Introduction to Macroeconomics · M5 · 2014-15
Problem set 4

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

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T2	USD	GBP	CAD	EUR	AUD
	1	0.67188	1.27108	0.94207	1.30031
	1.48835	1	1.89182	1.40212	1.93531
	0.78673	0.52859	1	0.74115	1.02299
	1.06150	0.71320	1.34925	1	1.38027
	0.76905	0.51671	0.97753	0.72450	1

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1. 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.

2. Appreciation. Let the exchange rate be $e = 2$ \$/€. (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.

3. 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).

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

5. 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?

6. 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)

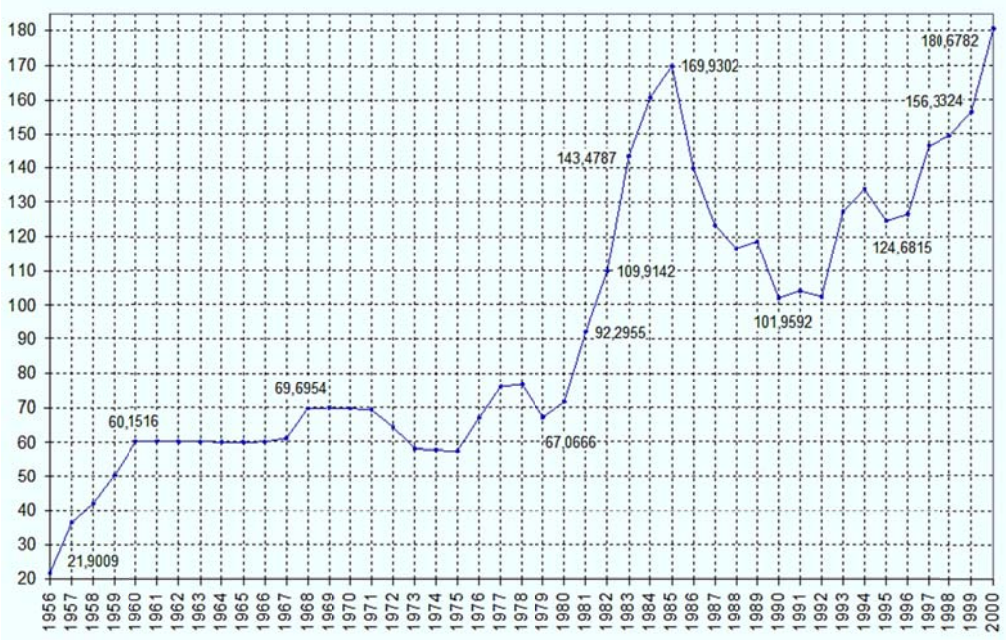
7. Central banks. (i) Explain, and represent graphically, what kind of currency market intervention by the Federal Reserve would cause an appreciation of the euro against the dollar. (ii) Would that intervention also cause an appreciation of the euro if it were carried out by the European Central Bank?

8. 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.

9. 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?

10. 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.

11. 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.economicswebinstitute.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.



12. 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?

13. 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?

14. 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		½	
150	150		2	

pick 5

15. 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

16. 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.

17. 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 $P^* = 250$.

18. 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?

19. Big Mac Index. (i) Choose a country from Table 2 and explain whether its currency is overvalued or undervalued with respect to the dollar according to purchasing power parity. Explain also what the numbers in each column mean and how they are obtained.

Country	BM price in local currency	Actual exchange rate (Jan 2014)	BM local price in $	Dollar PPP exchange rate	Over/under-valuation against $ (%)
Argentina	21	6.92	3.03	4.54	–34.39
Egypt	16.93	6.96	2.43	3.66	–47.40
France	3.8	0.74	5.15	0.82	11.47
Greece	3.05	0.74	4.14	0.66	–10.53
Indonesia	27939	12140.00	2.30	6041.95	–-50.23
Japan	310	104.25	2.97	67.04	–35.69
Mexico	37	13.33	2.78	8.00	–39.99
Norway	48	6.16	7.80	10.38	68.58
Spain	3.65	0.74	4.95	0.79	7.07
Ukraine	19	8.38	2.27	4.11	–50.96
United States	4.62	1.00	4.62	1.00	0.00

Table 1. Big Mac index, January 2014, http://bigmacindex.org

(ii) As regards Japan, in Table 2, $e_{\text{PPP}} = 77.24$ yen per dollar and e in the currency market is 117.77 yen per dollar. The deviation of e from e_{PPP} is $(117.77 - 77.24)/77.24 = 0.524 = 52.4\%$, but the table contends that the yen is undervalued by 34.41%. Explain the discrepancy.

(iii) Table 1 and the PPP theory based on the Big Mac index can be used to make a prediction regarding the future value of the exchange rate. Explain, for each country, whether the corresponding prediction is consistent with the results in Table 2.

(iv) Explain the results of Spain in Tables 1 and 2.

Country	BM price in local currency	Actual exchange rate (Jan 2015)	BM local price in $	Dollar PPP exchange rate	Over/under-valuation against $ (%)
Argentina	28	8.61	3.25	5.85	–32.11
Egypt	16.93	7.35	2.30	3.53	–51.91
France	3.9	0.86	4.52	0.81	–5.66
Greece	3.05	0.86	3.53	0.64	–26.22
Indonesia	27939	12480	2.24	5832.78	–53.26
Japan	370	117.77	3.14	77.24	–34.41
Mexico	49	14.63	3.35	10.23	–30.07
Norway	48	7.62	6.30	10.02	31.46
Spain	3.65	0.86	4.23	0.76	–11.71
Ukraine	19	15.82	1.20	3.97	–74.93
United States	4.79	1.00	4.79	1.00	0.00

Table 2. Big Mac index, January 2015, http://bigmacindex.org

(iv) Identify the countries in which the local price of the Big Mac remains constant in Tables 1 and 2. Knowing that the local price of the Big Mac in the US has increased, why the necessary conclusion is that the purchasing power parity of the currency of those countries (with respect to the dollar) cannot remain constant?

(v) Considering Tables 1 and 2, what can be inferred from having a country in which the local price of the Big Mac has increased and the e_{PPP} value of the dollar has also increased?

(vi) Identify the countries whose currency depreciates in passing from Table 1 to Table 2, and, among them, identify those whose e_{PPP} value increases. Interpret this result.

20. 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.

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

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

23. 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%.

24. Interest rate parity. Imagine that the Spanish currency were the peseta (Pts) and the Slovak currency were the Slovak koruna (or Slovak crown, Sk, the old official Slovak currency). Find the formula defining the interest rate parity involving the peseta and the Slovak crown when the exchange rate is quoted directly and your domestic currency is the peseta, if you are a Slovak citizen, and the Slovak crown, if you are not a Slovak citizen.

25. 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 Obama 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).

26. Relating the two currency market models. Letting e designate the exchange rate \$/€, the supply of euros function is $q_{€}^{s} = 2 \cdot e$, whereas the demand for euros function is $q_{€}^{d} = 12 - e$ (if $e > 12$, then $q_{€}^{d} = 0$). (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 obtaine in (i). [Hint: $q_{€}^{s} = 2 \cdot e \Rightarrow q_{€}^{s} = 2 \cdot q_{\$}/q_{€}^{s} \Rightarrow (q_{€}^{s})^2 = 2 \cdot q_{\$} \Rightarrow q_{\$} = (q_{€}^{s})^2/2$, which is the EU function.]

27. Exchange rate Sk/EUR. The chart below graphs the Slovak crown against the euro rate. (i) Indicate a period during which the euro appreciates against the Slovak crown. (ii) Indicate a period during which the Slovak crown depreciates against the euro. (iii) (a) When Spain joined the eurozone, the conversion rate was 166.386 Pts/€, whereas when the Slovak Republic joined the eurozone, the conversion rate was 30.1260 Sk/€. Determine the corresponding exchange rate between the peseta and the Slovak crown, and quote the rate both directly and indirectly. (b) If the conversion rate of the Slovak crown had been 45 Sk per euro, would the value of the peseta against the crown have been higher or smaller than in (a)?

http://upload.wikimedia.org/wikipedia/commons/f/fe/Euro_exchange_rate_to_SKK.svg