

Notes on the Elasticities Approach

(corrected 3/27/05)

As noted on page 303 of Caves, et al. (2002), TB^* , in units of foreign currency, e.g., yen (¥), is given by:

$$TB^{*\text{¥}} = (P/E) \times EX - P^* \times \hat{IM} \quad (0)$$

(where EX is the same as the X in the textbook, and \hat{IM} , in Japanese widgets) is the same as the M in the textbook). Multiply both sides by E , and divide by P , to obtain:

$$\frac{E \times TB^{*\text{¥}}}{P} = \frac{TB}{P} = EX - \left(\frac{EP^*}{P}\right) \times \hat{IM} \quad (1)$$

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

$$\frac{TB}{P} \equiv T\tilde{B} = EX - IM \quad (2)$$

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

$$IM = (EP^*/P) \times EX^* \equiv qEX^* \quad (3)$$

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:

$$T\tilde{B} = EX - qEX^* \quad (4)$$

(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:

$$\frac{\partial \tilde{T\bar{B}}}{\partial q} = \frac{\partial EX}{\partial q} - \left(q \frac{\partial EX^*}{\partial q} + EX^* \right)$$

$$\frac{\partial \tilde{T\bar{B}}}{\partial q} = \left(\frac{\partial EX}{\partial q} - q \frac{\partial EX^*}{\partial q} \right) - EX^* \quad (5)$$

$$\frac{\partial \tilde{T\bar{B}}}{\partial q} = (\text{volume effect}) + (\text{value effect})$$

One wants to know if $\partial \tilde{T\bar{B}} / \partial q$ is greater than or less than zero. Solve for:

$$0 < \frac{\partial EX}{\partial q} - q \frac{\partial EX^*}{\partial q} - EX^* \quad (6)$$

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

$$0 < \frac{\partial EX}{\partial q} \frac{q}{EX} - q \frac{\partial EX^*}{\partial q} \frac{q}{EX} - EX^* \frac{q}{EX} \quad (7)$$

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

$$0 < \varepsilon_{EX} - \frac{\partial EX^*}{\partial q} \frac{q}{EX^*} - 1 \quad (8)$$

Finally, define the import elasticity:

$$- \frac{\partial EX^*}{\partial q} \frac{q}{EX^*} \equiv \varepsilon_{IM}$$

then one obtains the Marshall-Lerner-Robinson condition:

$$1 < \varepsilon_{IM} + \varepsilon_{EX} \quad (9)$$

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

Caveats:

1. What if export supply and import supply elasticities are not infinite.
2. What if initial trade is not balanced.