International Monetary Economics

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Introduction

Chapter 17
Output and the Exchange Rate in the Short Run

Outline

Introductory remarks

- We will only look at the *"long term"* version of the model presented in KOM and will only consider *permanent* policy changes.
- We will exclude the temporary changes. Maybe, when reading the book chapter it will be necessary to also read the temporary parts.

The net exports function (NX)

$$Y = C + I + G + EX - IM$$

$$NX = EX\left(\frac{E \cdot P^*}{P}, Y^*\right) - IM\left(\frac{E \cdot P^*}{P}, Y\right)$$

$$NX = NX_0 - NX_1 Y + NX_2 Y^* + NX_3 \frac{E \cdot P^*}{P}$$

Equations of the model

$$(1)\quad Y = c_0 + c_1(Y - T) + b_0 - b_2 R + G + NX_0 - NX_1 Y + NX_2 Y^* + NX_3 \frac{E \cdot P^*}{P}$$

Goods market equilibrium condition

$$(2)\qquad \frac{M}{P} = d_0 + d_1 Y - d_2 R$$

Money market equilibrium condition

$$(3)\qquad R = R^*$$

UIP-Condition, complete capital mobility, small country assumption

Numerical example: $c_1 = 0.6$ and $NX_1 = 0.1$

- In case that Y increases by 1 EUR
  - private saving is up by 40 Cents $(1 - c_1 = 0.4)$ and
  - consumption is up by 60 Cents $(c_1 = 0.6)$
- Consumers demand domestic goods and foreign goods.
- By how much does demand for domestic goods increase?
- In case that Y increases by 1 EUR, demand for foreign goods is up by 10 Cents $(NX_1 = 0.1)$:
- Therefore, we can compute that demand for domestic goods (IMPORTS!) is up by 60 Cents minus 10 Cents = 50 Cents $(c_1 - NX_1 = 0.6 - 0.1 = 0.5)$.

Parameters

- c_1: Marginal propensity to consume
- b_2: Interest rate responsiveness of investments
- NX_1: Income responsiveness of net exports
- NX_2: Foreign income responsiveness of net exports
- NX_3: Real exchange rate responsiveness of net exports
- d_1: Income responsiveness of real money demand
- d_2: Interest rate responsiveness of real money demand

Variables

Endogenous variables:

- Y: Domestic GDP-level, Income, Output
- R: Domestic interest rate
- E: Nominal exchange rate (in a floating exchange rate system)

Exogenous variables:

- c_0: Autonomous component of consumption
- b_0: Autonomous component of investments
- NX_0: Autonomous component of net exports
- d_0: Autonomous component of money demand
- T: Taxes
- G: Government expenditures
- M: Money supply
- R^*: Foreign interest rate
- P: Domestic price level
- P^*: Foreign price level

The slope of the ISZZ-curve

$$Y = c_0 + c_1(Y - T) + b_0 - b_2 R + G + NX_0 - NX_1 Y + NX_2 Y^* + NX_3 \frac{E \cdot P^*}{P}$$

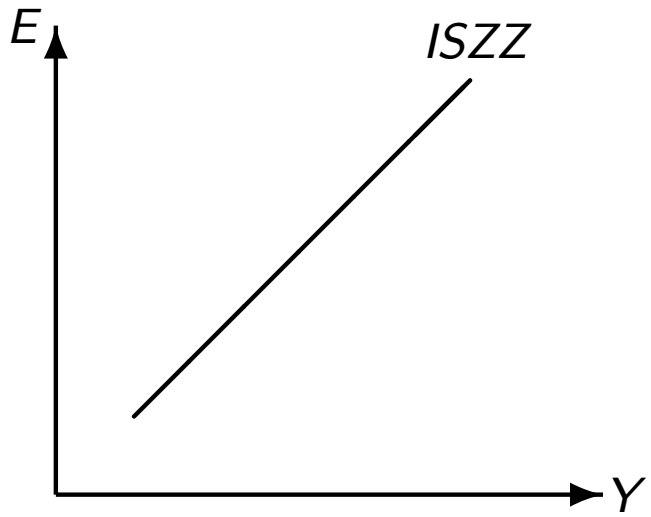
$$\boxed{R = R^*, \quad P = P^* = 1}$$

$$(4) \quad Y = c_0 + c_1(Y - T) + b_0 - b_2 R^* + G + NX_0 - NX_1 Y + NX_2 Y^* + NX_3 E$$

$$NX_3 E = Y - c_0 - c_1(Y - T) - b_0 + b_2 R^* - G - NX_0 + NX_1 Y - NX_2 Y^*$$

$$E = \frac{(1 - c_1 + NX_1)Y - c_0 + c_1 T - b_0 + b_2 R^* - G - NX_0 - NX_2 Y^*}{NX_3}$$

The goods market equilibrium condition: The ISZZ-curve



Slope of the ISZZ-curve in the exchange rate-income diagram:

$$\left.\frac{dE}{dY}\right|_{ISZZ} = \frac{1 - c_1 + NX_1}{NX_3} > 0$$

Shifts of the ISZZ-curve

$$Y = c_0 + c_1(Y - T) + b_0 - b_2 R^* + G + NX_0 - NX_1 Y + NX_2 Y^* + NX_3 \frac{E \cdot P^*}{P}$$

- The ISZZ-curve shifts to the right, if a variable changes that causes an increase in demand for goods.
- ISZZ to the right if: $c_0 \uparrow$, $T \downarrow$, $b_0 \uparrow$, $R^* \downarrow$, $G \uparrow$, $NX_0 \uparrow$, $Y^* \uparrow$.
- The ISZZ-curve does not shift if the exchange rate or the output level change, because these variables are displayed on the vertical/horizontal axis.

The slope of the LMZZ-curve

$$\frac{M}{P} = d_0 + d_1 Y - d_2 R$$

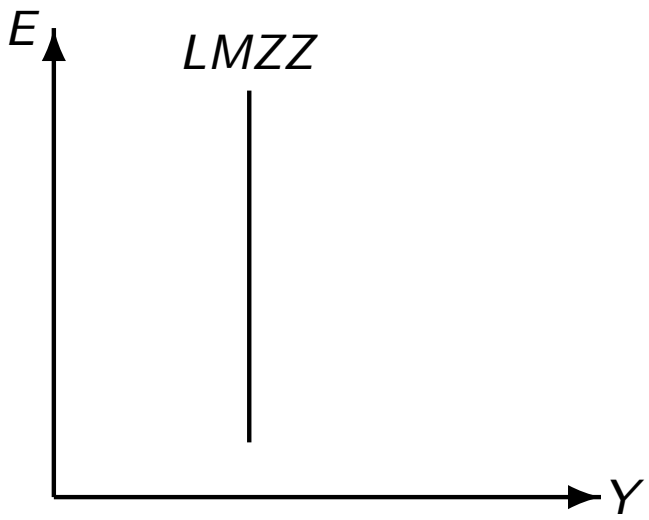
- $P = 1 \qquad M = d_0 + d_1 Y - d_2 R$

$$\boxed{R = R^*}$$

(5) $$M = d_0 + d_1 Y - d_2 R^*$$

- Does not depend on the exchange rate $\rightarrow$ LMZZ-curve is a vertical line

The money market equilibrium condition: The LMZZ-curve



Shifts of the LMZZ-curve

$$\frac{M}{P} = d_0 + d_1 Y - d_2 R^*$$

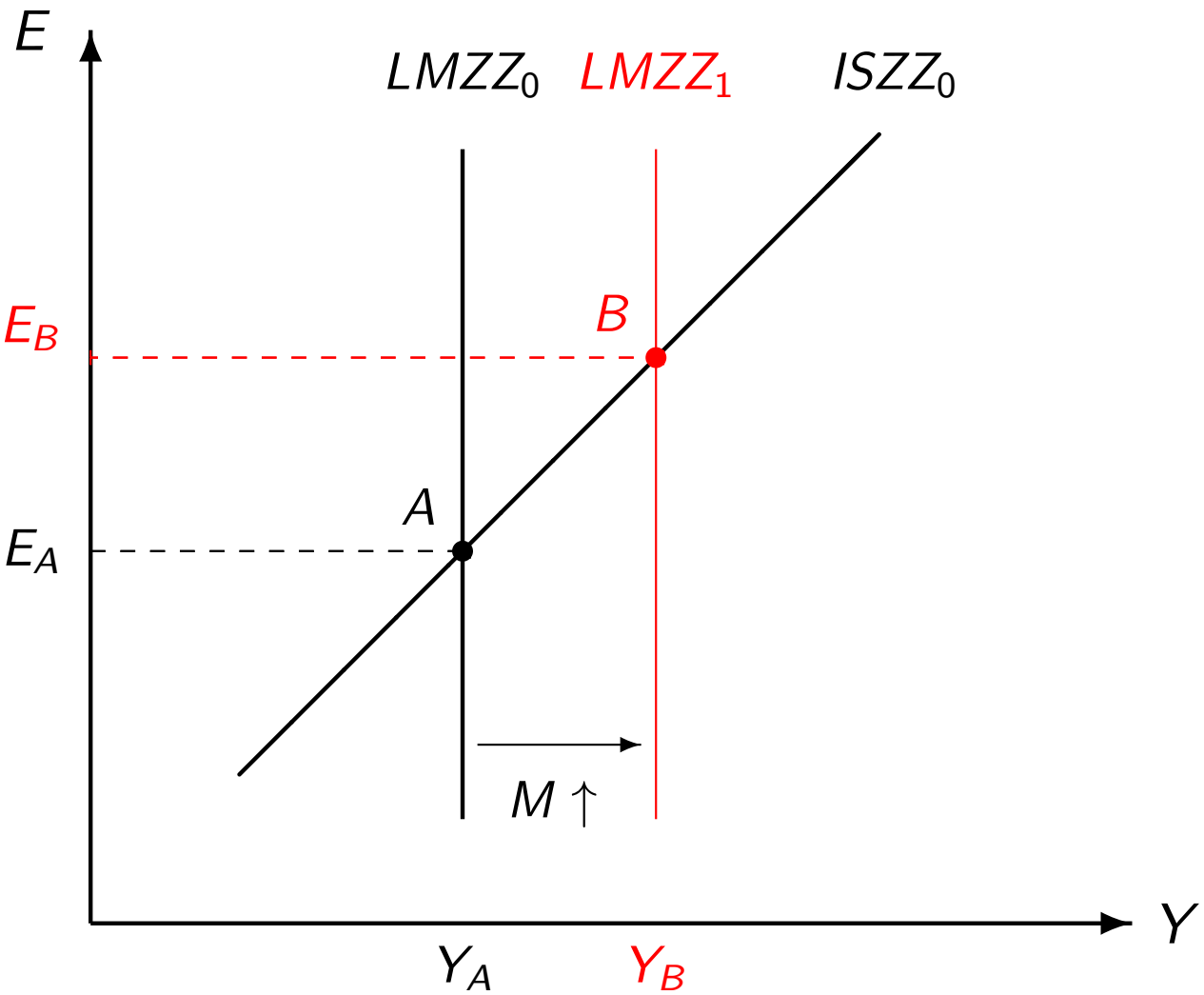
- If nominal money supply increases ($M \uparrow$),
- or the good price level decreases ($P \downarrow$),
- or the autonomous component of money demand decreases ($d_0 \downarrow$)
- or the foreign interest rate increases ($R^* \uparrow$)

the LMZZ-curve has to shift to the right.

- The LMZZ-curve does not shift if the exchange rate or the output level change.

Outline

Permanent increase in money supply



Matrix notation

$$(4a) \quad Y = c_0 + c_1(Y - T) + b_0 - b_2 R^* + G + NX_0 - NX_1 Y + NX_2 Y^* + NX_3 E$$

$$(5a) M = d_0 + d_1 Y - d_2 R^*$$

- We want to write the equations in matrix notation and sort the variables in a way that the endogenous variables are collected on the LHS and the exogenous variables are collected on the RHS.

$$\begin{aligned} Y - c_1 Y + NX_1 Y \quad -NX_3 E &= \quad c_0 - c_1 T + b_0 - b_2 R^* + G + NX_0 + NX_2 Y^* \\ d_1 Y \qquad\qquad\quad &= \quad M - d_0 + d_2 R^* \end{aligned}$$

Matrix notation

$$\begin{aligned} Y - c_1 Y + NX_1 Y \quad -NX_3 E &= \quad c_0 - c_1 T + b_0 - b_2 R^* + G + NX_0 + NX_2 Y^* \\ d_1 Y \qquad\qquad\quad\ \ &= \quad M - d_0 + d_2 R^* \end{aligned}$$

In matrix notation:

$$\begin{bmatrix} 1 - c_1 + NX_1 & -NX_3 \\ d_1 & 0 \end{bmatrix} \begin{bmatrix} Y \\ E \end{bmatrix} = \begin{bmatrix} c_0 - c_1 T + b_0 - b_2 R^* + G + NX_0 + NX_2 Y^* \\ M - d_0 + d_2 R^* \end{bmatrix}$$

Taking the total differential yields:

$$\begin{bmatrix} 1 - c_1 + NX_1 & -NX_3 \\ d_1 & 0 \end{bmatrix} \begin{bmatrix} dY \\ dE \end{bmatrix} = \begin{bmatrix} dc_0 - c_1 dT + db_0 - b_2 dR^* + dG + dNX_0 + NX_2 dY^* \\ dM - dd_0 + d_2 dR^* \end{bmatrix}$$

Income multiplier after monetary expansion: $dY/dM > 0$?

$$\begin{bmatrix} 1 - c_1 + NX_1 & -NX_3 \\ d_1 & 0 \end{bmatrix} \cdot \begin{bmatrix} dY \\ dE \end{bmatrix} = \begin{bmatrix} 0 \\ dM \end{bmatrix}$$

$$dY = \frac{\begin{vmatrix} 0 & -NX_3 \\ dM & 0 \end{vmatrix}}{\begin{vmatrix} 1 - c_1 + NX_1 & -NX_3 \\ d_1 & 0 \end{vmatrix}} = \frac{[0 \cdot 0] - [dM \cdot (-NX_3)]}{(1 - c_1 + NX_1) \cdot 0 - d_1(-NX_3)} = \frac{dM \cdot NX_3}{d_1 \cdot NX_3}$$

$$\frac{dY}{dM} = \frac{1}{d_1} > 0$$

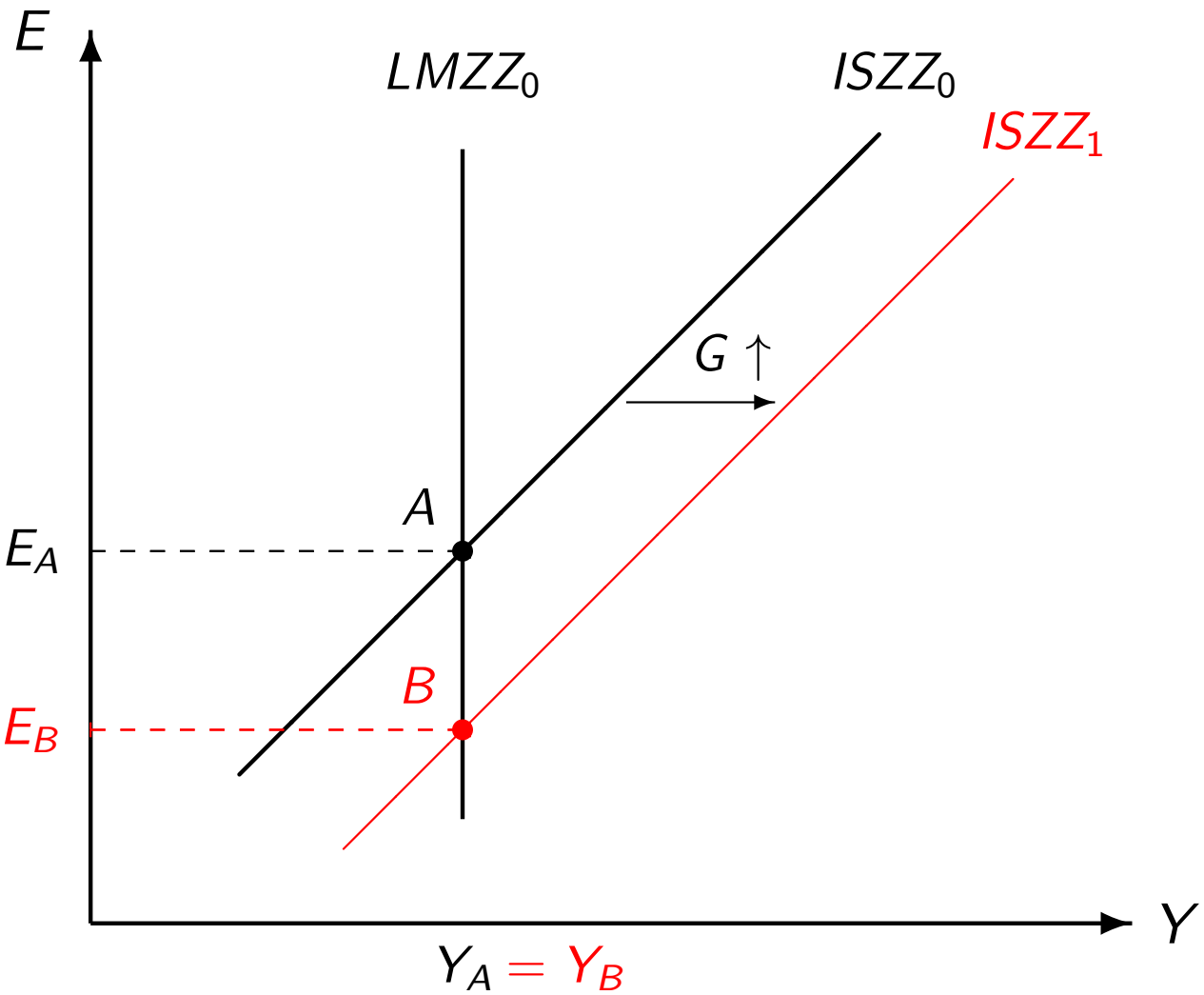
Exchange rate multiplier after monetary expansion: $dE/dM > 0$?

$$dE = \frac{\begin{vmatrix} 1 - c_1 + NX_1 & 0 \\ d_1 & dM \end{vmatrix}}{\begin{vmatrix} 1 - c_1 + NX_1 & -NX_3 \\ d_1 & 0 \end{vmatrix}} = \frac{(1 - c_1 + NX_1) \cdot dM - d_1 \cdot 0}{(1 - c_1 + NX_1) \cdot 0 - d_1(-NX_3)}$$

$$\frac{dE}{dM} = \frac{1 - c_1 + NX_1}{d_1 NX_3} > 0$$

Outline

Effects of a permanent expansionary fiscal policy



Effects of an expansionary fiscal policy

- An increase in government spending leads to an exchange rate induced crowding out effect of net exports.
- No effect on the GDP level.
- Fiscal policy is ineffective to stimulate the economy and to reduce the unemployment rate.
- BUT: fiscal policy is not neutral: The composition of GDP changes.

Income multiplier after fiscal policy: $dY/dG = 0$?

$$\begin{bmatrix} 1 - c_1 + NX_1 & -NX_3 \\ d_1 & 0 \end{bmatrix} \cdot \begin{bmatrix} dY \\ dE \end{bmatrix} = \begin{bmatrix} dG \\ 0 \end{bmatrix}$$

$$dY = \frac{\begin{vmatrix} dG & -NX_3 \\ 0 & 0 \end{vmatrix}}{\begin{vmatrix} 1 - c_1 + NX_1 & -NX_3 \\ d_1 & 0 \end{vmatrix}} = \frac{dG \cdot 0 - 0 \cdot (-NX_3)}{(1 - c_1 + NX_1) \cdot 0 - d_1(-NX_3)}$$

$$\frac{dY}{dG} = 0$$

No income effect!

Complete exchange rate induced crowding-out effect!

Exchange rate multiplier fiscal policy: $dE/dG < 0$?

$$\begin{bmatrix} 1 - c_1 + NX_1 & -NX_3 \\ d_1 & 0 \end{bmatrix} \cdot \begin{bmatrix} dY \\ dE \end{bmatrix} = \begin{bmatrix} dG \\ 0 \end{bmatrix}$$

$$dE = \frac{\begin{vmatrix} 1 - c_1 + NX_1 & dG \\ d_1 & 0 \end{vmatrix}}{\begin{vmatrix} 1 - c_1 + NX_1 & -NX_3 \\ d_1 & 0 \end{vmatrix}} = \frac{(1 - c_1 + NX_1) \cdot 0 - d_1 \cdot dG}{(1 - c_1 + NX_1) \cdot 0 - d_1(-NX_3)}$$

$$\frac{dE}{dG} = -\frac{d_1}{d_1 NX_3} = -\frac{1}{NX_3} < 0$$