

Problem Set 3

Due in Lecture on Wednesday, April 9th. "Box-in" your answers to the algebraic questions.

1. Policy under Floating Exchange Rates in the IS-LM-BP=0 model

Suppose the economy is given by the following set of equations.

(1) $Y = \bar{\alpha}[\bar{A} + \bar{EXP} - \bar{IMP} + (n + v)q - bi]$ <IS curve>

(1')
$$i = \frac{\bar{A} + \bar{EXP} - \bar{IMP} + (n + v)q}{b} - \left(\frac{1 - c(1 - t) + m}{b} \right) Y$$
 <IS curve>

Where $\bar{A} \equiv \bar{CO} - b\bar{TA} + \bar{IN} + \bar{GO}$

(2)
$$i = \frac{\mu}{h} - \left(\frac{1}{h} \right) \left(\frac{\bar{M}}{\bar{P}} \right) + \left(\frac{k}{h} \right) Y$$
 <LM curve>

(3)
$$i = - \left(\frac{1}{\kappa} \right) [(\bar{EXP} - \bar{IMP} + \bar{KA}) + (n + v)q] + \bar{i}^* + \left(\frac{m}{\kappa} \right) Y$$
 <BP=0 curve>

1.1 Assume the economy described above is under a floating exchange rate regime. Show graphically what happens if the government increases lump sum taxes.

1.2 Explain your answer to 1.1.

1.3 Now examine a monetary contraction from initial equilibrium, carefully distinguishing between initial impact, and the effect over time.

1.4 Explain why monetary policy has a larger effect in this open economy as opposed to that in a closed economy.

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

2.1 Assume the economy depicted in Question 1 experiences a fall in the foreign interest rate i^* . Show what happens both immediately, and over time.

2.2 Suppose the Fed doesn't want the dollar's value to change. What could it do? Answer, with the assistance of a graph.

2.3 Suppose instead of a foreign interest rate shock, 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 \bar{EXP} . Trace out the impact on the home economy, using a graph.

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. Covered and uncovered interest parity.

4.1 Assume that covered interest parity holds, so $(1+i) = (F/S)(1+i^*)$. Fill in the following grid (carry your answer out to three decimal places), for (a) and (b).

4.2 Assume that uncovered interest parity holds, so $(1+i) = (S^e/S)(1+i^*)$. Fill in the following grid (carry your answer out to three decimal places), for (c) and (d).

	i	i^*	F	S
a.	0.05	0.08	1.20	
b.	0.05		1.20	1.25
	i	i^*	S^e	S
c.		0.08	1.20	1.245
d.	0.06	0.09		1.245

5. Using real data to evaluate PPP and UIP. Consider the two tables drawn from the *Economist*, March 29th edition, on the attached pages. Answer these questions using equations, and show your work.

5.1 Using the 3 month interest rates, and assuming UIP holds, calculate the expected change in the dollar/pound 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 exchange rate. Show your work.

5.2 Using 10 year bonds, calculate what the implied change in the dollar/pound exchange rate is, over the next ten years.

5.3 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/pound rate over the next three months, and over the next ten years. Explain.

5.4 Given the inflation rates over the past year, what should have been the rate of change in the US dollar/pound exchange rate if relative purchasing power parity held?

5.5 Interpret the March 6th *Economist* poll of expected inflation rate for 2008 as the expected change from December 2007 to December 2008. What is the expected change in the US dollar/pound over that period if relative PPP holds?

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 2008†	Mar 26th	year ago	% of GDP 2008†	3-month latest	10-year gov't bonds, latest	
United States	-819.2 Jan	-738.6 Q4	-4.7	-	-	-2.4	2.26	3.49	
Japan	+105.4 Jan	+214.7 Jan	+4.7	99.1	116	-2.7	0.75	1.26	
China	+250.0 Feb	+249.9 2006	+10.4	7.03	7.73	0.2	4.50	3.98	
Britain	-177.2 Jan	-129.4 Q3	-3.8	0.50	0.51	-3.2	6.01	4.43	
Canada	+44.8 Jan	+12.5 Q4	+0.4	1.02	1.16	-0.3	1.85	3.59	
Euro area	+19.6 Jan	-1.2 Jan	-0.1	0.63	0.75	-1.0	4.72	3.87	
Austria	+0.4 Dec	+10.9 Q3	+2.7	0.63	0.75	-0.4	4.72	4.10	
Belgium	+15.4 Jan	+13.3 Sep	+2.0	0.63	0.75	-0.5	4.78	4.32	
France	-56.3 Jan	-36.9 Jan	-1.3	0.63	0.75	-2.8	4.72	4.10	
Germany	+263.5 Jan	+256.7 Jan	+5.2	0.63	0.75	0.8	4.72	3.88	
Greece	-57.1 Dec	-48.3 Dec	-12.0	0.63	0.75	-2.7	4.71	4.48	
Italy	-14.1 Jan	-51.1 Jan	-2.3	0.63	0.75	-2.8	4.72	4.43	
Netherlands	+57.2 Jan	+50.1 Q3	+6.8	0.63	0.75	0.5	4.72	4.12	
Spain	-139.6 Jan	-146.0 Dec	-9.1	0.63	0.75	nil	4.72	4.24	
Czech Republic	+4.4 Jan	-4.3 Jan	-3.2	16.2	21.0	-2.6	4.11	4.72	
Denmark	+3.4 Jan	+3.3 Jan	+1.8	4.73	5.57	3.6	5.25	4.16	
Hungary	-0.2 Jan	-6.8 Q3	-5.9	163	187	-4.1	8.14	8.10	
Norway	+63.1 Feb	+64.1 Q4	+15.8	5.09	6.07	17.9	6.20	4.29	
Poland	-12.2 Jan	-16.2 Jan	-4.0	2.24	2.91	-1.8	6.06	5.95	
Russia	+140.6 Jan	+76.6 Q4	+4.0	23.5	26.0	1.2	10.25	6.59	
Sweden	+19.1 Feb	+38.1 Q4	+6.1	5.98	6.99	1.5	4.11	3.94	
Switzerland	+11.9 Feb	+69.6 Q3	+14.6	1.00	1.21	0.7	2.85	2.83	
Turkey	-64.5 Jan	-38.9 Jan	-7.7	1.27	1.40	-2.9	13.35	6.51‡	
Australia	-19.7 Jan	-56.4 Q4	-5.6	1.09	1.24	1.5	7.76	6.10	
Hong Kong	-23.9 Jan	+27.4 Q4	+8.8	7.78	7.81	3.1	1.83	2.35	
India	-75.4 Jan	-10.9 Q3	-2.0	40.2	43.0	-3.1	7.29	8.09	
Indonesia	+40.0 Jan	+11.0 Q4	+2.1	9,180	9,150	-1.8	8.15	6.58‡	
Malaysia	+30.1 Jan	+28.7 Q3	+13.9	3.19	3.46	-3.1	3.62	3.41‡	
Pakistan	-16.9 Feb	-8.4 Q4	-7.0	62.8	60.6	-5.3	10.23	9.42‡	
Singapore	+34.8 Feb	+39.1 Q4	+23.5	1.38	1.52	1.0	1.38	2.20	
South Korea	+8.3 Feb	+3.8 Jan	+0.5	987	939	0.2	5.32	5.39	
Taiwan	+15.7 Feb	+31.7 Q4	+5.0	30.0	33.1	-1.6	2.70	2.23	
Thailand	+11.5 Jan	+15.0 Jan	+2.6	31.4	35.0	-2.8	3.25	3.90	
Argentina	+11.9 Jan	+7.3 Q4	+2.5	3.17	3.11	0.9	10.44	na	
Brazil	+36.5 Feb	-4.9 Feb	-0.4	1.74	2.08	-1.8	11.18	6.16‡	
Chile	+23.0 Feb	+7.2 Q4	+3.8	446	541	5.4	6.48	3.79‡	
Colombia	-0.8 Dec	-5.2 Q3	-4.3	1,820	2,173	-1.6	9.53	5.74‡	
Mexico	-11.7 Jan	-7.4 Q4	-1.5	10.7	11.1	nil	7.43	7.49	
Venezuela	+23.7 Q4	+20.0 Q4	+4.7	4.00	4.23‡	-2.6	14.36	6.55‡	
Egypt	-20.5 Q4	+0.5 Q1	+0.9	5.47	5.70	-7.0	5.73	5.08‡	
Israel	-11.0 Feb	+5.0 Q4	+2.2	3.49	4.18	-1.4	3.33	5.08	
Saudi Arabia	+146.4 2007	+98.9 2006	+22.8	3.75	3.75	12.8	2.26	na	
South Africa	-10.0 Jan	-20.6 Q4	-8.0	8.04	7.38	0.6	11.45	9.19	
MORE COUNTRIES	Data for the countries below are not provided in printed editions of <i>The Economist</i>								
Estonia	-4.4 Jan	-3.3 Jan	-13.1	9.93	11.7	0.6	6.35	na	
Finland	+12.0 Jan	+11.6 Jan	+3.8	0.63	0.75	4.6	4.63	4.08	
Iceland	-1.6 Feb	-3.2 Q4	-11.1	74.5	66.2	3.1	15.21	na	
Ireland	+36.3 Jan	-11.1 Q3	-3.8	0.63	0.75	-0.5	4.72	4.28	
Latvia	-7.2 Jan	-6.4 Jan	-18.2	0.44	0.53	1.0	5.56	na	
Lithuania	-7.3 Jan	-5.6 Jan	-12.0	2.19	2.58	-0.6	4.86	na	
Luxembourg	6.1 Dec	+4.7 Q3	na	0.63	0.75	0.9	4.72	na	
New Zealand	-3.6 Jan	-10.2 Q3	-7.5	1.25	1.41	3.0	7.35	6.43	
Peru	+8.3 Jan	+1.5 Q4	-0.2	2.77	3.18	1.0	5.19	na	
Philippines	-6.1 Jan	+6.4 Dec	+4.6	41.7	48.2	-0.2	6.44	na	
Portugal	-26.6 Dec	-21.0 Dec	-8.1	0.63	0.75	-2.6	4.72	4.31	
Slovakia	-0.9 Jan	-0.5 Nov	-2.8	20.7	25.1	-2.3	4.21	4.39	
Slovenia	-3.1 Jan	-2.2 Dec	-2.5	0.63	0.75	-0.8	na	na	

*Merchandise trade only. †The Economist poll or Economist Intelligence Unit forecast. ‡Dollar-denominated bonds. §Unofficial exchange rate.

Sources: National statistics offices and central banks; Thomson Datastream; Reuters; JPMorgan; Bank Leumi le-Israel; Centre for Monitoring Indian Economy; Danske Bank; Hong Kong Monetary Authority; Standard Bank Group; UBS; Westpac.

Output, prices and jobs

% change on year ago

	Gross domestic product				Industrial production latest	Consumer prices			Unemployment rate [†] , %
	latest	qtr* [†]	2008 [†]	2009 [†]		latest	year ago	2008 [†]	
United States	+2.5 Q4	+0.6	+1.5	+2.2	+1.0 Feb	+4.0 Feb	+2.4	+3.2	4.8 Feb
Japan	+2.0 Q4	+3.5	+1.4	+1.6	+2.2 Jan	+0.7 Jan	nil	+0.6	3.8 Jan
China	+11.2 Q4	na	+9.8	+9.0	+15.4 Feb	+8.7 Feb	+2.7	+4.5	9.5 2007
Britain	+2.9 Q4	+2.3	+1.9	+2.0	+0.4 Jan	+2.5 Feb [§]	+2.8	+2.4	5.2 Jan ^{††}
Canada	+2.9 Q4	+0.8	+1.7	+2.2	-1.3 Dec	+1.8 Feb	+2.0	+1.9	5.8 Feb
Euro area	+2.2 Q4	+1.6	+1.7	+1.8	+3.8 Jan	+3.3 Feb	+1.8	+2.5	7.1 Jan
Austria	+3.0 Q4	+2.3	+2.5	+2.3	+3.4 Dec	+3.2 Feb	+1.6	+2.1	4.2 Jan
Belgium	+2.4 Q4	+2.0	+1.9	+1.9	-1.9 Dec	+3.6 Feb	+1.8	+2.4	10.7 Feb ^{††}
France	+2.1 Q4	+1.4	+1.6	+1.7	+2.7 Jan	+2.8 Feb	+1.0	+2.2	7.5 Q4 ^{§§}
Germany	+1.8 Q4	+1.1	+1.7	+1.9	+7.0 Jan	+2.8 Feb	-6.0	+2.1	8.0 Feb
Greece	+3.6 Q4	+2.8	+2.4	+2.6	+1.6 Jan	+4.4 Feb	+2.7	+3.3	8.9 Dec
Italy	+1.9 Q3	+1.7	+1.0	+1.4	+0.5 Jan	+2.9 Feb	+1.8	+2.4	6.0 Q4
Netherlands	+4.5 Q4	+4.8	+2.3	+2.1	+2.0 Jan	+2.2 Feb	+1.5	+2.0	4.1 Feb ^{††}
Spain	+3.5 Q4	+3.2	+2.4	+2.1	-0.2 Jan	+4.4 Feb	+2.4	+3.5	8.8 Jan
Czech Republic	+6.6 Q4	+7.0	+4.7	+5.4	+9.3 Jan	+7.5 Feb	+1.5	+6.5	5.9 Feb
Denmark	+2.0 Q4	+1.8	+1.6	+1.8	-1.8 Jan	+3.1 Feb	+1.9	+2.2	2.1 Jan
Hungary	+0.7 Q4	+0.8	+2.5	+3.6	+6.6 Jan	+6.0 Feb	+8.8	+5.7	8.1 Jan ^{††}
Norway	+4.7 Q4	+5.2	+2.9	+2.6	-1.4 Jan	+3.7 Feb	+0.8	+3.1	2.4 Dec ^{††}
Poland	+6.1 Q4	na	+5.1	+4.3	+14.9 Feb	+4.2 Feb	+1.9	+4.0	11.5 Feb ^{††}
Russia	+7.7 Q3	na	+7.0	+6.0	+7.5 Feb	+12.7 Feb	+7.6	+12.5	5.8 Jan ^{††}
Sweden	+2.8 Q4	+3.1	+2.6	+2.5	+3.8 Jan	+3.1 Feb	+2.0	+2.6	6.1 Feb ^{††}
Switzerland	+3.6 Q4	+4.2	+2.0	+1.9	+9.1 Q4	+2.4 Feb	nil	+1.6	2.5 Jan
Turkey	+1.5 Q3	na	+3.7	+5.4	-0.4 Jan	+9.1 Feb	+10.2	+8.4	10.1 Q4 ^{††}
Australia	+3.9 Q4	+2.4	+3.3	+3.2	+1.6 Q3	+3.0 Q4	+3.3	+3.1	4.0 Feb
Hong Kong	+6.7 Q4	+6.6	+4.0	+4.6	-0.3 Q4	+6.3 Feb	+0.8	+4.0	3.3 Feb ^{††}
India	+8.4 Q4	na	+7.8	+7.2	+5.3 Jan	+5.5 Jan	+6.7	+5.8	7.2 2007
Indonesia	+6.3 Q4	na	+5.9	+6.3	+5.0 Jan	+7.4 Feb	+6.3	+6.8	9.8 Feb
Malaysia	+7.3 Q4	na	+5.5	+5.7	+7.0 Jan	+2.7 Feb	+3.1	+2.8	3.1 Q3
Pakistan	+7.0 2007**	na	+5.0	+5.3	-4.1 Dec	+11.3 Feb	+7.4	+9.3	6.2 2006
Singapore	+5.4 Q4	-4.8	+4.4	+4.7	+10.0 Feb	+6.5 Feb	+0.6	+3.3	1.6 Q4
South Korea	+5.5 Q4	+6.3	+4.5	+4.4	+11.8 Jan	+3.6 Feb	+2.2	+2.9	3.0 Feb
Taiwan	+6.4 Q4	na	+4.5	+4.3	+15.2 Feb	+3.9 Feb	-2.2	+1.7	4.0 Feb
Thailand	+5.7 Q4	+7.3	+4.8	+4.3	+12.5 Jan	+5.4 Feb	+2.3	+3.9	0.8 Dec
Argentina	+9.1 Q4	+8.0	+5.7	+4.5	+9.3 Feb	+8.4 Feb	+9.6	+10.9	7.5 Q4 ^{††}
Brazil	+6.2 Q4	+6.4	+4.3	+4.1	+8.5 Jan	+4.6 Feb	+3.0	+4.7	8.0 Jan ^{††}
Chile	+4.0 Q4	+3.7	+4.0	+4.6	+4.4 Jan	+8.1 Feb	+2.7	+5.9	7.2 Jan ^{††††}
Colombia	+6.6 Q3	+6.9	+4.5	+4.0	+5.7 Jan	+6.4 Feb	+5.3	+5.3	13.1 Jan ^{††}
Mexico	+3.8 Q4	+3.0	+1.9	+3.0	+3.1 Jan	+3.7 Feb	+4.1	+4.1	3.8 Feb ^{††}
Venezuela	+8.5 Q4	na	+5.5	+4.6	-2.5 Dec	+25.2 Feb	+20.4	+27.8	6.7 Q4 ^{††}
Egypt	+8.1 Q4	na	+7.4	+6.9	+7.5 2007**	+12.1 Feb	+12.6	+9.8	9.0 Q4 ^{††}
Israel	+6.8 Q4	+6.4	+3.5	+4.1	+5.3 Jan	+3.6 Feb	-0.8	+2.9	6.8 Q4
Saudi Arabia	+3.5 2007	na	+6.0	+5.6	na	+8.7 Feb	+3.0	+7.5	na
South Africa	+4.6 Q4	+5.3	+4.1	+4.8	+1.4 Jan	+9.8 Feb	+5.7	+7.0	25.5 Mar ^{††}
MORE COUNTRIES	Data for the countries below are not provided in printed editions of <i>The Economist</i>								
Estonia	+4.8 Q4	+3.2	+4.0	+4.3	+4.1 Jan	+11.3 Feb	+4.7	+9.0	5.6 Jan
Finland	+3.7 Q4	+3.8	+3.0	+3.0	+2.3 Jan	+3.7 Feb	+2.2	+3.0	6.2 Feb
Iceland	+4.6 Q4	+1.2	+2.0	+3.3	+0.4 2007	+6.8 Feb	+7.4	+5.0	1.0 Feb ^{††}
Ireland	+3.5 Q4	-3.3	+2.4	+2.6	+1.8 Jan	+4.8 Feb	+4.8	+3.0	5.2 Feb
Latvia	+8.0 Q4	na	+5.8	+6.0	-0.1 Jan	+16.7 Feb	+7.2	+10.5	5.0 Feb
Lithuania	+7.9 Q4	-4.3	+7.2	+6.4	na	+10.8 Feb	+4.3	+7.8	4.7 Feb ^{††}
Luxembourg	+5.6 Q3	+2.8	+4.9	+4.8	+5.2 Jan	+3.1 Feb	+2.0	+3.1	4.6 Feb ^{††}
New Zealand	+3.4 Q3	+1.1	+1.8	+2.6	+1.3 Q3	+3.2 Q4	+2.6	+2.9	3.4 Q4
Peru	+10.1 Jan	na	+6.3	+6.7	+10.0 Jan	+4.8 Feb	+0.4	+3.7	9.4 Jan ^{††}
Philippines	+7.3 Q4	+7.4	+5.4	+5.5	-1.8 Dec	+5.4 Feb	+2.6	+4.0	7.4 Q1 ^{††}
Portugal	+2.0 Q4	+3.0	+1.8	+2.1	-1.4 Jan	+2.9 Feb	+2.4	+2.3	7.8 Q4 ^{††}
Slovakia	+14.3 Q4	na	+7.5	+5.7	+8.4 Jan	+4.0 Feb	+2.7	+3.0	7.8 Feb ^{††}
Slovenia	+4.7 Q4	na	+4.6	+4.0	-0.1 Dec	+6.5 Feb	+2.1	+4.4	7.4 Jan ^{††}

*% change on previous quarter, annual rate. †The Economist poll or Economist Intelligence Unit estimate/forecast. ‡National definitions. §RPI inflation rate 4.1% in Feb. **Year ending June. ††Latest three months. †††Not seasonally adjusted. ††††New series.

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

	Real GDP, % change				Consumer prices		Current account	
	Low/high range		average		% increase		% of GDP	
	2008	2009	2008	2009	2008	2009	2008	2009
Australia	2.5/4.5	2.5/4.3	3.3 (3.5)	3.2 (3.3)	3.1	2.7	-5.6 (-5.4)	-5.4
Belgium	1.5/2.7	1.8/2.3	1.9	1.9 (2.0)	2.4 (2.3)	1.9	2.0 (2.5)	2.2 (2.3)
Britain	1.5/3.1	1.7/2.5	1.9 (1.7)	2.0 (2.1)	2.4 (2.3)	2.0	-3.8 (-3.7)	-3.4 (-3.3)
Canada	1.0/2.5	1.5/2.6	1.7	2.2 (2.4)	1.9 (1.8)	2.0	0.4 (0.3)	nil(-0.1)
France	1.3/2.1	1.2/2.2	1.6 (1.7)	1.7 (1.9)	2.2	1.7 (1.8)	-1.3 (-1.4)	-1.4 (-1.5)
Germany	1.4/2.5	1.4/2.3	1.7 (1.8)	1.9 (2.0)	2.1	1.7	5.2 (5.7)	5.2 (5.7)
Italy	0.7/1.7	1.0/2.0	1.0 (1.2)	1.4 (1.5)	2.4	1.9 (2.0)	-2.3 (-2.4)	-2.3
Japan	1.0/2.1	0.9/2.2	1.4 (1.3)	1.6 (1.8)	0.6	0.5 (0.6)	4.7 (4.8)	4.8 (5.0)
Netherlands	1.4/3.5	1.6/2.9	2.3 (2.0)	2.1	2.0 (2.1)	2.1	6.8 (7.3)	6.6 (7.2)
Spain	1.8/3.8	0.9/3.0	2.4	2.1 (2.4)	3.5 (3.2)	2.6 (2.7)	-9.1 (-9.0)	-8.3 (-8.2)
Sweden	2.2/3.3	1.8/3.1	2.6	2.5 (2.6)	2.6 (2.8)	2.2	6.1 (6.0)	6.1 (6.2)
Switzerland	1.5/2.8	1.6/2.2	2.0	1.9 (2.0)	1.6	1.2	14.6 (14.7)	14.9
United States	0.8/2.2	1.3/3.0	1.5 (1.6)	2.2 (2.5)	3.2 (2.9)	2.3 (2.2)	-4.7 (-4.8)	-4.3 (-4.4)
Euro area	1.3/2.6	1.3/2.3	1.7 (1.8)	1.8 (1.9)	2.5 (2.4)	2.0	-0.1	nil -0.1 (0.1)

Sources: ABN AMRO, BNP Paribas, Citigroup, Decision Economics, Deutsche Bank, Economist Intelligence Unit, Goldman Sachs, HSBC Securities, KBC Bank, JPMorgan Chase, Morgan Stanley, Scotiabank, UBS

Economist, March 6, 2008.