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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:

$$TB^{*¥} = (\overline{P} / E) \times EX - \overline{P}^* \times IM \tag{0}$$

(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:

$$\frac{E \times TB^{*¥}}{\overline{P}} = \frac{TB}{P} = EX - \left(\frac{E\overline{P}^*}{P}\right) \times IM \tag{1}$$

TB is the trade balance in nominal domestic currency terms; *TB*/*P* is the trade balance denominated in US widgets. Define the trade balance ($T\widetilde{B}$) in domestic widget terms as the difference between exports (*EX*) denominated in US widgets and imports (*IM'*) denominated in US widgets:

$$\frac{TB}{\overline{P}} \equiv T\widetilde{B} = EX - IM' \tag{2}$$

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

$$IM' = (E\overline{P}^* / \overline{P}) \times EX^* \equiv qEX^* \tag{3}$$

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:

$$T\widetilde{B} = EX - qEX^* \tag{4}$$

(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:

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

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

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

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

$$0 < \frac{\partial EX}{\partial q} - q\frac{\partial EX^*}{\partial q} - EX^* \tag{6}$$

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

$$0 < \frac{\partial EX}{\partial q}\frac{q}{EX} - q\frac{\partial EX^*}{\partial q}\frac{q}{EX} - EX^*\frac{q}{EX} \tag{7}$$

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

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

Finally, define the import elasticity:

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

then one obtains the Marshall-Lerner-Robinson condition:

$$1 < \varepsilon_{IM} + \varepsilon_{EX} \tag{9}$$

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.