

CHAPTER 5

The Open Economy

MACROECONOMICS SIXTH EDITION
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In this chapter, you will learn...

- accounting identities for the open economy
- the small open economy model
 - what makes it "small"
 - how the trade balance and exchange rate are determined
 - how policies affect trade balance & exchange rate

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Trade/GDP ratio, selected countries, 2004
 (Imports + Exports) as a percentage of GDP

Luxembourg	275.5%	Germany	71.1%
Ireland	150.9	Turkey	63.6
Czech Republic	143.0	Mexico	61.2
Hungary	134.5	Spain	55.6
Austria	97.1	United Kingdom	53.8
Switzerland	85.1	France	51.7
Sweden	83.8	Italy	50.0
Korea, Republic of	83.7	Australia	39.6
Poland	80.0	United States	25.4
Canada	73.1	Japan	24.4

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In an open economy,

- spending need not equal output
- saving need not equal investment

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The national income identity in an open economy

$$Y = C + I + G + NX$$

or, $NX = Y - (C + I + G)$

Diagram illustrating the components of the national income identity:

- output** (purple box) points to Y
- domestic spending** (blue box) points to $(C + I + G)$
- net exports** (green box) points to NX

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Trade surpluses and deficits

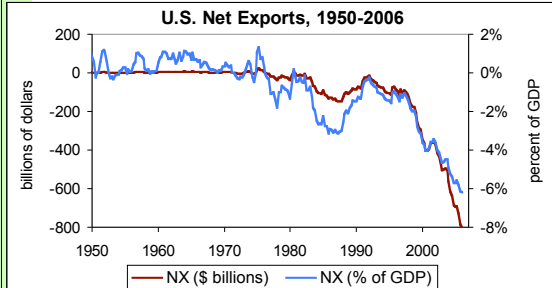
$$NX = EX - IM = Y - (C + I + G)$$

- trade surplus:**
 output > spending and exports > imports
 Size of the trade surplus = NX
- trade deficit:**
 spending > output and imports > exports
 Size of the trade deficit = $-NX$

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U.S. net exports, 1950-2006



International capital flows

- **Net capital outflow**
 $= S - I$
 = net outflow of “loanable funds”
 = net purchases of foreign assets
 the country’s purchases of foreign assets
 minus foreign purchases of domestic assets
- When $S > I$, country is a net lender
- When $S < I$, country is a net borrower

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The link between trade & cap. flows

$$NX = Y - (C + I + G)$$

implies

$$\begin{aligned}
 NX &= (Y - C - G) - I \\
 &= S - I
 \end{aligned}$$

trade balance = net capital outflow

Thus,
 a country with a trade deficit ($NX < 0$)
 is a net borrower ($S < I$).

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Saving and investment in a small open economy

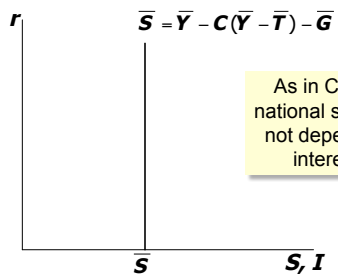
- An open-economy version of the loanable funds model from Chapter 3.
- Includes many of the same elements:
 - production function $Y = \bar{Y} = F(\bar{K}, \bar{L})$
 - consumption function $C = C(Y - T)$
 - investment function $I = I(r)$
 - exogenous policy variables $G = \bar{G}, T = \bar{T}$

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National saving: The supply of loanable funds



As in Chapter 3,
 national saving does
 not depend on the
 interest rate

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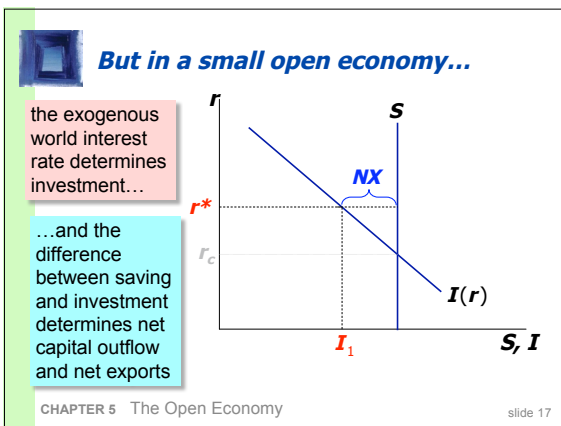
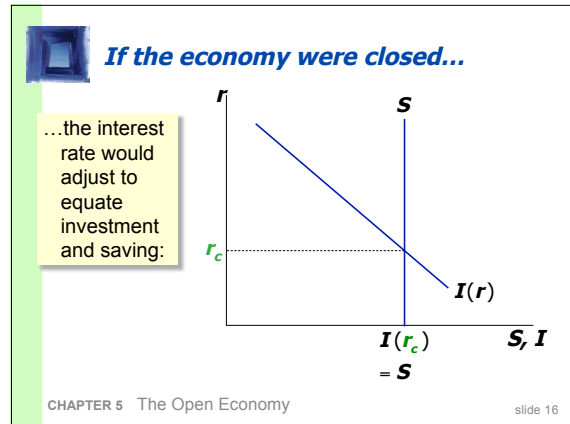
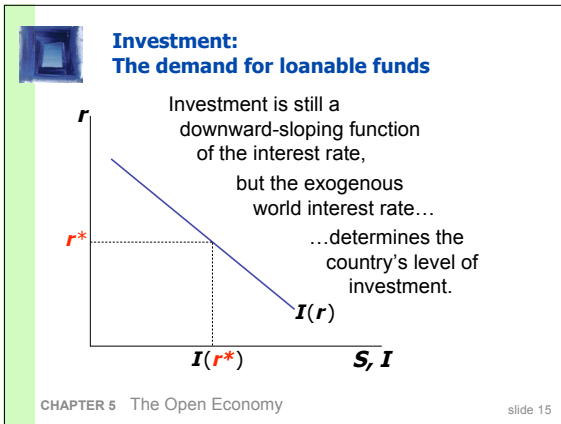
Assumptions re: Capital flows

- domestic & foreign bonds are perfect substitutes (same risk, maturity, etc.)
- perfect capital mobility:**
no restrictions on international trade in assets
- economy is **small:**
cannot affect the world interest rate, denoted r^*

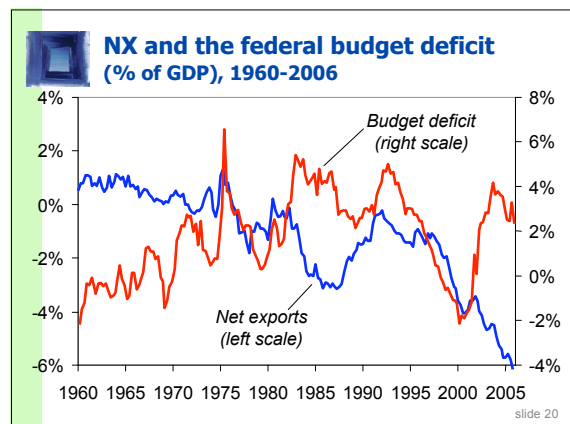
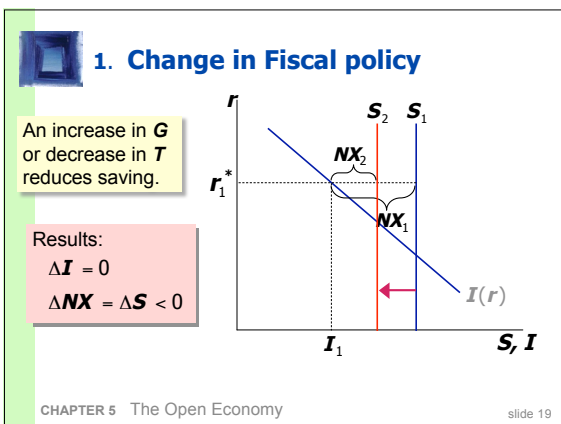
a & b imply $r = r^*$
 c implies r^* is exogenous

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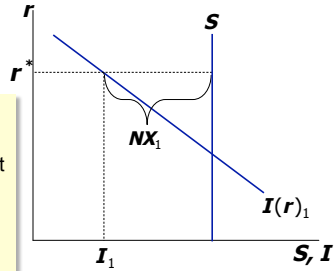
- ### Next, two experiments:
1. Change in fiscal policy
 2. An increase in investment demand
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2. An increase in investment demand

EXERCISE:

Use the model to determine the impact of an increase in investment demand on NX , S , I , and net capital outflow.



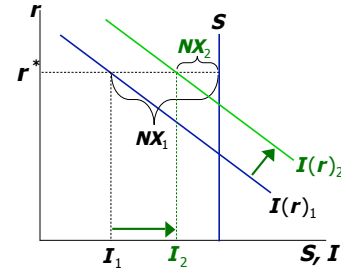
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2. An increase in investment demand

ANSWERS:

$\Delta I > 0$,
 $\Delta S = 0$,
 net capital
 outflow and
 NX fall by the
 amount ΔI



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The nominal exchange rate

e = nominal exchange rate,
 the relative price of
 domestic currency
 in terms of foreign currency
 (e.g. Yen per Dollar)

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A few exchange rates, as of 2/11/08

country	exchange rate
Canada	1.00 CDN\$/US\$
Euro	0.69 Euro/\$
Indonesia	9,271 Rupiahs/\$
Japan	106.9 Yen/\$
Mexico	10.8 Pesos/\$
South Africa	7.8 Rand/\$
U.K.	0.51 Pounds/\$

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The real exchange rate

the lowercase
 Greek letter
 epsilon

ϵ = real exchange rate,
 the relative price of
 domestic goods
 in terms of foreign goods
 (e.g. Japanese Big Macs per
 U.S. Big Mac)

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Understanding the units of ϵ

$$\begin{aligned} \epsilon &= \frac{e \times P}{P^*} \\ &= \frac{(\text{Yen per } \$) \times (\$ \text{ per unit U.S. goods})}{\text{Yen per unit Japanese goods}} \\ &= \frac{\text{Yen per unit U.S. goods}}{\text{Yen per unit Japanese goods}} \\ &= \text{Units of Japanese goods} \\ &\quad \text{per unit of U.S. goods} \end{aligned}$$

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~ McZample ~

- one good: Big Mac
- price in Japan:
 $P^* = 200$ Yen
- price in USA:
 $P = \$2.50$
- nominal exchange rate
 $e = 120$ Yen/\$



To buy a U.S. Big Mac, someone from Japan would have to pay an amount that could buy 1.5 Japanese Big Macs.

$$\epsilon = \frac{e \times P}{P^*} = \frac{120 \times \$2.50}{200 \text{ Yen}} = 1.5$$

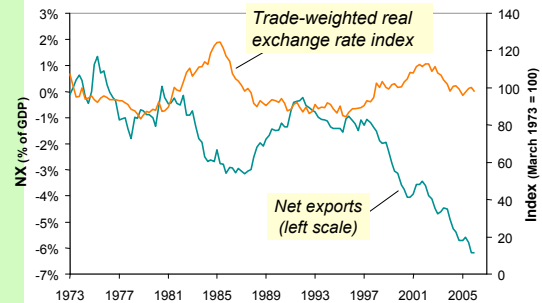
ϵ in the real world & our model

- In the real world:**
We can think of ϵ as the relative price of a basket of domestic goods in terms of a basket of foreign goods
- In our macro model:**
There's just one good, "output."
So ϵ is the relative price of one country's output in terms of the other country's output

How NX depends on ϵ

- $\uparrow \epsilon \Rightarrow$ U.S. goods become more expensive relative to foreign goods
- $\Rightarrow \downarrow EX, \uparrow IM$
- $\Rightarrow \downarrow NX$

U.S. net exports and the real exchange rate, 1973-2006

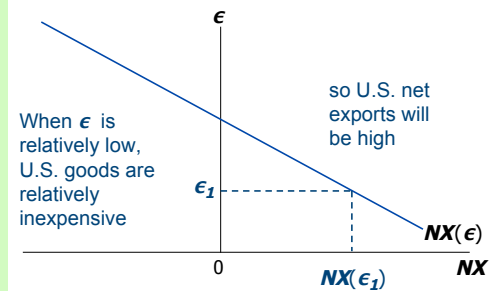


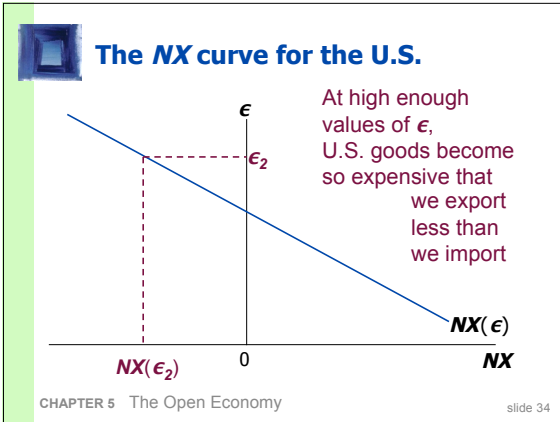
The net exports function

- The **net exports function** reflects this inverse relationship between NX and ϵ :

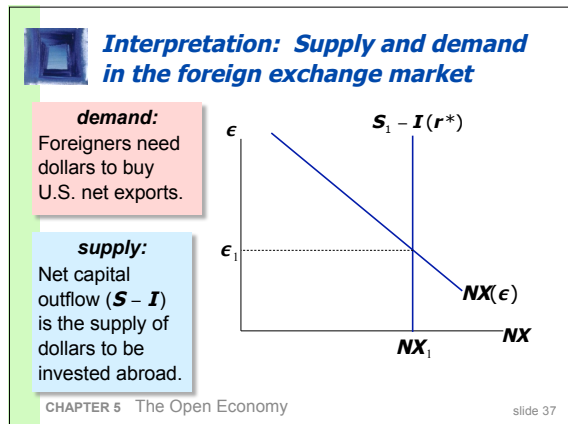
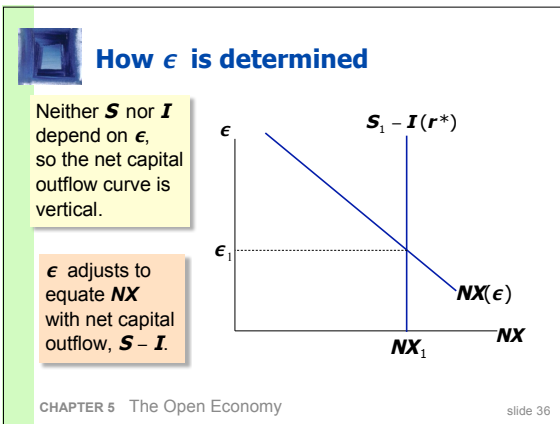
$$NX = NX(\epsilon)$$

The NX curve for the U.S.

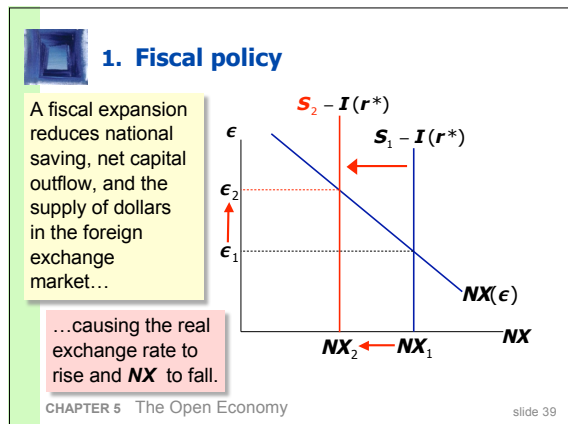




- ### How ϵ is determined
- The accounting identity says $NX = S - I$
 - We saw earlier how $S - I$ is determined:
 - S depends on domestic factors (output, fiscal policy variables, etc)
 - I is determined by the world interest rate r^*
 - So, ϵ must adjust to ensure $NX(\epsilon) = S - I(r^*)$
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- ### Next, three experiments:
- Change in fiscal policy
 - An increase in investment demand
 - Trade policy to restrict imports
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2. Increase in investment demand

An increase in investment reduces net capital outflow and the supply of dollars in the foreign exchange market...

...causing the real exchange rate to rise and NX to fall.

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3. Trade policy to restrict imports

At any given value of ϵ , an import quota $\Rightarrow \downarrow IM \Rightarrow \uparrow NX$
 \Rightarrow demand for dollars shifts right

Trade policy doesn't affect S or I , so capital flows and the supply of dollars remain fixed.

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3. Trade policy to restrict imports

Results:
 $\Delta \epsilon > 0$ (demand increase)
 $\Delta NX = 0$ (supply fixed)
 $\Delta IM < 0$ (policy)
 $\Delta EX < 0$ (rise in ϵ)

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The determinants of the nominal exchange rate

- Start with the expression for the real exchange rate:

$$\epsilon = \frac{e \times P}{P^*}$$
- Solve for the nominal exchange rate:

$$e = \epsilon \times \frac{P^*}{P}$$

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The determinants of the nominal exchange rate

- So e depends on the real exchange rate and the price levels at home and abroad...
- ...and we know how each of them is determined:

$$\frac{M^*}{P^*} = L^*(r^* + \pi^*, Y^*)$$

$$\frac{M}{P} = L(r^* + \pi, Y)$$

$e = \epsilon \times \frac{P^*}{P}$

$NX(\hat{a}) = \bar{S} - I(r^*)$

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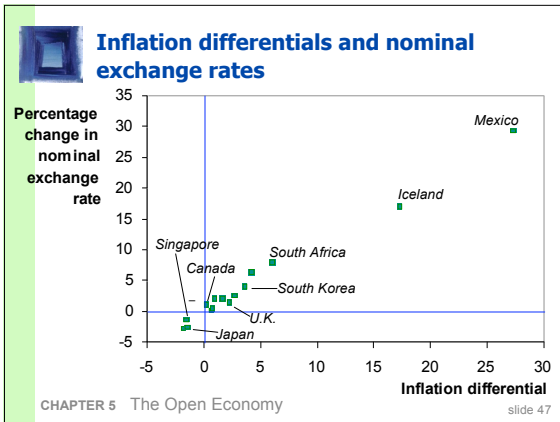
The determinants of the nominal exchange rate

$$e = \epsilon \times \frac{P^*}{P}$$

- Rewrite this equation in growth rates (see "arithmetic tricks for working with percentage changes," Chap 2):

$$\frac{\Delta e}{e} = \frac{\Delta \epsilon}{\epsilon} + \frac{\Delta P^*}{P^*} - \frac{\Delta P}{P} = \frac{\Delta \epsilon}{\epsilon} + (\pi^* - \pi)$$
- For a given value of ϵ , the growth rate of e equals the difference between foreign and domestic inflation rates.

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Purchasing Power Parity (PPP)

Two definitions:

- A doctrine that states that goods must sell at the same (currency-adjusted) price in all countries.
- The nominal exchange rate adjusts to equalize the cost of a basket of goods across countries.

Reasoning:

- arbitrage, the law of one price

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Purchasing Power Parity (PPP)

PPP: $e \times P = P^*$

Cost of a basket of foreign goods, in foreign currency.

Cost of a basket of domestic goods, in foreign currency.

Cost of a basket of domestic goods, in domestic currency.

- Solve for e : $e = P^*/P$
- PPP implies that the nominal exchange rate between two countries equals the ratio of the countries' price levels.

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Does PPP hold in the real world?

- No, for two reasons:
 - International arbitrage not possible.
 - nontraded goods
 - transportation costs
 - Different countries' goods not perfect substitutes.
- Nonetheless, PPP is a useful theory:
 - It's simple & intuitive
 - In the real world, nominal exchange rates tend toward their PPP values over the long run.

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CASE STUDY: The Reagan deficits revisited

	1970s	1980s	actual change	closed economy	small open economy
$G - T$	2.2	3.9	↑	↑	↑
S	19.6	17.4	↓	↓	↓
r	1.1	6.3	↑	↑	no change
I	19.9	19.4	↓	↓	no change
NX	-0.3	-2.0	↓	no change	↓
ϵ	115.1	129.4	↑	no change	↑

Data: decade averages; all except r and ϵ are expressed as a percent of GDP; ϵ is a trade-weighted index.

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Chapter Summary

- National income accounts identities:
 - $Y = C + I + G + NX$
 - trade balance $NX = S - I$ net capital outflow
- Impact of policies on NX :
 - NX increases if policy causes S to rise or I to fall
 - NX does not change if policy affects neither S nor I . Example: trade policy

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Chapter Summary

- Exchange rates
 - nominal: the price of a country's currency in terms of another country's currency
 - real: the price of a country's goods in terms of another country's goods
 - The real exchange rate equals the nominal rate times the ratio of prices of the two countries.



Chapter Summary

- How the real exchange rate is determined
 - **NX** depends negatively on the real exchange rate, other things equal
 - The real exchange rate adjusts to equate **NX** with net capital outflow



Chapter Summary

- How the nominal exchange rate is determined
 - **e** equals the real exchange rate times the country's price level relative to the foreign price level.
 - For a given value of the real exchange rate, the percentage change in the nominal exchange rate equals the difference between the foreign & domestic inflation rates.