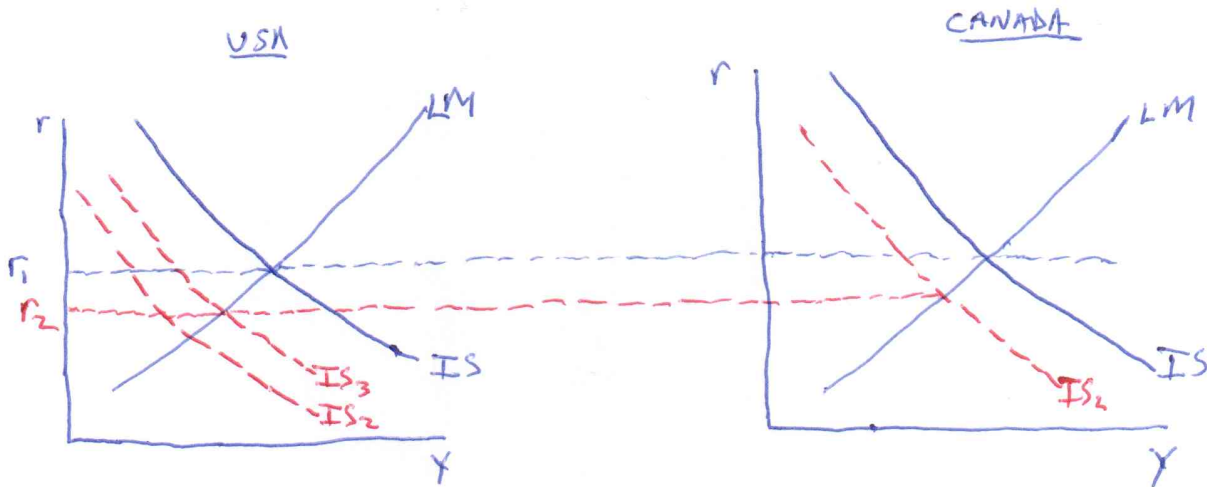


PROBLEM SET 4  
(Solutions)

1. (15 points). There has been much recent discussion in the U.S. about reducing the government budget deficit. Suppose that in fact the U.S. does reduce its deficit, by some combination of higher taxes and lower spending. According to the Mundell-Fleming model, what would be the consequences for Canada? Illustrate your answer with a graph. (Hint: Canada has a flexible exchange rate against the U.S. dollar).

*The US fiscal contraction shifts the US IS curve down and to the left. This puts downward pressure on US interest rates, and triggers capital outflows from the US to Canada. The US dollar depreciates. As a result, US net exports rise, and Canadian net exports fall. The decline in Canadian net exports shifts Canada's IS down and to the left. The increase in US net exports causes the US IS curve to shift back toward its original position, but not all the way, since the US is a large country, and world interest rates fall. Output declines in both countries (in the short-run). It declines in Canada both because the C\$ appreciates, which makes Canadian goods relatively expensive, and because incomes and spending are lower in the US, which reduces their demand for Canadian goods. The graph is as follows*



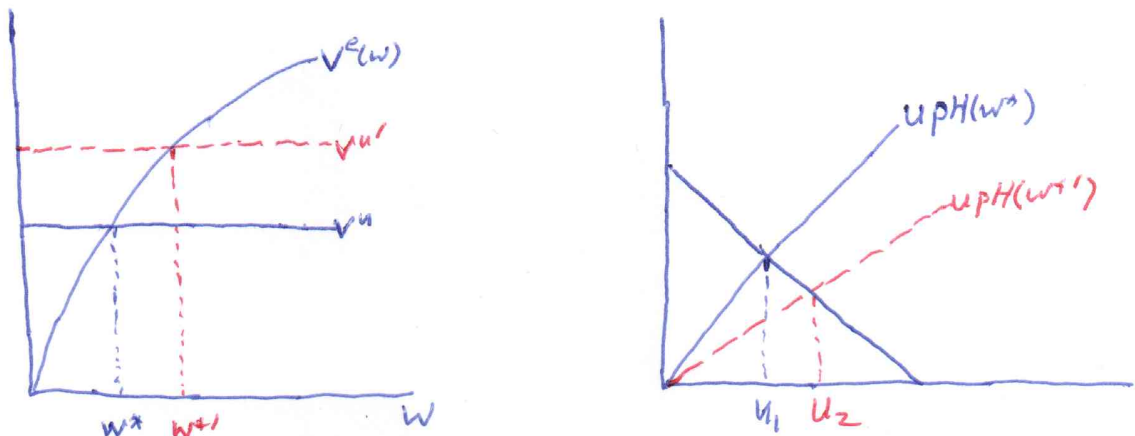
2. (15 points). A couple of weeks ago, Iceland announced that it was thinking about adopting the Canadian dollar as its currency. This would not likely have much of an effect on Canada, since Iceland is so small. However, it could have significant effects in Iceland. Use the Mundell-Fleming model

to describe under what conditions this would increase macroeconomic stability in Iceland. Could it actually make Iceland more unstable? (Use graphs to illustrate your answer).

Now goods market shocks in Iceland that are not perfectly correlated with those in Canada will cause greater instability in Iceland. For example, if Iceland had its own currency, with a flexible exchange rate, a decline in demand for Iceland's goods would be partially offset by a depreciation of its currency, which would promote net exports, and help to offset the decline in demand. However, with a fixed exchange rate against the C\$ (a common currency is the ultimate fixed exchange rate!), when Iceland's IS curve shifts down, it is not possible for the interest rate or the currency value to fall, in order to help offset the decline. The only way for the goods market to respond is for output and income to decline. (Effectively, the LM curve in Iceland becomes horizontal at the Canadian interest rate (which equals the world interest rate, if Canada has open capital markets). Of course, the flip side is that Iceland's economy becomes more stable in response to financial market (LM curve) shocks. Presumably, that is why they are thinking of adopting the loonie.

3. (15 points). Use the search model from Chpt. 16 to illustrate how an increase in labor market uncertainty could increase the equilibrium unemployment rate.

If we think of an increase in labor market uncertainty as a widening of the wage distribution (with little or no change in the mean), then the option value of search increases. (Who knows, you may get lucky and get a job at Goldman Sachs, and retire at 40). The key to this result, is that although you are also more likely to get low wage offers, you can simply reject those, and hold out for a better offer next time. In terms of the model, this causes the  $V^u$  curve to shift up, which increases the reservation wage. (With job separations, the  $V^e$  would also shift up, but less so. I have omitted this effect for simplicity). The increase in the reservation wage shifts the  $H(w)$  curve down, which increases the equilibrium unemployment rate. (See the following graph).



4. (15 points). Consider the following 'expectations-augmented Phillips Curve', discussed in Chpt. 17,

$$\pi - \pi^e = a(Y - Y^T)$$

where  $\pi$  is actual inflation,  $\pi^e$  is the public's expected inflation,  $Y$  is actual output, and  $Y^T$  is the trend (or 'natural') rate of output. Suppose the Central Bank's objective is to choose inflation so as to minimize the following social welfare function,

$$W(Y, \pi) = \alpha(\pi - \pi^*)^2 + \beta(Y - Y^*)^2$$

where  $\pi^*$  is the inflation target,  $Y^*$  is output target, and  $(\alpha, \beta)$  are fixed parameters summarizing the relative costs of inflation and output deviations.

- (a) Calculate the Central Bank's optimal inflation rate as a function of the public's expected inflation rate. Suppose the public has 'Rational Expectations', so that  $\pi^e = \pi$ . What is the equilibrium inflation rate? How does it depend on the relationship between  $Y^*$  and  $Y^T$ ? Explain.

*Substituting the expectations-augmented Phillips Curve into the objective function gives us*

$$W(\pi) = \alpha(\pi - \pi^*)^2 + \beta \left[ \frac{1}{a} (\pi - \pi^e) + (Y^T - Y^*) \right]^2$$

*Differentiating with respect to  $\pi$  gives the first-order condition*

$$2\alpha(\pi - \pi^*) + 2\beta \left[ \frac{1}{a} (\pi - \pi^e) + (Y^T - Y^*) \right] \frac{1}{a} = 0$$

*Solving this for  $\pi$  gives*

$$\pi = \frac{\alpha a^2}{\beta + \alpha a^2} \pi^* + \frac{\beta}{\beta + \alpha a^2} \pi^e + \frac{\beta a}{\beta + \alpha a^2} (Y^* - Y^T)$$

*Imposing the Rational Expectations condition,  $\pi^e = \pi$ , produces the following solution for  $\pi$*

$$\pi = \pi^* + \frac{\beta}{\alpha a} (Y^* - Y^T)$$

*Notice that equilibrium inflation is above its target if the government's target output is above the natural (or trend) output. When  $Y^* > Y^T$ , the government has an incentive to surprise the public, and the public knows this. They factor this incentive into their expectations, and inflation rises up until the point that the government no longer has an incentive to surprise the public. Also note that the inflation bias increases when output costs ( $\beta$ ) are high relative to inflation costs ( $\alpha$ ).*

- (b) Now suppose the public has 'adaptive expectations', and in particular, suppose the expected inflation rate is equal to last period's actual inflation rate, so that  $\pi_t^e = \pi_{t-1}$ . Using your answer from part (a) describe how inflation and output will evolve over time. What will be the long-run outcome?

*If the public has adaptive expectations, then inflation will only gradually converge to the above Rational Expectations equilibrium. We know that it will converge, since the coefficient on  $\pi^e$  in the above reaction function is less than one. We can depict the dynamics in the following graph*

