

**Problem Set 2 Answers**

Due *in lecture* on Thursday, November 12. "Box - in" your answers to the algebraic questions.

1. Consider a CC-LM model, where CC is given by:

$$y = Y(i, \rho) \tag{4}$$

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$$\rho = \varphi(i, y, R, Z) \tag{6}$$

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So that:

$$dY(1 - Y_\rho \rho_Y) = (Y_\rho \rho_i + Y_i)di + Y_\rho \rho_R dR + Y_\rho \rho_Z dZ \tag{8}$$

and

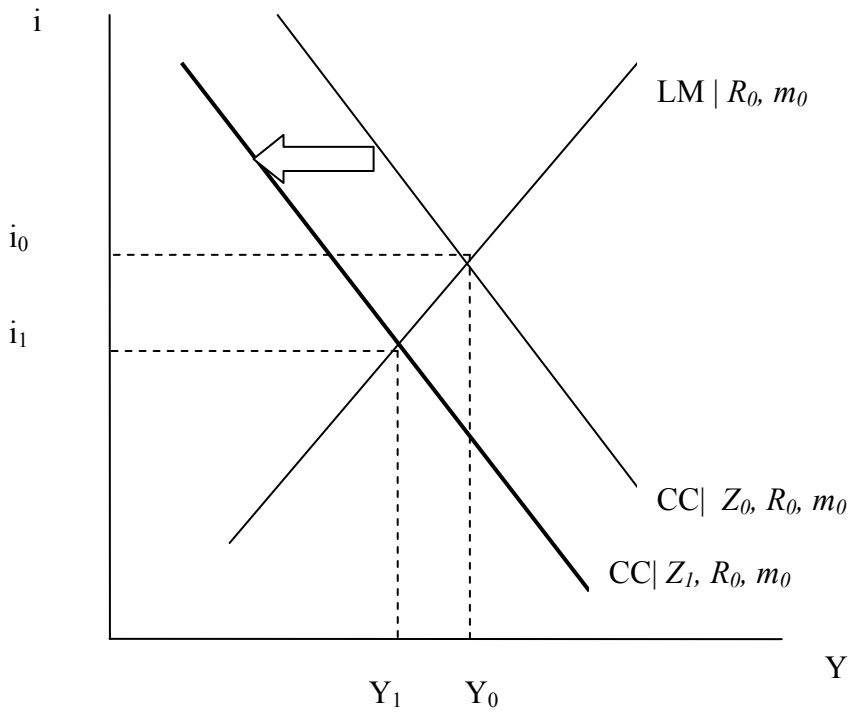
$$dY = \frac{(Y_\rho \rho_i + Y_i)di + Y_\rho \rho_R dR + Y_\rho \rho_Z dZ}{(1 - Y_\rho \rho_Y)} \tag{8'}$$

And the LM curve is given by:

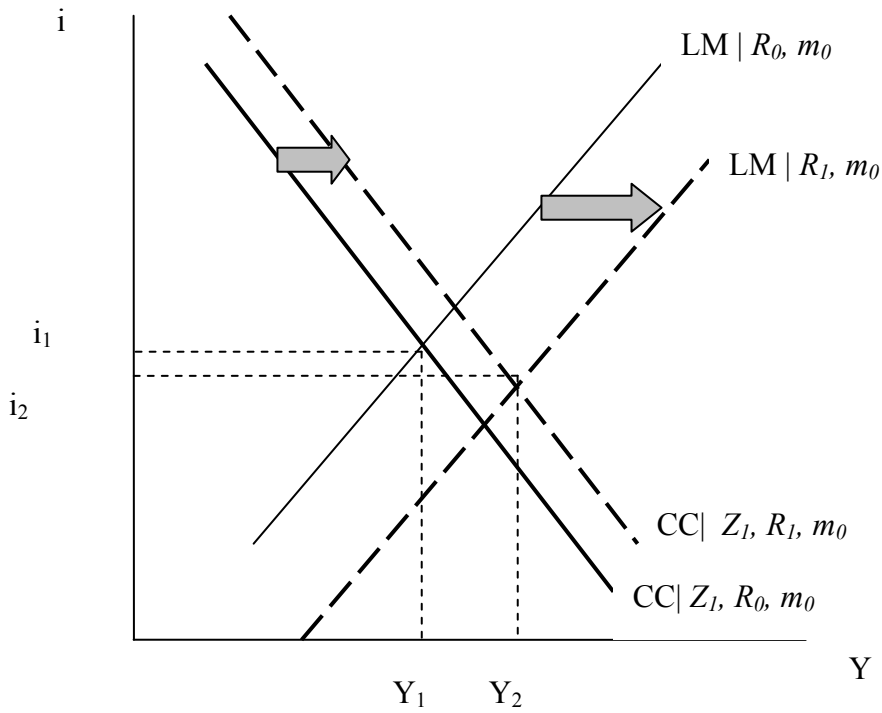
$$di = \frac{m(dR) - D_Y dY}{D_i} \tag{10}$$

1.1 Show what happens if the investment projects that are funded by loans suddenly look more “risky” than they used to (e.g., loans for buying houses or loans for building shopping malls).

When Z rises, ρ rises, (according to equation 7); this means that loan supply decreases, which in turn means that the CC curve shifts in.



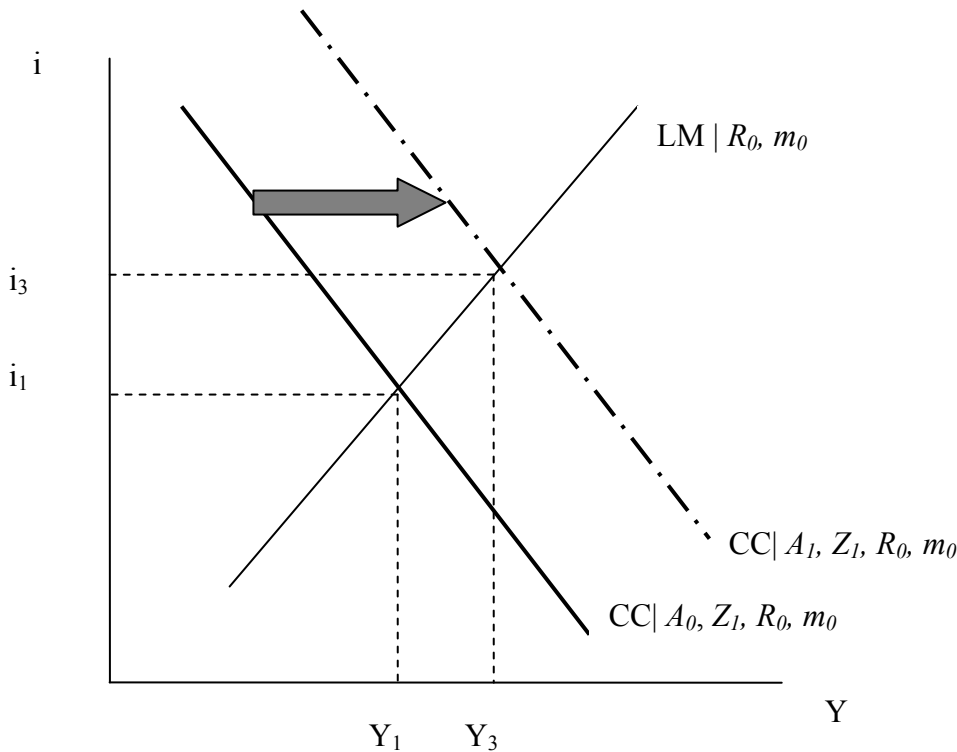
1.2 Show what happens if the Fed increases the amount of reserves in the economy by undertaking open market operations. Assume that the Fed does not pay interest on reserves.



The increase in reserves increases the money stock, in the usual fashion, thus shifting out the LM curve. However, increased reserves also results in increased credit supply (decreased lending rate). This means the CC curve shifts out as well. Economic activity rises to  $Y_2$ , the interest rate falls to  $R_2$ .

1.3 Will an increase in government spending have a positive or negative impact on income? Explain, using a graph.

The CC curve essentially augments the IS curve with additional shift variables; so things that shifted the IS curve, like an increase in autonomous spending to  $A_1$  from  $A_0$  will shift out the CC curve. Output unambiguously increases.



2. Data exercise: Taylor rule.

Consider the Taylor rule:

$$i_t^{FF} = \pi_t + 0.5(y_t - y_t^*) + 0.5(\pi_t - \pi_t^*) + r$$

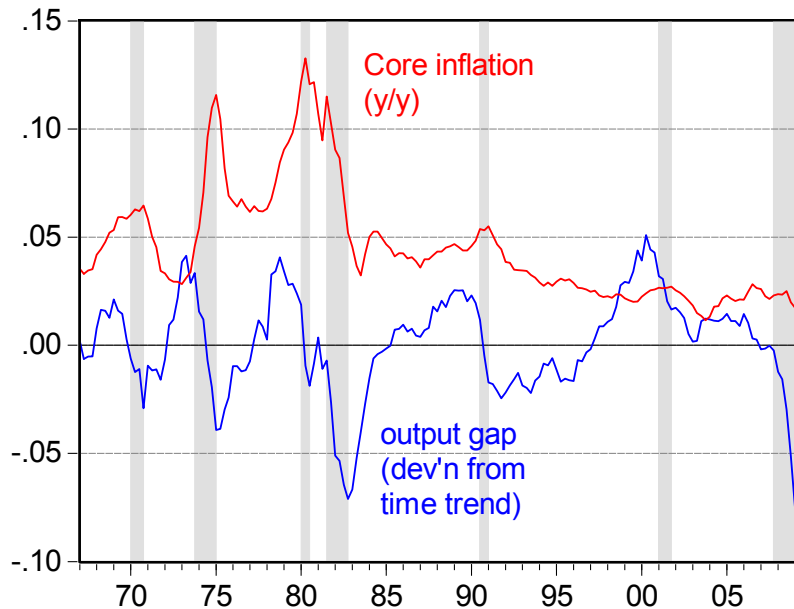
Where  $i_t^{FF}$  is the target Fed Funds rate,  $y_t$  is log GDP,  $y_t^*$  is the measure of potential GDP (so  $y_t - y_t^*$  is the output gap),  $\pi_t$  is the inflation rate, and  $\pi_t^*$  is the target inflation rate, and  $r$  is the natural rate of interest.

2.1 Download data for real GDP and core CPI from the St. Louis Fed's FREDII website, for the 1967Q1-2009Q3 period. Estimate the output gap by run a regression of log GDP on a constant, time trend (and possibly time trend squared), and taking the residual as the output gap. Setting the target inflation rate at 0.02 (2%) and the natural rate of interest as 0.025 (2.5%), calculate the target Fed Funds rate for 2009Q3.

Dependent Variable: LGDP05  
 Method: Least Squares  
 Date: 11/13/09 Time: 19:08  
 Sample: 1967Q1 2009Q3  
 Included observations: 171

	Coefficient	Std. Error	t-Statistic	Prob.
C	8.271451	0.003774	2191.976	0.0000
TIME	0.007566	3.84E-05	197.0944	0.0000
R-squared	0.995668	Mean dependent var		8.914603
Adjusted R-squared	0.995643	S.D. dependent var		0.375412
S.E. of regression	0.024781	Akaike info criterion		-4.545865
Sum squared resid	0.103781	Schwarz criterion		-4.509120
Log likelihood	390.6714	Hannan-Quinn criter.		-4.530955
F-statistic	38846.19	Durbin-Watson stat		0.117402
Prob(F-statistic)	0.000000			

The output gap looks like this:



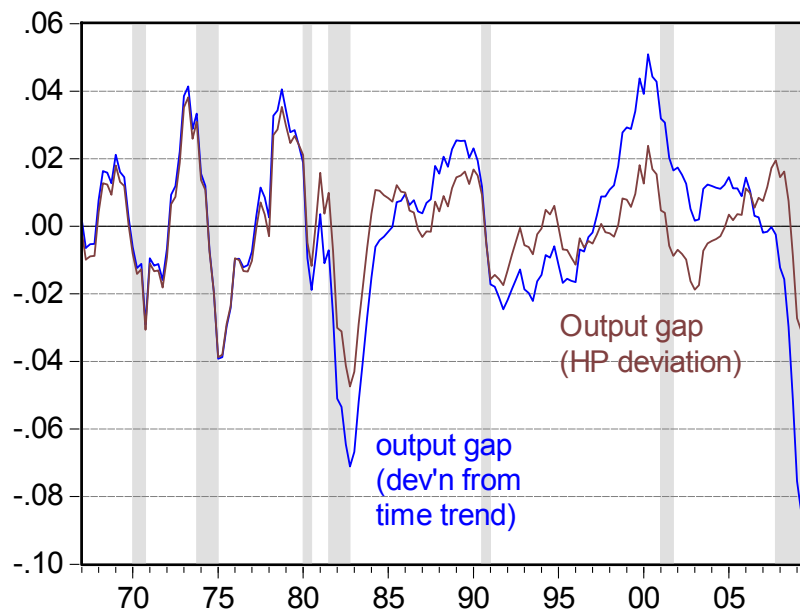
With the 2009Q3 output gap equal to -0.084, and y/y CPI core inflation is 0.015. . Let's use the Taylor rule.

$$i_t^{FF} = \pi_t + 0.5(y_t - y_t^*) + 0.5(\pi_t - \pi_t^*) + r$$

$$-0.0045 = 0.015 + 0.5(-0.084) + 0.5(0.015 - 0.02) + 0.025$$

So the target interest rate according to the Taylor rule should be negative 0.5 percent.

2.2 Download an alternative output gap from <http://www.ssc.wisc.edu/~mchinn/outputgap.xls> . Redo your calculations for problem 2.1. How have your answers changed as a consequence of this alternative output gap?



The output gap defined as a deviation from an HP-trend is -0.024 in 2009Q3.

$$0.0255 = 0.015 + 0.5(-0.024) + 0.5(0.015 - 0.02) + 0.025$$

So the target interest rate should be 2.6 percent.

3. Suppose we have an economy given by the following equations (IS-LM-BP=0) under floating exchange rates.

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

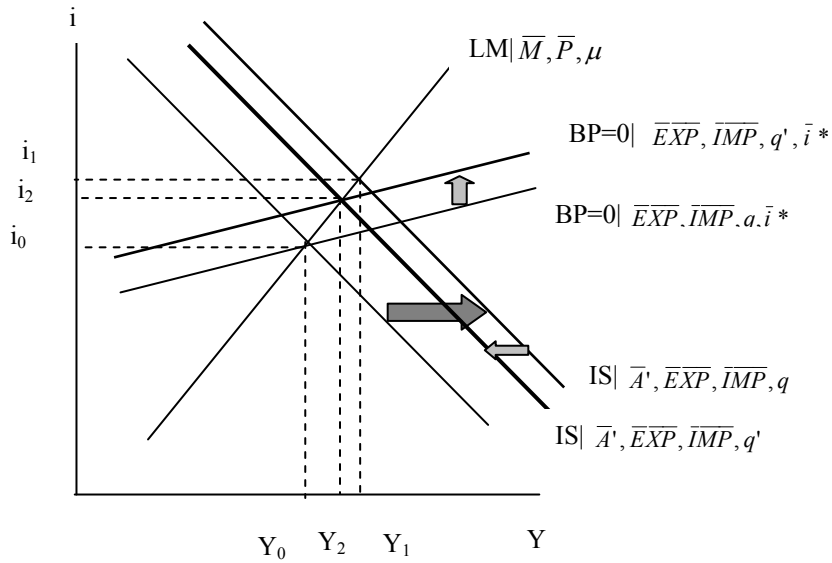
$$(1') \quad i = \frac{\bar{A} + \bar{EXP} - \bar{IMP} + (n + v)q}{b} - \left( \frac{1 - c(1 - t) + m}{b} \right) Y \quad \text{<IS curve>}$$

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

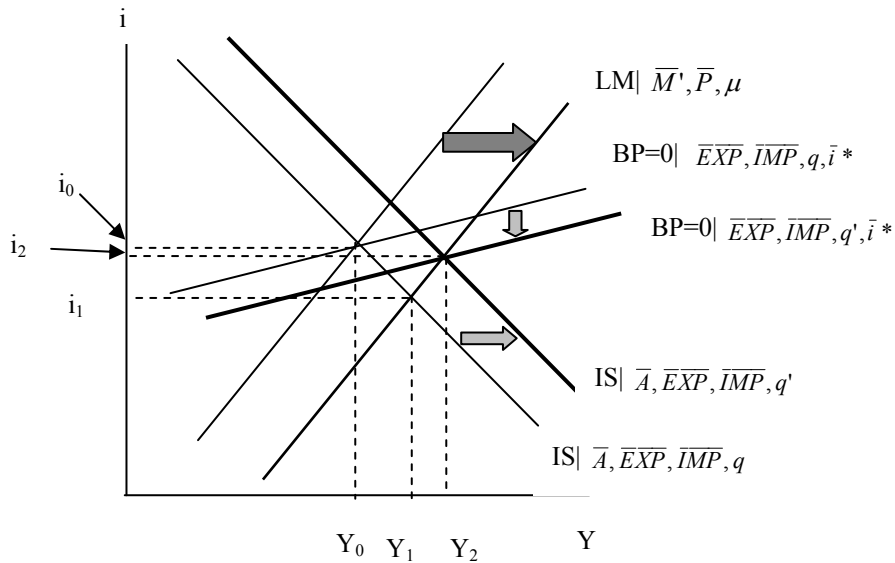
$$(3) \quad i = - \left( \frac{1}{\kappa} \right) [(\bar{EXP} - \bar{IMP} + \bar{KA}) + (n + v)q] + \bar{i}^* + \left( \frac{m}{\kappa} \right) Y \quad \text{<BP=0 curve>}$$

And assume we wish to increase output, and  $m/\kappa$  is small.

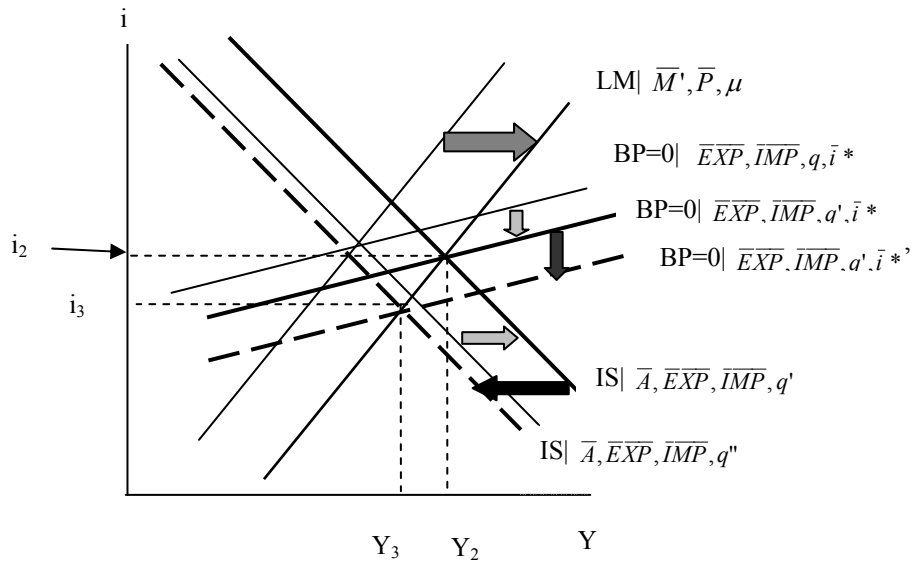
3.1 Show what happens when government spending is increased.



3.2 Show what happens if the money supply is increased.



3.3 Show what happens if the money supply is increased, both at home and abroad? Will the currency depreciate or appreciate (i.e., can you accomplish expenditure switching)?



The decrease in foreign interest rates induces a drop in the BP=0 schedule. The interest rate now exceeds that necessary for external balance, so the home currency appreciates. As a consequence, the IS curve shifts in.

3.4 Suppose import demand is given by:

$$IM = \overline{IMP} + mY - nq(1 + \tau)$$

Where  $\tau$  is the tariff rate. Suppose the government raises the tariff rate from zero to  $\tau_0 > 0$ . What happens to output?

The effect is the same as in the answer to question 3.1.

3.5 Suppose the foreign country responds to 3.4 by reducing  $\overline{EXP}$ . What happens to the home country?

In macroeconomic terms, retaliation nullifies the curve shifts in the answer to question 3.4.