Assignment 3 EE312 (Semester 2/2019)

1. Due Feb 26th, 2020 (before 11.30 pm. Submit your work on the BE Moodle.)
2. For question 1 and question 2, even-numbered groups are assigned to do even-numbered sub questions.
3. Question 3 is required for every group.

Question 1: (True/False)

1.1 IS (random) shocks can generate a bigger volatility in real GDP under elastic money demand than under inelastic money demand.

1.2 The effect of fiscal policy is the strongest when monetary authority chooses to accommodate the government policy by fixing the interest rate.

1.3 Based on the Keynesian theory, demand shocks produce a negative co-movement between price and output. That is, price is a countered-cyclical variable under demand shocks.

1.4 Based on the Keynesian theory, interest rate is a countered-cyclical variable under supply shocks.

Question 2 (Self-adjustment theorem and expectation)

2.1 Suppose the economy is operating at the long-term trend, i.e. natural level. Analyze the impact of a permanent increase in the money supply under the following scenarios.

a. What would be the short-run impact on macroeconomic variables if *the permanent increase is* ***unexpected***. Use the 4-diagram that we discussed in class.

b. Describe what would happen over the medium-run. Link your analysis to the 4-diagram used in the previous sub-question.

c. Based on your analysis above, complete the following table.

Variables	**Short-run (relative to initial level)**	**Medium-run**	
		Relative to after-shock level (short-run)	**Relative to initial level before shock**
Output (real GDP)			
Consumption			
Investment			
Labor employment			
Nominal wage			
Price			
Real wage			

Interest rate			

d. If the permanent increase in the money supply is ***anticipated***, what would be the short-run impact on macroeconomic variables? Would one observe a deviation of actual output from the trend level?

2.2 Suppose the economy is operating at the long-term trend, i.e. natural level. Analyze the impact of a permanent decrease in government transfers under the following scenarios.

a. What would be the short-run impact on macroeconomic variables if *the permanent cut is* ***unexpected***. Use the 4-diagram that we discussed in class.

b. Describe what would happen over the medium-run. Link your analysis to the 4-diagram used in the previous sub-question.

c. Based on your analyses above, complete the following table.

Variables	**Short-run (relative to initial level)**	**Medium-run**	
		Relative to after-shock level (short-run)	**Relative to initial level before shock**
Output (real GDP)			
Consumption			
Investment			
Labor employment			
Nominal wage			
Price			
Real wage			
Interest rate			

d. If the permanent cut in government transfers is **anticipated**, what would be the short-run impact on macroeconomic variables? Would one observe a deviation of actual output from the trend level?

Question 3 (*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 inflati

Assume that the inflation expectation is given by,

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

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

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

3.1) 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 ($\bar{\pi}$)?

3.2) Do you believe the answer given in 3.1? Why or why not? (Hint: Think about how people are more likely to form the expectations of inflation.)

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

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

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

3.5) From (3.4), what can we conclude about inflation when $\theta = 1$ and unemployment rate is kept at 3%?

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 ($\bar{\pi}$).

3.6) 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?

3.7) 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?

3.8) Given the result in (3.7) and its full commitment to keep unemployment rate at 5%, what happen to inflation in period t+12, t+13, t+14, t+15?

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

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

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.

3.10) 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.

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

3.12) Redo (3.10) and (3.11) 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?

3.13) Following from the analysis in (3.12), what would be the required policy plan in year t+19 if the government wants to keep the inflation equal to *the targeted level* ($\bar{\pi}$)?

3.14) 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?

Question 1: (True/False)

1.1 IS (random) shocks can generate a bigger volatility in real GDP under elastic money demand than under inelastic money demand.

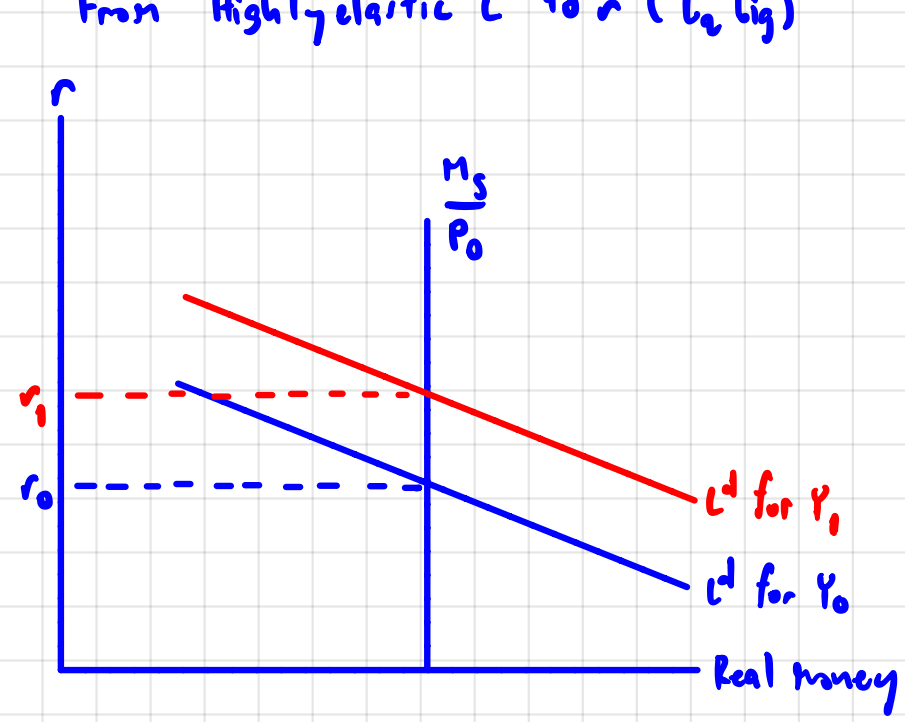
1.2 The effect of fiscal policy is the strongest when monetary authority chooses to accommodate the government policy by fixing the interest rate.

1.3 Based on the Keynesian theory, demand shocks produce a negative co-movement between price and output. That is, price is a countered-cyclical variable under demand shocks.

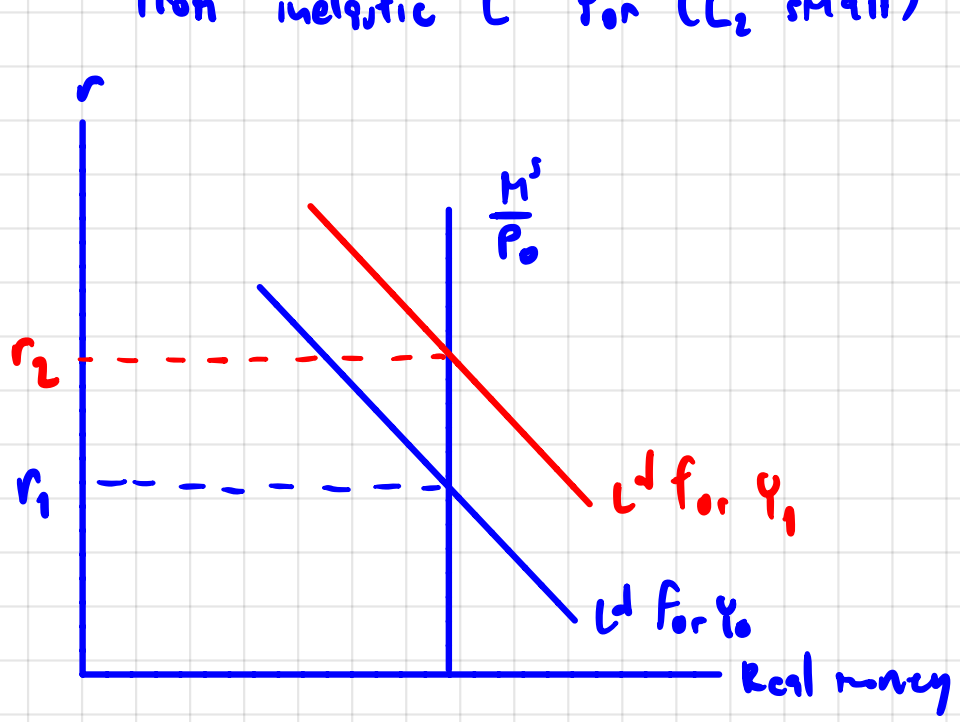
1.4 Based on the Keynesian theory, interest rate is a countered-cyclical variable under supply shocks.

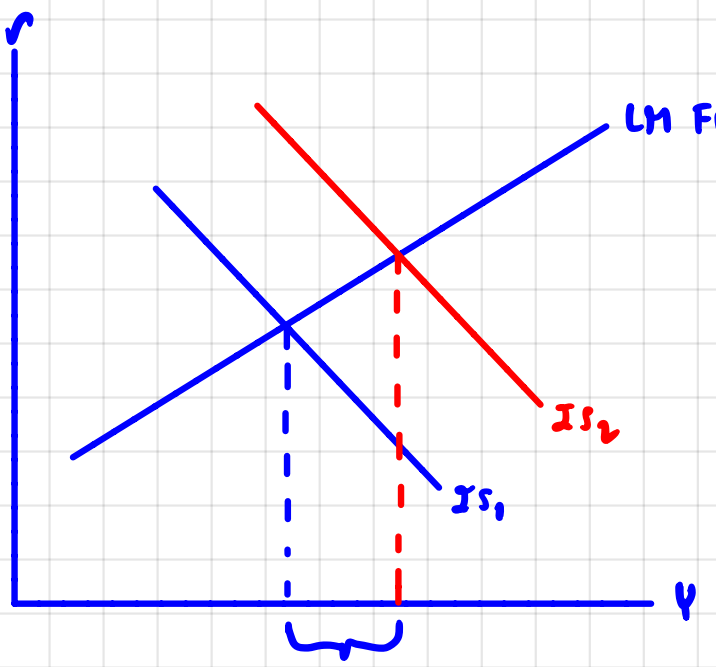
1.1) True from the figure

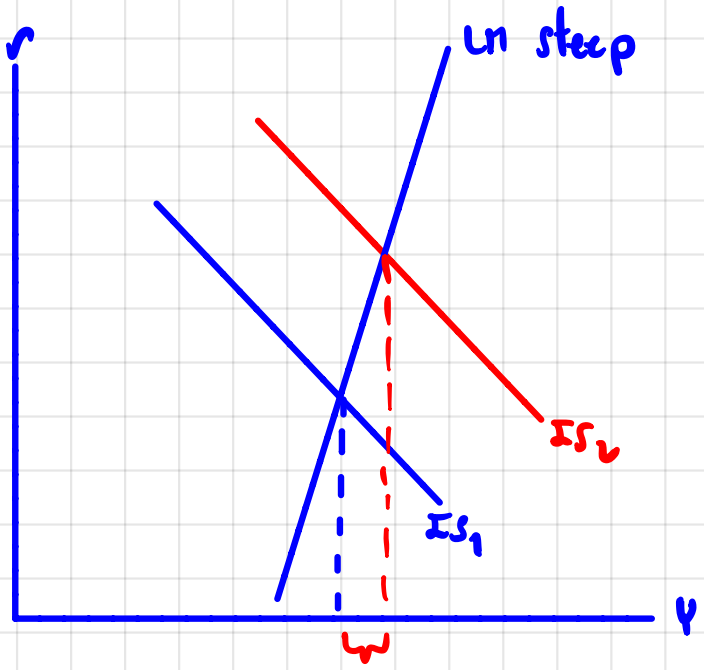
From Highly elastic L^d to r (L_2 big)



From inelastic L^d for (L_2 small)



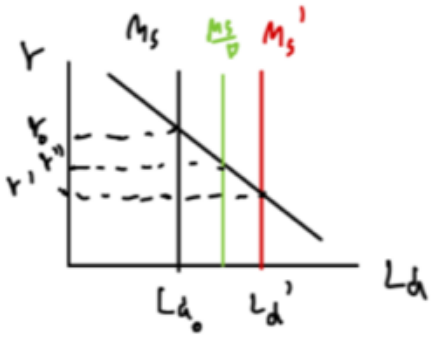


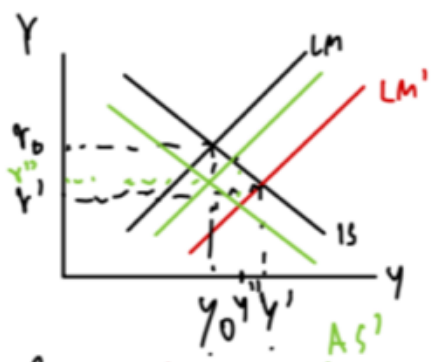


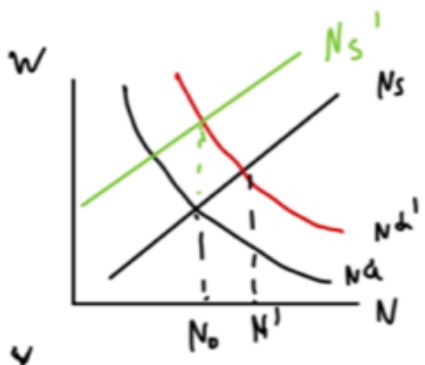
1.3) True. Due to the fact that price goes up, $\frac{M^S}{P}$ goes down and then it affects the interest rate so when interest rate goes up, it cause investment and consumption goes down.

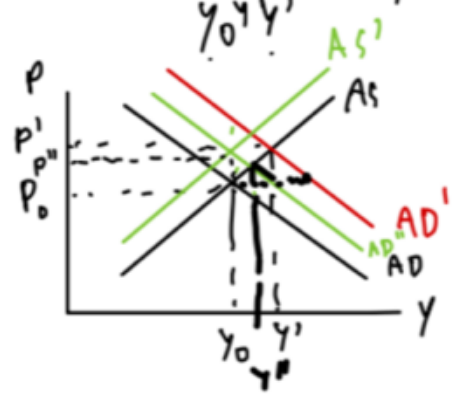
2.1.) permanent M_S ↑.

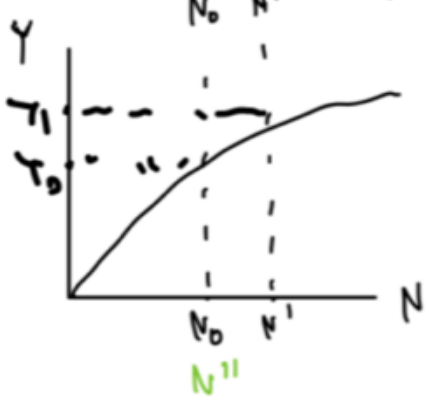
a).









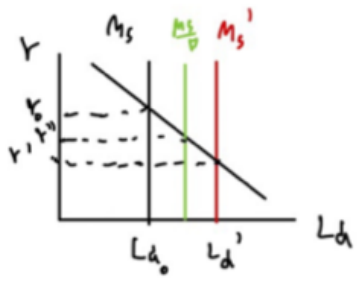


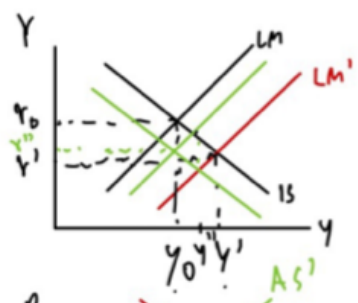
When money supply increase, interest rate in the market will decrease ($r_0 \to r_1$) that make LM shift to the right.

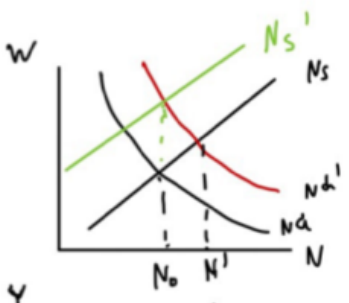
In AD-AS model, AD is shifted to the right because the effect of shifting LM curve. At first price, there is excess demand. price should be higher to eliminate excess demand ($P_0 \to P_1$). Higher price also affect LM curve to shift left as $\frac{M_S}{P}$ ↑. Then, out put decrease from ($Y_1 \to Y''$). Meanwhile, the effect of higher price contributes to lower realwage, but nominal wage is higher that shift labor demand to the right, and labor unemployment is increase.

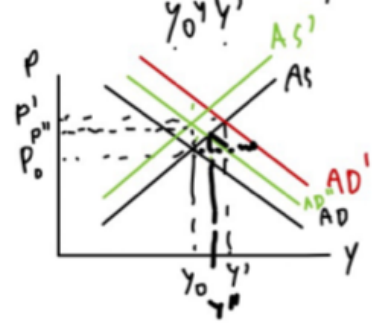
2.17)

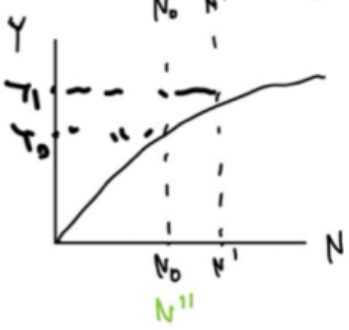
B.









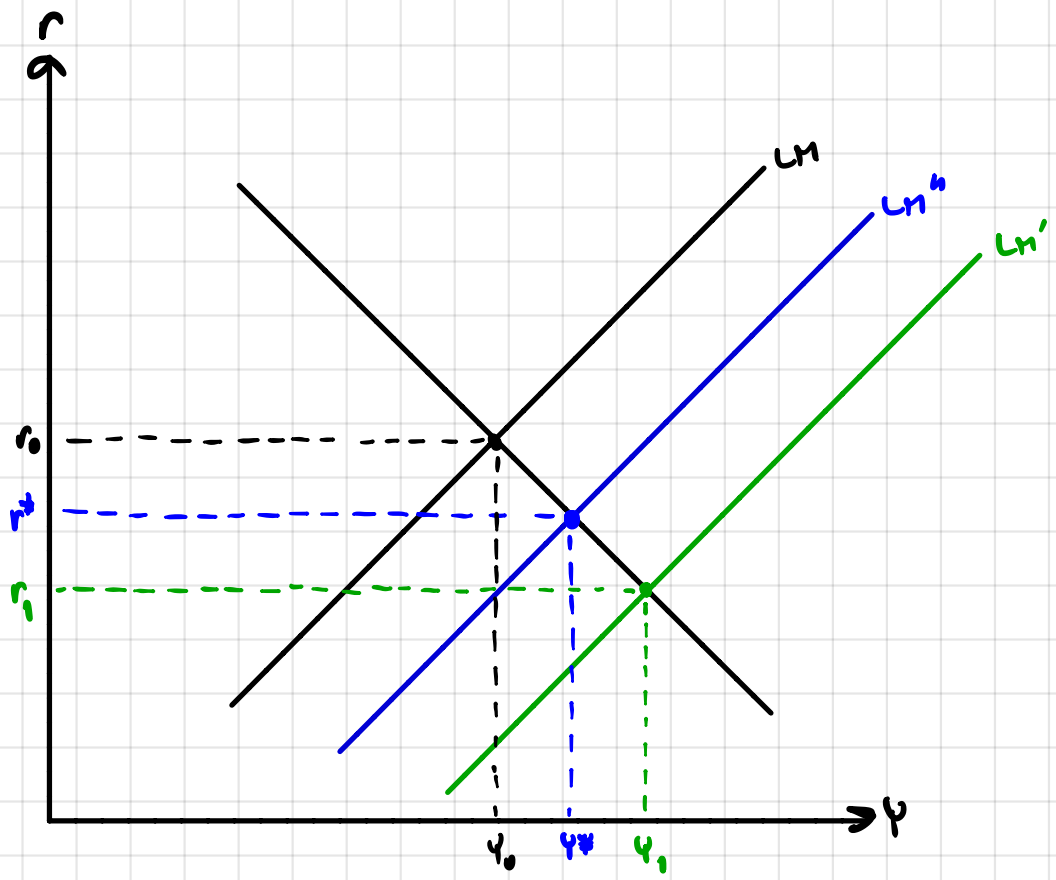


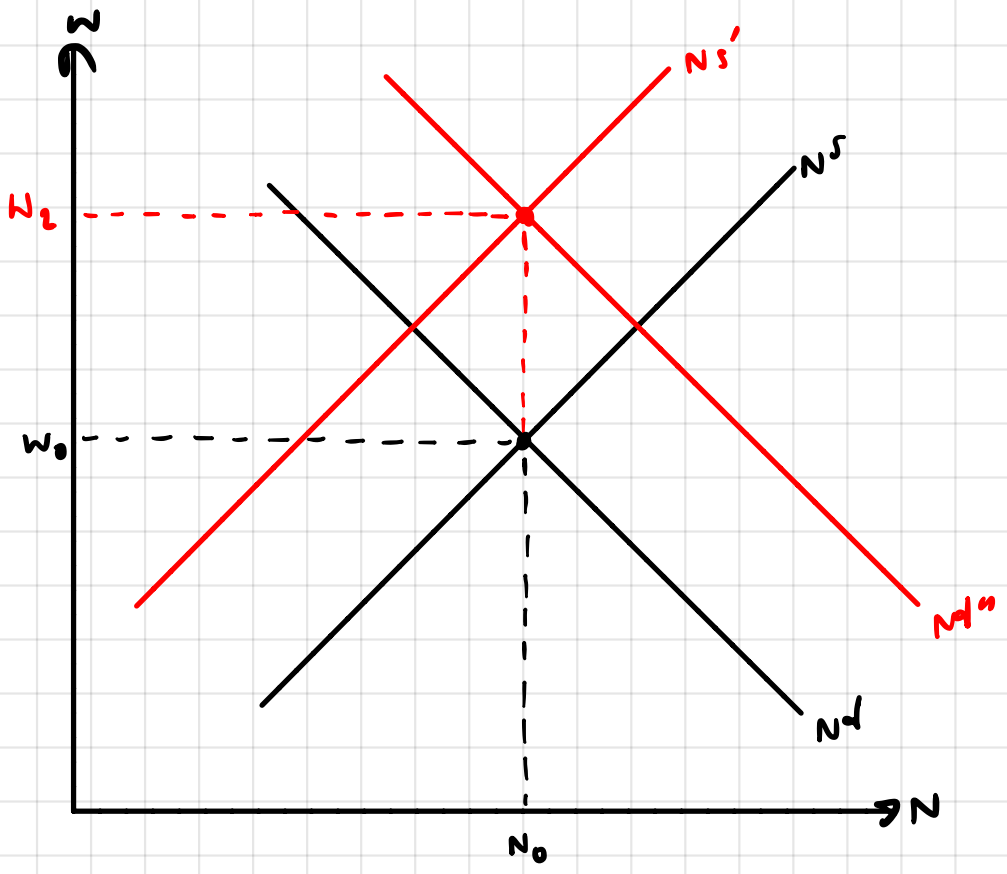
In medium run, there is self-correcting mechanism that will bring the economy back to its potential level. As $\frac{M_S}{P}$ ↑ there is an excess demand that cause price to increase. As time pass by, people revise their price expectation. They underestimate the price. So, they renegotiate new wage makes $N_S \to N_S'$. Also, Aggregate supply shift to the left as the price increase, firm hires more labour result in higher labor demand ($N_D \to N_D'$). After self-correcting adjustment, economy is returned to the full potential level where output and employment rate are the natural level at Y_0 and N_0.

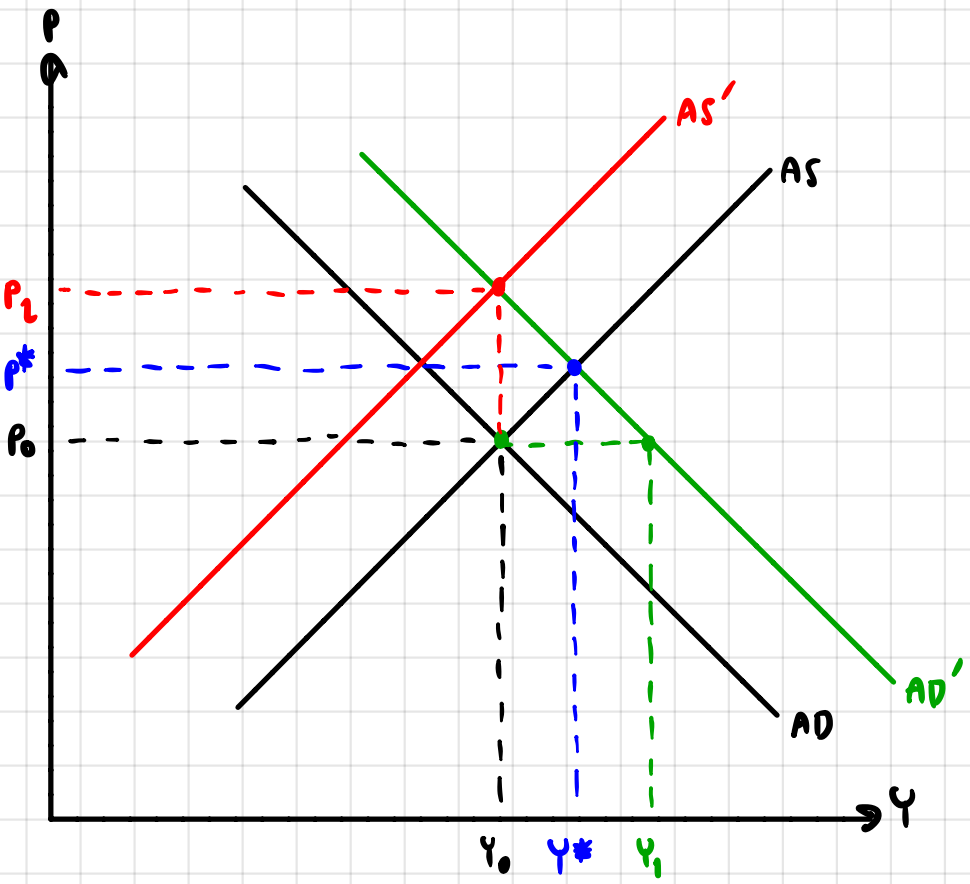
c.)

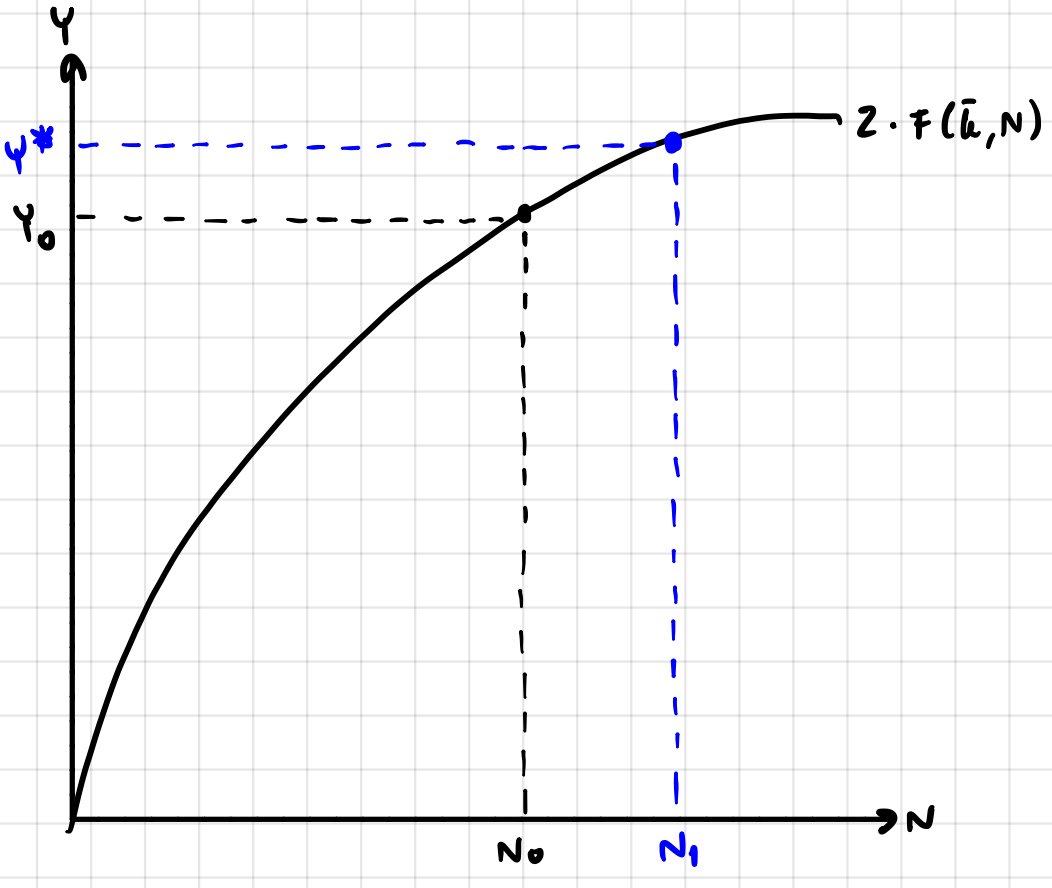
Variables	Short-run (relative to initial level)	Medium-run	
		Relative to after-shock level (short-run)	Relative to initial level before shock
Output (real GDP)	↑	↓	↑
Consumption	↑	↓	↑
Investment	↑	↓	↑
Labor employment	↑	↓	-
Nominal wage	-	↑	↑
Price	↑	↑	↑
Real wage	↓	↑	-
Interest rate	↓	↑	↓

d.) The impact of permanent increase in MS effect the decrease nominal interest rate in short-run aggregate supply (SRAS). SRAS decrease affect the full-employment and impact permanently on higher price level.









Question 3 (*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

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

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

3.1) 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 ($\bar{\pi}$)?

Given that $\theta = 0$, $u_t^n = 0.05$, $u_t = 0.03$, $\bar{\pi} = 0.02$

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

$= (1-0)0.02 + 0(\pi_{t-1})$

$\pi_t^e = 0.02 = 2\%$

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

$\pi_t = 0.02 - 0.7(0.03 - 0.05) + 0$

$\pi_{t+1} = 0.02 - 0.7(0.03 - 0.05) + 0$

$\vdots$

$\pi_{t+5} = 0.02 - 0.7(0.03 - 0.05) + 0$

$\Big\} 0.034 = 3.4\%$

$\pi_t, \pi_{t+1}, \pi_{t+2}, \pi_{t+3}, \pi_{t+4}, \pi_{t+5} = 3.4\% > 2\% = \bar{\pi}$

3.2) Do you believe the answer given in 3.1? Why or why not? (Hint: Think about how people are more likely to form the expectations of inflation.)

No, because theta (θ) is unlikely to be 0 and people will use past information to form inflation expectation.

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

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

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

given $u = 3\%$, $\theta = 1$; $\pi_t^e = (1-1)\bar{\pi} + (1)\pi_{t-1} = \pi_{t-1} \Rightarrow$ past year

$\pi_{t+1} = 0.034 - 0.7(0.03 - 0.05) + 0 = 0.048 = 4.8\%$

$\pi_{t+2} = 0.048 - 0.7(0.03 - 0.05) + 0 = 0.062 = 6.2\%$

$\pi_{t+3} = 0.062 - 0.7(0.03 - 0.05) + 0 = 0.076 = 7.6\%$

$\pi_{t+4} = 0.076 - 0.7(0.03 - 0.05) + 0 = 0.09 = 9\%$

3.5 inflation rate will depend on π_{t-1} and not depend on $\bar{\pi}$, and inflation rate will increase constantly at 1.4% / year because when $u_t = 3\%$ $0.7(u_t - u_t^n) = 0.7(3-5)$ for every year. So it will increase equally every year by 1.4%.

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 ($\bar{\pi}$).

3.6) 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?

$u_t = 0.05$; $\pi_t^e = (1-1)\bar{\pi} + (1)\pi_{t-1}$ → 0

$\pi_{t+10} = 0.09 + 0.2(0.05 - .05)$

$= 0.09 = 9\%$

∴ No, $\pi_{t+10} > \bar{\pi} = 2\%$ Central bank cannot achieve the targeted inflation.

3.7) 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?

3.8) Given the result in (3.7) and its full commitment to keep unemployment rate at 5%, what happen to inflation in period t+12, t+13, t+14, t+15?

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

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

3.7) If government need to bring inflation rate down to 2%. ; $\theta = 1$

$\pi_{t+11} = 0.09 - 0.2(u_t - 0.05) + 0$

$0.02 = 0.09 - 0.2(u_t - 0.05)$

$u_t - 0.05 = \frac{0.09 - 0.02}{0.2}$

$u_t = 0.1 + 0.05 = 15\%$

∴ Government must increase unemployment rate to 15%.

3.8) $\theta = 1$, $u_t = 0.05$

$\pi_{t+11} = 0.02 - 0.2(0.05 - 0.05) + 0 = 0.02$

⋮

$\pi_{t+15} = 0.02 - 0.2(0.05 - 0.05) + 0 = 0.02$

} 2%

3.9) Theta value decrease to zero because the past information doesn't effect the future.

3.10) 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.

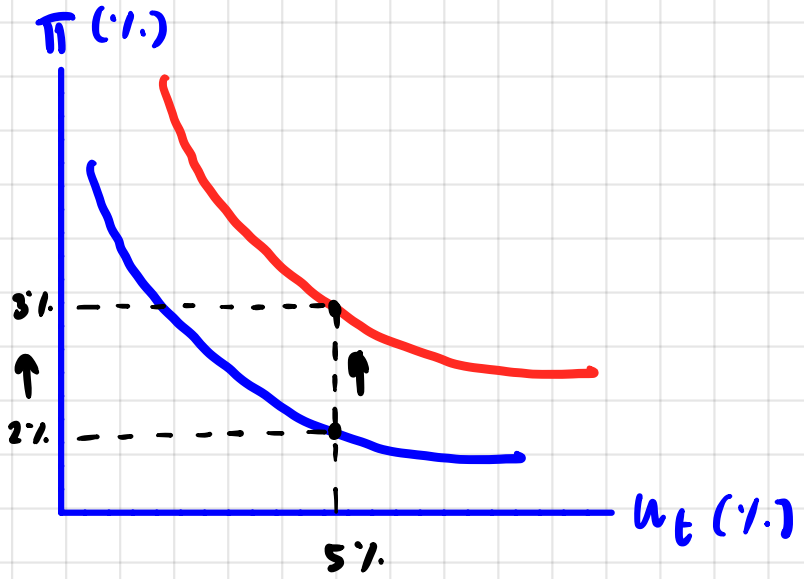
3.11) What happen to the inflation in period t+18 and t+19?

3.12) Redo (3.10) and (3.11) 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?

3.10) Given that $t+16$; $v = 0$, $t+17$; $v = 1$, $t+18$; $v = 0$

$\pi_{t+16} = 0.02 - 0.2(0.05 - 0.05) + 0 = 0.02 = 2\%$

$\pi_{t+17} = 0.02 - 0.2(0.05 - 0.05) + 0.01 = 0.03 = 3\%$



increase in inflation rate causes phillips curve shifts upward.

3.11)

$\pi_{t+18} = 0.02 - 0.2(0.05 - 0.05) + 0 = 0.02$

$\pi_{t+19} = 0.02 - 0.2(0.05 - 0.05) + 0 = 0.02$

} 2%

3.12) Given that $t+17, t+18$; $\theta = 1$ → $\pi_t^e = (1-1)\bar{\pi} + (1)\pi_{t-1} = \pi_{t-1}$

$\pi_{t+17} = 0.03 - 0.2(0.05 - 0.05) = 0.03$

$\pi_{t+18} = 0.03 - 0.2(0.05 - 0.05) = 0.03$

} 3%

∴ $\pi_{t+18} \neq \bar{\pi}$

3.13) Following from the analysis in (3.12), what would be the required policy plan in year t+19 if the government wants to keep the inflation equal to *the targeted level* ($\bar{\pi}$)?

3.14) 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?

3.13) Given that $\bar{\pi} = 0.02$, $\theta = 1$

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

$$\pi_{t+19} = \pi_t^e - 0.9(u_t - u_t^n) + v_0$$

$$0.02 = 0.03 - 0.7(u_t - 0.05) + 0$$

$$u_t - 0.05 = \frac{0.03 - 0.02}{0.9}$$

$$u_t = 0.014 + 0.05 = 0.014 = 6.4\%$$

∴ To reduce inflation rate to the target level, Government should increase the unemployment rate to 0.064 or 6.4%.

3.14) If economy faces with negative aggregate supply shock, Firm will see the disadvantage of employing labor. So, they cut down their labor, which makes labor demand shift to the left. Therefore, unemployment rate of economy will rise, but inflation rate will decrease. On the other hand if economy faces with positive supply shock, Firm will hire More labor, which makes labor demand shift to the right. Therefore, unemployment rate will decrease, but inflation rate will increase