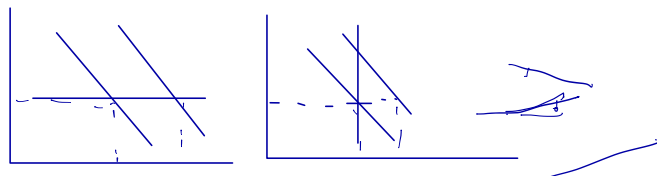


Group. 8

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.**

6 ↑ 4 ↑



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.** True because fixed interest rate represent situation
- 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.

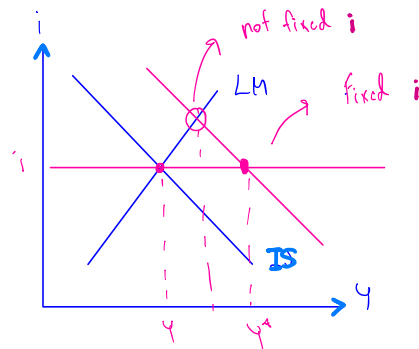
Question 2 (Self-adjustment theorem and expectation)

- 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			

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

True because if monetary authority fixed interest rate, when apply fiscal policy it causes IS curve to shift rightward. As a result, economy have higher outputs, and when fixed interest rate it will avoid crowding out effect occurrence hence, it will not have partially drop in outputs.



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

True because interest rate has negative relationship with GDP or y .

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)	decrease	increase	—
Consumption	decrease	increase	increase
Investment	Increase	increase	increase
Labor employment	decrease	increase	—
Nominal wage	decrease	decrease	decrease
Price	decrease	decrease	decrease
Real wage	—	increase	increase
Interest rate	decrease	decrease	decrease

- 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,

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

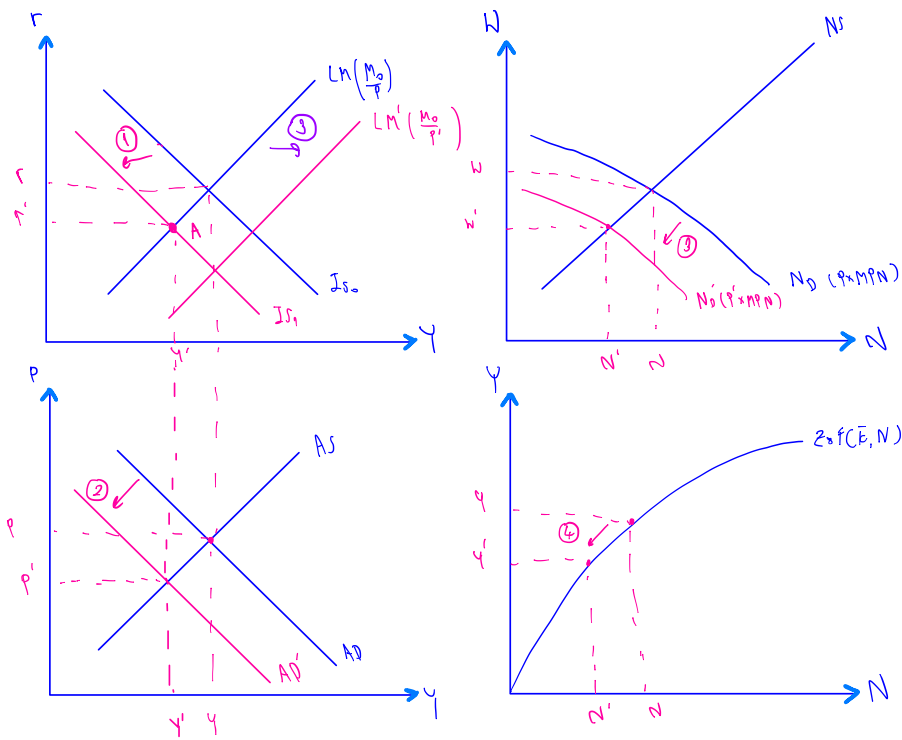
where π_t = inflation

π_t^e = expected inflation

u_t = actual unemployment rate

u_t^n = the natural rate of unemployment

a) 2.2



firstly, when a permanent decrease in government transfers occurs, it will make IS curve

shift leftward because if government spending decrease, it will make aggregate expenditure (AE) drop.

As a result, overall income will drop from IS_0 to IS_1 . In order to mitigate the problem, interest rate must be adjusted to be lower from r to r' until reached point A. Then when IS curve shift leftward,

AD curve will shift leftward as followed from AD to AD' . This circumstance cause price decrease from P to P' and output also decline from Y to Y' . Afterward, considering the decreasing in price (P') it simultaneously make LM curve shift rightward from LM to LM'

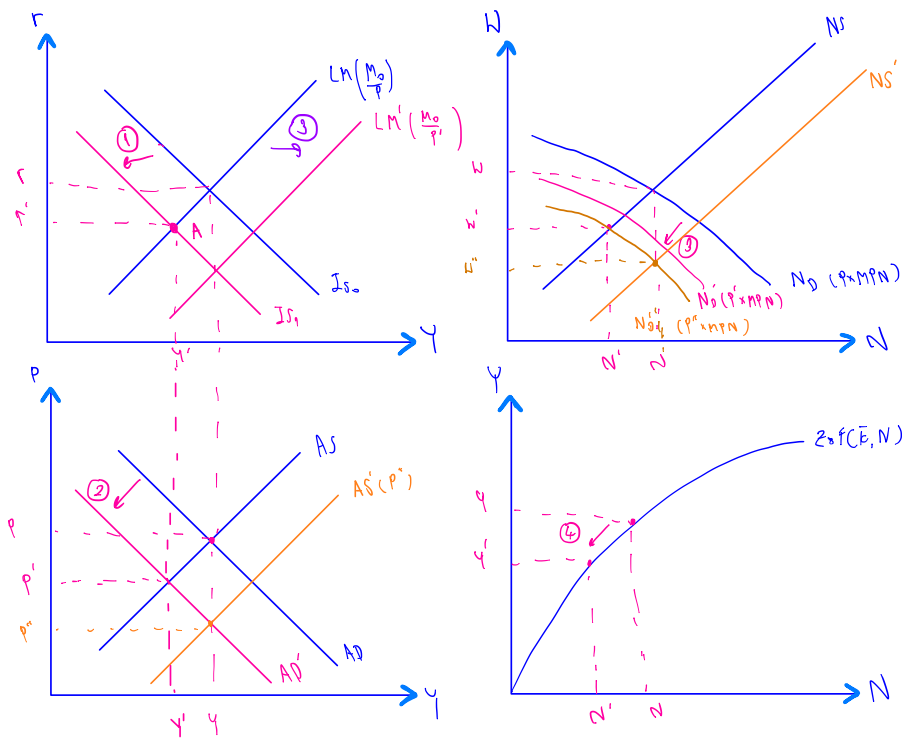
because since price decreases, real money supply will drop. Another effect of decreasing in price is that it will lower value marginal product of labour (VMPN). As a result firms will hire less labour to work. Then N_0 curve shift leftward to be N_0' which it will represent lower wage

from w to w' for hiring less workers, and also labor who want to work for firms will also drop from N to N' . Finally, when firms hire less workers outputs that generated by

labours will drop hence, it represented by moving along the production function curve that is Y to Y' .

2

b)



from the previous graph, since AD shock occurs it means that considering in labour market the real wage increase, hence to work at the same level labour want wage only at the w' . Linking this occurrence to aggregate supply curve, it means that firms will pay lower cost of production than before hence, AS will shift rightward to AS' . Then the price level from P will drop to P' as a result firms will revise their decision for hiring less labour because value from marginal product of labour drops.

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)	decrease	increase	—
Consumption	decrease	increase	increase
Investment	increase	increase	increase
Labor employment	decrease	increase	—
Nominal wage	decrease	decrease	decrease
Price	decrease	decrease	decrease
Real wage	—	increase	increase
Interest rate	decrease	decrease	decrease

- 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?

AD and N^d will shift to the left. The price expectation will drop suddenly. N^s and AS will shift to the right. P will drop from P to P' . Wage will drop from w to w' . The output, number of labor and unemployment rate are fixed.

ϑ_t = other supply shocks that directly affect the inflation rate

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

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 ($\bar{\pi}$)?

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 to 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.

3.1) 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 ($\bar{\pi}$)? $\bar{\pi} = 2\%$, $u_t = 0.03$, $u_{t+1} = 0.05$

$$\pi_t = (1-\theta)\bar{\pi} + \theta(\pi_{t-1}) - 0.7(u_t - u_t^e) + \cancel{\gamma_t^e}$$

$$\theta = 0, \quad \pi_t = \bar{\pi} = 0.7(u_t - u_t^e) = \cancel{\gamma_t^e}$$

$$= 0.02 - 0.7(0.03 - 0.03)$$

$$= 0.02 + 0.014 = 0.034 = 3.4\%$$

Since $\theta = 0$, hold forever, $\pi_t = \pi_{t+1} = \dots = \pi_{t+5}$
 $\therefore \pi_t > \bar{\pi}$ that is $3.4\% > 2\%$

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 θ is depend on interest of people with the inflation so this variables will be vary which is not fixed at 0, but vary from 0 to 1.

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?

θ increases because people are now interested in effect of inflation from previous period in the past.

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

$$\pi_t = (1-\theta)\bar{\pi} + \theta(\pi_{t-1}) - 0.7(u_t - u_t^e) + \cancel{\gamma_t^e}$$

$$\theta = 1, \quad \pi_t = \pi_{t-1} - 0.7(u_t - u_t^e)$$

$$\pi_{t+5} = 0.034, \quad \pi_{t+6} = \pi_{t+5}^{0.034} - 0.7(0.03 - 0.03)$$

$$= 0.034 + 0.014 = 0.049 = 4.9\%$$

$$\pi_{t+7} = \pi_{t+6}^{0.049} - 0.7(0.03 - 0.03)$$

$$= 0.049 + 0.014 = 0.062 = 6.2\%$$

$$\pi_{t+8} = \pi_{t+7}^{0.062} - 0.7(0.03 - 0.03)$$

$$= 0.062 + 0.014 = 0.076 = 7.6\%$$

$$\pi_{t+9} = \pi_{t+8}^{0.076} - 0.7(0.03 - 0.03)$$

$$= 0.076 + 0.014 = 0.09 = 9\%$$

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

When $\theta = 1$ holding unemployment rate at 3%, π_{t+6} until π_{t+9} will not stay the same, but inflation will increase over the period by 4.1%.

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 ($\bar{\pi}$). $\bar{\pi} = 2\%$

- 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 $t=12, t=13, t=14, t=15$?

$$3.6) \quad \pi_t = (1-\theta)\bar{\pi} + \theta(\pi_{t-1}) - 0.7(u_t - u_t^*) + \gamma_t^0$$

$$\pi_{t+10} = \pi_{t+10}^0 - 0.7(0.05 - 0.05)$$

$\therefore 9\%$, Central bank fail for achieving targeted inflation.

3.7) We set condition that π_{t+11} must equal to $\bar{\pi}$

$$\pi_{t+11} = \pi_{t+10} - 0.7(u_{t+11} - u_{t+11}^*)$$

$$0.02 = 0.09 - 0.7(u_{t+11} - 0.05)$$

$$0.02 = 0.09 - 0.7u_{t+11} + 0.035$$

$$u_{t+11} = \frac{0.09 + 0.035 - 0.02}{0.7} = 0.15 = 15\%$$

$\therefore$ Unemployment rate at period $t+11$ must be 15%.

$$3.8) \quad \pi_{t+12} = \pi_{t+11} - 0.7(0.05 - 0.05)$$

$$\therefore 0.02 = 2\%$$

$$\pi_{t+13} = \pi_{t+12} - 0.7(0.05 - 0.05)$$

$$\therefore 0.02 = 2\%$$

$$\pi_{t+14} = \pi_{t+13} - 0.7(0.05 - 0.05)$$

$$\therefore 0.02 = 2\%$$

$$\pi_{t+15} = \pi_{t+14} - 0.7(0.05 - 0.05)$$

$$\therefore 0.02 = 2\%$$

$\therefore$ If we inflation rate at $t+12$ will cause $\pi_{t+12} \dots \pi_{t+15}$ result same rate of inflation at 2%.

Now suppose in year $t=16$, the value of theta reduces from 1 to 0. $\theta = 0$

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

θ reduces from 1 to 0 because people consider that expected inflation rate has no relation with previous year inflation rate that is π_{t+11} until π_{t+15} stay the same at 2%.

$$\pi_t = (1-\theta)\bar{\pi} + \theta(\pi_{t-1}) - 0.7(u_t - u_t^*) + \gamma_t^0$$

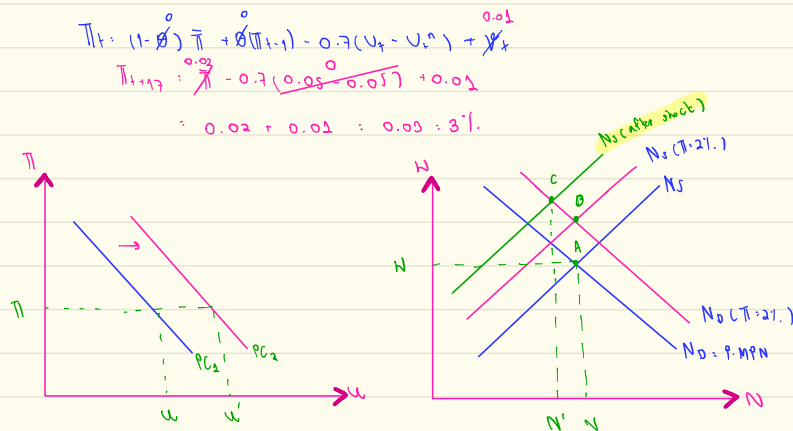
$$\pi_{t+16} = \bar{\pi} = 0.02$$

- ✓ 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?

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.

$$\psi = 0.01$$

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 $t+19$?

$$\pi_t = (1-\theta)\bar{\pi} + \theta(\pi_{t-1}) - 0.7(u_t - u_n) + \psi_t$$

$$\pi_{t+18} = \bar{\pi} - 0.7(0.05 - 0.05) + 0$$

$$= 0.02 = 2\%$$

$$\pi_{t+19} = \bar{\pi} - 0.7(0.05 - 0.05)$$

$$= 2\%$$

$\therefore$ Inflation at period $t+18$ and $t+19$ is same at 2%.

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?

$$3.12) \quad \pi_t = (1-\theta)\bar{\pi} + \theta(\pi_{t-1}) - 0.7(u_t - u_t^n) + \frac{0.01}{\theta} \epsilon_t$$

$$\pi_{t+17} = \pi_{t+16} - 0.7(0.05 - 0.05) + 0.01$$

$$= 3\%$$

$$\pi_{t+18} = \pi_{t+17} - 0.7(0.05 - 0.05) + 0$$

$$= 3\%$$

$\therefore \pi_{t+17}$ and π_{t+18} is higher than targeted inflation ($\bar{\pi}$) because when $\theta=1$, it implies that supply shock from period $t+17$ still affect inflation in period $t+18$.

$$3.13) \quad \pi_{t+19} = \pi_{t+18} - 0.7(u_{t+19} - u_{t+19}^n) + \frac{0}{\theta} \epsilon_t$$

$$0.02 = 0.03 - 0.7(u_{t+19} - 0.05)$$

$$u_{t+19} = 0.064 = 6.4\%$$

$\therefore$ In order to keep inflation rate in period $t+19$ to be the same as targeted inflation, government must trade off level of higher unemployment rate in period $t+19$ by 1.4% compared with natural rate of unemployment.

* 3.14) In the first case if $w_t = u_t^n$ and $\theta=0$ there is no volatility that is $\pi_t = \pi_t^0$. However, considering for volatility if $\theta > 0$ from supply shock π_t will be equal to $\pi_t^0 + \theta \epsilon_t$ that is higher than π_t^0 which represents volatility in inflation. In unemployment case, when supply shock occurs to make $\pi_t = \bar{\pi}$ government must trade off with the higher level of unemployment rate which represent volatility in unemployment. Moreover, target inflation ($\bar{\pi}$) play a role in economy that is if $\bar{\pi}$ is equal to inflation rate. It can imply that our economy is perfectly stable, but if $\bar{\pi}$ is deviated from inflation rate much so we can imply that economy is less stable.