Real Exchange Rate Appreciation and the Trade Balance*

Econ 434

Fall 2004

When we first discussed the current account we talked only about the real interest rate. Why then do we need real exchange rate adjustment for the trade balance to improve? The basic answer is what is called "home bias" in consumption, which I will explain. The important question to think about is whether the current account can improve without a change in the value of the dollar. Suppose that we decide to increase savings because we wake up hating the current account deficit. The question is whether we can accomplish this without the dollar changing in value. It is obviously an important policy issue.

To answer this question we need a simple model where the dollar plays some role. Here we will think of two-countries, the US and the rest of the world. So our net exports are the net imports of the rest of the world. You must notice then that if we are to improve our current account balance, the rest of the world must decrease theirs.

Our simple model has two elements. First, start with the trade balance, which we know is equal to income minus expenditure,

$$T \equiv NX = y - a. \tag{1}$$

Notice here that I have used the notation NX to remind that the trade balance is equal to net exports.[1] This is an accounting identity, so it must hold true for any value of the real exchange rate; indeed, the real exchange

*This note is based on the appendix to Lecture 1 of Krugman, Exchange Rate Instability. See also Maurice Obstfeld and Kenneth Rogoff, "The Unsustainable US Current Account Deficit Revisited," at http://www.nber.org/papers/w10869.

[1]Notice that a is not absorption. It is total domestic expenditure, that is total spending

rate does not directly appear in this expression. In figure 1 we can express this relationship as TT_0. Given the level of expenditure, a_0, and the level of output the trade balance is independent of p, the price of domestic goods in terms of foreign goods (the inverse of q, essentially),[2] by virtue of the accounting identity (1). In figure 1 when expenditure falls, we move to TT_1.

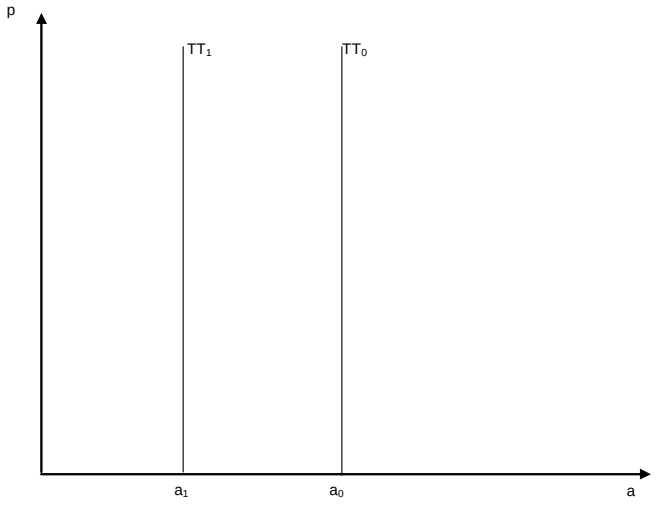

Figure 1: Expenditure and the Real Exchange Rate

We must also worry about the world current account which we know adds to zero. World expenditure must equal world income, so

$$y^* + py = pa + a^* \tag{2}$$

where p is the relative price of domestic goods in terms of the numeraire, foreign good. This implies

$$a^* - y^* = p(y - a) \tag{3}$$

by people in the US. Absorption (usually A) is spending on domestic goods and services. When I write a I am referring to total expenditure, and y is total output. So if m is the share of purchases spend on imports, we can write total imports $M = ma$, and $M^* = m^*a^*$ for the foreign country.

[2] I am going to treat the foreign price level as the numeraire, so p is the price of domestic goods in units of the foreign good. Hence, if p rises we are less competitive, and vice versa. You can thus think of p as the inverse of the real exchange rate.

Now from (1) the trade balance is the difference between income and expenditure. But it is also equal to net exports, which are just exports less imports. To make matters simple, let us suppose that imports are a fixed share of expenditure, and let these shares be given by m, and m^* respectively. Notice that our exports are the rest of the world's imports, m^*a^*, but this is measured in the foreign currency, so we have to divide by p to convert to units of domestic expenditure. Hence, we have

$$NX = \frac{1}{p}m^*a^* - ma \tag{4}$$

hence, using (4) into (3) we have

$$\begin{aligned} a^* - y^* &= p\left(\frac{1}{p}m^*a^* - ma\right) &(5)\\ &= m^*a^* - pma &(6)\end{aligned}$$

Some tedious algebra is now needed. Notice that from (2) we can write $py = pa + (a^* - y^*)$. But we can substitute for $a^* - y^*$ using (6) yielding:

$$py = pa + m^*a^* - pma$$

or

$$py = pa\,(1 - m) + m^*a^* \tag{7}$$

now collect the terms with p,

$$\begin{aligned} py - pa(1-m) &= m^*a^*\\ py + pam - pa &= m^*a^*\end{aligned}$$

or

$$p\,[y + a(m-1)] = m^*a^* \tag{8}$$

We can now substitute for a^* in expression (8) since from (3) we know that $a^* = y^* + p(y - a)$, so we can write (7) as

$$p\,[y + a(m-1)] = m^*\,[y^* + p(y-a)] \tag{9}$$

collecting terms with p on the LHS we have $p\,[y + a(m-1)] - m^*p(y-a) = m^*y^*$ or

$$p\,[y + a(m-1)] - m^*py + m^*pa = m^*y^*$$

or

$$p\left[y(1-m^*)+a(m+m^*-1)\right]=m^*y^*$$

Thus we have

$$p=\frac{m^*y^*}{D} \tag{10}$$

where $D \equiv \left[y(1-m^*)+a(m+m^*-1)\right]$. Expression (10) is what we are after. It tells us how p varies with a, and how the presence of home bias, $m+m^*<1$ impacts the result.

So if there is home bias we have $m+m^*<1$, so if a rises D falls. Home bias means that the coefficient on a in D is negative. So when a rises D falls in expression (10). Hence, p must rise. Thus combinations of a and p that keep the world supply and demand for goods in balance must be upwards sloping. We have the UU curve in figure 2. If we start with the trade balance given by TT_0 and p_0, suppose that domestic expenditure is reduced. This shifts the TT curve to the left. Given UU, we see that the relative price of domestic goods must fall (the real exchange rate must rise).

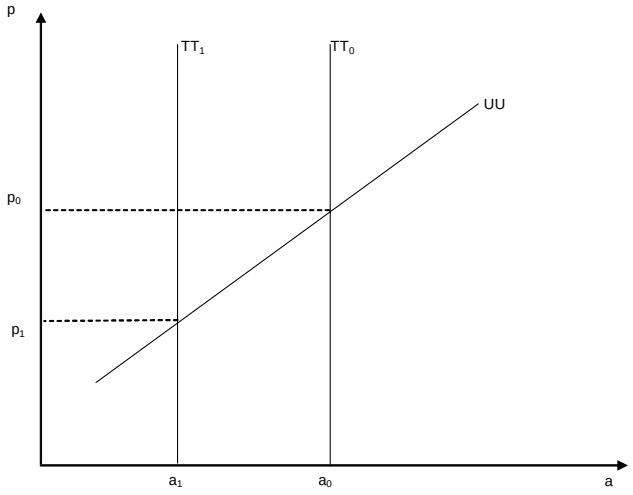

Figure 2: Real Depreciation

We are quite used to hearing politicians demand that foreigners expand their economies. We can now see why. Suppose that y^* increases. From expression (10) we can see that p would be higher for every value of a; in other words, the UU curve shifts upwards in figure 2. Hence, if foreign

output rises as domestic expenditure falls then the dollar does not need to depreciate. That makes sense, not all the rise in foreign output will be purchased by foreigners. So there will be an excess supply of foreign goods, which will depress their relative price, offsetting the pressure on p to rise.

What has happened? With lower expenditure net exports must rise by virtue of the accounting identity. So net exports in the rest of the world must fall by the same amount. There is a redistribution of spending globally. How does this come about? World income has not changed (assume) so that means that row expenditure must have risen by the amount it fell in the US. But the row only spends $m^* < 1$ on US goods. So there will be an excess supply of our exports. The relative price of our goods must fall so that foreigners increase their expenditure on them. This is because of home bias. So the relative price of domestic goods must fall. That is why we have $p_1 < p_0$ in figure 2.

To see this more clearly, suppose that US output falls by Δa then (assume $p = 1$, initially) $\Delta a^* = -\Delta a$. Since we spend only m on imports, the fall in expenditure increases the supply of our goods in the world market by $(1 - m)\Delta a$, since this is the amount of stuff we used to buy that we are now trying to export. The rest of the world is spending more, but only m^* of this is on our goods, so demand rises by $\Delta a^* m^*$. Hence, the excess demand for US exports changes by

$$m^* \Delta a^* + (1 - m)\Delta a$$

and given the assumption that $\Delta a^* = -\Delta a$, this is just equal to

$$= \Delta a(1 - m - m^*)$$

It thus follows that if $m + m^* < 1$ the excess demand for US goods falls, and so its price must fall. If there was no home bias, on the other hand, if $m + m^* = 1$, then the fall in the demand for US exports would be zero, and no change in the relative price is required.

One more point. Suppose that the economy becomes more closed. That means that UU becomes more steep. This follows because as $m + m^*$ gets smaller the effect of a given change in a on D is larger, so from (10) the change in p is larger. This follows because more closed means we purchase less imports, so $m+m^*$ gets smaller. With a steeper UU the required change in the real exchange rate is larger for any reduction in the trade balance.

Return now to the absence of home bias. What does this mean? If domestic and foreign goods are perfect substitutes it means that all goods

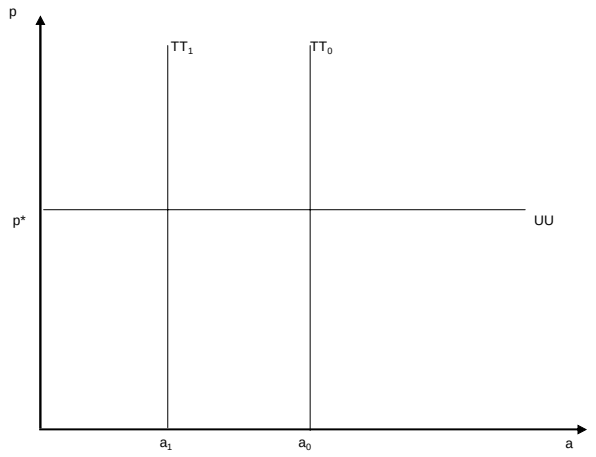

Figure 3: No Home Bias

are tradable. Notice, however, that if $m + m^* = 1$ then p is independent of a. In this case UU is horizontal in $p-a$ space. This case is given in figure 3, with a horizontal UU curve. If all goods are tradable we know the real exchange rate should not change due to PPP. There is only one consumer basket for all countries so we do not require a relative price change to shift expenditure from domestic to foreign goods. An interest rate change is sufficient. But if the consumption baskets differ then relative price changes – i.e., the real exchange rate – must shift to alter the composition of expenditure towards domestic goods.

0.1 Final Point

A final point for now. Some, such as Alan Greenspan argue that correcting US CA deficits will not require large dollar depreciation because capital markets are highly integrated – the Feldstein-Horioka puzzle has disappeared. But this misses the point. Even if capital markets are fully integrated the real exchange rate must change if goods markets are not fully integrated. That is the point of this note. If there was no home bias, or more generally, if we had a one-good economy there would be no need for relative price adjustment. But with non-traded goods and home bias we do.

The impact of capital-market integration is on the amount we can borrow

to finance CA deficits. Thus, it effects the timing of when the dollar will depreciate. How much the dollar must decline in real terms depends on how easy it is to increase net exports. This depends on the terms of trade and on how much of US production consists of non-tradables, and likewise for the rest of the world. The simplest way to think about it is that we cannot export non-tradable goods, so the larger the share of US production that is non-tradeable, the greater the change in relative prices needed to shift production that way. But our increase in net exports means less net exports in the rest of the world, so the impact on them depends on how easy it is for them to shift to more non-tradables. This note deals with this in a very simple way, but hopefully some of the point is clear.

It is important to understand the message here. What we have seen is that for the current account to improve the dollar must depreciate in real terms. This does not mean real dollar depreciation will cause the current account to improve. That is a different question (which was discussed in the answer key to midterm 2). Real depreciation can lead to a current account improvement only if it results in more savings relative to investment. If it does not, the dollar could depreciate and the current account deficit could remain. Here we answered the opposite question: whether savings can rise relative to investment without the dollar having to depreciate. It is important to understand why these are different questions.