Public Affairs 854
Spring 2006
University of Wisconsin-Madison

Menzie D. Chinn
Social Sciences 7418

Notes on the Elasticities Approach (corrected)

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

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

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

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

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

$$\frac{TB}{P} \equiv \widetilde{TB} = EX - IM \tag{2}$$

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

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

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:

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

(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:

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

$$\frac{\partial \tilde{TB}}{\partial q} = \left(\frac{\partial EX}{\partial q} - q \frac{\partial EX^*}{\partial q} \right) - EX^* \qquad (5)$$

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

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

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

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

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

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

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

Finally, define the import elasticity:

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

then one obtains the Marshall-Lerner-Robinson condition:

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

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?

Pa854_elasticity_s06.doc
20.1.2006, rev. 30.1.2006