

Equilibrium on the currency market
– *elasticity approach,*
Marshall-Lerner condition

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Agenda for today: Marshall-Lerner condition

- Marshall-Lerner condition
 - assumptions
 - Impact of devaluation / depreciation of the national currency on trade
 - Trade balance in national currency
 - Trade balance in foreign currency
 - Curve 'J,'
 - Based on: Caves R., Frankel J., Jones R., *World Trade and Payments: An Introduction*

Marshall-Lerner condition: assumptions of the analysis

- Many models discussed so far: our trade balance depends on the exchange rate; positive correlation between E and trade balance (with direct quotation)
- **Our research question:** when will the depreciation of the national currency improve the trade balance?
- Key role of demand elasticities – for foreign goods in domestic country and for domestic goods abroad!

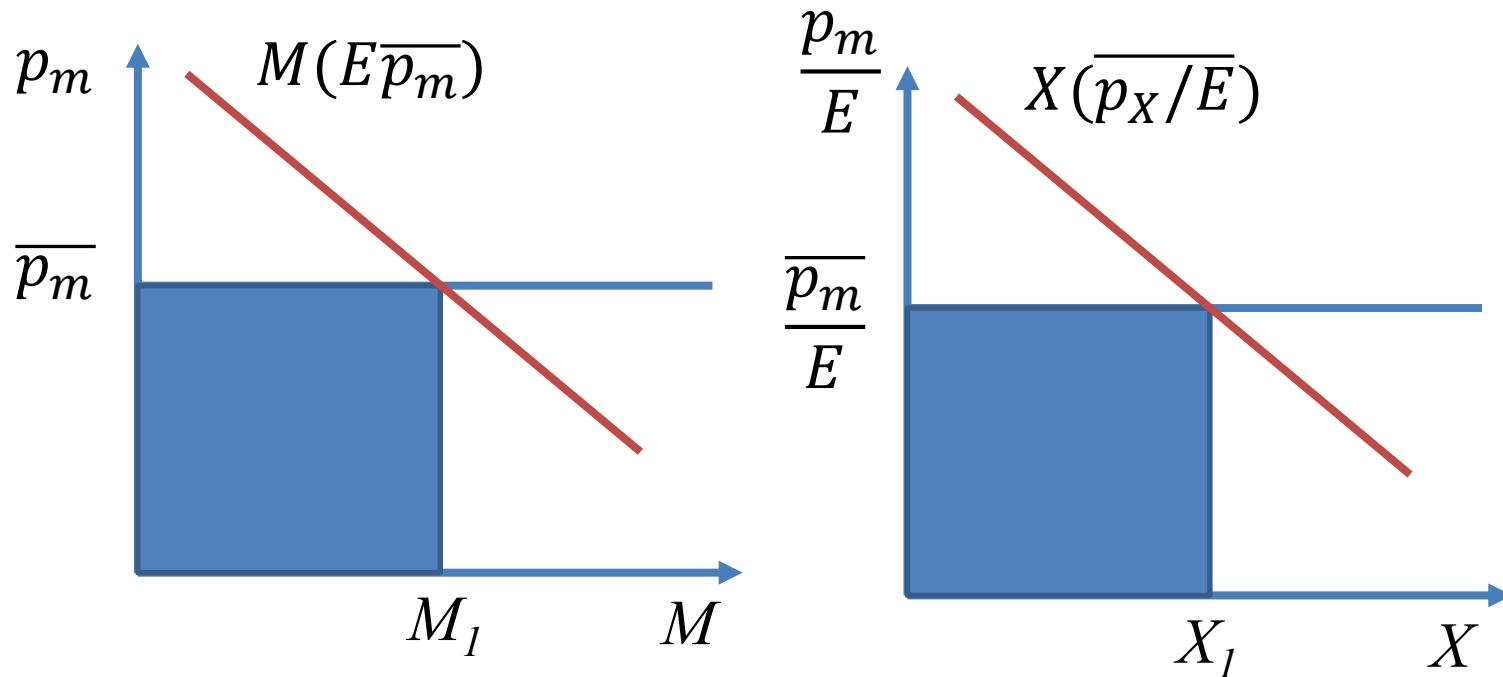
Marshall-Lerner condition: assumptions of the analysis

- **Assumptions of the analysis:**
- We **ignore capital flows** - we identify balance of payments with the trade balance
- **Income is constant** (the impact of the change in income on the demand for domestic and foreign goods is ignored)
- **Consumers** buying domestic or imported goods are driven by prices expressed in their **national currency**
- The supply of domestic and foreign goods is **perfectly flexible**, which means that export price in domestic currency and import price in foreign currency are constant (Keynesian case).

Impact of devaluation / depreciation of the national currency on trade balance

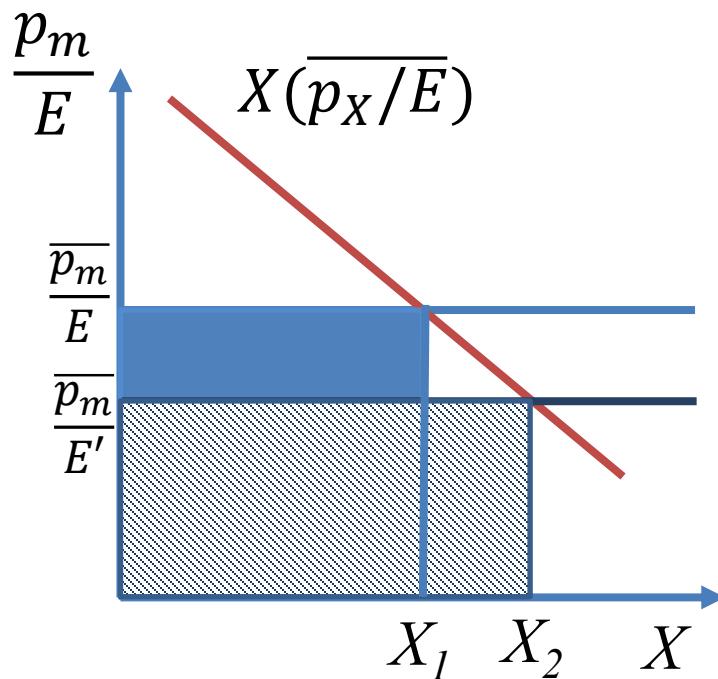
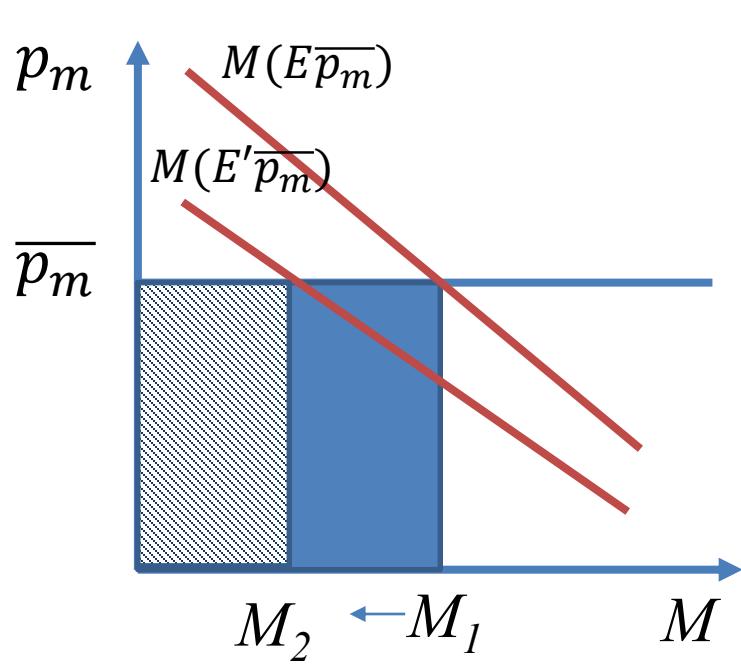
- Notation:
 - $M(E)$ – imports volume,
 - $X(E)$ – exports volume,
 - p_m - price of imported good in foreign currency (determined by producer),
 - p_x - price of exported good in domestic currency (determined by producer),
- So production depends only on the demand:
 - $M(E) = M_D(Ep_m)$
 - $X(E) = X_D(p_x/E)$
- Trade balance in domestic currency $p_x X(E) - Ep_m M(E)$
- Trade balance in foreign currency: $(p_x X(E))/E - p_m M(E)$

Value of imports and exports in foreign currency



- Trade balance in foreign currency: $(p_x X(E))/E - p_m M(E)$

Value of imports and exports in foreign currency



- Trade balance in foreign currency: $(p_x X(E))/E - p_m M(E)$

Impact of devaluation / depreciation of the national currency on trade balance

- The relative price of foreign goods is rising - the demand of domestic consumers for imported goods are falling, i.e. imports are falling (M)
- Domestic goods at foreign prices are cheaper - the demand for domestic goods is increasing abroad - exports are growing (X)
- **CHANGES IN VALUES in foreign currency:**
- Change in import expenditure in foreign currency: $p_m M (E)$ – **decrease** (constant price, but smaller quantity)
- Change in export revenues in foreign currency: $p_x X (E) / E$ – **ambiguous effect** (bigger quantity, but smaller unit revenue)
- Effect for trade balance: **ambiguous effect**

Impact of devaluation / depreciation of the national currency on trade balance

- Alternative approach
- **CHANGES IN VALUES** in domestic currency:
- Change in import expenditure in national currency: $Ep_m M (E)$ – ambiguous effect
- Change in export revenues in national currency: $p_x X (E)$ - increase
- Effect for trade balance: **ambiguous effect**

- **SO: WHEN DEPRECIATION OF DOMESTIC CURRENCY RESULTS IN IMPROVEMENT OF TRADE BALANCE?**

Trade balance in domestic currency

- Trade balance:

$$B = p_x X(E) - E p_m M(E)$$

- We differentiate the above expression over E :

$$\frac{dB}{dE} = p_x \frac{dX(E)}{dE} - p_m \left(M(E) + E \frac{dM(E)}{dE} \right) > 0$$

- We divide both sides by $p_m M(E)$:

$$\frac{dB}{dE} = \frac{p_x}{p_m M(E)} \frac{dX(E)}{dE} - 1 - \frac{E}{M(E)} \frac{dM(E)}{dE} > 0$$

- Now let's define:

$$\varepsilon_m \equiv - \frac{E}{M(E)} \frac{dM(E)}{dE}$$

Trade balance in domestic currency

$$\frac{dB}{dE} = \frac{p_x X(E)}{Ep_m M(E)} \frac{E}{X(E)} \frac{dX(E)}{dE} + \varepsilon_m > 1$$

- Let's define again:

$$\varepsilon_x \equiv \frac{E}{X(E)} \frac{dX(E)}{dE}$$

- Then the above condition may be expressed:

$$\frac{p_x X(E)}{Ep_m M(E)} \varepsilon_x + \varepsilon_m > 1$$

Trade balance in domestic currency

$$\frac{p_x X(E)}{E p_m M(E)} \varepsilon_x + \varepsilon_m > 1$$

- Now, let's define:

$$\alpha = \frac{p_x X(E)}{E p_m M(E)}$$

- So, we may conclude, that depreciation will improve trade balance (expressed in domestic currency) when:

$$\alpha \varepsilon_x + \varepsilon_m > 1$$

Trade balance in domestic currency

$$\alpha \varepsilon_x + \varepsilon_m > 1$$

- α may be interpreted as a measure of trade balance equilibrium. If we have trade balance in equilibrium, then $\alpha = 1$.
- So with initial equilibrium in trade balance, depreciation will improve it, when

$$\varepsilon_x + \varepsilon_m > 1$$

- This condition is called Marshall-Lerner Condition

Trade balance in foreign currency

- We define trade balance as:

$$B^* = \frac{p_x}{E} X(E) - p_m M(E)$$

- We need to differentiate both sides over E and divide both sides by $p_x \frac{1}{E^2 X(E)}$
- Keeping our previous definitions of ε_x and ε_m , we will get:

$$\varepsilon_x + \frac{1}{\alpha} \varepsilon_m > 1$$

Conditions for improvement of trade balance resulting from depreciation of home currency

- Condition for improvement of trade balance expressed in domestic currency:

$$\alpha \varepsilon_x + \varepsilon_m > 1$$

- Condition for improvement of trade balance expressed in foreign currency:

$$\varepsilon_x + \frac{1}{\alpha} \varepsilon_m > 1$$

- With $\alpha = 1$, both conditions are simplified to:

$$\varepsilon_x + \varepsilon_m > 1$$

Marshall-Lerner condition

How about initial disparity in trade balance?

- The real condition for improving the trade balance expressed the national currency:

$$\alpha \varepsilon_x + \varepsilon_m > 1$$

- Condition M-L:

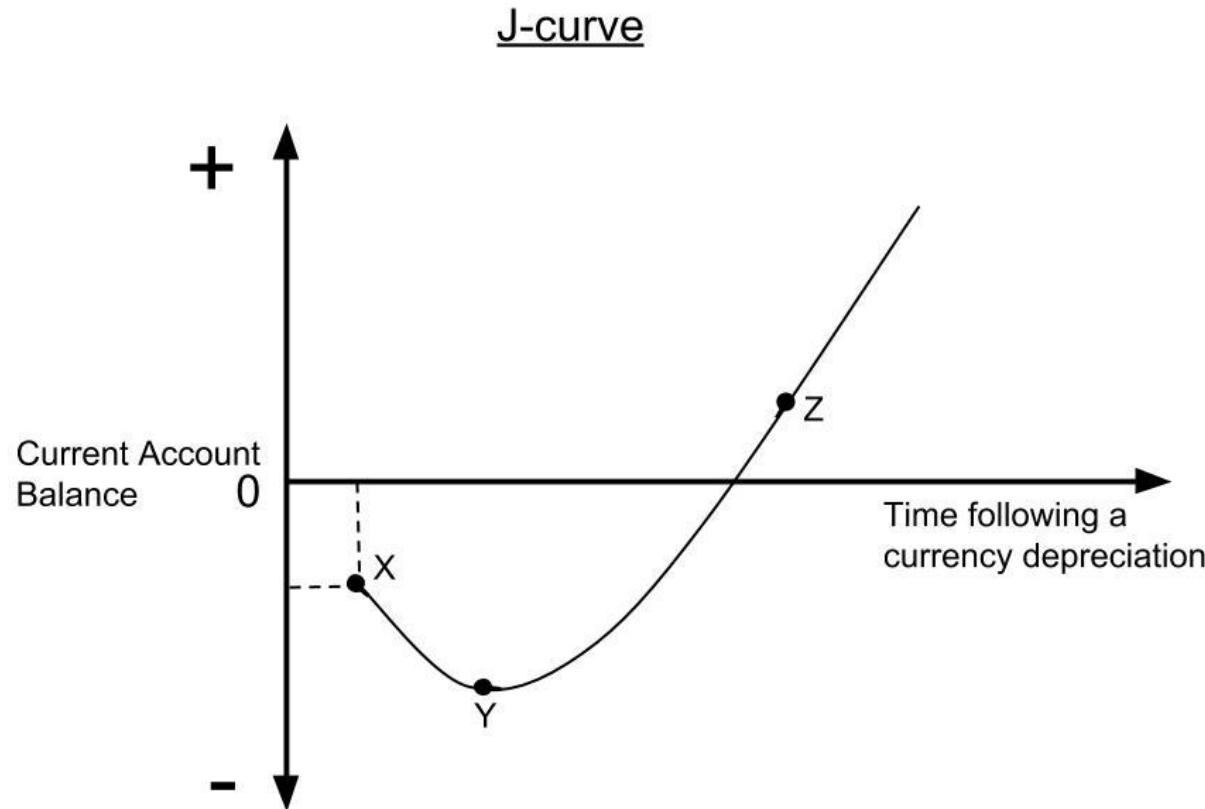
$$\varepsilon_x + \varepsilon_m > 1$$

- If the trade balance initially shows a deficit, then $\alpha < 1$. This means that the Marshall-Lerner condition is too weak a condition for improving the balance.
- Example: let $\alpha = 0.8$, $\varepsilon_x = 0.9$, $\varepsilon_m = 0.2$. The M-L condition is of course met, but the real condition is not: $0.8 \times 0.9 + 0.2 < 1$!

Trade elasticity in practice

- Hooper P., Johnson K. H., Marquez J. Trade Elasticities for G-7 Countries (1998). FRB International Finance Discussion Paper No. 609.
- Quarterly data for G-7 countries, 1950-1996

J-curve



Explanation of the J-curve

- Although short-term elasticities are low, they are higher in the long term
- Consumers need time for substitution
- Long-term contracts - fixed delivery price
- "Pricing to market" - reducing the price of exported goods in national currency so that the price in foreign currency is constant - lower profits, but preserved market share

Marshall-Lerner condition: ax example

- The US exports 10 million pants to Germany at a price of USD 10 a piece and imports 2 million pots at a price of EUR 50 per one pot. Let's assume that initially the EUR / USD exchange rate is 1. How will the 10% depreciation of the dollar against the euro affect the US trade balance?
- New rate after depreciation: USD 1 costs EUR 0.9, i.e. EUR 1 costs USD 1.111.

	Initially	After depreciation			
	ε_x	0	$\frac{1}{2}$	$\frac{3}{4}$	1
	ε_m	0	0	$\frac{3}{5}$	$\frac{1}{2}$
$X(E)$	10 m	10 m	10.5 m	10.75 m	11 m
$M(E)$	2 m	2 m	2 m	1.87 m	1.89 m
p_x	10	10	10	10	10
Ep_m	50	55.56	55.56	55.56	55.56
$p_x X(E)$	100 m	100 m	105 m	107.5 m	110 m
$Ep_m M(E)$	100 m	111.1 m	111.1 m	103.9 m	105 m
B	0	-11.1 m	-6.1 m	+3.6 m	+5.0 m