

## Introduction to Macroeconomics · M5 · 2015-16

### Problem set 5

**1. Unemployment.** (i) Is it possible that, at the same time, the participation rate rises and the unemployment rate falls? If so, why? (ii) Explain the differences between frictional unemployment and structural unemployment. Suggest examples of both.

**2. Unemployment.** (i) Explain if it is possible that, at the same time, unemployment increases and the unemployment rate decreases. (ii) Explain if it is possible that employment increases and, simultaneously, the unemployment rate also increases.

**3. Okun's law and AS function.** Suppose Okun's law takes the following form:  $\Delta u = 12 - \Delta y$ , where  $\Delta u = u - u_{-1}$  and  $\Delta y = y - y_{-1}$ . Let the Phillips curve be given by  $\pi = 5 - u$ . (i) Graph each of the two relationships. (ii) Combine the two equations to obtain an AS function. (iii) Plot the resulting AS function.

**4. Phillips curve.** Consider the Phillips curve  $\pi = \alpha - \beta \cdot u$ , where  $\alpha$  and  $\beta$  are positive constants. (i) Make a graph of the Phillips curve. (ii) Let  $\alpha$  include the inflation rate  $\pi^e$  expected by people. Show graphically the effect on the Phillips curve of an increase in  $\pi^e$ .

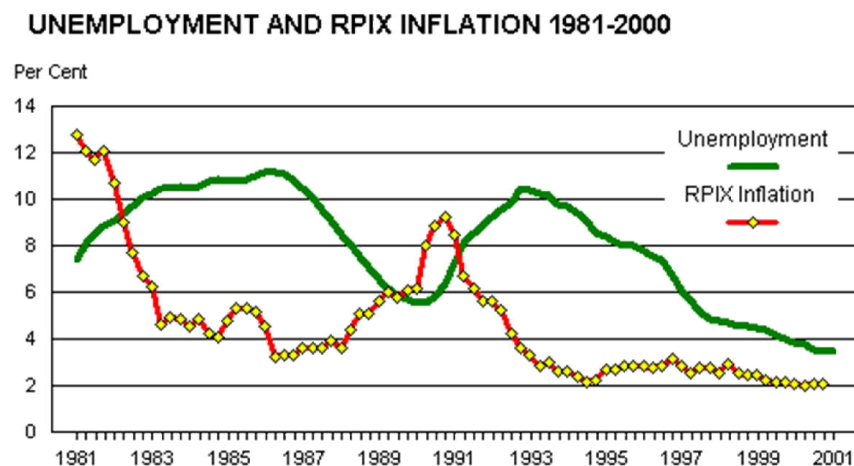
**5. Okun's law and Phillips curve.** Suppose Okun's law is defined as in Exercise 3. Explain how a Phillips curve can be obtained in the AS-AD model when the AD function is allowed to shift but the AS function is not. That is, show that, with a fixed AS function, a reduction in the unemployment rate must be accompanied by a rise in the inflation rate.

**6. Swan diagram.** Suppose that some event shifts the external balance function so that, for any given level of domestic spending, the real exchange rate that allows the economy to reach the external balance is now smaller than before the event.

- (i) Suggest an event that could cause this shift.
- (ii) Represent the new EB function.

- (iii) Determine what is the effect of this event on the real exchange rate and the domestic spending level that simultaneously ensure the internal and external balances.
- (iv) Call  $a$  the point on the Swan diagram where an economy is initially located. If  $a$  lies in Region I, it is possible that the shift of the EB function puts  $a$  in Region III? And in Region IV?
- (v) Identify a region (II, III, or IV) such that, no matter the point in that region representing the initial situation of the economy, the point remains in the same region after the shift of the EB function.

**7. Inflation and unemployment.** The chart below shows the unemployment rate  $u$  and the inflation rate  $\pi$  in the UK (RPIX = retail price index excluding mortgage interest payments  $\approx$  underlying inflation). Identify periods during which  $u$  and  $\pi$  are consistent with a stable Phillips curve and periods in which they are not.



[http://www.tutor2u.net/economics/content/topics/inflation/philips\\_curve.htm](http://www.tutor2u.net/economics/content/topics/inflation/philips_curve.htm)

**8. Competitive labour market model.** Consider the following competitive labour market. Letting  $\omega$  designate the real wage rate, the supply of labour function is given by  $N^S = \omega - 2$  if  $\omega \geq 2$  and  $N^S = 0$  otherwise. There are 99 identical firms that use labour to produce the same commodity using the production function  $q = \ln n$ , where  $q$  is the amount of the commodity produced with the amount  $n$  of labour. The price  $p$  of the commodity is determined in a competitive market and assumed given. [For simplicity,

suppose that workers used the price  $p$  to calculate the real wage rate  $\omega$  that appears in the supply function.]

- (i) Find the market equilibrium and identify this equilibrium in a graphical representation of the market.
- (ii) What is the amount of involuntary unemployment created by a minimum (real) wage rate set at  $\omega = 5$ ?
- (iii) Answer (ii) if  $\omega = 15$ .

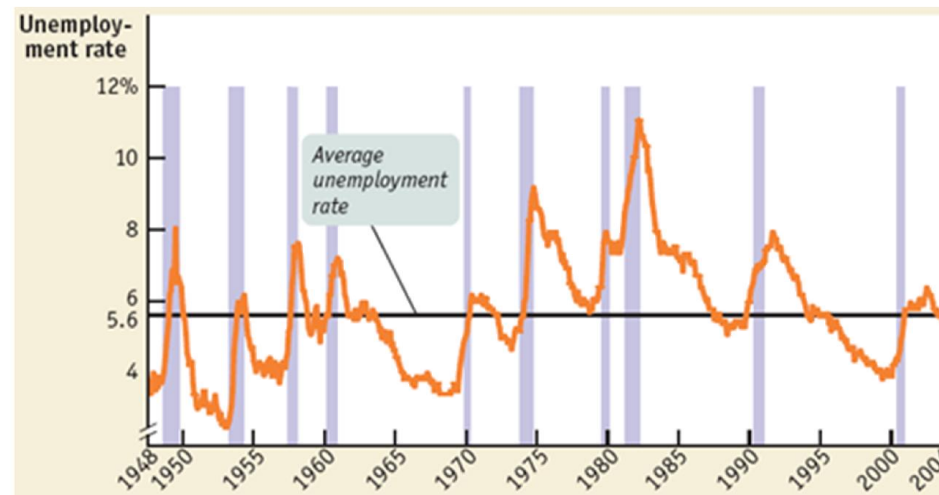
**9. E-PIS model.** In the E-PIS model, for every function of the model, identify the shift in the function that could reduce involuntary unemployment and suggest an event that could cause that shift.

**10. Deflation theories.** (i) Indicate two features that Fisher's debt deflation theory and Koo's balance sheet recession theory have in common and two features that differentiate them. (ii) Why the effectiveness of monetary policy may differ between the *yin* and *yang* phases of an economy?

**11. Segmented competitive labour market model.** Firms classify workers in two types, I and II. Letting  $\omega$  designate the real wage rate, the supply of labour function of type I workers is  $N^S = \omega$ . The supply function of type II workers is  $N^S = \omega/4$ . The firms preferring to hire type I workers have collectively a demand for labour function given by  $N^d = 40 - \omega$  if  $\omega \leq 40$  and  $N^d = 0$  otherwise. The firms preferring to hire type II workers have exactly the same demand function.

- (i) Find the market equilibrium in each segment and identify the equilibria in a graphical representation of the segments.
- (ii) Compute the average real wage rate (weighted by the weight of each type of workers in total employment).
- (iii) What is the amount of involuntary unemployment when workers take into account the average real wage rate to decide whether they supply labour or not?
- (iv) Indicate in a graphical representation how to reduce involuntary unemployment by shifting the supply or demand functions from the type I segment.
- (v) Determine the change in involuntary unemployment when the demand for type II workers shifts to the right and becomes  $N^d = 60 - \omega$  if  $\omega \leq 60$  and  $N^d = 0$  otherwise.

**12. Business cycle and unemployment.** The chart below shows the unemployment rate  $u$  of the US economy (recessions represent shaded areas). (i) On inspection, what is the relationship between  $u$  and the business cycle that the chart suggests? (ii) Does  $u$  appear to be a procyclical or a counter-cyclical variable?



<http://www.worthpublishers.com/krugmanwellsnew/main.htm>

**13. AS-AD model.** (i) During the world recession of the 1970s economies typically experienced a rise in the inflation rate and, at the same time, a reduction in real GDP. What changes in the functions of the AS-AD model could explain that outcome? (ii) During the world recession of the 1930s economies typically experienced a decrease in both the inflation rate and real GDP. What changes in the functions of the AS-AD model could explain that outcome? (iii) In terms of the evolution of the inflation rate and real GDP, to which of the two abovementioned crises is the crisis that started around 2008 more similar? Explain your answer.

**14. AS-AD model.** By means of the AS-AD model, and assuming that the economy is initially at its macroeconomic equilibrium, determine the effect on the macroeconomic equilibrium of the following events. In each case, explain the difference between assuming that the economy is on the non-inflationary region of the AS function and assuming that it is on the inflationary region.

- (1) A significant number of immigrants come to the economy
- (2) Autonomous consumption (the consumption that does not depend on income) falls
- (3) The central bank buys government bonds
- (4) Tourists no longer want to visit the country
- (5) Oil prices surge
- (6) The rest of the world becomes more competitive
- (7) The rest of the world becomes richer
- (8) The foreign nominal interest rate rises
- (9) 20% of employed workers retires
- (10) The domestic stock market crashes
- (11) A drought devastates the country
- (12) The economy experiences a technological revolution
- (13) The government cuts taxes on the firms' profits
- (14) Trade unions go on strike for two-weeks
- (15) 50% of all the banks in the economy go bankrupt
- (16) 50% of all the firms in the economy close
- (17) The world wide web is closed
- (18) The government severely cuts spending on public services
- (19) The government simultaneously reduces transfers and taxes
- (20) The government reduces the firms' contributions to social insurance
- (21) It becomes easier for firms to dismiss workers
- (22) One of the previous events and the following one in the list simultaneous occur
- (23) Businessmen expect a drop in consumption
- (24) The government offers subsidies to develop renewable sources of energy
- (25) Businessmen become extraordinarily optimistic about future business conditions
- (26) The government defaults on public debt payments
- (27) People expect a rise in the inflation rate
- (28) People expect a rise in the interest rate
- (29) Firms expect a rise in the government budget deficit
- (30) Alien intelligent life is discovered

**15. Proccyclical/coincident variables.** Explain the difference between a proccyclical variable and a coincident variable.

**16. AS-AD model.** The AD function is given by  $AD = 1/\pi$ . The AS function is defined in two parts:  $Y = \pi/4$  if  $0 \leq \pi \leq 8$  and  $Y = 2$  if  $\pi > 8$ .

- (i) Graph the two functions and indicate the maximum level of production.
- (ii) Compute the macroeconomic equilibrium.
- (iii) Compute again the macroeconomic equilibrium if the AS function changes to  $Y = \pi/4$  if  $0 \leq \pi \leq 12$  and  $Y = 2$  if  $\pi > 12$ .
- (iv) Suggest three events that could have caused the shift in the AS function described in (iii).
- (v) Determine the macroeconomic equilibrium if the AS function is as in (iii) and the AS function is  $AD = 16/\pi$ .
- (vi) What event could explain the change from  $AD = 1/\pi$  to  $AD = 16/\pi$ ? Indicate some event that could not.

**17. Hyperinflation.** (i) Suggest some event that may lead the economy to enter the hyperinflationary region of the AS function. (ii) Calculate the annual inflation rate if prices double every day.

**18. AD expansion.** (i) Indicate two events, not appearing in the lecture notes, that may hit positively on aggregated planned consumption. (ii) Do the same for investment. (iii) Do the same for net exports.

**19. Inflation.** In his *Response to the Paradoxes of Malestroit* (1568), the French political philosopher Jean Bodin (1530-1596) states the following:

In my opinion, several causes lay behind the increase in prices that we have witnessed. The main and almost unique cause (one that nobody has referred to previously) is the abundance of gold and silver, which is greater in this kingdom than it has been in the last 400 years. The second cause is due in part to monopolies. The third cause is scarcity, which is caused both by the export trade and by waste. And there is also the luxurious consumption by the kings and the nobles, who raise the price of fashionable goods.

Analyze in the AS-AD model, or by means of equations presented in the course, the impact on the inflation rate of each the four causes listed by Bodin (analyze each cause independently of the rest of causes).

**20. AS-AD model.** The government decrees that even days are no longer working days, so workers are forbidden to be at work any such day and firms are legally obliged to close factories and facilities every such day. Using the AS-AD model, determine graphically the effect of that measure on the macroeconomic equilibrium when a whole year is considered and explain the changes in the aggregate functions that cause the effect determined. (ii) Assuming that the economy is big enough, how would that measure affect the macroeconomic equilibrium, the aggregate supply function, and the aggregate demand function of the rest of the world? Explain your answer.

**21. Expenditure multiplier.** The AD function in period  $t$  is  $AD_t = C_t + I_t$ , where  $C_t = 4 + 0.6 \cdot Y_t + 0.5 \cdot W_t - \pi_t$  and  $I_t = 6 + 0.2 \cdot Y_t$ , where  $Y_t$  is income and  $W_t$  the financial wealth.

- (i) Fill out the following table assuming that  $Y_{t+1} = AD_t$  and that the inflation rate and financial wealth have constant values  $\pi = 1$  and  $W = 10$ .
- (ii) Calculate the value  $Y^*$  to which the sequence  $(Y_1, Y_2, Y_3, \dots)$  converges (that is, solve for  $Y_t$  the equation  $Y_{t+1} = AD_t = Y^*$  by making  $t = t + 1$ ).
- (iii) Find the formula that gives the equilibrium value  $Y^*$  as a function of  $W$  (do the same as in (ii) but leaving  $W$  as a parameter, without replacing  $W$  by 10).
- (iv) What is the change in financial wealth ensuring that  $Y^* = 95$ ?
- (v) Find the equilibrium value  $Y^*$  with  $W = 10$  and AS function  $Y_t = 2 \cdot \pi_t$ .

$t$	$AD_{t-1}$	$C_t$	$I_t$	$AD_t$	$Y_t$
1	50				
2					
3					
4					

**23. Wage-led and profit-led economic regimes.** Explain why the distinction between wage-led and profit-led economic regime is relevant to ascertain the effects on the economy of labour market reforms that increase the share of profits (and reduces the share of wages) in aggregate income.

**24. GDP, employment, productivity interaction.** Consider (4)-(9) in the notes. For each equation, analyze the impact of a change in each parameter.

**25. Macroeconomic equilibrium.** Find out how each of the following events is likely to alter the macroeconomic equilibrium in the AS-AD model. [Write “↑” if there is an increase or a shift to the right; “↓” if there is a fall or a shift to the left; “=” if there is no change; and “?” if the change is uncertain.]

Event	AS	AD	$\pi$	$Y$
Taxes paid by firms are cut				
The government expenditure is reduced				
The cost to firms of dismissing workers goes up				
Oil prices rise and the central bank applies a monetary policy intended to keep the inflation rate constant				
The government transfers and taxes both fall				
50% of all the banks go bankrupt				
50% of all the firms go bankrupt				
Expectations on the evolution of the economy turn depressed				
Foreign real GDP grows				
Foreign inflation rate falls				
The domestic currency appreciates				
A big asteroid is going to hit the Earth soon				

**26. AS-AD model.** On April 4, 2014, a new investment law was enacted in Bolivia: the *Ley de Promoción de Inversiones*. The goal of this law was to set the legal and institutional framework to promote investment in Bolivia and attract foreign capital in order to foster economic growth, stimulate the social and economic development of the country, and create jobs. (i) Analyze in the aggregate supply and aggregate demand model the effect on the macroeconomic equilibrium of the success in the application of the law and explain your graphical analysis. (ii) What if investors believe that the law will be ineffective because the government is not going to respect it?

**27. AS-AD model.** The economy is initially at its macroeconomic equilibrium. Analyze graphically and explain the separate and joint effect of the following measures on the macroeconomic equilibrium: (i) immediate (and unexpected by businessmen) reduction of the payments made by firms to the social security system; (ii) immediate (and unexpected by consumers) increase of the VAT (value-added tax).