>Y2), and price level (P=P0 > P2=Pe). With the higher price, the value of marginal product increases along; this results in an increase in demand for labor, captured by Nd=mpn*p0. Despite a mismatch between the expected price and the actual price, workers cannot raise their wage instantaneously but keep their wage scheme fixed at the preset schedule given by NS(Pe=P2). In equilibrium, labor employment will rise to N=N0). Each worker will receive W=W0. The real wage will be falling below the level that workers earned before the policy shock.

d) Does the equilibrium point indicated in "c" represent a sustained equilibrium? Why? Discuss about what happen, if any, after the medium-run adjustment. Use the figure and indicate the points that represent the equilibrium after the medium-run adjustment (Hint: if the point(s) is not provided in the figure, add one(s) and complete the figure on your own.)

No, with the mismatch between the expected price and the actual price, workers will adjust their wage schedule whenever they can. Workers will require higher nominal wage. The below figure represents the adjustment that will be required so that the economy reverts to the natural equilibrium. D represents the equilibrium in the goods market while J represent the equilibrium in the labor market. Note that price increases from po to p1 and nominal wage increases from wo to w3.





e) If the expansionary policy is instead anticipated, discuss what happen to the equilibrium in the short-run. Does your answer differ from the previous case when the policy is unanticipated?

The economy will directly jump from the initial situation to point D and point J; there won't be any temporary equilibrium. Anticipated fiscal policy will not generate any real effects; the effect of anticipated fiscal policy only results in an increase in nominal price and nominal wage. This case is different from the previous case when policy is surprisingly implemented. In that case, the fiscal expansion generates real effects on output. However, the impact is short-lived; the economy will quickly revert to the natural equilibrium. Over the course of medium-run adjustment, both anticipated and unanticipated will be neutral. The only point makes one differentiated from the other is the pattern in which neutrality is achieved.

Question 4. (*Evolutionary inflation dynamic* and Gaining trust) Suppose that the Phillips curve takes the following form,

$$\pi_t = \pi_t^e - 0.7(u_t - u_t^n) + \vartheta_t$$

where π_t = inflation

π_t^e = expected inflation

u_t = actual unemployment rate

u_t^n = the natural rate of unemployment

ϑ_t = other supply shocks that directly affect the inflation rate

Assume that the inflation expectation is given by,

$$\pi_t^e = (1-\theta)\bar{\pi} + \theta\pi_{t-1}$$

where $\bar{\pi}$ is the level of targeted inflation, set and publically announced by the central bank. In words, we assume that people form the expectation using the weighted average between past observed inflation and the targeted inflation rate. The value of theta (θ) could be between 0 and 1.

Suppose that (i) θ is now equal to zero, (ii) the rate of unemployment initially stays at the natural rate of unemployment, assumed to be equal to 5%, (iii) ϑ_t is set equal to zero where there is no random shocks, and the inflation target ($\bar{\pi}$) is set to be 2%. *In year t, the government decides to bring the unemployment rate down to 3%, and hold it there forever.* Answer the following question

4.1) Determine the rate of inflation in period t, t+1, t+2, t+3, t+4, t+5.How does the value of inflation in each period compare with the targeted inflation ($\bar{\pi}$)?

			expected		actual	natural	Gap		actual
Time	theta	pibar	inflation	sacrifice ratio	U	U	U	shock	inflation
t	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+1	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+2	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+3	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+4	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+5	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%

4.2) Do you believe the answer given in 4.1? Why or why not? (Hint: Think about how people are more likely to form the expectations of inflation.)

If the inflation expectation is really formed in the way assuming in the question, actual inflation will be persistently off the target for 6 periods in a row. This should cast doubt among agents whether they make any mistake in the formation of inflation expectation. In fact, agents should have figured out that their expected inflation had been too low to be true; using the 2% inflation targeted as the expected inflation should not make sense. As a result, given that the agents learn over time, the answer given in 4.1 is highly unlikely.

Now suppose in year t+6, θ increases from 0 to 1. Suppose that the government still determines to keep unemployment rate at 3%

4.3) Why might theta (θ) increase this way?

By the learning process, they should revise the inflation expectation formula so that their expected inflation can come close to the actual ones. Because they repeatedly see that actual inflation in each period is equal to previous period inflation, it makes sense for the agents to instead put 100% weight of the inflation expectation on the past observed inflation, rather than the targeted inflation.

4.4) What might be the rate of inflation in period t+6, t+7, t+8, and t+9?

			expected		actual	natural	Gap		actual
Time	theta	pibar	inflation	sacrifice ratio	U	U	U	shock	inflation
t	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+1	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+2	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+3	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+4	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+5	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+6	1	2.00%	3.40%	(0.70)	3.00%	5.00%	-2.00%	0.00%	4.800%
t+7	1	2.00%	4.80%	(0.70)	3.00%	5.00%	-2.00%	0.00%	6.200%
t+8	1	2.00%	6.20%	(0.70)	3.00%	5.00%	-2.00%	0.00%	7.600%
t+9	1	2.00%	7.60%	(0.70)	3.00%	5.00%	-2.00%	0.00%	9.000%

4.5) From (4.4), what can we conclude about inflation when $\theta = 1$ and unemployment rate is kept at 3%?

Inflation rate will be accelerating (rising) if the unemployment rate is kept below the natural rate of unemployment.

Now suppose in year t+10, a new government is elected. The government reforms the authority under control. It determines to keep unemployment rate at 5% and brings the inflation down to the targeted level ($\bar{\pi}$).

4.6) What happen to inflation in period t+10 if the government instead keeps the unemployment rate at 5%. Would this allow central bank to be successful in achieving the targeted inflation in period t+10?

When unemployment rate is kept at 5%, there will be no unemployment gap. However, as the expected inflation is 9%, the actual inflation will then be 9% as well. The central bank cannot successfully achieve the 2% targeted inflation in period t+10.

			expected		actual	natural	Gap		actual
Time	theta	pibar	inflation	sacrifice ratio	U	U	U	shock	inflation
t	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+1	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+2	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+3	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+4	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+5	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+6	1	2.00%	3.40%	(0.70)	3.00%	5.00%	-2.00%	0.00%	4.800%
t+7	1	2.00%	4.80%	(0.70)	3.00%	5.00%	-2.00%	0.00%	6.200%
t+8	1	2.00%	6.20%	(0.70)	3.00%	5.00%	-2.00%	0.00%	7.600%
t+9	1	2.00%	7.60%	(0.70)	3.00%	5.00%	-2.00%	0.00%	9.000%
t+10	1	2.00%	9.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	9.00%

4.7) To bring down the inflation to the targeted level, what does government need to do in period t+11? What will happen to the unemployment rate?

Given the 9% expected inflation, actual inflation will be 2% only if the unemployment gap is 10%. That is, central bank must generate the recession so that the inflation problem can be solved. To see this, we set actual inflation equal to 2% for the 9% expected inflation, and solve for the level of unemployment gap that makes the Phillips relation hold. This would imply that u-un = 10%. The level of unemployment rate that is required to bring the inflation down to 2% must be 15%.

4.8) Given the result in (4.7) and its full commitment to keep unemployment rate at 5%, what happen to inflation in period t+12, t+13, t+14, t+15?

			expected		actual	natural	Gap		actual
Time	theta	pibar	inflation	sacrifice ratio	U	U	U	shock	inflation
t	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+1	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+2	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+3	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+4	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+5	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+6	1	2.00%	3.40%	(0.70)	3.00%	5.00%	-2.00%	0.00%	4.800%
t+7	1	2.00%	4.80%	(0.70)	3.00%	5.00%	-2.00%	0.00%	6.200%
t+8	1	2.00%	6.20%	(0.70)	3.00%	5.00%	-2.00%	0.00%	7.600%
t+9	1	2.00%	7.60%	(0.70)	3.00%	5.00%	-2.00%	0.00%	9.000%
t+10	1	2.00%	9.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	9.00%
t+11	1	2.00%	9.00%	(0.70)	**15.00%**	5.00%	**10.00%**	0.00%	2.00%
t+12	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+13	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+14	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+15	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%

Now suppose in year t+16, the value of theta reduces from 1 t0 0.

4.9) Why might theta (θ) reduce this way? What can we imply about the value of theta (θ) and the past macroeconomic outcomes?

People have seen from the past that central bank have been serious in keeping the inflation checked at the targeted level. This regains the credibility among the public, and therefore pushing agents to revise the inflation expectation rule with an adjustment in theta. Since they believe in the central bank, they will put 100% weight in their inflation expectation on the targeted inflation rate.

Now suppose that, in year t+17, Oil price suddenly increases, causing the random supply shocks to be equal to 1%*. Assume the supply shock occurs temporarily, and takes the value of 1% only in period t+17. In the period afterwards, the shocks disappear, with the value of* ϑ_t *set to remain zero.*

4.10) With the supply shock and the policy to keep unemployment rate at its natural level, what is the inflation in period t+17? Supplement your analysis using the diagram that we discussed in class.

			expected		actual	natural	Gap		actual
Time	theta	pibar	inflation	sacrifice ratio	U	U	U	shock	inflation
t	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+1	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+2	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+3	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+4	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+5	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
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t+8	1	2.00%	6.20%	(0.70)	3.00%	5.00%	-2.00%	0.00%	7.600%
t+9	1	2.00%	7.60%	(0.70)	3.00%	5.00%	-2.00%	0.00%	9.000%
t+10	1	2.00%	9.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	9.00%
t+11	1	2.00%	9.00%	(0.70)	**15.00%**	5.00%	**10.00%**	0.00%	2.00%
t+12	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+13	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
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t+15	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+16	0	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+17	0	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	**1.00%**	3.00%

If the central bank keeps the unemployment at its natural level, actual inflation will be 3% under a 1% temporary supply shock. The effect of supply shock can be captured by a vertical shift of Phillips curve. (see figure 1) The economy moves from point A to point B.

4.11) What happen to the inflation in period t+18 and t+19?

With the reputation established in the past, inflation expectation will be anchored at 2%; public will believe that future inflation will be equal to 2%. Once the supply shock has gone, inflation will suddenly be back to 2% in period t+18. (see figure 1)

			expected		actual	natural	Gap		actual
Time	theta	pibar	inflation	sacrifice ratio	U	U	U	shock	inflation
t	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
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t+2	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
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t+12	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+13	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+14	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+15	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+16	0	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+17	0	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	**1.00%**	3.00%
t+18	0	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+19	0	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%

42.12) Redo (4.10) and (4.11) with the alternative assumption that the value of theta (θ) sets equal to 1. What would happen to the inflation in period t+17 and t+18? Would the inflation in period t+18 be equal to the targeted level?

Suppose instead that theta is "1" and the temporary supply shock hits the economy in period t+17, the actual inflation will be 3% in the period. This is the same as in previous question where with zero-theta, after-shock inflation is 3%. However, with theta equal to one, agents believe that inflation will be equal to past observed inflation. Then, in period t+18 when the shock does not present, inflation expectation will be 3%, and hence resulting in 3% actual inflation in the period.

			expected		actual	natural	Gap		actual
Time	theta	pibar	inflation	sacrifice ratio	U	U	U	shock	inflation
t	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+1	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+2	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+3	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+4	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+5	0	2.00%	2.00%	(0.70)	3.00%	5.00%	-2.00%	0.00%	3.400%
t+6	1	2.00%	3.40%	(0.70)	3.00%	5.00%	-2.00%	0.00%	4.800%
t+7	1	2.00%	4.80%	(0.70)	3.00%	5.00%	-2.00%	0.00%	6.200%
t+8	1	2.00%	6.20%	(0.70)	3.00%	5.00%	-2.00%	0.00%	7.600%
t+9	1	2.00%	7.60%	(0.70)	3.00%	5.00%	-2.00%	0.00%	9.000%
t+10	1	2.00%	9.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	9.00%
t+11	1	2.00%	9.00%	(0.70)	**15.00%**	5.00%	**10.00%**	0.00%	2.00%
t+12	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+13	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+14	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+15	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+16	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	2.00%
t+17	1	2.00%	2.00%	(0.70)	5.00%	5.00%	0.00%	**1.00%**	3.00%
t+18	1	2.00%	3.00%	(0.70)	5.00%	5.00%	0.00%	0.00%	3.00%

4.13) Following from the analysis in (4.12), what would be the required policy plan in year t+19 if the government wants to keep the inflation equal to *the targeted level ($\bar{\pi}$)*?

With the same logic as introduced earlier in (4.7), central bank needs to generate recession to bring down the inflation to 2%. This requires 1.43% of unemployment rate, which is equivalent to having unemployment rate equal to 6.43%. (see figure 3)

4.14) Based on the analysis given so far, do you think what could possibly determine the volatility of rate of inflation and the rate of unemployment under the presence of supply shocks? How does the credible commitment on inflation target play role in the determination of macroeconomic stability outcomes?

The two experiments above suggest that the ability to control inflation expectation is so important. Note from the case that theta is equal to 0 (full control of inflation expectation; highly credible inflation target), central bank can reduce the inflation to 2% without paying any cost. Conversely, with theta equal to 1 (no control as inflation expectation depends on past outcome), the effect of one-time supply shock persists even if the shock occurs in only one period. Without

the ability to control inflation expectation, central bank would be required to generate a temporary recession to bring the inflation down to 2%. This implies that the path of real economic activities will be more unstable under the imperfect control of inflation expectation than under the perfect control of inflation expectation. In economics, having kept the inflation low and build up central banks' reputation is worthwhile for handling the supply shocks; the cost of disinflation under supply shock can be ideally costless.

Figure 1

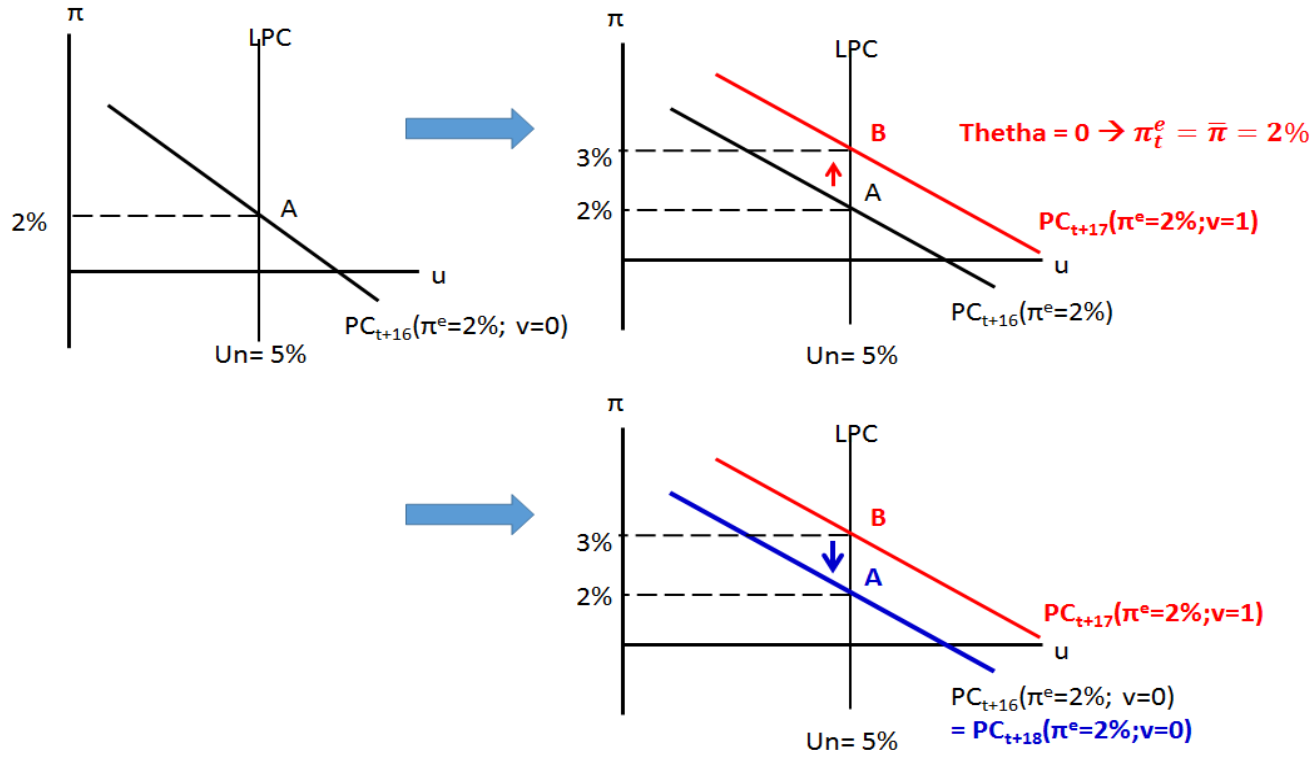


Figure 2

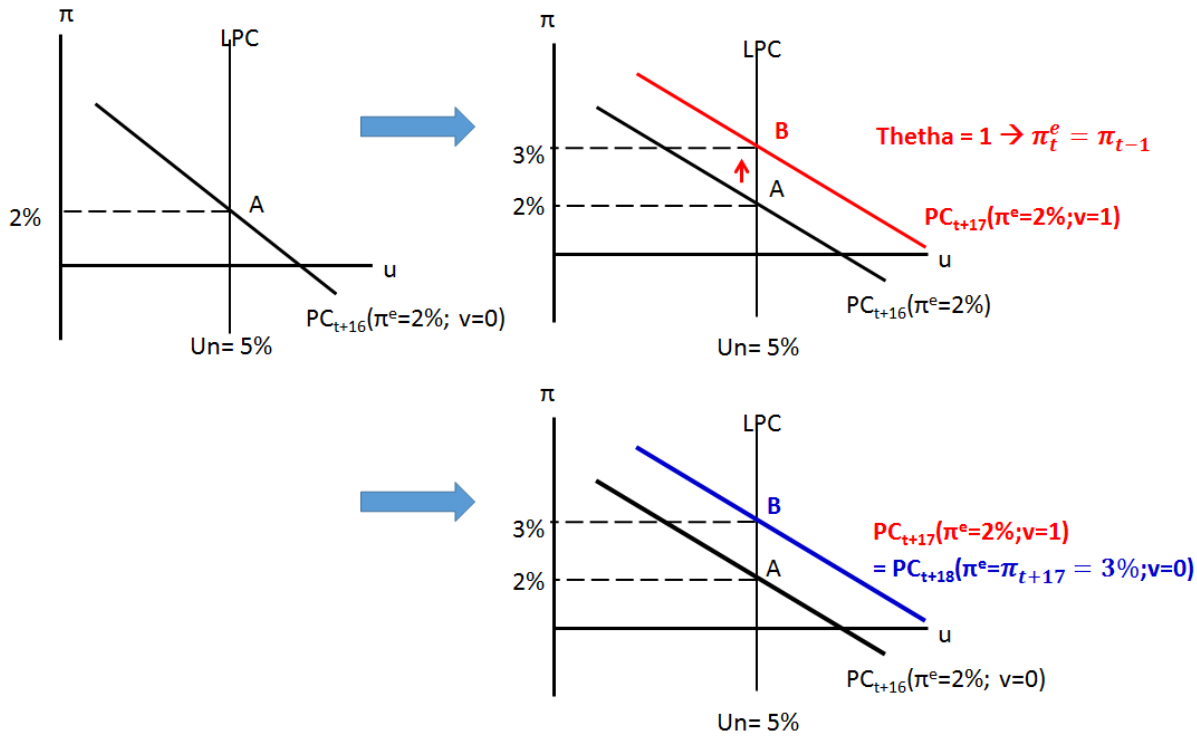
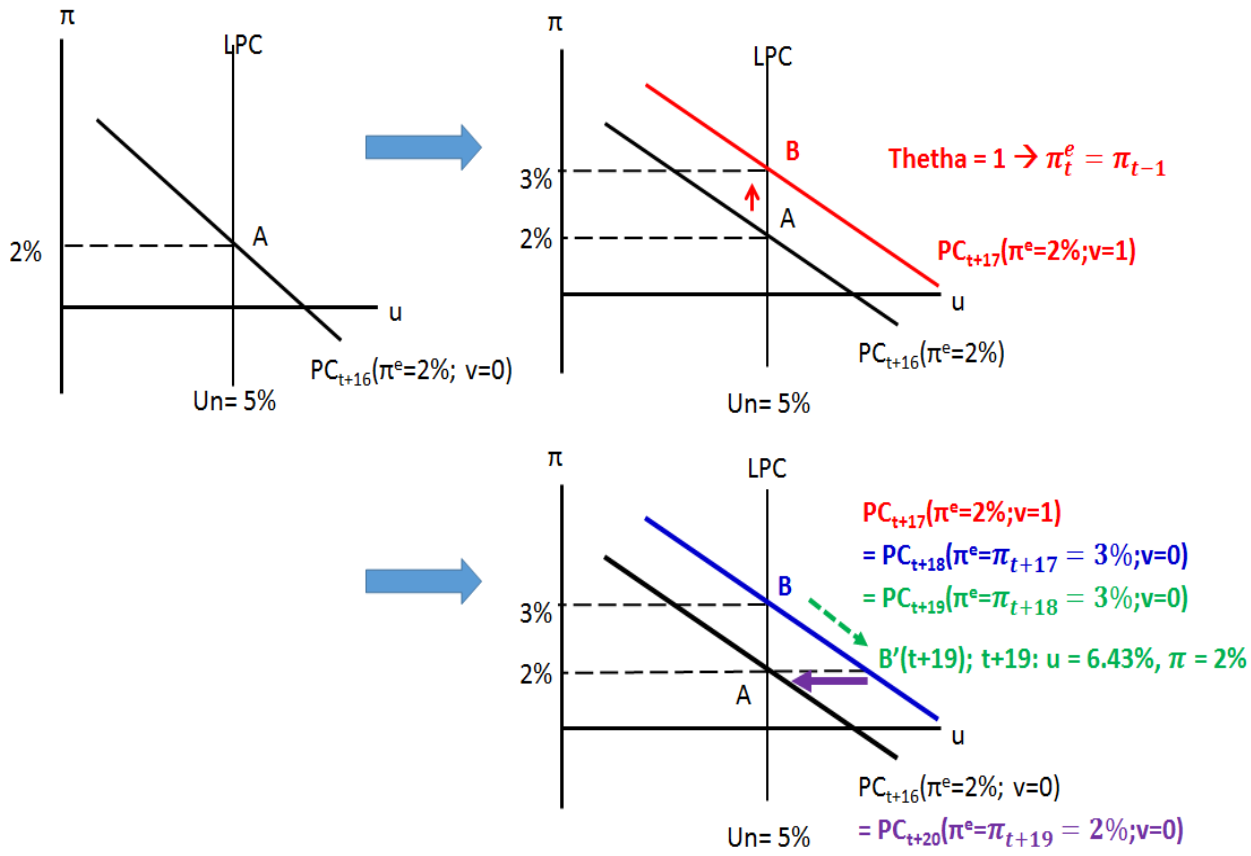


Figure 3



In period t = 18 when the supply shock has faded away, the Philips curve will stay the same as if the supply shock still persists. This is because the inflation expectation increases from 2% to 3%, following from the assuming condition that theta is equal to 1. The Phillips curve in period t+18 is given by the blue one. In all subsequent periods, inflation will get stuck at 3% forever if the central bank only aims to keep the unemployment rate at 5%. To reduce the inflation, central bank needs to sacrifice in the short-run with a recession; this is in order to bring the inflation expectation down. Based on the calculation, this needs U = 6.43%, i.e. higher unemployment than the natural level. This is graphically captured by the change in equilibrium from B to B'. The Philips curve in period t+19 will be the same as that in period t+18; government only chooses another mixture of outcome through the implementation of a contractionary policy.

Once 2% inflation is reached in period t+19, the inflation expectation in period t+20 will be 2%. Graphically, the blue Philips curve is now shifted down to the black one; this is due to the falling inflation expectation. Central bank can return to keep the unemployment rate at the natural level while at the same time the inflation rate is back to the normal 2% target; the economy moves from B' to A.