

Introduction to Macroeconomics · M4 · 2016-17

Problem set 3

1. Properties of money. Find something that: (i) could be medium of exchange and store of value but not, or hardly, unit of account; (ii) could be medium of exchange but neither store of value nor unit of account; (iii) could be store of value and unit of account but not medium of exchange; and (iv) nor medium of exchange, nor store of value, nor unit of account.

2. Reserve ratio. (i) Let $M0 = 1,000$, $M1 = 4,000$, and $r = 0.1$. What change in the liquidity ratio l would neutralize the effect on $M1$ of a 10% fall in $M0$? (ii) Let $M0 = 1,000$, $M1 = 4,000$, and $l = 0.1$. What change in the reserve ratio r would neutralize the effect on $M0$ of a 10% increase in $M0$?

3. Money multiplier. Using derivatives, find the effect on the money multiplier of a rise in r and a fall in l .

4. Cash. The money multiplier is 2. Bank reserves are $R = 100$. Sight deposits are $D = 1,000$. Find the currency E held by the public.

5. M0, M1. (i) Explain two differences between $M0$ and $M1$. (ii) Can $M0$ be greater than $M1$? And smaller than $M1$? And equal to $M1$?

6. M0, M1. Let $M1 = 4,000$, $mm = 2$, and $r = 0.3$. (i) Find $M0$ and l . (ii) Calculate $M1$ if, given the results in (i), r dropped to zero. Explain the mechanism that produces the change in $M1$ (reason what happens to loans, expenditure, revenues, deposits, and $M1$ when r becomes 0).

7. Money multiplier. Find the money multiplier if: (i) the liquidity ratio is 0.1, the monetary base is 500, and the money stock is 1,000; (ii) the liquidity ratio is 0.1, the monetary base is 550, and the currency E held by the public is 100.

8. Monetary aggregates. The monetary base is €37,000, bank reserves amount to €12,000, and the liquidity ratio is 1/10. (i) Calculate (to two decimal places only) the currency held by the public, the money stock $M1$, deposits, the reserve ratio, and the money multiplier. (ii) If the aim of the central bank is to increase the money stock by 10%, which change in the reserve ratio would accomplish that goal? (iii) In the initial situation, what is the effect on $M1$ of a €2,000 increase in $M0$?

9. M0, M1, M2. Can $M0$ rise and, at the same time, $M1$ drop? (ii) Can $M0$ fall and, at the same time, $M2$ rise?

10. Money multiplier. Find the money multiplier if the liquidity ratio is 0.1, the monetary base is 550, and the currency the public holds is 100.

11. Cash and deposits. Determine the amount of cash E and deposits D if the money stock $M1$ equals 900 and the liquidity ratio is 1/2.

12. Money creation process. (i) Explain how an increase in unemployment is likely to affect the money multiplier process. (ii) Considering the money multiplier process, indicate three events that could lower the money multiplier. (iii) How is the money stock likely to be affected by an increase in the number of people that do not repay bank loans?

13. M0. Find the monetary base if the money multiplier is 3/2, reserve and liquidity ratios coincide, and the currency the public holds is 150.

14. Currency and liquidity ratio. With $M1 = 1,000$, $M0 = 500$, reserve ratio equal to 3/8, and deposits $D = 800$, find the liquidity ratio l and the currency E held by the public.

15. Reserve ratio. With $M1 = 1,200$ and $M0 = 300$, find the reserve ratio if the reserve ratio is half the liquidity ratio.

16. M0. Calculate $M0$ if $M1 = 1,200$, the reserve ratio is 1/10 and the currency held by the public is 200.

17. Deposits and M0. In the textbook model of money creation find the formula that expresses D in terms of $M0$ (and the rest of parameters).

18. Loans and M1. In the alternative model of money creation consider the expression (4) that relates $M1$ with L . (i) Calculate the partial derivatives of this expression with respect to r and with respect to l , and interpret the results. (ii) Find the formula that relates $M0$ and L .

19. Eurozone. Identify three eurozone members whose country name does not contain the letter "a".

20. Money multiplier process. Name five variables involved in the money multiplier process.

21. Money multiplier. Suppose currency has an expiry date: coins and banknotes newly issued by the central bank are legal tender for just six months. Explain how this event is likely to affect the money multiplier.

22. Rates of return. The government of Spain issues T-bills. With probability $2/3$ the government pays the full nominal value of the T-bill at maturity, in which case the profit an investor obtains from buying a T-bill is €60. With probability $1/3$ the government defaults and the investor loses €30 from each T-bill bought. The government of Greece also issues T-bills. With probability $1/2$ the government pays the full nominal value of the T-bill at maturity, in which case the profit an investor obtains from buying a T-bill is €120. With probability $1/3$ the government defaults and the investor loses €60 from each T-bill bought. There are two options.

- **Option 1.** Purchase of two T-bills issued by the government of Greece.
- **Option 2.** Purchase of one T-bill issued by the government of Greece and one T-bill issued by the government of Spain.

(i) Calculate the return of each option assuming that the default risks are uncorrelated. (ii) Calculate the return of each option assuming that the government of Spain defaults if and only if the government of Greece defaults (suppose that the probability that the Spanish government defaults is determined by the Greek probability). (iii) In (ii), replace the values 120 and -60 corresponding to the possible results of the Greek investment by values x and $-y$ such that: (a) the expected return coincides with the expected return of a Spanish T-bill; and (b) the return of purchasing one Spanish T-bill and one Greek T-bill is negative under the conditions of (ii).

23. Reserve ratio. Find the reserve ratio if the monetary base is 350, deposits amount to 1,000, and the liquidity ratio equals $1/4$.

24. Money multiplier. Explain the economic mechanism by means of which an increase in the liquidity ratio affects the money multiplier.

25. Money creation models. Explain one difference between the textbook model of money creation and the alternative model and one common characteristic.

26. Reserve ratio. Cash in the hands of the public is 100. Deposits amount to 600. With both deposits and the cash in the hands of the public remaining constant, the money multiplier has jumped from 2 to 4. If possible, find the change in the reserve ratio.

27. Money creation. Initially, banks lend 100% of all the funds they could legally lend. How is the money creation process likely to be affected by the banks' decision of reducing the proportion of funds lent to 50%?

28. Money creation process. Consider Example 16.1. Calculate the values that, in Table 7, would correspond to rounds 6 and 7.

29. Money creation process [optional]. (i) Show that, in the textbook model of bank money creation with unknown values for r and l , the final increment ΔD resulting for an increase $\Delta M0$ in the monetary base is given by the formula

$$\Delta D = \frac{1}{r + l} \cdot \Delta M0 .$$

(ii) Determine the formula obtained from the previous one when $\Delta M0$ is replaced by $\Delta M1$.

30. M1. What is the meaning of the expression “M1 is endogenous”?

31. Instability of the financial sector. Identify three reasons that could justify the belief that the financial sector of an economy is inherently unstable.

32. Liquidity and reserve ratios. (i) The money multiplier is 2. Deposits equal four times reserves. If possible, find the liquidity ratio. (ii) The money multiplier is 2, the monetary base is 1,000, and deposits amount to 1,500. If possible, find the reserve ratio; if not possible, explain why.

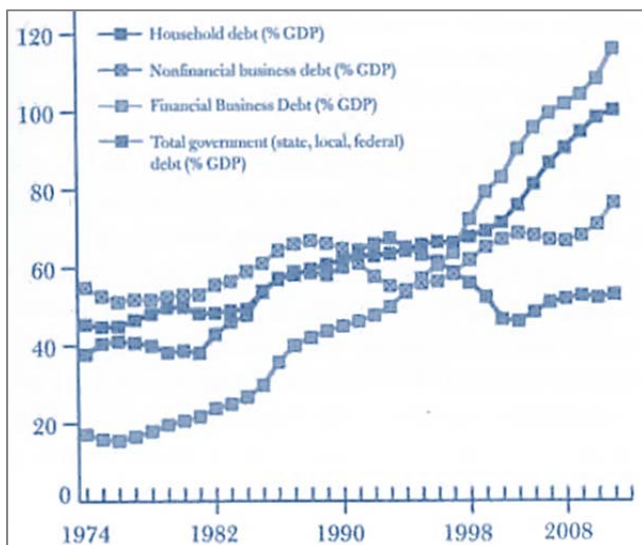
33. Money creation process. Explain how each of the following three events is likely to be affect the money multiplier process: (i) the bankruptcy of half of the banking system of an economy; (ii) firms and households decide to borrow from banks only 50% of what banks offer to lend; (iii) people double their liquidity ratio (from 0.2 to 0.4) and, at the same time, the reserve ratio is reduced from 0.4 to 0.3.

34. Definitions. Define the concepts of securitization and financial depth.

35. Financial sector. The financial sector can be considered fragile. Why?

36. OMOs. The expression “Quantitative easing” (QE) refers to a policy by means of which a central bank buys assets (for instance, government bonds) mainly from non-bank financial companies (like pension funds and insurance companies). QE aims to increase private spending directly by circumventing the banking sector. (i) Is a QE programme essentially like an expansionary or a contractionary OMO? (ii) Analyze the effect of a QE programme on the interest rate using the liquidity market model.

37. Money multiplier. Explain two ways of slowing down the money multiplier process.



38. Financial sector. The chart on the left plots debt magnitudes in relation to GDP in the US (Fred Magdoff & Michael Yates, 2009, *The ABCs of the Economic Crisis*, p. 77). For instance, in 2007, all US debt (by households, businesses, and government) amounted to 350% of GDP. Considering the aggregate of the four curves, can it be concluded that the financial sector has grown to become bigger than the real sector or vice versa? Justify the answer.

39. Eurozone. Find: (i) two eurozone members whose names in English contain the letter “o”; (ii) one eurozone member that does not belong to the European Union; and (iii) one member of the European Union sharing borders with no eurozone member.

40. T-bills. Assume that the relationship between the economy’s interest rate i and the price of T-bills holds. (i) The face value of T-bills is 1,000. The discount factor is equal to the interest rate. Find the price of T-bills. (ii) Find the interest rate if the price of T-bills doubles the face value of T-bills. (iii) The interest rate is 20%. Find by how much the interest rate should change to double the price of T-bills.

41. M1. The monetary base is 200. The liquidity ratio is equal to the reserve ratio. Deposits are 400. If possible, find **M1** and the money multiplier; if not possible, explain why.

42. Interest rate. The real interest rate is zero. Real GDP has decreased by 5%. Nominal GDP has decreased by 3%. If possible, find the approximate value of the nominal interest rate; if not possible, explain why.

43. 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 $i > 0$?

44. 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.

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

46. Interest rate, discount factor. (i) Can the discount factor 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.

47. 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%.

48. 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. Calculate the face value of the T-bill.

49. Equilibrium interest rate. (i) Identify three events that may cause an increase in 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.

50. 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.

51. Price and rate of return. Explain why a fall in the price of T-bills is likely to be accompanied by an increase in the rate of return of T-bills.

52. 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 $\frac{2}{3}$.

53. Liquidity market model. Consider the liquidity market model with increasing supply of liquidity function and decreasing demand for liquidity function. Ascertain 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) A significant number of factories close
- (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 expansionary open market operation
- (6) More foreigners purchase domestic financial assets
- (7) The population of the economy grows old
- (8) The banks refuse to lend to persons 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) Spain leaves the eurozone
- (20) (1) and (2) occur simultaneously
- (21) The first ten events occur simultaneously
- (22) A bank run takes place

54. 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 produce 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 what would make the measure effective.

55. 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) Suggest an open market operation capable of neutralizing the effect on the interest rate established in (b) and illustrate your answer graphically.

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

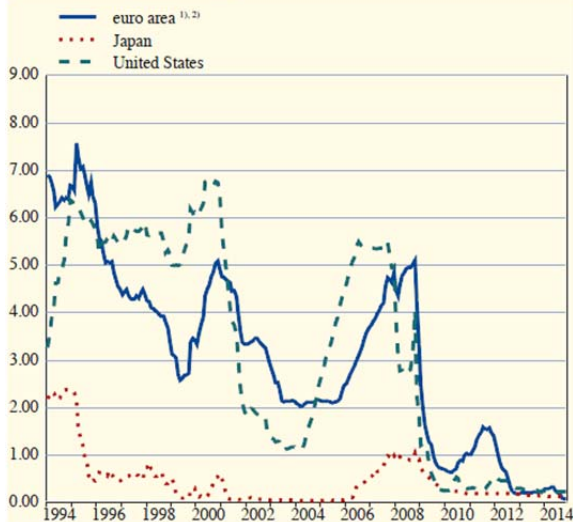
57. Fisher effect. Explain if having a negative real interest rate for five years is consistent with the Fisher effect.

58. 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%.

59. Liquidity market model. (i) With the help of a graphical representation of the liquidity market model, 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.

60. Robin Hood tax. (i) Analyze graphically the effect on the equilibrium interest rate of establishing a tax on the sales of existing financial assets. It is the sellers who must pay the tax. The central bank and the government are both tax-exempt. (ii) Suggest a monetary policy measure by the central bank that could neutralize the change in the volume of liquidity found in (i).

C26 3-month money market rates
(monthly averages; percentages per annum)



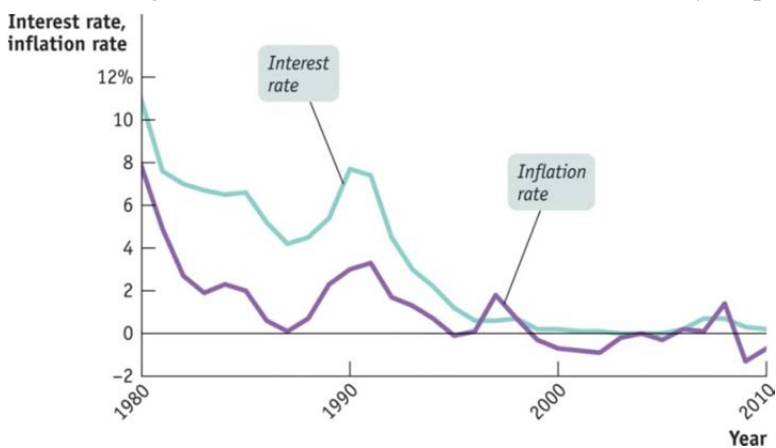
61. Liquidity market model. (i) Over the two decades represented in the chart on the left, can monetary policy be considered, in all three economies, rather expansionary or rather contractionary?

ECB Monthly Bulletin, December 2014

<http://www.ecb.europa.eu/pub/pdf/mobu/mb201412en.pdf> (S43)

62. Expansionary monetary policy. Explain four ways by means of which a central bank can increase liquidity.

63. Real interest rate, Japan. (i) Does the chart below 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)

64. Fisher equation. Economies **A** and **B** have the same real interest rate. The inflation rate in **A** is five percentage points higher than in **B**. According to the Fisher equation, which economy has the higher nominal interest rate and by how many percentage points? Justify your answer in detail.

65. 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) [Optional] 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				

66. MROs by the ECB. The ECB provides €500 million of liquidity by means of an MRO executed as 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				

67. OMOs. Explain the expression “contractionary open market operation”.

68. 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 or fundamental 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.

69. 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?

70. 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 does not allow Spanish firms and citizens to borrow from French banks).

(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.

71. 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.

72. T-bills. One million T-bills are issued in period t . Each one is sold at a price equal to €1,000 and promises to pay € V in $t + 1$. The interest rate from t to $t + 1$ is 50%. Find the value of V consistent with the absence of arbitrage opportunities.

73. Fisher equation. Using the Fisher equation, find the value of the nominal interest rate if real GDP is 100 and the GDP deflator inflation rate is 10%.

74. 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) Fisher equation and interest rates set by the central bank
- (11) Fisher effect and Fisher hypothesis
- (12) Reserve requirement and open market operation
- (13) Discount factor and real GDP

75. 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.

76. Liquidity market model. Find all the equilibria interest rate if the demand for liquidity function is

$$L^d = \begin{cases} 8 - i & \text{if } 0 \leq i \leq 8 \\ 0 & \text{if } i > 8 \end{cases}$$

and the supply of liquidity is given by the expressions $i = 14 + 2 \cdot L^s$ if $L^s > 0$ and $L^s = 0$ if $0 \leq i \leq 14$.

77. T-bills. Assuming that the relationship between the economy's interest rate i and the price of T-bills holds, find the price of T-bills (when issued) if their face value is 1,000 and the discount factor (based on i) is $1/2$.

78. Central bank. (i) Explain why the central bank cannot simultaneously control the interest rate i and the money stock $M1$. (ii) List three functions of a central bank.

79. Real interest rate. The price level today is 100; tomorrow, 200. By lending €1,000 today, you get €1,200 tomorrow. Calculate the corresponding exact real interest rate.

80. Interest rate. A government announces a debt default: interest payments corresponding to the government's public debt will not be honoured for the next ten years. Explain and analyze graphically the effect of this announcement on the domestic interest rate.

81. Discount factor. Assuming valid the equation linking the price of T-bills and the interest rate of the economy, calculate the economy's discount factor if the price of T-bills, when issued, is 500 and their face value is 1,000.

82. T-bills. T-bills with face value V are about to be issued in period t . They mature in period $t + 1$. The interest rate between t and $t + 1$ is negative. What can be said about the relationship between V and the price P at which the T-bills are initially sold?

83. Liquidity market model. In the first week of May 2015 the Danish government announced that it was planning to allow gas stations, clothing stores, and restaurants the option to stop taking cash payments. Explain how this measure would affect the money multiplier process and the money multiplier itself.

<http://qz.com/399531/denmark-hopes-to-boost-its-economy-by-eliminating-cash/>

84. Bank runs. There are many instances of bank runs in the US economic history: 1819, 1837, 1857, 1873, 1893, 1907... (i) Explain, with the help of the liquidity market model, the effect of a bank run on the interest rate, stating clearly which function or functions shift and why. (ii) Suggest two monetary policy measures that could offset the effect of the bank run on the interest rate and indicate the function or functions that each measure modifies.

85. Open market operation. Explain what an open market operation is, pick two macroeconomic variables affected by this kind of operation, and indicate how they are affected.

86. Real interest rate. Calculate the real interest rate between period $t = 0$ and period $t = 1$ if the CPI in $t = 0$ is 100, the CPI in $t = 1$ is 105, and the nominal interest rate between $t = 0$ and $t = 1$ is 3%.

87. Fisher effect. Indicate two variables having to do with the Fisher effect and another two completely unrelated to the Fisher effect.

88. ECB. (i) Name two of the decision-making bodies of the European Central Bank. (ii) Find the ECB web page where two bodies are described. (iii) Has the European Central Bank ever set a negative (nominal) interest rate? If so, indicate which one.

89. T-bills. Assuming the formula that relates the face value of a T-bill, its price, and the interest rate calculate the face value: (i) if the discount factor is 1 and the price is 100; (ii) if the interest rate is 100% and the price is 100.

90. Real interest rate. Compute the real interest rate if the nominal interest rate equals the inflation rate.

91. Liquidity market model. Initial situation: purchasers of financial assets have to pay a tax when purchasing financial assets, whereas the sale of financial assets is tax-free. (a) Using the liquidity market model, explain and analyze graphically the effect on the equilibrium interest rate of each of the following events: (i) the government removes the tax on purchasers of financial assets; (ii) the government imposes a tax on the sellers of financial assets when selling financial assets. (b) Indicate a monetary policy measure that could offset the effect on the interest rate when both (i) and (ii) occur.

92. Interest rate. The (exact) real interest rate between t and $t + 1$ is 10%. According to the CPI, the purchasing power in t of €1,000 is 5 baskets of goods. The CPI in $t + 1$ is 300. Find, if possible, the CPI inflation rate between t and $t + 1$ and the nominal interest rate between t and $t + 1$.

93. Real interest rate. Explain the meaning of the sentence "the exact real interest rate between periods t and $t + 1$ is 10%".

94. Liquidity market model. Indicate how the following events are likely to modify the market functions (“→” = shift to the right, “←” = shift to the left) and the equilibrium interest rate i^* (“↑” = goes up, “↓” = goes down, “=” = unaltered, “?” = ambiguous or uncertain change), where **S** = supply of liquidity function and **D** = demand for liquidity function.

	S	D	i^*
The central bank conducts an expansionary OMO			
Households reduce the amount of financial assets bought			
The government issues T-bills			
Banks refuse to lend to firms and, to finance their activities, firms sell financial assets that they have previously bought			
The central bank reduces the legal reserves ratio			
Banks expect an immediate rise in the inflation rate but firms and the public in general ignore the rise			
Firms and households refuse to buy financial assets anymore			

95. Purchasing power. Explain the meaning of the sentence “according to the CPI, the purchasing power in period t of €1,000 is 5 baskets of goods”.

96. Real interest rate. If you lend €1,000 in period t you get €2,000 in period $t + 1$. The CPI in t is 100. The CPI in $t + 1$ is 200. Find the real interest rate between t and $t + 1$.

97. Poland. Poland economy data are shown below (<http://www.focus-economics.com/countries/poland>).

	2011	2012	2013	2014	2015
CPI inflation rate (annual variation, %)	4.6	2.4	0.7	-1.0	-0.5
Policy interest rate (%)	4.5	4.25	2.5	2	1.5
Stock market (annual variation, %)	-20.8	26.2	8.1	0.3	-9.6
Money (annual variation, %)	11.5	4.2	6.7	8.8	9.7

(i) Is the evolution of the first two magnitudes consistent with the Fisher effect? Justify the answer. (ii) Is the evolution of the second and third magnitudes consistent with the relationship between interest rates and prices of financial assets? Justify the answer. (iii) During which years is the evolution of the last magnitude consistent with an expansionary monetary policy and during which years consistent with a contractionary monetary policy? Justify the answer.

97. Italy. Banca Popolare and BPM have merged to create the third biggest bank in Italy. The bank merger is intended to create a “larger, stronger, and more transparent” bank. Using the liquidity market model analyze, and explain, the impact on the equilibrium interest rate of a bank merger with the above characteristics.

<http://www.lavanguardia.com/economia/20160324/40654769221/italia-banca-popolare-bpm-fusion.html>

98. Money creation process. Imagine that the central bank declares all banknotes no longer valid and that only coins can be used to make cash payments. How is this measure likely to affect the money creation process and the value of the money multiplier?

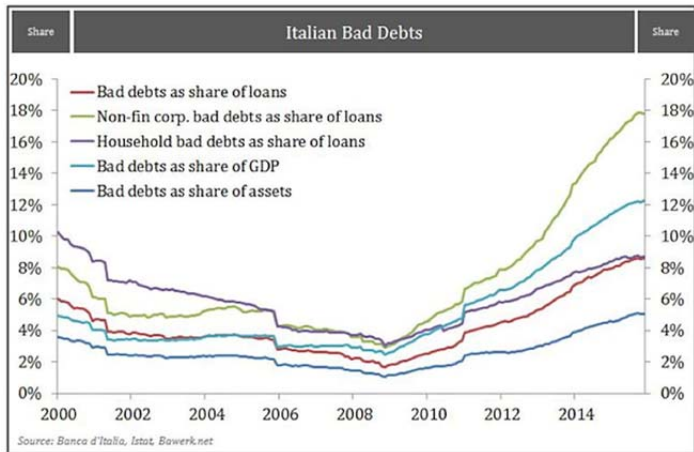
99. Money multiplier. If possible, find the money multiplier if deposits **D** double the bank reserves **R**, cash **E** is one-fourth of **M1**, and **M0** is twice **E**. If not possible, explain why not.

100. Venezuela. “Venezuela has been teetering on the brink of default the past two months. The country is barely making enough money on oil exports to cover its debt payments. This year Venezuela owes over \$10 billion in debt payments. Nearly half of that is due in October and November. ‘I’m 99% sure they’re going to default this year,’ says Russ Dallen, managing partner at LatInvest, a Miami-based firm that invests in Venezuela.”

<http://money.cnn.com/2016/01/18/news/economy/venezuela-economy-meltdown/index.html>

Assume that the Venezuelan bolivar is the home currency and the dollar the foreign currency. Assume as well that the currency market is not subject to capital controls. Explain and analyze graphically in the currency market model whether the bolivar should be expected to appreciate or depreciate against the dollar if the Venezuelan government refuses to pay at maturity the face value of T-bills bought by American investors.

101. Poland and currency market. Assume that the Polish zloty is the home currency and the euro the foreign currency. Initially, a policy has been implemented to encourage foreign investors to invest in Poland. The new policy is to remove advantages to foreign investors. Explain and analyze graphically in the currency market model the effect of the new policy on the exchange rate.



102. Italian banking crisis. [Italy is the eighth-largest economy in the world] The chart on the left shows what appears to be the breaking down of the Italian banking system: the proportion of nonperforming loans with respect to the assets of the Italian

banking system has been growing in the last years and is approaching 20% (during the worst of the most recent US banking crisis, that proportion did not exceed 3.5%). Some southern Italian banks reach nearly 40%.

<http://www.mauldineconomics.com/editorial/these-are-the-5-biggest-risks-that-could-break-up-the-european-union/VLW>

(i) Using the liquidity market model for the Italian economy, analyze the impact on the equilibrium interest rate of an increase in the proportion of nonperforming loans in the banking system. (ii) Suggest a monetary policy measure by the European Central Bank that could neutralize that impact and represent that measure in the model.

103. Liquidity model. The government is not collecting enough revenue to cover its debt payments. To justify an eventual default, the government changes the laws so that it is easier for debtors not to pay their debts. Specifically, in some circumstances, borrowers may choose not to repay their loans. Explain and analyze graphically in the liquidity market model the likely effect of this policy measure on the equilibrium interest rate.

104. Central banks. (i) Explain, and represent graphically, what kind of currency market intervention by the Federal Reserve would cause an appreciation of the euro against the dollar. (ii) Would that intervention also cause an appreciation of the euro if it were carried out by the European Central Bank?



Central Bank and pledges from the nation's policy makers to keep borrowing costs on hold."

<http://www.bloomberg.com/news/articles/2016-03-31/zloty-has-best-month-in-year-as-ecb-shifts-focus-from-s-p-cut>



106. Currency market. The chart on the left shows the evolution of the exchange rate between the Polish currency and the euro after the ratings agency S&P downgraded Poland's foreign credit rating. The reasons given by the agency were that "The change in the rating outlook to negative reflects our view that there is potential for further erosion of the independence, credibility, and effectiveness of key institutions, especially the National Bank of Poland". Explain by means of the currency market

model the connection between the downgrading of Poland's credit and the depreciation of the Polish currency (which felt nearly a 4% during January 2016). <http://www.ft.com/fastft/2016/01/15/poland-downgraded-by-sp-zloty-tumbles/>

107. PPP. (i) Suppose a currency is overvalued according to its PPP value. What can be said about the associated real exchange rate? [Hint: is greater, smaller, or equal to 1?] (ii) Assume that P^* is twice P . What is the value of the nominal exchange rate implied by PPP?

108. The Morawiecki Plan. “We want to support more Polish businesses as it’s better to have more local capital. Right now the conditions for international companies are better than those for Polish businesses. In order to attract foreign investment we are paying huge money for some of these projects to come. Over the past several years many Polish companies have felt that they have been treated in a discriminatory way. However, we are not going to discriminate against anybody.”

<http://www.warsawvoice.pl/WVpage/pages/article.php/28445/article>

T1	USD	GBP	CAD	EUR	AUD
USD	1	0.63804	0.99588	0.73879	0.96732
GBP	1.56729	1	1.56082	1.15789	1.51607
CAD	1.00414	0.64069	1	0.74185	0.97133
EUR	1.35357	0.86364	1.34799	1	1.30933
AUD	1.03378	0.65960	1.02952	0.76375	1

Refresh in 0:38 | Feb 07, 2013 06:49 UTC

T2	USD	GBP	CAD	EUR	AUD
USD	1	0.79643	1.33831	0.92054	1.31381
GBP	1.25560	1	1.68039	1.15583	1.64962
CAD	0.74721	0.59510	1	0.68784	0.98169
EUR	1.08632	0.86518	1.45383	1	1.42721
AUD	0.76115	0.60620	1.01865	0.70067	1

Refresh in 0:51 | Mar 28, 2017 06:00 UTC

109. Nominal exchange rate. Consider tables T1 and T2, taken from <http://www.x-rates.com/>. In T1, for instance, €1 can purchase \$1.35357.

(i) Does the euro appreciate or depreciate with respect to the dollar from T1 to T2?

(ii) Is there any currency with respect to which both the euro and the

dollar appreciate from T1 to T2?

(iii) Identify a currency that, in passing from T1 to T2, appreciated with respect to the dollar but depreciated with respect to the euro or vice versa.

110. Appreciation. Let the exchange rate be $e = 2 \text{ } \$/\text{€}$. (i) Calculate the new exchange rate that makes the dollar appreciate a 50% with respect to the euro. (ii) Find the new exchange rate needed to induce a 20% appreciation of the euro with respect to the dollar.

111. Currency market. (i) Explain if the euro appreciates or depreciates with respect to the dollar if the US real GDP increases. Illustrate your explanation by means of a graphical representation of the currency market. (ii) Address the same two questions (explain and illustrate) if the European Central Bank conducts an expansionary open market operation. (iii) Address the same two questions if the events in (i) and (ii) occur simultaneously.

112. PPP. Find the purchasing power parity exchange rate (when the euro is the home currency and indirect quotation is adopted) if the nominal exchange rate is $2 \text{ } \text{€}/\text{\$}$, the eurozone CPI is 200, and the US CPI is 600 (assuming that both CPIs are based on the same basket of goods).

113. Currency arbitrage. Explain how triangular arbitrage would alter the exchange rates $1 \text{ } \text{\$/€}$, $1 \text{ } \text{\$/¥}$, and $2 \text{ } \text{€}/\text{¥}$.

114. Three currencies. (i) Is it possible for the yen to depreciate with respect to the euro and, simultaneously, to appreciate with respect to the dollar? (ii) If so, would the euro appreciate or depreciate with respect to the dollar?



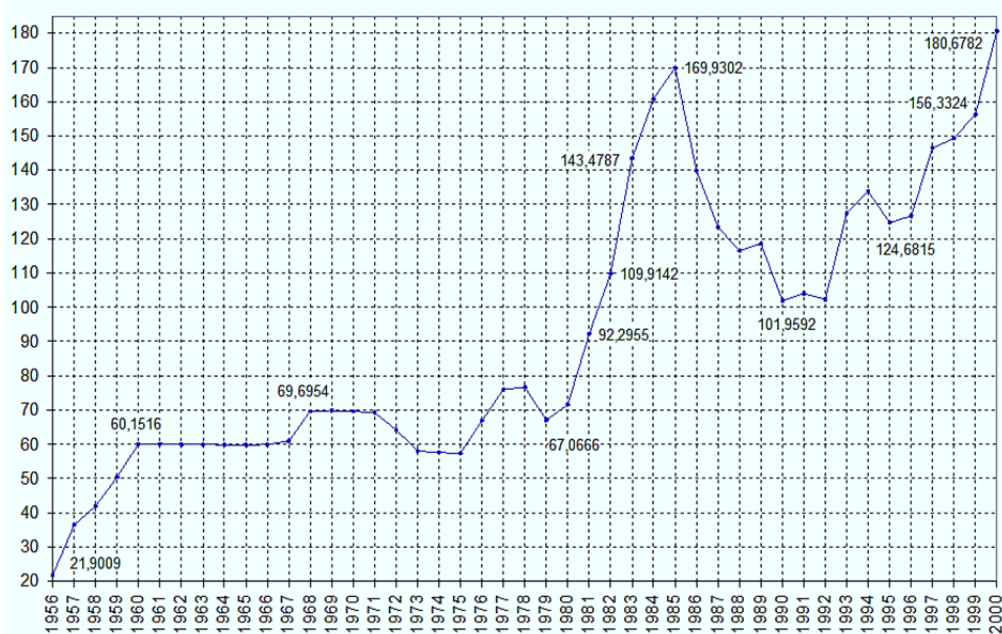
115. Appreciation and depreciation. In the chart on the left, for each foreign currency, indicate a period in which the euro: (i) appreciates with respect to the currency; (ii) depreciates with respect to the currency.

ECB Monthly Bulletin, December 2014
www.ecb.europa.eu/pub/pdf/mobu/mb201412en.pdf (S72)

116. Liquidity market model. Suggest events causing the shifts of the functions indicated below and specify the effect on the equilibrium interest rate (if the effect is not ambiguous).

- (i) Supply of liquidity shifts to the left, demand for liquidity shifts to the right.
- (ii) Supply of liquidity shifts to the right, demand for liquidity to the left.
- (iii) Supply of liquidity shifts to the right, demand for liquidity fixed.
- (iv) Supply of liquidity and demand for liquidity both shift to the left.

117. Peseta-dollar exchange rate. The chart below shows the peseta-dollar exchange rate (1956 to 2000): how many pesetas could be purchased with one dollar (http://www.economicswbinstitute.org/data/world_exchangerates.zip). (i) Select an interval during which the peseta depreciated with respect to the dollar. (ii) Pick two years between which the peseta appreciated with respect to the dollar. (iii) Conjecture how the graph showing the dollar-peseta exchange rate should look like.



118. PPP. Reus and Tarragona are independent countries with their own currency, the reuro and the tarragollar, respectively. The exchange rate between reuro and tarragollar is 2 reuros per tarragollar. The price of French bread is 3 reuros a piece in Reus and 1 tarragollar a piece in Tarragona. (i) Is the reuro overvalued or undervalued with respect to its PPP value? If so, by how much? (ii) Assuming that there is no significant transportation cost, what changes would cause the commercial arbitrage of French bread in the exchange rate and the prices in Reus and Tarragona?

119. Over/undervaluation. By how much is the euro overvalued or undervalued with respect to its purchasing power parity level if $e = 2$ \$/€ and the US price level doubles the eurozone price level?

120. Over/undervaluation. Fill out the following table, where P is the eurozone CPI, P^* is the US CPI, e_{PPP} is the exchange rate \$/€ ensuring purchasing power parity, e is the equilibrium exchange rate \$/€ in the currency market, and the last column is the one where it must be specified in which percentage the euro is overvalued or undervalued with respect to the dollar according to e_{PPP} .

P	P^*	e_{PPP}	e	Overvalued/undervalued (%)
100	200		1	
100	200		2	
100	200		$\frac{1}{2}$	
150	150		2	

121. Currency market. Determine the effect on the equilibrium exchange rate of the following events.

- (1) The arrival of a significant number of immigrants from the US
- (2) The Federal Reserve buys government bonds
- (3) The Federal Reserve and the ECB purchase government bonds
- (4) The Federal Reserve buys government bonds and the ECB sells them
- (5) The reduction of the number of tourists coming from the US
- (6) An increase in the US GDP
- (7) An increase in the US GDP while the eurozone GDP decreases
- (8) An increase in the eurozone CPI
- (9) An increase in both the eurozone CPI and US CPI
- (10) Germany or Catalonia leave the eurozone
- (11) The US declares war on the eurozone

122. Real exchange rate. (i) Compute the real exchange rate and the purchasing power parity exchange rate if the nominal exchange rate in the currency market is $e = 1/4$ €/\$, the US CPI is $P^* = 800$, and the eurozone CPI is $P = 400$ (specify the units of the two rates computed). (ii) If the purchasing power parity exchange rate differs from the nominal exchange rate in the currency market, explain if the euro is overvalued or undervalued with respect to the dollar and calculate the over/undervaluation percentage.

123. Real exchange rate. Find the real exchange rate if the nominal rate is 2 \$/€, the eurozone price level is $P = 500$, and the US price level is $P^* = 250$.

124. Three currencies. (i) If the dollar-euro exchange rate is 20 \$/€ and the yen-euro exchange rate is 10 ¥/€, what should presumably be the yen-dollar rate? (ii) Let the dollar appreciate versus the euro and the yen depreciate versus the euro. Must the dollar appreciate or depreciate versus the yen?

125. Real exchange rate. (i) What is to be expected to happen to the real exchange rate between the dollar and the euro if the euro depreciates with respect to the dollar and the inflation rate in the US is higher than the inflation rate in the eurozone? (ii) Is it possible for the euro to appreciate against the dollar in nominal terms but, at the same time, depreciate in real terms? Explain your answer.

126. Arbitrage. State something that the concepts of triangular arbitrage and spatial arbitrage have in common and something that differentiates them.

127. Exchange rate. Indicate something that the concepts of appreciation and devaluation have in common and something that differentiates them.

128. Parities. (i) Between periods t and $t + 1$ the euro is expected to depreciate by 5% against the dollar. If the US nominal interest rate between those periods is 8%, calculate the European nominal interest rate consistent with the interest rate parity. (ii) Find the domestic inflation rate consistent with the relative purchasing power parity if the foreign inflation rate is 5%.

129. Interest rate parity. Imagine that the Spanish currency were the peseta (Pts) and consider the Polish currency, the złoty (pronounced ['zwɔti]). Find the formula defining the interest rate parity involving the peseta and the złoty when the exchange rate is quoted directly and the domestic currency is the peseta, if you are a Polish citizen, and the złoty, if you are not.

130. Currency market. (i) Suggest an event that would cause a depreciation of the dollar against the euro. (ii) Explain how, and for what reason, the supply of euros function and the demand for euros function are affected by that event. (iii) Show the effects described in parts (i) and (ii) in a graphical representation of the currency market model. (iv) Explain, and represent graphically in the appropriate model, the effect on the macroeconomic equilibrium of the event suggested in part (i).

131. Currency market. Imagine that the wealthy Russians have their money on US bank accounts and that they come to believe that Russia is going to invade Ukraine. Suppose: (a) that those wealthy Russians know that, in case of invasion, the Trump administration will freeze the US bank accounts owned by Russians; (b) that they think that Swiss banks are a safer place for their money than Mother Russia; and (c) that there is no currency market to exchange dollars for Swiss francs.

(i) Analyze graphically the effect on the exchange rates rouble/Swiss franc and rouble/dollar of the belief that Russia is going to invade Ukraine. [Fact in May 2014: the number of new opened private banking accounts in Switzerland by Russians was skyrocketing since the onset of the Ukraine crisis earlier in 2014 and there were many indications that Switzerland were not going to participate in eventual international sanctions against Russia.]

(ii) Suggest an intervention on the currency market by the Central Bank of Russia that could offset the effect on the rate rouble/dollar found in (i).

132. Relating the two currency market models. Letting e designate the exchange rate \$/€, the supply of euros function is $q_{\text{€}}^s = 2 \cdot e$, whereas the demand for euros function is $q_{\text{€}}^d = 12 - e$ (if $e > 12$, then $q_{\text{€}}^d = 0$). (i) Find the equilibrium exchange rate and the volume of euros traded in equilibrium. (ii) Obtain the EU and US functions from the market functions defined in (i) —assuming that the demand for euros lies behind the US function and the supply of euros generates the EU function—, represent them graphically, and verify that the intersection of the functions EU and US provides the same equilibrium results as those obtained in (i). [Hint: $q_{\text{€}}^s = 2 \cdot e \Rightarrow q_{\text{€}}^s = 2 \cdot q_{\$}/q_{\text{€}}^s \Rightarrow (q_{\text{€}}^s)^2 = 2 \cdot q_{\$} \Rightarrow q_{\$} = (q_{\text{€}}^s)^2/2$, which is the EU function.]

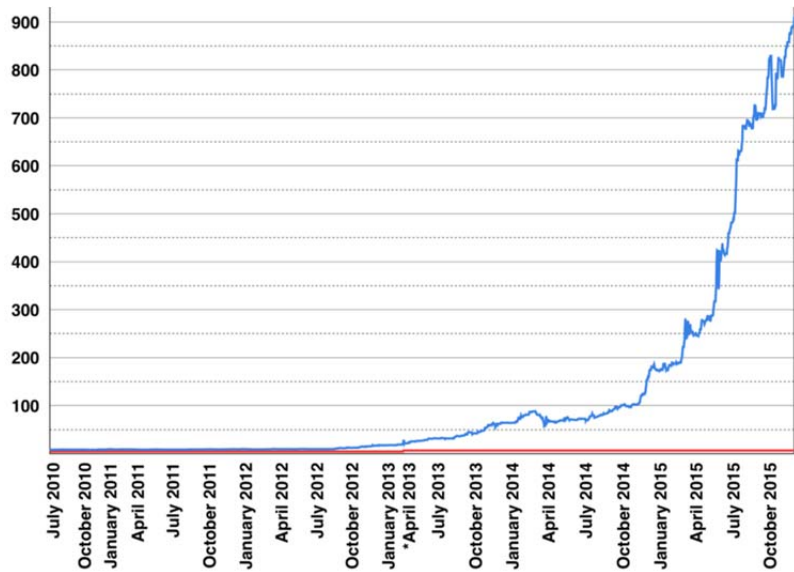
133. Currency market model. Suggest events causing the shifts of the functions indicated below and specify the effect on the equilibrium interest rate (if the effect is not ambiguous).

(i) Supply of euros does not change, demand for euros shifts to the left.

(ii) Supply of euros shifts to the left, demand for euros to the right.

(iii) Supply of euros shifts to the right, demand for euros to the left.

(iv) Supply of euros and demand for euros both shift to the right.



138. Exchange rate Sk/EUR.

The chart on the left graphs the Venezuelan Bolívar against the dollar, an implied and the official rate (the lower almost flat line). (i)

Indicate a period during which the

dollar appreciates against the Bolívar. (ii) Indicate a period during which the Bolívar depreciates against the dollar. (iii) What could explain the difference between the two rates? (iv) If you want to convert dollars into Bolívares, which rate would you prefer to use? (v) And if you had Bolívares and wanted to get dollars? (vi) What troubles are likely to cause to the Venezuelan authorities the existence of two rates?

[https://en.wikipedia.org/wiki/File:Implied vs Official Value VEF 2014.png](https://en.wikipedia.org/wiki/File:Implied_vs_Official_Value_VEF_2014.png)

139. PPP. (i) What is the purchasing power parity exchange rate? (ii) In which units is it measured? (iii) State the formula that defines the concept.

140. Parities. (i) Using the relative purchasing parity, what is the rate of appreciation of the euro against the dollar if the European inflation rate is -3% and the US inflation rate is 0% ? (ii) With the help of the uncovered interest rate parity, what is the expected rate of appreciation of the euro against the dollar if the European interest rate is 3% and the US interest rate is 0% ?

141. Real exchange rate. (i) Write down the formula of the real exchange rate. (ii) The eurozone CPI is 50. The US CPI is 100. Compute the nominal exchange rate between the euro and the dollar that makes the real exchange rate equal to four US baskets of goods per eurozone basket of goods. Specify the units of the exchange rate calculated.

142. Currency market. Since 2013 negotiations have been conducted to establish a free trade agreement between the US and the European Union (the Transatlantic Trade and Investment Partnership). Using a graphical representation of the currency market model involving the euro and the dollar, and taking the dollar as the domestic currency, explain the effect on the exchange rate $\text{€}/\text{\$}$ of the approval of a free trade agreement between the US and the European Union assuming that the lifting of commercial barriers is more beneficial to US consumers than to consumers from the European Union.

<http://blogs.lse.ac.uk/euoppblog/2013/02/28/eu-usa-free-trade-deal/>

143. Interest and exchange rates. Explain how changes in the nominal interest rate affect the nominal exchange rate.

144. Foreign income. Select two variables of the domestic economy that are affected by a rise in foreign income Y^* and explain how the change in Y^* affects them.

145. Currency market. (i) Identify five events shifting the market supply function of euros to the right. (ii) Identify five events shifting the market demand function for euros to the right.

146. Fixed/floating. Indicate a feature that the fixed and the floating exchange rate regimes have in common and some other that differentiates them.

147. Regimes. Consider the standard currency market model that involves the euro and the dollar. (i) What is the (most immediate) effect on the equilibrium exchange rate $\text{\$/€}$ of an expansionary open market operation conducted by the US Federal Reserve? (ii) What intervention in the currency market should the European Central Bank carry out to revert the exchange rate to its initial value?

148. PPP. Calculate the purchasing power parity exchange rate (adopting the dollar as the home currency) if the nominal exchange rate is $2 \text{ €}/\text{\$}$, the eurozone CPI is 200, and the US CPI is 100.

149. Inflation rate. The (exact) real interest rate between t and $t + 1$ is 10% . According to the CPI, the purchasing power in t of $\text{€}1,000$ is 5 baskets of goods. The CPI in $t + 1$ is 300. Find, if possible, the CPI inflation rate between t and $t + 1$ and the nominal interest rate between t and $t + 1$.

150. Real exchange rate. Calculate the real exchange rate (adopting the dollar as the home currency) if the nominal exchange rate is 2 €/\$, the eurozone CPI is 200, and the US CPI is 100.

151. Real exchange rate. Can the real exchange rate be smaller than the nominal exchange rate? If so, what would it mean? Can the real exchange rate be smaller than the real interest rate?

152. Triangular arbitrage. Given the exchange rates 2 \$/¥ and 4 €/¥, suggest: (i) a value of the exchange rate €/€ that prevents triangular arbitrage; and (ii) another one making that arbitrage possible. Justify the answers. In case (ii) identify the trading sequence between currencies generating a loss in the trade.

153. Depreciation. Using the currency market model explain whether having a large and growing trade deficit tends to depreciate the domestic currency. Consider, if necessary, an economy like that of Venezuela, which exports essentially petroleum and refined products, and imports almost everything else (including most food). https://en.wikipedia.org/wiki/Economy_of_Venezuela

154. Inflation rate. Explain something that triangular arbitrage and commercial arbitrage have in common and something that differentiates them.

155. Purchasing parity. According to the relative purchasing parity, what is the rate of appreciation of the euro against the dollar if the European inflation rate is 5% and the US inflation rate is -2%?

156. T-bills. (i) Assuming the formula that relates the face value of a T-bill, its price, and the interest rate, calculate the discount factor if the price of T-bills is 900 and their face value is 1,200. (ii) Explain what the value of the discount factor represents.

157. Interest rate parity According to the uncovered interest rate parity, what is the expected rate of appreciation of the euro against the dollar if the European interest rate is 3% and the US interest rate is -1%?

158. Money creation process. Explain how the money creation process and the money multiplier are likely to be affected by: (i) the decision of banks to increase voluntarily their reserve ratio; (ii) the generalized use among consumers of mobile phones to make payments.

159. Trinity. What is incompatible according to the impossible trinity?

160. Interest rate. Calculate the real interest rate if nominal GDP equals the GDP deflator inflation rate.

161. Exchange rate. (i) Calculate the real exchange rate (adopting the dollar as the home currency) if the nominal exchange rate is 6 \$/€, the European CPI is 120, and the US CPI is 20. (ii) Calculate also the corresponding purchasing power parity exchange rate.

162. GDP. Can an appreciation or a depreciation cause an increase in the domestic GDP? If so, explain how.

163. M0 & OMOs. The reserve ratio is 30%. The liquidity ratio is 20%. The money stock is 24,000. (i) Find the monetary base. (ii) Explain what kind of open market operation would increase (and explain also how the operation would increase) the money stock by 48,000. (iii) Calculate the amount involved in the open market operation.

164. Currency market. Let DKK stand for “Danish crown” and SKK for “Swedish crown”. (i) Explain and analyze graphically the effect on the exchange rate DKK/SEK of a reduction in the Danish GDP. (ii) The central bank of Sweden, the Riksbanken, is the oldest bank of the world. Explain and analyze graphically the effect on the exchange rate DKK/SEK of a contractionary monetary policy implemented by the Riksbanken.

165. OMO. Explain if the following assertion is true or false: “A contractionary open market operation occurs when people or firms sell financial assets.”

166. Big Mac Index. Explain the meaning of the values in the table below and how they are obtained.

Country	BM price in local currency	Actual exchange rate (Jan 2016)	BM local price in \$	Dollar PPP exchange rate	Over-valuation against \$ (%)
Switzerland	6.5	1.01	6.44	1.31	30.69
Mexico	49	17.44	2.81	9.93	-42.99
Spain	3.5	0.93	3.76	0.709	-23.68
United States	4.93	1.00	4.93	1.00	0.00