

Problem Set 4 · The currency market

1. Nominal exchange rate. Consider the following tables taken from the web site <http://www.x-rates.com/>. To interpret the data, the exchange rates on March 13, 2012, mean that 1 dollar can purchase 0.765873 euros and that 1 euro can purchase 1.30569 dollars.

Table 1

| | USD | GBP | CAD | EUR | AUD |
|--|----------|---------|----------|---------|----------|
| | 1 | 1.46719 | 0.81564 | 1.35069 | 0.698363 |
| | 0.681573 | 1 | 0.555918 | 0.9206 | 0.475985 |
| | 1.22603 | 1.79882 | 1 | 1.65599 | 0.856214 |
| | 0.740357 | 1.08624 | 0.603865 | 1 | 0.517037 |
| | 1.43192 | 2.1009 | 1.16793 | 1.93409 | 1 |

Tuesday, March 24, 2009

(i) Is the euro appreciating or depreciating with respect to the dollar from Table 1 to Table 2? And from Table 2 to Table 3? And from Table 3 to Table 4?

(ii) Is there any currency with respect to which the euro appreciates from Table 1 to 2, from Table 2 to 3, and from Table 3 to 4?

(iii) Identify a currency that, in passing from Table 1 to Table 2 appreciated with respect to the dollar but, in passing from Table 3 to Table 4, depreciated with respect to the dollar.

Table 2

| | USD | GBP | CAD | EUR | AUD |
|--|----------|---------|----------|----------|----------|
| | 1 | 1.59507 | 0.943725 | 1.39369 | 0.881251 |
| | 0.626928 | 1 | 0.591648 | 0.873748 | 0.552481 |
| | 1.05963 | 1.69019 | 1 | 1.4768 | 0.9338 |
| | 0.717515 | 1.14449 | 0.677137 | 1 | 0.632311 |
| | 1.13474 | 1.81001 | 1.07089 | 1.5815 | 1 |

Tuesday, February 2, 2010

Table 3

| | USD | GBP | CAD | EUR | AUD |
|--|----------|---------|----------|----------|----------|
| | 1 | 1.61651 | 1.01183 | 1.37771 | 1.00617 |
| | 0.618615 | 1 | 0.625938 | 0.852278 | 0.622433 |
| | 0.9883 | 1.5976 | 1 | 1.3616 | 0.994399 |
| | 0.725837 | 1.17332 | 0.734429 | 1 | 0.730316 |
| | 0.993866 | 1.60659 | 1.00563 | 1.36926 | 1 |

Wednesday, February 2, 2011

(iv) Identify a currency that depreciated with respect to the euro from Table 1 to Table 2 but appreciated with respect to the euro from Table 3 to Table 4.

Table 4

| | USD | GBP | CAD | EUR | AUD |
|--|----------|---------|----------|----------|----------|
| | 1 | 1.5623 | 1.00802 | 1.30569 | 1.04926 |
| | 0.640078 | 1 | 0.645217 | 0.835749 | 0.671608 |
| | 0.992035 | 1.54986 | 1 | 1.29529 | 1.0409 |
| | 0.765873 | 1.19653 | 0.772022 | 1 | 0.8036 |
| | 0.953052 | 1.48896 | 0.960704 | 1.24439 | 1 |

Tuesday, March 13, 2012

(v) In going from Table 1 to Table 4, which currencies appreciate with respect to the euro? Which ones depreciate?

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

3. Appreciation. In Figures 1-5 (source: <http://www.ecb.int/stats/eurofxref/eurofxref-hist.zip>), indicate a period in which the euro appreciates (depreciates) with respect to the other displayed currency.



Figure 1. Dollar-euro exchange rate (USD/EUR), 4 January 1999 – 14 March 2012

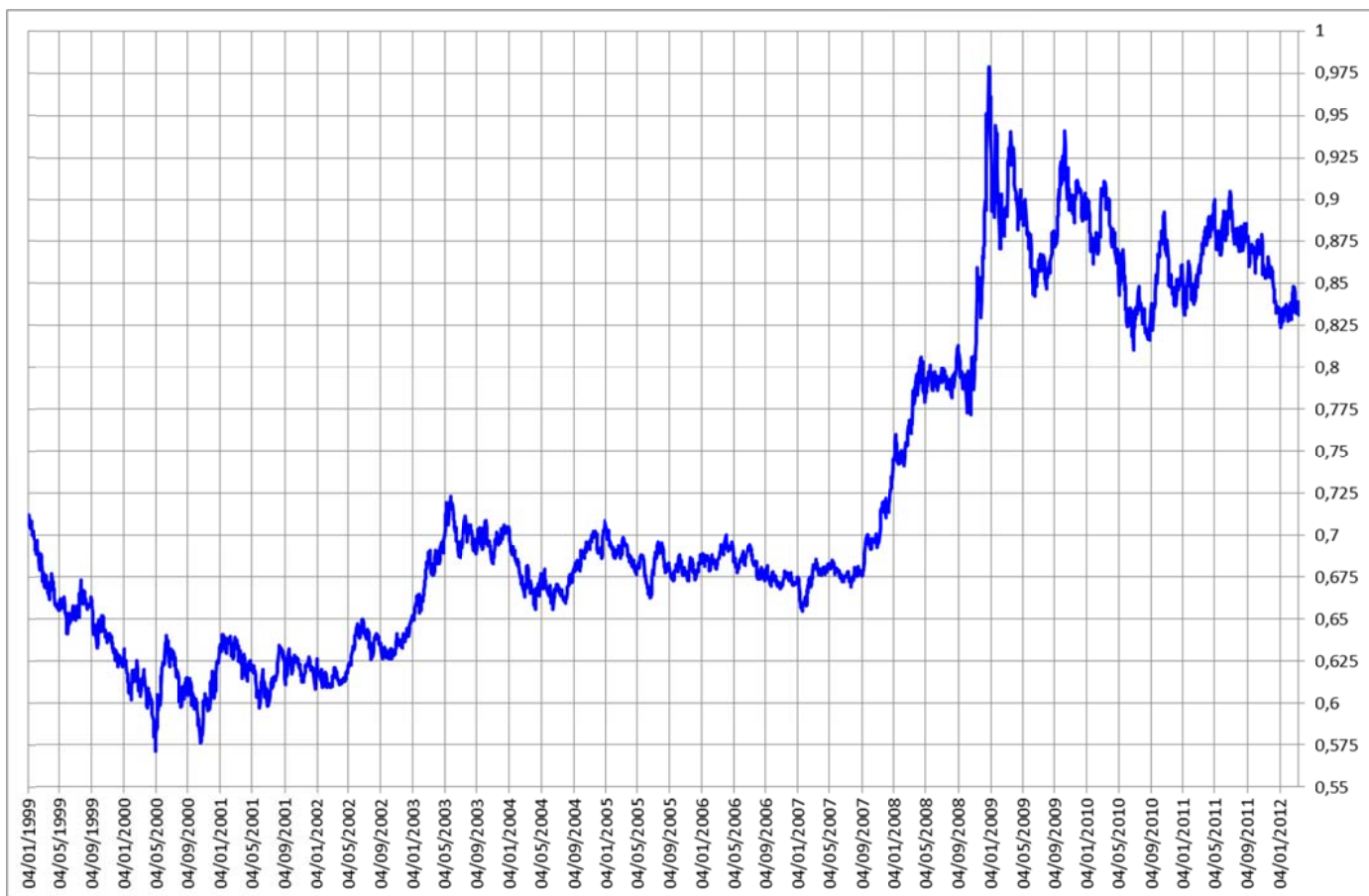


Figure 2. Pound sterling-euro exchange rate (GBP/EUR), 4 January 1999 – 14 March 2012

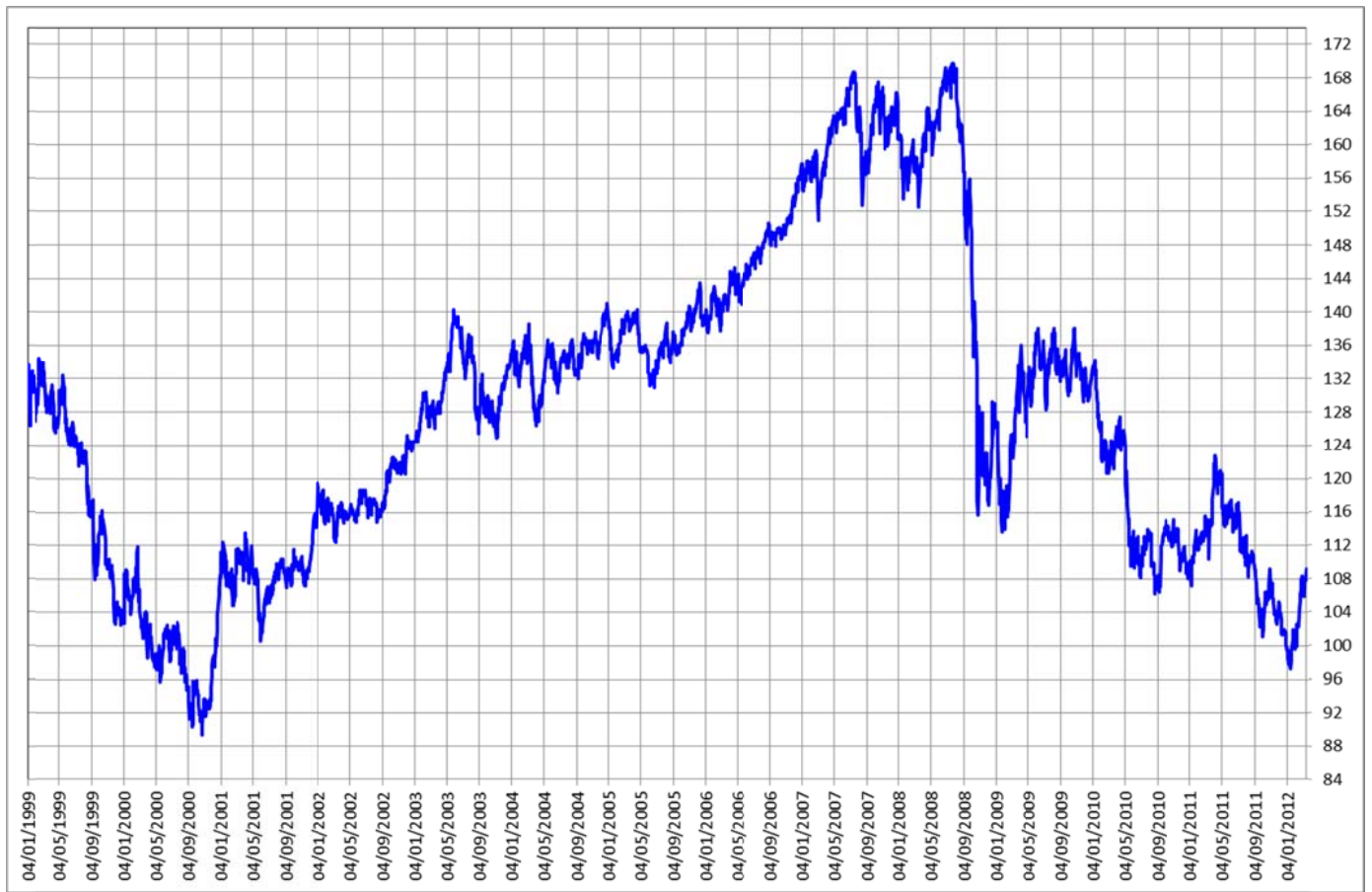


Figure 3. Yen-euro exchange rate (JPY/EUR), 4 January 1999 – 14 March 2012



Figure 4. Ruble-euro exchange rate (RUB/EUR), 1 April 2005 – 14 March 2012

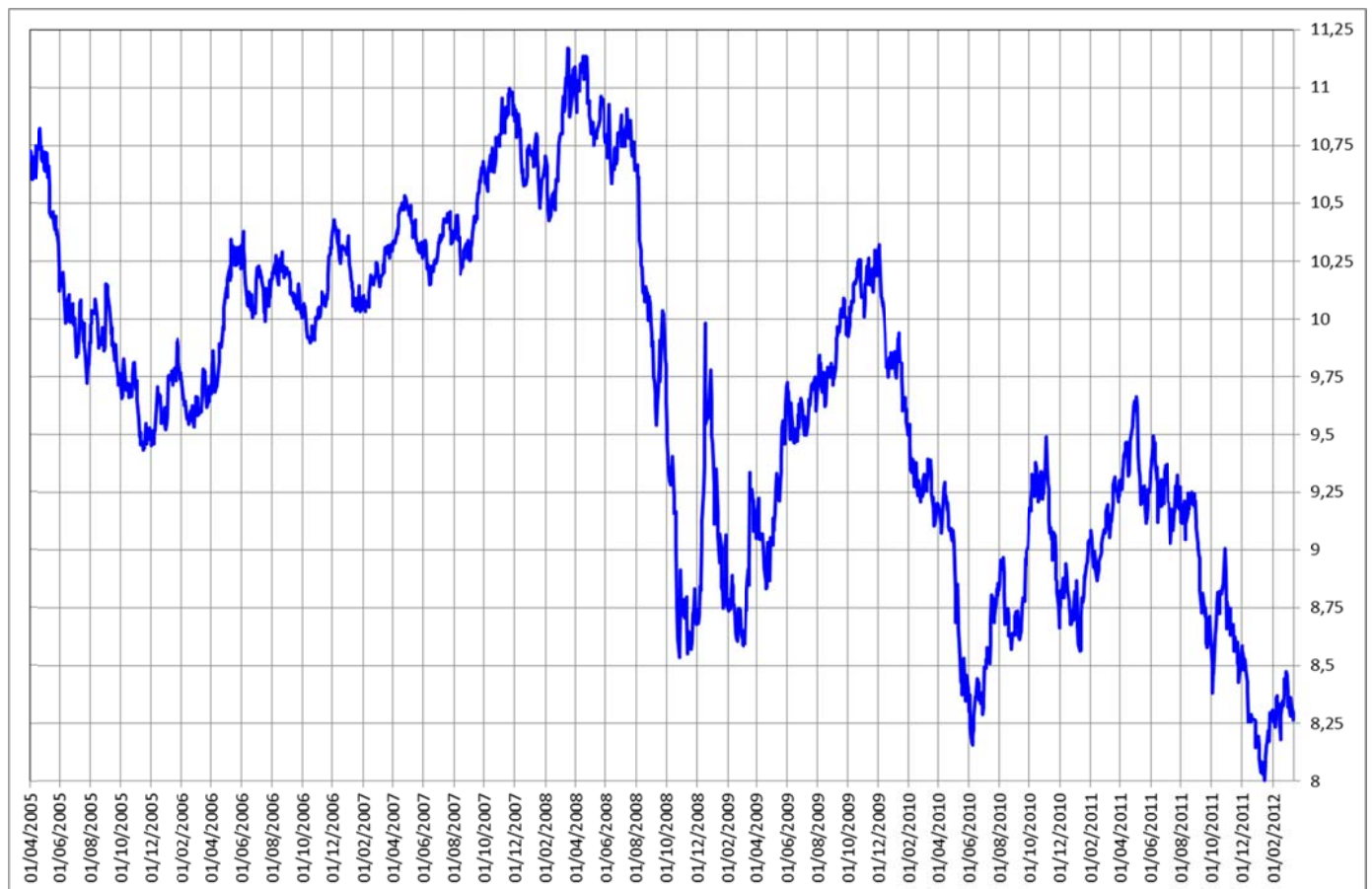


Figure 5. Yuan-euro exchange rate (CNY/EUR), 1 April 2005 – 14 March 2012
 CNY = ISO 4217 Code of the Renminbi (RMB), official currency of the People's Republic of China
 The *yuán* is the primary unit of renminbi · <http://en.wikipedia.org/wiki/CNY>

- 4. 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?
- 5. Currency arbitrage.** Explain how triangular arbitrage would alter the exchange rates 1 \$/€, 1 \$/¥, and 2 €/¥.
- 6. Commercial arbitrage.** Reus and Tarragona are independent countries with their own currencies, 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. Assuming that there is no significant transportation cost, what changes would cause the commercial arbitrage of French bread in the exchange rate and the price of French bread in Reus and Tarragona?
- 7. Currency market.** (i) Explain if the euro appreciates or depreciates with respect to the dollar if the US real GDP rises. 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 executes an expansionary open market operation. (iii) Address the same two questions if the events in (i) and (ii) occur simultaneously.
- 8. 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?

9. Peseta-dollar exchange rate. Fig. 6 shows the peseta-dollar exchange rate from 1956 to 2000. The graph indicates how many pesetas could be purchased with one dollar.

- (i) Select an interval during which the peseta depreciated with respect to the dollar.
- (ii) Select any 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.

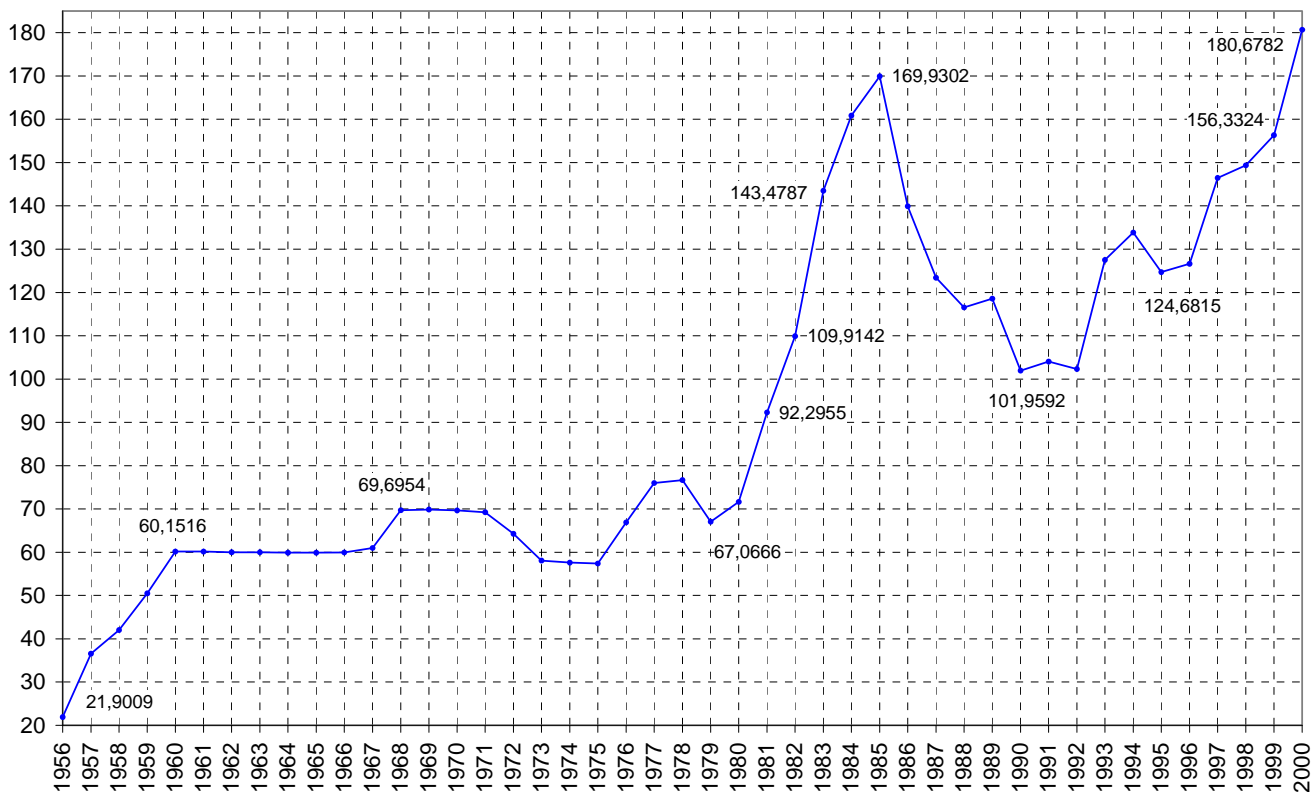


Fig. 6. Peseta-dollar exchange rate, 1956–2000

<http://www.economicswbinstitute.org/data/worldexchangerates.zip>

10. 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 consistent with (implied by) PPP?

11. Over/undervaluation. Fill out the following table, where P is the Eurozone CPI, P^* is the US CPI, e_{PPP} is the exchange rate $\$/\epsilon$ ensuring purchasing power parity, e is the equilibrium exchange rate $\$/\epsilon$ 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 | |

12. Big Mac Index. [Warning: slightly hard] Consider Table 5. (i) Explain whether the Argentinean peso was overvalued or undervalued with respect to the dollar according to purchasing power parity. Specifically, explain what the numbers in each column mean and how they are obtained. (ii) Do the same for the euro. (iii) In the case of Sweden, $e_{PPP} = 9.77$ crowns (Swedish kronor) per $\$$ and e from the currency market is 6.93 crowns per dollar. The percent deviation of e from e_{PPP} turns out to be -29.06% . But Table 5 contends that the crown is overvalued a 41%. Explain the discrepancy.

The Economist Big Mac index, January 2012

| Country | Big Mac prices in local currency | Big Mac prices in dollars* | Implied PPP† of the dollar | Actual dollar exchange rate January 11th 2012 | Under (-)/over (+) valuation against the dollar, % |
|---------------|----------------------------------|----------------------------|----------------------------|---|--|
| United States | \$ 4.20 | 4.20 | - | - | - |
| Argentina | Peso 20.0 | 4.64 | 4.77 | 4.31 | 10 |
| Australia | A\$4.80 | 4.94 | 1.14 | 0.97 | 18 |
| Brazil | Real 10.25 | 5.68 | 2.44 | 1.81 | 35 |
| Britain | £2.49 | 3.82 | 1.69 | 1.54 | -9 |
| Canada | C\$4.73 | 4.63 | 1.13 | 1.02 | 10 |
| Chile | Peso 2,050 | 4.05 | 488 | 506 | -3 |
| China** | Yuan 15.4 | 2.44 | 3.67 | 6.32 | -42 |
| Colombia | Peso 8,400 | 4.54 | 2001 | 1852 | 8 |
| Costa Rica | Colones 2,050 | 4.02 | 488 | 510 | -4 |
| Czech Rep | Koruna 70.22 | 3.45 | 16.73 | 20.4 | -18 |
| Denmark | DK 31.5 | 5.37 | 7.50 | 5.86 | 28 |
| Egypt | Pound 15.5 | 2.57 | 3.69 | 6.04 | -39 |
| Euro area | € 3.49 | 4.43 | 1.20 | 1.27 | 6 |
| Hong Kong | HK\$ 16.5 | 2.12 | 3.93 | 7.77 | -49 |
| Hungary | Forint 645 | 2.63 | 153.67 | 246 | -37 |
| India*** | Rupee 84.0 | 1.62 | 20.01 | 51.9 | -61 |
| Indonesia | Rupiah 22,534 | 2.46 | 5369 | 9160 | -41 |
| Israel | Shekel 15.9 | 4.13 | 3.79 | 3.85 | -2 |
| Japan | Yen 320 | 4.16 | 76.24 | 76.9 | -1 |
| Latvia | Lats 1.65 | 3.00 | 0.39 | 0.55 | -29 |
| Lithuania | Litas 7.8 | 2.87 | 1.86 | 2.72 | -32 |
| Malaysia | Ringgit 7.35 | 2.34 | 1.75 | 3.14 | -44 |
| Mexico | Peso 37 | 2.70 | 8.82 | 13.68 | -36 |
| New Zealand | NZ\$ 5.10 | 4.05 | 1.22 | 1.26 | -4 |
| Norway | Kroner 41 | 6.79 | 9.77 | 6.04 | 62 |
| Pakistan | Rupee 260 | 2.89 | 61.95 | 90.1 | -31 |
| Peru | Sol 10.0 | 3.71 | 2.38 | 2.69 | -12 |
| Philippines | Peso 118 | 2.68 | 28.11 | 44.0 | -36 |
| Poland | Zloty 9.10 | 2.58 | 2.17 | 3.52 | -38 |
| Russia | Rouble 81.0 | 2.55 | 19.30 | 31.8 | -39 |
| Saudi Arabia | Riyal 10.0 | 2.67 | 2.38 | 3.75 | -36 |
| Singapore | S\$ 4.85 | 3.75 | 1.16 | 1.29 | -11 |
| South Africa | Rand 19.95 | 2.45 | 4.75 | 8.13 | -42 |
| South Korea | Won 3,700 | 3.19 | 882 | 1159 | -24 |
| Sri Lanka | Rupee 290 | 2.55 | 69.09 | 113.9 | -39 |
| Sweden | SKr 41 | 5.91 | 9.77 | 6.93 | 41 |
| Switzerland | SFr 6.50 | 6.81 | 1.55 | 0.96 | 62 |

| | | | | | |
|----------|------------|------|-------|-------|-----|
| Taiwan | NT\$ 75.0 | 2.50 | 17.87 | 30.0 | -40 |
| Thailand | Baht 78 | 2.46 | 18.58 | 31.8 | -41 |
| Turkey | Lira 6.60 | 3.54 | 1.57 | 1.86 | -16 |
| UAE | Dirhams 12 | 3.27 | 2.86 | 3.67 | -22 |
| Ukraine | Hryvnia 17 | 2.11 | 4.05 | 8.04 | -50 |
| Uruguay | Peso 90 | 4.63 | 21.44 | 19.45 | 10 |

*At market exchange rate (January 11th 2012)
† Purchasing-price parity; local price divided by price in United States
‡ Average of four cities
§ Dollars per pound
** Average of five cities
†† Weighted average of prices in euro area
§§ Dollars per euro
*** Maharaja Mac

Table 5. Big Mac index, 11 January, 2012

<http://www.economist.com/blogs/graphicdetail/2012/01/daily-chart-3>

http://www.scribd.com/fullscreen/78055840?access_key=key-15f8eo0bvuir2hz6zsja

13. 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?

14. Currency market. (i) Identify 5 events shifting the market supply function of euros to the right. (ii) Identify 5 events shifting the market demand function for euros to the right.

15. 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 exchange 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?

16. Real exchange rate. 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?

17. 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) Both the Federal Reserve and the European Central Bank purchase government bonds
- (4) The Federal Reserve buys government bonds and the European Central Bank sells them
- (5) The reduction of the number of tourist coming from the US
- (6) An increase in the US GDP
- (7) An increase in the US GDP combined with a decrease in the Eurozone GDP
- (8) An increase in the Eurozone CPI
- (9) An increase in both the Eurozone CPI and US CPI
- (10) Germany leaves the Eurozone

18. 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 €/\$, the Eurozone CPI is 200, and the US CPI is 600 (assuming that both CPIs are based on the same basket of goods).

19. 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.

Multiple choice questions

- Arbitrage and speculation differ from each other in that
 - arbitrage only takes place in the currency market, whereas speculation only takes place in the loan market.
 - there is absolutely no difference between them.
 - the outcome of speculation is always a sure event for the speculator, while the outcome of arbitrage is always uncertain for the arbitrageur.
 - None of the above
- Depreciation and devaluation differ from each other in
 - absolutely nothing.
 - that depreciation is a government decision, whereas devaluation is determined by the currency market.
 - that depreciation is a reduction of the exchange rate, while devaluation is an increase of the exchange rate.
 - None of the above
- In which case could triangular arbitrage be carried out?
 - 1 \$/€ 1 \$/¥ 1 €/¥
 - 2 \$/€ 4 \$/¥ 2 €/¥
 - 2 \$/€ 2 \$/¥ 1 €/¥
 - 2 \$/€ 2 \$/¥ 2 €/¥
- The open economy trilemma refers to
 - interest rates, monetary policy, and capital mobility.
 - exchange rates, monetary policy, and monetary base.
 - discount factors, open market operations, and speculation.
 - exchange rates, monetary policy, and capital mobility.
- The denial of which sentence is not true?
 - The real interest rate may be smaller than the real exchange rate.
 - The real interest rate is always higher than the real exchange rate.
 - The real interest rate is always equal to the real exchange rate.
 - The real interest rate is always smaller than the real exchange rate.
- Reus is an independent country with the reuro as home currency. What action by the Central Bank of Reus would not cause an appreciation of the reuro versus the euro?
 - A contractionary open market operation
 - An increase in the reserve ratio
 - The purchase of euros (paid with reuros)
 - The purchase of reuros (paid with euros)
- What is the foreseeable effect on the exchange rate \$/€ of the purchase by the European Central Bank of financial assets?
 - Appreciation of the € with respect to the \$
 - Depreciation of the \$ with respect to the €
 - There is absolutely no connection between the loan market and the currency market
 - None of the above
- From which value to which value the dollar depreciates with respect to the euro?
 - From 4 \$/€ to 2 €/€
 - From 2 \$/€ to 2 €/€
 - From 2 €/€ to 0.5 \$/€
 - From 2 €/€ to 4 \$/€
- What could explain the depreciation of the euro with respect to the dollar?
 - A fall in the Eurozone prices
 - An increase in the Eurozone interest rate
 - A decrease in the US interest rate
 - A fall in the prices of the US

10. What could not explain the depreciation of the euro with respect to the dollar?
- A fall in the Eurozone prices
 - An increase in the Eurozone interest rate
 - A decrease in the US interest rate
 - None of the above
11. Let the real exchange rate be expressed as foreign baskets/domestic basket. How does an increase in the foreign CPI affect the real exchange rate, with the rest of variables determining the real exchange rate held fixed?
- Causes a rise in the real exchange rate
 - Causes a reduction in the real exchange rate
 - Does not affect the real exchange rate
 - None of the above
12. If $P = 100$, $P^* = 50$, and $e = 1$ $\$/\epsilon$, then, according to PPP, the euro is
- overvalued.
 - undervalued.
 - at parity level.
 - None of the above
13. The competitiveness of the Eurozone improves when, other things being equal,
- the euro depreciates with respect to the dollar.
 - the Eurozone CPI rises.
 - the US CPI falls.
 - None of the above
14. Using proper technical terms, the euro appreciates against the dollar if
- the US government time ago set a fixed exchange rate at 2 $\epsilon/\$$ and now changes that fixed rate to 2 $\$/\epsilon$.
 - there is a floating exchange rate regime between the two currencies and the equilibrium exchange rate in the currency market goes from 2 $\epsilon/\$$ to 2 $\$/\epsilon$.
 - there is a floating exchange rate regime between the two currencies and the equilibrium exchange rate in the currency market goes from 2 $\$/\epsilon$ to 2 $\epsilon/\$$.
 - the US government time ago set a fixed exchange rate at 2 $\$/\epsilon$ and now changes that fixed rate to 2 $\epsilon/\$$.
15. The euro is likely to depreciate against the dollar in the currency market if
- the US real GDP increases.
 - the US nominal interest rate falls.
 - the Eurozone inflation rate goes up.
 - None of the above
16. The nominal exchange rate is 2 $\$/\epsilon$, the Eurozone CPI is 200, and the US CPI is 100. In this case, the euro is
- overvalued with respect to its purchasing power parity value.
 - undervalued with respect to its purchasing power parity value.
 - at its purchasing power parity level.
 - None of the above
17. The Federal Reserve has decided to intervene in the currency market to make the dollar appreciate with respect to the euro. Which measure is appropriate to reach that goal?
- According to the impossible trinity, no such measure exists.
 - The Federal Reserve buys euros in the currency market.
 - The Federal Reserve buys dollars in the currency market.
 - The Federal Reserve sells dollars in the currency market.
18. Which sentence is not true?
- Triangular arbitrage is not possible when exchange rates are 0.5 $\$/\epsilon$, 3 $\$/\text{¥}$, and 6 $\epsilon/\text{¥}$.
 - There is a tendency for the euro to appreciate against the dollar if the interest rate in the Eurozone goes up.
 - If the real exchange rate differs from 1, then the nominal exchange is not at its purchasing power parity level.
 - Revaluation in a fixed exchange regime is equivalent to depreciation in a floating exchange regime.
19. The impossible trinity
- says that triangular arbitrage causes currency crises.
 - relates the competitiveness of an economy to the purchasing power parity exchange rate.
 - says that spatial arbitrage causes the real appreciation of the exchange rate.
 - implies that a country with an independent monetary policy and no capital control cannot adopt a fixed exchange regime.
20. In passing from 2 $\$/\epsilon$ to 2 $\epsilon/\$$,
- the euro appreciates with respect to the dollar.
 - the dollar appreciates with respect to the euro.
 - the dollar depreciates with respect to the euro.
 - None of the above