

**Problem Set 3** (rev'd 4/10)

Due in Lecture on Wednesday, April 13. "Box-in" your answers to the algebraic questions.

**1. Shocks under Floating Exchange Rates in IS-LM-BP=0**

- 1.1 Suppose foreign income falls. Further assume the foreign country is large relative to the home country, so that the impact on the home country can be represented as a reduction in  $\overline{EXP}$ . Trace out the impact on the home economy, using a graph.
- 1.2 Could the home economy offset the impact of the foreign income shock using monetary policy? If yes, show how the proposed policy would operate, graphically.
- 1.3 Could the foreign country seek to nullify the impact of the home country's monetary policy? How?

**2. Aggregate Demand and Aggregate Supply**

Suppose output is at potential, or full employment, GDP in period 0 and period 1. Further assume the price level has been constant at  $P_0=P_1$ .

- 2.1 Consider what happens if oil prices double in period 2. Show the impact on output and the price level, both in the short run, and over time. You can assume  $P_t^e = P_{t-1}$ .
- 2.2 Suppose instead of the expected price level equaling the lagged price level, the following holds true:  $\pi_t^e = \pi_{t-1}$ . Answer 2.1, for periods 2, and 3.

**3. Purchasing power parity.**

Consider absolute purchasing power parity, in logs (i.e., where lowercase letters denote logged values of uppercase letters):

$$s_t = p_t - p_t^*$$

- 3.1 Explain what happens to the exchange rate if the foreign price level rises by 10%.
- 3.2 Suppose only *relative* PPP holds,  $s_t = p_t - p_t^* - \kappa$ . Answer again 1.1.
- 3.3 If relative PPP holds, what must be true when US inflation is -3% and foreign inflation is 2%?

**4. Using real-world data to evaluate PPP and UIP**

Consider the two tables drawn from the *Economist*, March 31st edition, on the attached pages. Answer these questions using equations, and show your work.

- 4.1 Using the 3 month interest rates, and assuming UIP holds, calculate the expected change in the dollar/euro exchange rate over the next three months. Be sure to state what the rate will be, in

annualized terms, and what will be the actual percentage change in the dollar/pound/euro exchange rate. Show your work.

- 4.2 Using 10 year bonds, calculate what the implied change in the dollar/euro exchange rate is, over the next ten years.
- 4.3 Given the empirical evidence on the relationship between exchange rate changes and interest differentials provided in the table in the handout on CIP and UIP, what do you expect to happen to the dollar/euro rate over the next three months, and over the next ten years. Explain.
- 4.4 Given the inflation rates over the past year, what should have been the rate of change in the US dollar/euro exchange rate if relative purchasing power parity held?
- 4.5 Interpret the March 5th *Economist* poll of expected inflation rate for 2011 as the expected change from December 2010 to December 2011. What is the expected change in the US dollar/euro over that period if relative PPP holds?

**The Economist poll of forecasters, March averages** (previous month's, if changed)

	Real GDP, % change				Consumer prices		Current account	
	Low/high range		average		% change		% of GDP	
	2011	2012	2011	2012	2011	2012	2011	2012
Australia	2.3/3.6	2.8/4.6	3.1 (3.2)	3.7 -	3.2	3.0 -	-3.0(-1.9)	-3.6 -
Belgium	1.4/2.1	1.5/2.2	1.7 (1.8)	1.8 -	2.2	2.0 -	1.2	1.3 -
Britain	1.1/2.4	1.6/2.7	1.6 (1.8)	2.0 -	3.8 (3.7)	2.3 -	-1.7(-1.5)	-1.3 -
Canada	2.0/3.2	2.2/3.5	2.6	2.8 -	2.3 (2.2)	2.2 -	-2.5(-2.4)	-1.8 -
France	1.2/2.4	1.4/2.6	1.7 (1.5)	1.8 -	1.8 (1.7)	1.7 -	-1.8(-1.9)	-1.8 -
Germany	2.1/3.4	1.4/2.5	2.6	2.0 -	1.9 (1.8)	1.8 -	4.9	4.7 -
Italy	0.5/1.6	0.6/2.2	1.1	1.3 -	2.1 (2.0)	1.9 -	-3.0(-3.2)	-2.7 -
Japan	1.1/3.1	1.2/2.8	1.7 (1.5)	2.0 -	-0.1 (-0.2)	0.2 -	3.3 (3.2)	3.3 -
Netherlands	1.2/3.3	1.3/2.4	1.8 (1.7)	1.8 -	1.7 (1.8)	1.7 -	5.9 (6.1)	5.8 -
Spain	-0.5/1.0	0.2/1.8	0.6 (0.4)	1.2 -	2.2 (2.0)	1.4 -	-3.8(-3.5)	-3.2 -
Sweden	2.9/5.0	2.4/3.5	3.9 (3.6)	2.8 -	2.3 (2.1)	2.0 -	6.3 (6.5)	6.6 -
Switzerland	1.6/2.8	1.3/2.8	2.0 (2.1)	2.0 -	0.8 (0.7)	1.4 -	10.9	10.7 -
United States	2.5/4.0	2.2/3.9	3.3 (3.1)	3.2 -	2.1 (1.7)	1.8 -	-3.4	-3.4 -
Euro area	1.1/2.3	1.4/2.3	1.6 (1.5)	1.7 -	2.2 (2.0)	1.8 -	-0.3(-0.2)	-0.1 -

Sources: Bank of America, BNP Paribas, Citigroup, Commerzbank, Decision Economics, Deutsche Bank, Economist Intelligence Unit, Goldman Sachs, HSBC Securities, ING, JPMorgan Chase, KBC Bank, Morgan Stanley, RBC, RBS, Schroders, Scotiabank, Société Générale, Standard Chartered, UBS

Source: *Economist*, March 5, 2011.

## Output, prices and jobs

% change on year ago

	Gross domestic product				Industrial production latest	Consumer prices			Unemployment rate <sup>†</sup> , %
	latest	qtr*	2011 <sup>†</sup>	2012 <sup>†</sup>		latest	year ago	2011 <sup>†</sup>	
United States	+2.8 Q4	+3.2	+3.3	+3.2	+5.6 Feb	+2.1 Feb	+2.1	+2.1	8.9 Feb
Japan	+2.2 Q4	-1.3	+1.7	+2.0	+2.8 Feb	nil Feb	-1.1	-0.1	4.6 Feb
China	+9.8 Q4	na	+9.0	+8.7	+14.9 Feb	+4.9 Feb	+2.7	+5.0	9.6 2009
Britain	+1.7 Q4	-2.0	+1.6	+2.0	+4.4 Jan	+4.4 Feb <sup>§</sup>	+3.0	+3.8	8.0 Jan <sup>††</sup>
Canada	+3.2 Q4	+3.3	+2.6	+2.8	+6.3 Dec	+2.2 Feb	+1.6	+2.3	7.8 Feb
Euro area	+2.0 Q4	+1.2	+1.6	+1.7	+6.6 Jan	+2.4 Feb	+0.8	+2.2	9.9 Jan
Austria	+2.7 Q4	+3.2	+1.8	+1.7	+8.4 Jan	+3.0 Feb	+1.9	+1.9	4.3 Jan
Belgium	+1.8 Q4	+1.1	+1.7	+1.8	+11.7 Dec	+3.4 Feb	+0.7	+2.2	11.5 Nov <sup>††</sup>
France	+1.5 Q4	+1.4	+1.7	+1.8	+5.2 Jan	+1.7 Feb	+1.3	+1.8	9.6 Jan
Germany	+4.0 Q4	+1.5	+2.6	+2.0	+12.4 Jan	+2.1 Mar	+1.1	+1.9	7.1 Mar
Greece	-6.6 Q4	-5.6	-4.0	+0.3	-5.1 Jan	+4.4 Feb	+2.8	+1.8	14.8 Dec
Italy	+1.5 Q4	+0.5	+1.1	+1.3	+0.6 Jan	+2.4 Feb	+1.1	+2.1	8.6 Jan
Netherlands	+2.4 Q4	+2.5	+1.8	+1.8	+7.4 Jan	+1.9 Feb	+0.8	+1.7	5.1 Feb <sup>††</sup>
Spain	+0.6 Q4	+0.9	+0.6	+1.2	+6.0 Jan	+3.6 Mar	+1.5	+2.2	20.4 Jan
Czech Republic	+2.9 Q4	+2.0	+2.0	+3.1	+16.9 Jan	+1.8 Feb	+0.6	+2.2	9.6 Feb
Denmark	+2.7 Q4	-1.6	+2.1	+2.0	+5.9 Jan	+2.7 Feb	+1.9	+2.0	4.0 Feb
Hungary	+2.0 Q4	+0.8	+2.0	+3.5	+10.9 Jan	+4.1 Feb	+5.7	+3.6	11.5 Feb <sup>††</sup>
Norway	+1.6 Q4	+10.1	+1.5	+2.1	-6.4 Jan	+1.2 Feb	+3.0	+2.4	3.2 Jan <sup>§§</sup>
Poland	+4.4 Q4	na	+4.2	+3.9	+10.7 Feb	+3.6 Feb	+2.9	+3.4	13.2 Feb <sup>††</sup>
Russia	+5.0 Q4	na	+4.3	+4.5	+5.8 Feb	+9.6 Feb	+7.2	+9.1	7.4 Feb <sup>††</sup>
Sweden	+7.3 Q4	+5.1	+3.9	+2.8	+15.0 Jan	+2.5 Feb	+1.2	+2.3	7.9 Feb <sup>††</sup>
Switzerland	+3.2 Q4	+3.5	+2.0	+2.0	+6.1 Q4	+0.5 Feb	nil	+0.8	3.4 Feb
Turkey	+9.2 Q4	na	+5.1	+5.3	+18.9 Jan	+4.2 Feb	+10.1	+5.9	11.4 Dec <sup>††</sup>
Australia	+2.7 Q4	+3.0	+3.1	+3.7	-0.3 Q4	+2.7 Q4	+2.1	+3.2	5.0 Feb
Hong Kong	+6.2 Q4	+6.1	+4.7	+4.0	+5.8 Q4	+3.7 Feb	+2.8	+4.1	3.6 Feb <sup>††</sup>
India	+8.2 Q4	na	+9.0	+8.7	+3.7 Jan	+9.3 Jan	+16.1	+7.4	10.8 2010
Indonesia	+6.9 Q4	na	+6.1	+6.3	+7.6 Jan	+6.8 Feb	+3.8	+6.9	7.1 Aug
Malaysia	+4.8 Q4	na	+4.8	+5.4	+1.0 Jan	+2.9 Feb	-11.2	+3.1	3.4 Jan
Pakistan	+4.1 2010**	na	+2.6	+3.9	+2.2 Dec	+12.9 Feb	+13.0	+11.7	na nil
Singapore	+12.0 Q4	+3.9	+4.1	+5.0	+4.8 Feb	+5.0 Feb	+1.0	+3.2	2.2 Q4
South Korea	+4.8 Q4	+2.2	+4.6	+4.1	+9.1 Feb	+4.5 Feb	+2.7	+3.6	4.0 Feb
Taiwan	+6.9 Q4	nil	+4.3	+4.3	+13.3 Feb	+1.3 Feb	+2.3	+1.5	4.6 Feb
Thailand	+3.8 Q4	+4.8	+4.3	+4.8	-3.4 Feb	+2.9 Feb	+3.7	+3.8	1.0 Nov
Argentina	+9.2 Q4	+10.5	+5.3	+3.7	+10.3 Jan	+10.0 Feb <sup>***</sup>	+9.1	+11.2	7.3 Q4 <sup>††</sup>
Brazil	+5.0 Q4	+3.0	+4.3	+4.5	+2.5 Jan	+6.0 Feb	+4.8	+6.2	6.4 Feb <sup>††</sup>
Chile	+5.8 Q4	+3.8	+6.0	+5.2	+1.9 Feb	+2.7 Feb	+0.3	+3.1	7.3 Jan <sup>†††</sup>
Colombia	+3.6 Q3	+0.9	+4.5	+4.8	+6.2 Jan	+3.2 Feb	+2.1	+3.6	13.6 Jan <sup>††</sup>
Mexico	+4.6 Q4	+5.1	+3.9	+3.6	+6.6 Jan	+3.6 Feb	+4.8	+4.2	5.4 Feb <sup>††</sup>
Venezuela	+0.6 Q4	na	+0.8	+2.1	+1.8 Dec	+29.8 Feb	+27.0	+32.6	7.7 Q4 <sup>††</sup>
Egypt	+5.5 Q3	na	+4.1	+4.9	+4.3 Q3	+10.7 Feb	+11.7	+15.2	8.9 Q4 <sup>††</sup>
Israel	+6.2 Q4	+7.7	+4.0	+4.1	+4.4 Jan	+4.2 Feb	+3.6	+3.4	6.6 Q4
Saudi Arabia	+0.6 2009	na	+5.5	+4.0	na	+4.9 Feb	+4.6	+6.3	na
South Africa	+3.8 Q4	+4.4	+3.7	+4.8	+1.3 Jan	+3.7 Feb	+5.7	+4.6	24.0 Q4 <sup>††</sup>
<b>MORE COUNTRIES</b>	Data for the countries below are not provided in printed editions of <i>The Economist</i>								
Estonia	+6.7 Q4	nil	+3.8	+3.5	+28.8 Jan	+5.7 Feb	-0.2	+4.4	13.6 Q4
Finland	+5.2 Q4	+7.0	+3.5	+1.8	+5.9 Jan	+3.3 Feb	+0.1	+2.9	8.0 Feb
Iceland	+0.1 Q4	-5.9	+1.0	+1.8	-6.9 2009	+1.9 Feb	+7.3	+2.5	8.6 Feb <sup>††</sup>
Ireland	-0.7 Q4	-6.4	-1.3	+1.3	+1.3 Jan	+2.2 Feb	-3.2	-1.8	13.5 Feb
Latvia	+3.6 Q4	na	+3.5	+3.6	+6.5 Jan	+4.0 Feb	-4.2	+3.0	18.3 Sep
Lithuania	+4.4 Q4	+7.0	+2.9	+3.1	+17.2 Jan	+3.0 Feb	-0.5	+3.7	14.2 Feb <sup>††</sup>
Luxembourg	+3.8 Q3	+6.1	+3.0	+3.1	+7.5 Dec	+3.6 Feb	+1.5	+2.6	6.3 Feb <sup>††</sup>
New Zealand	+1.4 Q4	+1.5	+2.4	+2.6	nil Q3	+4.0 Q4	+2.0	+4.6	6.8 Q4
Peru	+10.0 Jan	na	+6.5	+5.9	+9.5 Dec	+2.2 Feb	+0.8	+2.2	11.1 Feb <sup>††</sup>

## Trade, exchange rates, budget balances and interest rates

	Trade balance*		Current-account balance		Currency units, per \$		Budget balance	Interest rates, %	
	latest 12 months, \$bn	latest 12 months, \$bn	% of GDP 2011†	Mar 30th	year ago	% of GDP 2011†	3-month latest	10-year gov't bonds, latest	
United States	-659.7 Jan	-470.2 Q4	-3.4	-	-	-8.8	0.24	3.45	
Japan	+84.6 Jan	+190.7 Jan	+3.3	83.1	93.4	-7.9	0.16	1.21	
China	+161.9 Feb	+331.1 Q4 <sup>§</sup>	+4.1	6.56	6.83	-1.7	4.17	3.98	
Britain	-148.9 Jan	-56.1 Q4	-1.7	0.62	0.66	-9.0	0.83	3.66	
Canada	-9.3 Jan	-48.5 Q4	-2.5	0.97	1.01	-2.1	0.91	3.39	
Euro area	-6.7 Jan	-83.5 Jan	-0.3	0.71	0.74	-4.1	1.23	3.34	
Austria	-5.7 Dec	+10.5 Q3	+2.6	0.71	0.74	-3.7	1.23	3.76	
Belgium	+20.4 Jan	+5.4 Sep	+1.2	0.71	0.74	-4.4	1.23	4.24	
France	-70.4 Jan	-56.0 Jan	-1.8	0.71	0.74	-6.4	1.23	3.70	
Germany	+206.7 Jan	+178.1 Jan	+4.9	0.71	0.74	-0.5	1.23	3.33	
Greece	-37.6 Jan	-31.1 Jan	-2.9	0.71	0.74	-8.1	1.23	12.47	
Italy	-39.6 Jan	-74.9 Jan	-3.0	0.71	0.74	-4.3	1.23	4.76	
Netherlands	+52.3 Jan	+60.5 Q4	+5.9	0.71	0.74	-4.3	1.23	3.50	
Spain	-66.4 Jan	-63.5 Dec	-3.8	0.71	0.74	-6.7	1.23	5.16	
Czech Republic	+6.6 Jan	-7.2 Q4	-2.7	17.4	18.8	-4.6	1.22	4.07	
Denmark	+13.2 Jan	+18.5 Jan	+3.8	5.29	5.50	-4.8	1.34	3.56	
Hungary	+7.2 Jan	+1.5 Q3	-1.0	189	196	-3.1	6.10	7.32	
Norway	+55.7 Feb	+53.4 Q4	+12.9	5.59	5.94	+9.4	2.64	3.82	
Poland	-7.9 Jan	-15.5 Jan	-2.8	2.85	2.85	-7.5	4.19	6.28	
Russia	+152.6 Jan	+72.6 Q4	+4.8	28.5	29.4	-3.4	8.00	4.73	
Sweden	+11.7 Feb	+29.1 Q4	+6.3	6.33	7.20	-0.8	2.39	3.34	
Switzerland	+20.0 Feb	+83.2 Q3	+10.9	0.92	1.05	-0.5	0.18	1.88	
Turkey	-75.0 Jan	-51.4 Jan	-6.5	1.56	1.52	-3.3	8.11	9.28	
Australia	+20.4 Jan	-31.7 Q4	-3.0	0.97	1.09	-2.0	4.91	5.53	
Hong Kong	-41.3 Jan	+14.8 Q4	+8.2	7.79	7.76	+3.0	0.26	2.56	
India	-112.5 Feb	-53.1 Q3	-2.7	44.8	44.9	-5.0	7.31	8.12	
Indonesia	+21.9 Jan	+6.3 Q4	+1.1	8,718	9,100	-1.3	10.15	4.73†	
Malaysia	+33.2 Jan	+28.0 Q4	+13.9	3.03	3.26	-5.5	3.04	2.83†	
Pakistan	-15.8 Feb	-1.4 Q4	-2.7	85.3	84.0	-6.7	13.40	10.86†	
Singapore	+45.9 Feb	+49.5 Q4	+17.1	1.26	1.40	-0.2	0.44	2.34	
South Korea	+45.3 Feb	+29.0 Jan	+2.0	1,104	1,131	-1.6	3.37	4.39	
Taiwan	+9.9 Feb	+40.6 Q4	+8.1	29.5	31.8	-1.4	1.18	1.39	
Thailand	+12.9 Jan	+13.8 Jan	+3.8	30.3	32.3	-3.2	2.70	3.50	
Argentina	+11.4 Feb	+3.6 Q4	+0.8	4.05	3.88	-2.1	12.38	na	
Brazil	+21.7 Feb	-49.2 Feb	-2.9	1.64	1.78	-2.5	11.67	6.16†	
Chile	+15.3 Feb	+3.8 Q4	-0.7	482	525	0.8	4.20	2.84†	
Colombia	-1.1 Jan	-7.8 Q3	-2.4	1,879	1,922	-3.1	3.65	4.48†	
Mexico	-2.6 Jan	-5.7 Q4	-1.0	11.9	12.3	-2.1	4.30	7.42	
Venezuela	+27.1 Q4	+14.4 Q4	+6.4	5.30	na	-5.5	14.96	6.55†	
Egypt	-25.5 Q3	-4.6 Q3	-5.7	5.97	5.51	-12.1	9.60	6.58†	
Israel	-9.0 Feb	+6.7 Q4	+1.5	3.50	3.69	-2.9	3.18	4.48	
Saudi Arabia	+147.9 2010	+21.0 Q4	+18.8	3.75	3.75	+7.0	0.75	na	
South Africa	+1.5 Jan	-10.0 Q4	-5.5	6.81	7.34	-5.3	5.58	8.65	

**MORE COUNTRIES** Data for the countries below are not provided in printed editions of *The Economist*

Estonia	-0.7 Jan	+0.6 Jan	+2.2	11.1	11.6	-1.6	1.23	na
Finland	+4.6 Jan	+7.5 Jan	+2.7	0.71	0.74	-1.6	1.16	3.64
Iceland	+1.0 Feb	-1.0 Q4	+0.9	115	127	-5.0	3.88	na
Ireland	+59.3 Dec	-1.5 Q4	+3.3	0.71	0.74	-9.9	1.23	8.72
Latvia	-1.5 Jan	+0.7 Jan	-0.7	0.50	0.52	-5.8	0.58	na
Lithuania	-2.7 Jan	+0.3 Jan	-0.1	2.45	2.55	-6.1	1.40	na
Luxembourg	-6.6 Dec	+5.0 Q3	na	0.71	0.74	-1.2	1.23	na
New Zealand	+0.6 Jan	-5.9 Q4	-1.2	1.31	1.41	-5.6	2.92	5.63