Econ 434 Professor Ickes

Fall 2008

Midterm Exam I: Answer Key

1. *(25%) Consider the economy of Macronesia (which is small despite its name). Here people have access to world capital markets but under current circumstances they choose neither to borrow or lend. In a two-period diagram draw production opportunities and indifference curves for Macronesia, and draw the world interest rate. Label the consumption point as A.*

   brief answer See figure 1

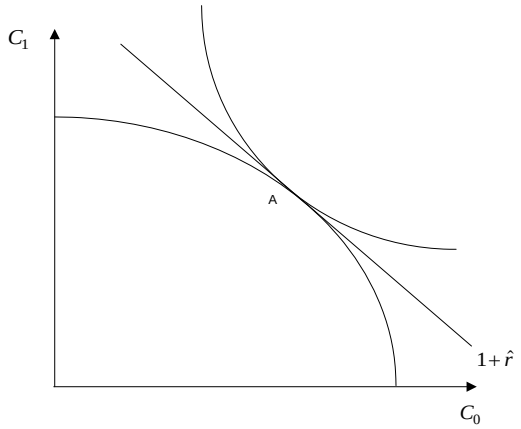

Figure 1: Macronesia

   (a) *Imagine that a great discovery (perhaps oil) takes place which will greatly increase future income in Macronesia, but leave current income unchanged. How does the production opportunities set shift? What would happen to consumption if Macronesia did not have access to world capital markets? Label this consumption point B.*

   brief answer See figure 2. Now there are greater future opportunities. Residents now want to consume more in the present and the future in autarky.

   (b) *What happens to the autarky rate of interest in Macronesia? Explain.*

   brief answer The autarky rate rises. Else there would be an excess demand for present consumption. The oil discovery raises lifetime wealth. People want to consume more in the present and the future. But there is no more present output. So the price of present output (consumption) must rise. The higher autarky rate causes people to invest in the future opportunities.

   (c) *If Macronesia has access to the world capital markets what happens to production and consumption? Explain. Label the new consumption point C. In the wake of the discovery is welfare higher with open or closed capital markets? Explain.*

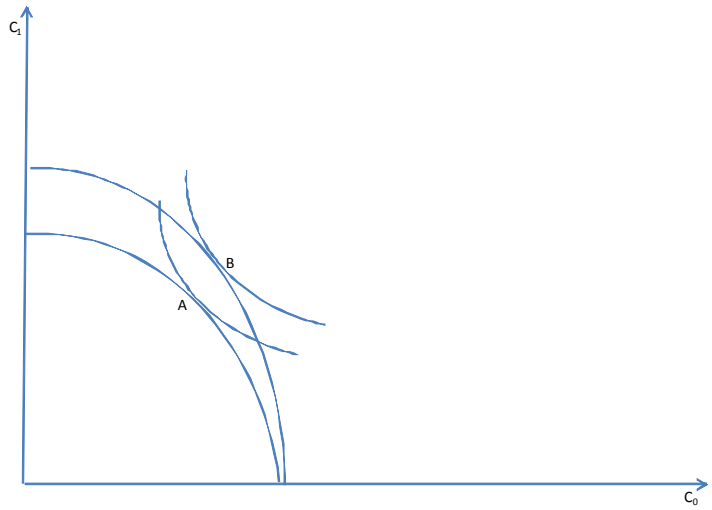

Figure 2: Macronesia discovers oil

brief answer See figure 3. Before discovery we produce at A and consume at point C.

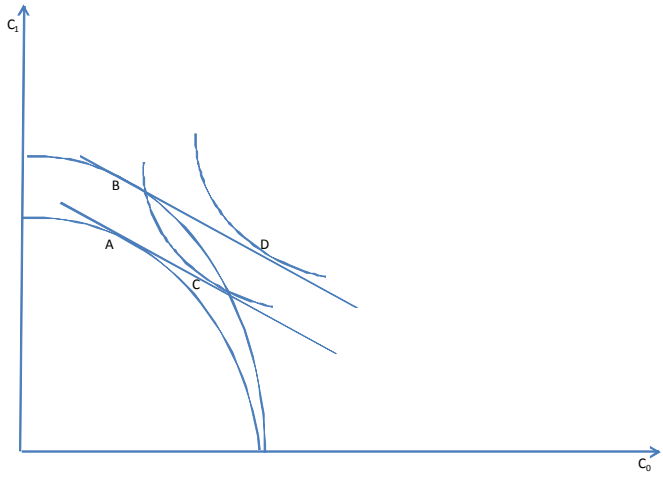

Figure 3: Macronesia with Open Capital Markets

Afterwards, we produce at B and consume at D. As Macronesia is small the interest rate does not change. Welfare is clearly higher with open than with closed capital markets since we now consume at a point that is not on the production frontier – a point that was not feasible in the closed economy.

(d) *Suppose Macronesia was a large economy. How does your answer to part (c) change, if at all? Explain. Is welfare higher (in Macronesia) after the discovery when Macronesia is small or large? Explain.*

brief answer If Macronesia is large then the world interest rises. This implies that consumption cannot rise as much as in part c. The budget line is now steeper as in

figure 4. This is the red dotted budget line. Macronesia now produces at point E and consumes at point F. Notice that point E lies to the southeast of point B. The higher rate means less investment. Notice that point F has less consumption than at point D, so welfare is lower. But welfare is still higher than in Macronesia were closed.

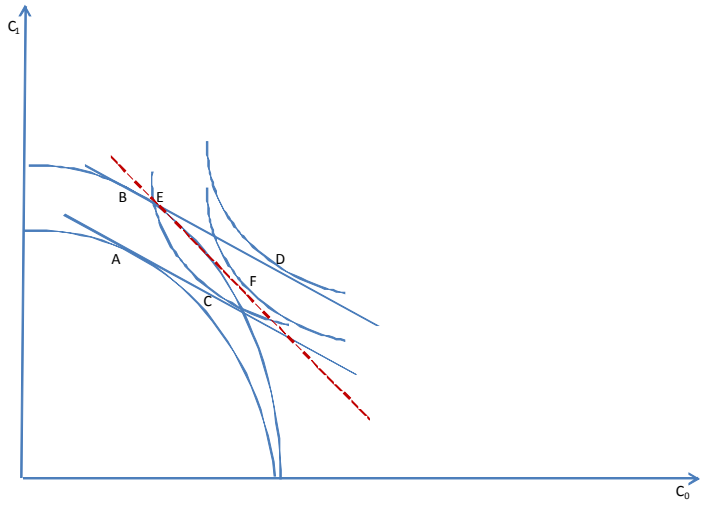

Figure 4: A Large Macronesia

2. *(25%) Consider the dynamic model of the current account balance. Suppose that the government levies a tax of f per worker on each young person. (f^* for the foreign country). The tax revenue is wasted by the government — it has no productive result. Suppose that f increases, but f^* is unchanged.*

   (a) *What happens to the steady state capital-labor ratio of the home country if the economy is closed? Explain*

   brief answer It must fall because some of savings is being wasted by the government. The transition curve $G(k)$ must shift down in, as in figure 5. This is evident also from the equation for the capital-labor ratio, $k_{t+1} = (1-\alpha)(1-\beta)A_t k_t^{\beta} - f$. Clearly, for any level of k_t a higher f means a lower k_{t+1}.

   (b) *What happens to the world steady state capital-labor ratio if the economy is open?*

   brief answer The world steady state capital-labor ratio must fall in this case. You can simply re-label figure 5 for the world capital-labor ratio by noting that it is now world savings that matters, which is an average of savings in each country. Thus, the equation for the world steady state capital-labor ratio is $k_{t+1} = (1-\overline{\alpha})(1-\beta)A_t k_t^{\beta} - \overline{f}$, where $1-\overline{\alpha}$ is the population-weighted average savings rate ($\overline{\alpha} = \frac{N\alpha + N^*\alpha^*}{N+N^*}$), and $\overline{f}$ is the population-weighted average tax, $\overline{f} = \frac{Nf + N^*f^*}{N+N^*}$. Since f^* did not change, $\overline{f}$ must rise, and so the world steady state capital labor ratio must fall.

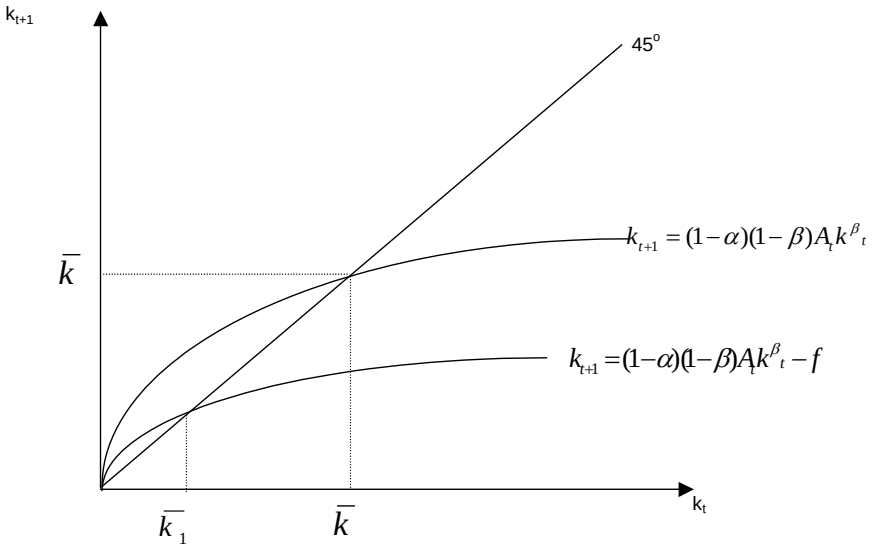

Figure 5:

(c) *What happens to the current account balance in the home country when f rises? What happens to the current account balance of the foreign country? Which country will experience net capital inflows?*

brief answer In the home country the current account balance must fall. In the absence of trade its capital-labor ratio would be below that in the foreign country. So the rate of return would be higher. Factor-price equalization requires that capital flow from the foreign country to the home country. Hence, the home country will experience a net capital inflow. The foreign country experiences a net capital outflow, as they invest some of their assets abroad.

(d) *How does this analysis compare to what would happen if the savings rate in the home country fell?*

brief answer It is exactly the same answer (this is enough for full credit). The world capital-labor ratio falls, the home country runs a current account deficit and imports capital. Perhaps the only difference is that in this case the change is in accord with people's preferences. If people in the home country voted to waste their taxes, then the case is identical. It is hard to believe that people would vote for taxes that the government just wastes, though perhaps casual observation suggests otherwise. If the taxes were imposed involuntarily they are worse off.

3. *(25%) Consider the two-country model of interest determination and suppose that domestic investment and savings are given by:*

$$\begin{aligned} I_{US} &= 200 - 4r_{us} \\ S_{US} &= 40 + 6r_{us} \end{aligned}$$

and that investment and savings in the rest of the world are given by:

$$\begin{aligned} I_{ROW} &= 240 - 8r_{\text{row}} \\ S_{ROW} &= 90 + 7r_{\text{row}} \end{aligned}$$

(a) *Suppose the US is a closed economy. What will the interest rate be in the US? What will the interest rate be in the rest of the world (you can round off to the nearest tenth, if necessary)?*

brief answer In a closed economy $I_{US} = S_{US}$, so $40 + 6r_{us} = 200 - 4r_{us}$. Thus,

$$\begin{aligned} 10r_{US} &= 160 \\ r_{US} &= \frac{160}{10} = 16 \end{aligned}$$

In the ROW we have

$$\begin{aligned} 240 - 8r_{\text{row}} &= 90 + 7r_{\text{row}} \\ 150 &= 15r_{\text{row}} \Longrightarrow r_{\text{row}} = \frac{150}{15} = 10 \end{aligned}$$

(b) *Suppose that the US opens up to the rest of the world. What will the world interest rate be equal to (you can round off to the nearest tenth, if necessary)?*

brief answer Now world saving must equal the world interest rate, so

$$\begin{aligned} 200 - 4r^* + 240 - 8r^* &= 40 + 6r^* + 90 + 7r^* \\ 440 - 40 - 90 &= r^*(12 + 6 + 7) = 25r^* \\ r^* &= \frac{310}{25} = 12.4 \end{aligned}$$

(c) *At the equilibrium world interest rate calculate net savings in the US and the ROW. Will the US have positive net savings?*

brief answer We know that at r^* the US will have negative net savings. This follows because at $r_{US} = 16$ we had $I_{US} = S_{US}$, and $r^* = 12.4 < 16$, so savings will decrease and investment will be higher. So we know the answer. But we are supposed to calculate it. We can substitute into the savings and investment functions to obtain the answer. For the US, we have:

$$\begin{aligned} I_{US} &= 200 - 4 * 12.4 = 150.4 \\ S_{US} &= 40 + 6 * 12.4 = 114.4 \end{aligned}$$

so net savings is negative: $114.4 - 150.4 = -36.0$.

(d) *Suppose that savings in the rest of the world rose because of a taste shift in favor of future consumption in those countries. How would you think about this in this model? What would happen to the world interest rate? What would happen to the US current account deficit?*

brief answer Savings rising in the rest of the world means that the savings function shifts to the right: there is higher savings at any interest rate. For example, suppose (just to take a specific example, any number bigger than 90 will do) that now we have $S_{ROW} = 120 + 7r_{\text{row}}$, then the world interest rate is given by:

$$\begin{aligned} 200 - 4r^* + 240 - 8r^* &= 40 + 6r^* + 120 + 7r^* \\ 440 - 40 - 120 &= r^*(12 + 6 + 7) = 25r^* \\ r^* &= \frac{280}{25} = 11.2 \end{aligned}$$

So the world interest rate falls. This means that the US will invest more and save less, so the current account deficit will grow larger (bigger deficit).

$$\begin{aligned} I_{US} &= 200 - 4 * 11.2 = 155.2 \\ S_{US} &= 40 + 6 * 11.2 = 107.2 \end{aligned}$$

So the current account deficit is now -48.0.

4. *(15%) Short answer questions.*

   (a) *Give or take $500 billion, how large are US net foreign assets (or, within 5% what share are NFA of US GDP)?*

   brief answer $-\$2.6$ trillion, or about -24% of GDP.

   (b) *What is the relationship between a country's net foreign asset position today and its future net exports? If NFA today is negative what do we know about future net exports? Explain.*

   brief answer Current net foreign assets are equal to the negative of the present value of future net exports. This is the intertemporal budget constraint.

$$-(1+r)A_t = \sum_{s=t}^{t+T} \left(\frac{1}{1+r}\right)^{s-t} NX_s$$

   If the LHS today is negative then future net exports must be positive in present value terms.