Notes on the Elasticities Approach

Let the US be the home country, and the foreign country be Japan. As noted on page 295 of Caves, et al. (2007), $TB^*$, in units of foreign currency, e.g., yen (¥), is given by:

$$TB^* = \frac{\bar{P}}{E} \times EX - \bar{P}^* \times IM$$

(where $EX$ is the same as the $X$ in the textbook, and $IM$ is the same as the $M$ in the textbook). Overbars indicate fixed values. Multiply both sides by $E$, and divide by $P$, to obtain:

$$\frac{E \times TB^*}{P} = \frac{TB}{P} = EX - \left( \frac{E \bar{P}^*}{P} \right) \times IM$$

$TB$ is the trade balance in nominal domestic currency terms; $TB/P$ is the trade balance denominated in US widgets. Define the trade balance ($TB\tilde{}$) in domestic widget terms as the difference between exports ($EX$) denominated in US widgets and imports ($IM'$) denominated in US widgets:

$$\frac{TB}{P} \equiv TB\tilde{} = EX - IM'$$

However, imports are the foreign (*) country's exports, so:

$$IM' = (E \bar{P}^* / \bar{P}) \times EX^* \equiv qEX^*$$

where $q$ is a real exchange rate, measured in terms of number of home widgets needed to purchase one foreign widget. Then the trade balance is functionally defined as:

$$TB\tilde{} = EX - qEX^*$$

(As in the textbook, we take the income levels as exogenously fixed.) To determine the response of the trade balance to a change in the real exchange rate, take the partials with respect to the real exchange rate:
\[
\frac{\partial \tilde{TB}}{\partial q} = \frac{\partial EX}{\partial q} - \left( q \cdot \frac{\partial EX^*}{\partial q} + EX^* \right)
\]
\[
\frac{\partial \tilde{TB}}{\partial q} = \left( \frac{\partial EX}{\partial q} - q \cdot \frac{\partial EX^*}{\partial q} \right) - EX^*
\]
\[
\frac{\partial \tilde{TB}}{\partial q} = (\text{volume effect}) + (\text{value effect})
\]

One wants to know if \( \frac{\partial \tilde{TB}}{\partial q} \) is greater than or less than zero. Solve for:

\[
0 < \frac{\partial EX}{\partial q} - q \cdot \frac{\partial EX^*}{\partial q} - EX^*
\]

(6)

Multiply both sides by the quantity \((q/EX)\) to obtain:

\[
0 < \frac{\partial EX}{\partial q} \cdot \frac{q}{EX} - q \cdot \frac{\partial EX^*}{\partial q} \cdot \frac{q}{EX} - EX^* \cdot \frac{q}{EX}
\]

(7)

Define the first term as \( \varepsilon_{EX} \), the export supply elasticity. Further note that if initial trade is balanced, then \( EX = qEX^* \) such that \( q/EX = 1/EX^* \).

\[
0 < \varepsilon_{EX} - \frac{\partial EX^*}{\partial q} \cdot \frac{q}{EX^*} - 1
\]

(8)

Finally, define the import elasticity:

\[
- \frac{\partial EX^*}{\partial q} \cdot \frac{q}{EX^*} \equiv \varepsilon_{IM}
\]

then one obtains the Marshall-Lerner-Robinson condition:

\[
1 < \varepsilon_{IM} + \varepsilon_{EX}
\]

(9)

which is appropriate for export demand and import supply elasticities that are infinite.

Caveats:

1. What if export demand and import supply elasticities are not infinite?
2. What if initial trade is not balanced?
3. Recall, prices of exports are fixed in domestic currency terms; prices of the foreign country’s exports are fixed in foreign currency terms.

Pa854_elasticity_s09.doc
1.2.2009