

Introduction to Macroeconomics · M5 · 2013-14

Problem set 4

1. Interest rate. (i) May the nominal interest rate of an economy be persistently negative? What would that mean? (ii) And zero? (iii) Can people be considered more patient when $i = 0$ than when $i > 0$?

2. Rate of return. (i) Compute the rate of return of a €120 loan when only 80 are repaid. (ii) What if 80 are loaned and 120 repaid? (iii) Find in each case the corresponding discount factor.

3. Present value. Calculate the present discounted value at period 1 of €100: (i) from period 2 when the interest rate is 5%; (ii) from period 3 when the interest rate is 5% at period 1 and at period 2; (iii) from period 3 when the interest rate is 5% at period 1 and 10% at period 2; (iv) from period 3 when the interest rate is 10% at period 1 and 5% at period 2; (v) from period 3 when the interest rate is 10% at periods 1 and 2.

4. Interest rate, discount factor. (i) Is it possible for the discount factor to rise while the interest rate is also rising? (ii) €50 from period 1 are worth €60 in period 2. Find the corresponding interest rate and discount factor.

5. T-bills. (i) Compute the rate of return of a T-bill with face value $V = 210$ and price $P = 200$. (ii) Find the interest rate i under which the rate of return of the T-bill agrees with i . (iii) Find the face value of T-bills priced 200 if the interest rate is 5%.

6. T-bills. (i) Find the price (that prevents arbitrage) of a T-bill with face value 1,200 if the real interest rate is 5% and the inflation rate is 15%. (ii) The nominal interest rate is 10% and the price of a T-bill is 200. Find the face value of the T-bill.

7. Price and rate of return. Explain why the fall in the price of T-bills is accompanied by an increase of the rate of return of T-bills.

8. Discount factor. (i) The discount factor is 0.6 and the price of a T-bill is 200. Given the relationship between the interest rate and the price of T-bills, find the face value of the T-bill. (ii) Calculate the present value of 200 if the (per one) interest rate is $2/3$.

9. Liquidity market model. Consider the liquidity market model in which the supply of liquidity function is always increasing. Determine the likely effect on the equilibrium interest rate and the amount of liquidity of each of the following events.

- (1) The arrival of a large number of immigrants
- (2) The closing of a significant number of factories
- (3) There is an increase in the proportion of income saved by households
- (4) To finance important investment projects the main firms of the economy issue corporate bonds
- (5) The central bank executes an expansive open market operation
- (6) There is an increase of foreigners willing to purchase domestic financial assets
- (7) The population of the economy grows old
- (8) The banks decide not to concede any loan to individuals younger than 40-year old
- (9) Foreign banks enter the economy and settle new offices
- (10) Unemployment doubles
- (11) The inflation rate doubles
- (12) It is expected that the inflation rate will double
- (13) The central bank increases the reserve ratio and sells T-bills to banks
- (14) The central bank increases the reserve ratio and purchases T-bills from banks
- (15) The government budget goes from surplus to deficit
- (16) The stock market crashes
- (17) Unquestionable evidence that the afterlife exists is made public
- (18) The economy goes into a recession (GDP falls)
- (19) Russia invades Ukraine (consider the Russian and the Ukrainian liquidity markets separately)

10. Equilibrium interest rate. (i) Identify three events, different from the ones in Exercise 9, that may cause an increase of the equilibrium interest rate and another three that may cause a fall in the equilibrium amount of liquidity. (ii) Identify two events that may cause, simultaneously, a fall in the equilibrium interest rate and a fall in the equilibrium amount of liquidity.

11. Money multiplier process, loan market, monetary policy. Banks have voluntarily decided to increase their reserves substantially. (i) Explain the effect that this decision is likely to cause on the money multiplier process. (ii) By means of a graphical representation of the liquidity market, show the impact of that decision on the equilibrium interest rate. (iii) Suggest a measure by the central bank that could offset that impact and explain why the measure can offset it.

12. Real interest rate. Find the real interest rate in a certain period if the nominal interest rate is 5%, the CPI at the beginning of the period is 200, and the GDP deflator at the end of the period is 220.

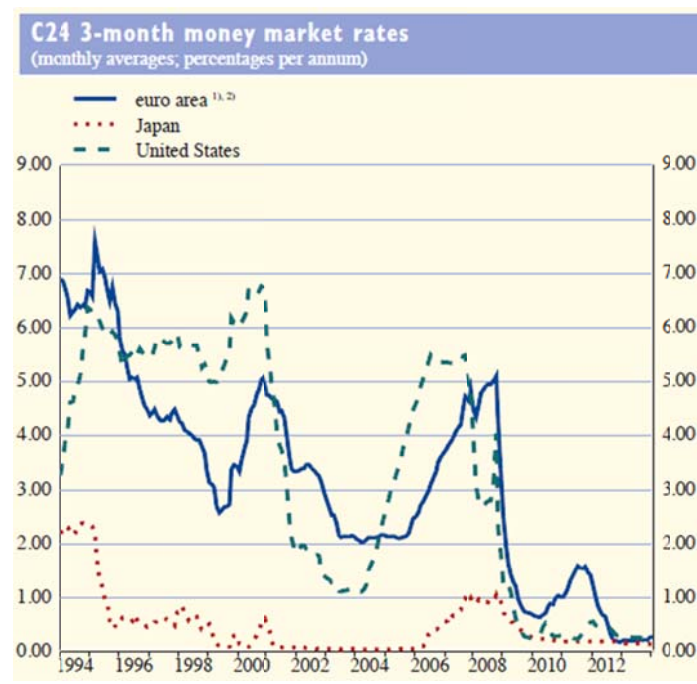
13. Liquidity market model. (i) Find out the effect on the loan market equilibrium of: (a) a reduction in the government deficit; (b) a reduction in the government deficit that takes place at the same time as a reduction in the number of banks. (ii) Suggests an open market operation capable of neutralizing the effect on the interest rate established in (b) and illustrate your answer graphically.

14. Equilibrium interest rate. (i) Which is the effect on the interest rate of an increase in the reserve ratio that occurs as the same time as a sale of T-bills by the central bank? (ii) And if the sale were a purchase?

15. Fisher effect. Explain if having a negative real interest rate for five years is consistent with the Fisher effect.

16. Real interest rate. Find the real interest rate: (i) if the nominal interest rate is 5% and the CPI is 200; (ii) if the real interest rate is constant and the inflation rate is 5%.

17. Liquidity market model. (i) Over the two decades represented in chart C24, can monetary policy be considered, in all three economies, rather expansionary or rather contractionary?



ECB Monthly Bulletin, February 2014
www.ecb.europa.eu/pub/pdf/mobu/mb201402en.pdf (S44 & S46)

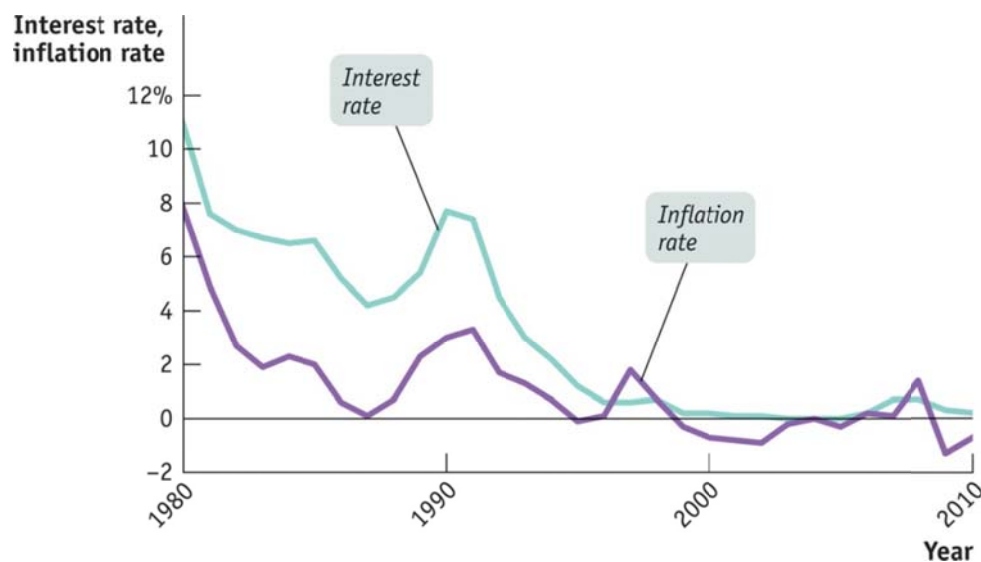


(ii) Consider the period 2009-2013. (a) Where does the chart suggest that the monetary policy has been more expansionary, in the US or in the eurozone? (b) Is the evolution of the interest rates consistent with the evolution of the stock market indices as shown in chart C27?

18. Liquidity market model. (i) With the help of a graphical representation of the liquidity market, determine and explain the effect on the equilibrium interest rate of an increase in the number of people that purchase financial assets. (ii) Suggest two measures by the central bank that could neutralize that effect and indicate in a graphical representation of the market how these measures achieve the desired goal.

19. Expansionary monetary policy. Explain four ways by means of which a central bank can increase the liquidity of an economy.

20. Real interest rate, Japan. (i) Does the chart provide information concerning the real interest rate? (ii) If so, identify a period in which it is positive and another one in which it is negative. (iii) Can a period be identified during which it rises? And another one during which it falls?



http://bcs.worthpublishers.com/krugmanwellsmacro3/default.asp?t_768077 (Chapter 16 → Student PowerPoint Slides)

21. MROs by the ECB. The European Central Bank (ECB) decides to provide liquidity (€500 million) to the market by means of a main refinancing operation (MRO) executed through a variable rate tender procedure. (i) Calculate, in the following table, the allotment to each bank. (ii) Determine the marginal interest rate of the tender. (iii) Answer the same question if the ECB decides to provide €300 million.

i	<i>bids by the banks</i>				<i>allotment by the ECB</i>			
	B1	B2	B3	B4	B1	B2	B3	B4
5.5%	30	25	10	15				
5.4%	40	30	25	20				
5.3%	50	35	30	40				
5.2%	70	50	50	60				
5.1%	100	80	90	80				
5.0%	120	100	100	100				

22. MROs by the ECB. The ECB provides €500 million of liquidity by means of an MRO executed with a fixed rate tender procedure. Find, in each table, how the ECB allots the €500 million to the banks.

<i>bids by the banks</i>				<i>allotment by the ECB</i>			
B1	B2	B3	B4	B1	B2	B3	B4
200	100	50	400				

<i>bids by the banks</i>				<i>allotment by the ECB</i>			
B1	B2	B3	B4	B1	B2	B3	B4
100	50	50	150				

<i>bids by the banks</i>				<i>allotment by the ECB</i>			
B1	B2	B3	B4	B1	B2	B3	B4
150	80	70	200				

23. Monetary policy. A speculative bubble (market bubble or speculative mania) occurs when the price of a good or financial asset is systematically inflated with respect to what may be called its “intrinsic value”. In this case, most of the trade in the market is carried out under the expectation that the price of the good or the financial asset will rise, so buyers typically buy expecting to be able to sell later at a higher price. A speculative bubble bursts when the price of the good or financial asset suddenly plummets (crashes). Explain why central banks generally respond to a stock market crash by conducting expansionary open market operations.

24. Interest rate. (i) Why a rise in the interest rate tends to cause a fall in the price of financial assets? (ii) Is it true that the interest rate tends to go down when the central bank sells financial assets?

25. Liquidity market model. (i) By means of a graphical representation of the liquidity market model (with an upward sloping market supply function), determine and explain (separately) the effect on the interest rate of:

(a) placing a 10% tax on bank loans that has to be paid by borrowers (those who obtain the loan);

(b) the prohibition of obtaining loans from other countries with the same currency (for instance, the Spanish government bans Spanish firms and citizens from asking French banks for a loan).

(ii) Suggest two measures by the central bank that could neutralize the effect on the interest rate in case (a) and show in a graphical representation how any of these measures achieves the goal.

26. Face value of T-bills. Assuming that the relationship between the economy’s interest rate and the price of T-bills holds, determine the face value of T-bills if the discount factor is $5/6$ and the price of T-bills when issued is 600.

27. Similarities and differences. For each of the following pairs of concepts, indicate something that the two concepts have in common and something that differentiates them.

- (1) Nominal interest rate and discount factor
- (2) Nominal interest rate and real interest rate
- (3) Nominal interest rate and inflation rate
- (4) Nominal interest rate and M1
- (5) Open market operation and price of a T-bill
- (6) Open market operation and discount factor
- (7) Arbitrage and nominal interest rate
- (8) Eurosystem and European System of Central Banks
- (9) Marginal lending facility and Euribor
- (10) Variable tender main refinancing operation and minimum reserves
- (11) Central bank and endogenous money
- (12) Fisher equation and interest rate set by the European Central Bank
- (13) Fisher effect and Fisher hypothesis
- (14) Discount factor and real GDP

28. Liquidity market model. Consider the variation on the liquidity market model in which the supply of loans function is increasing up to a certain point (i', L') and, for each interest rate $i > i'$, the supply function becomes vertical at the value $L = L'$.

(i) Draw this function. Draw also a standard demand for liquidity function such that the equilibrium interest rate i^* is higher than i' .

(ii) Suppose that, for any shift to the right or to left of the supply of liquidity function, the resulting function remains vertical at L' , so the supply of liquidity cannot be higher than L' . Taking as initial situation the market equilibrium drawn in (i), analyze graphically the effect on the interest rate when an expansionary open market operation is conducted and indicate which functions are affected by the open market operation.