

The nominal exchange rate

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

The real exchange rate

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)

*the lowercase
Greek letter
epsilon*

Understanding the units of ϵ

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

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

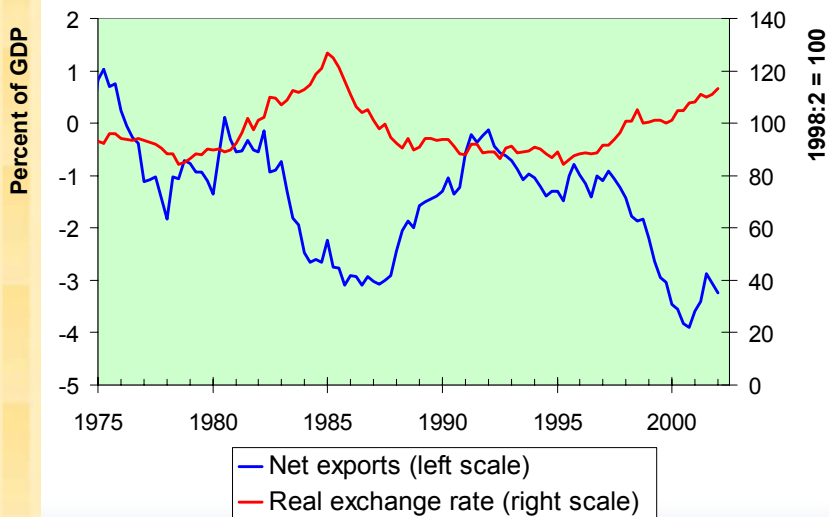
How NX depends on ϵ

$\uparrow \epsilon \Rightarrow$ 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, 1975-2002

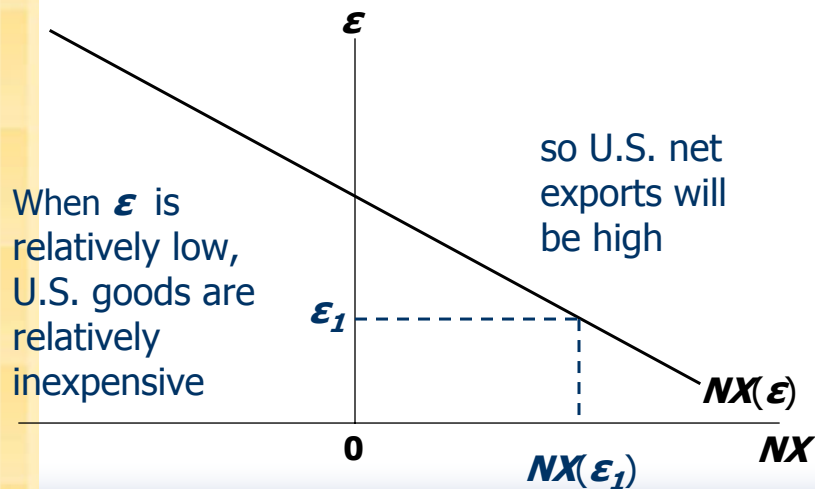


The net exports function

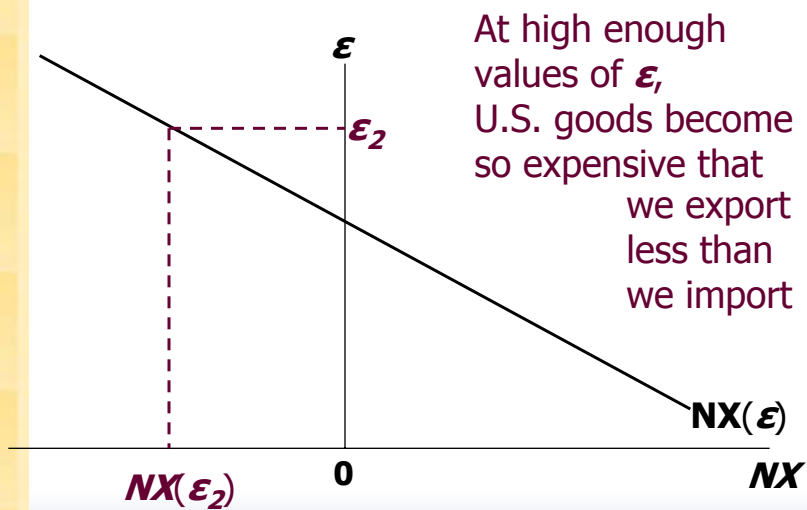
- The **net exports function** reflects this inverse relationship between NX and ϵ :

$$NX = NX(\epsilon)$$

The NX curve for the U.S.



The NX curve for the U.S.



How ϵ is determined

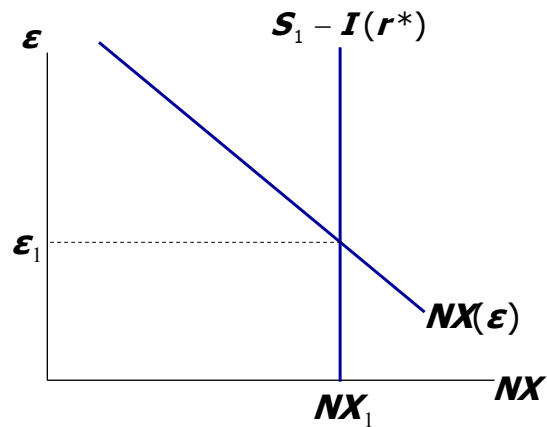
- The accounting identity says $NX = S - I$
- We saw earlier how $S - I$ is determined:
 - S depends on domestic factors (output, fiscal policy variables, etc)
 - I is determined by the world interest rate r^*
- So, ϵ must adjust to ensure

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

How ϵ is determined

Neither S nor I depend on ϵ , so the net capital outflow curve is vertical.

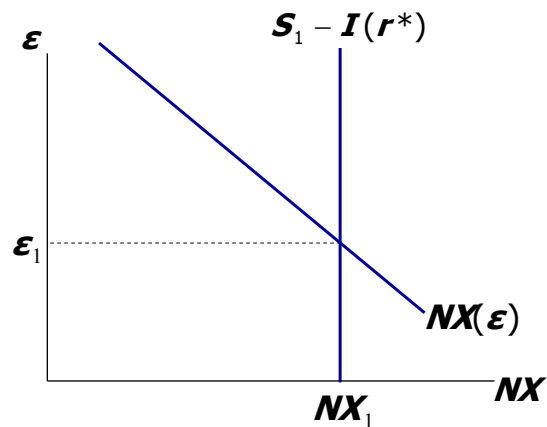
ϵ adjusts to equate NX with net capital outflow, $S - I$.



Interpretation: supply and demand in the foreign exchange market

demand:
Foreigners need dollars to buy U.S. net exports.

supply:
The net capital outflow ($S - I$) is the supply of dollars to be invested abroad.



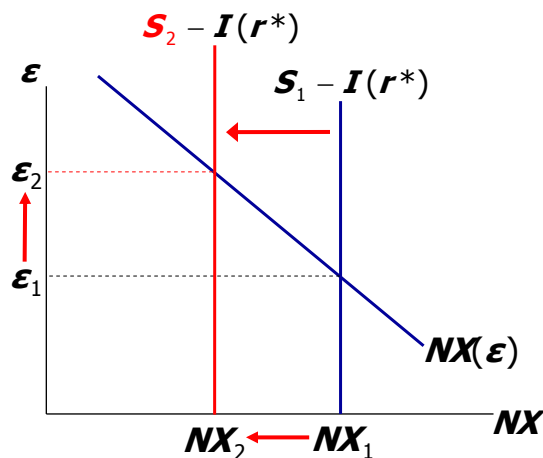
Four experiments

1. Fiscal policy at home
2. Fiscal policy abroad
3. An increase in investment demand
4. Trade policy to restrict imports

1. Fiscal policy at home

A fiscal expansion reduces national saving, net capital outflows, and the supply of dollars in the foreign exchange market...

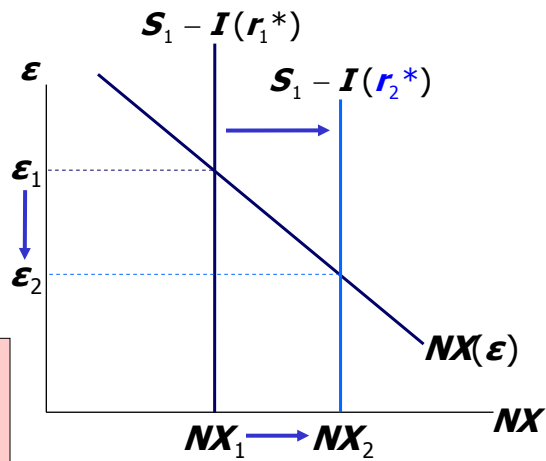
...causing the real exchange rate to rise and NX to fall.



2. Fiscal policy abroad

An increase in r^* reduces investment, increasing net capital outflows and the supply of dollars in the foreign exchange market...

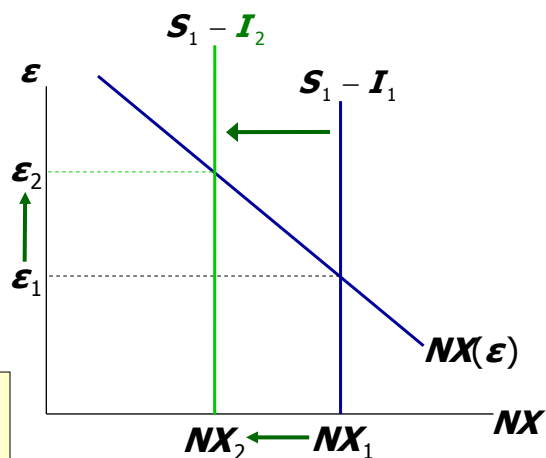
...causing the real exchange rate to fall and NX to rise.



3. An increase in investment demand

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

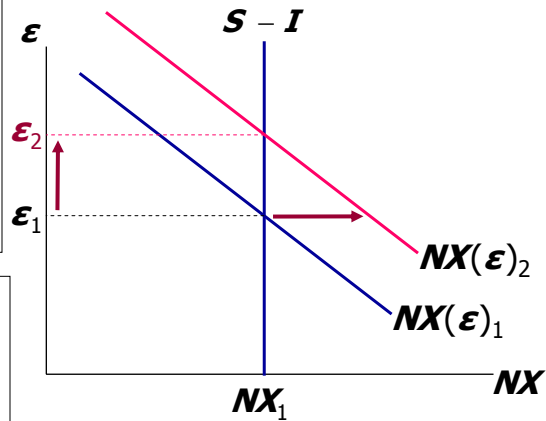
...causing the real exchange rate to rise and NX to fall.



4. Trade policy to restrict imports

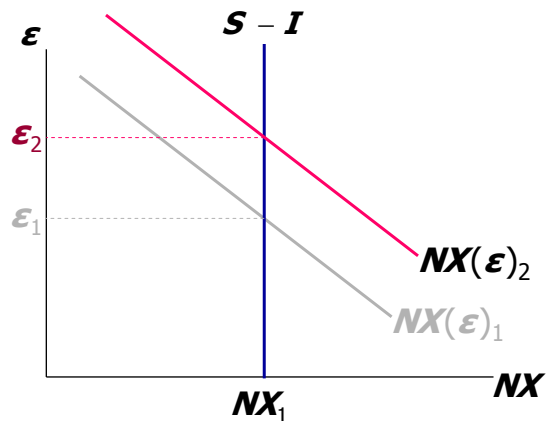
At any given value of ϵ , an import quota
 $\Rightarrow \downarrow \mathbf{IM} \Rightarrow \uparrow \mathbf{NX}$
 \Rightarrow demand for dollars shifts right

Trade policy doesn't affect \mathbf{S} or \mathbf{I} , so capital flows and the supply of dollars remains fixed.



4. Trade policy to restrict imports

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



The Determinants of the Nominal Exchange Rate

- Start with the expression for the real exchange rate:

$$\boldsymbol{\varepsilon} = \frac{\boldsymbol{e} \times \boldsymbol{P}}{\boldsymbol{P}^*}$$

- Solve it for the nominal exchange rate:

$$\boldsymbol{e} = \boldsymbol{\varepsilon} \times \frac{\boldsymbol{P}^*}{\boldsymbol{P}}$$

The Determinants of the Nominal Exchange Rate

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

$$\boldsymbol{e} = \boldsymbol{\varepsilon} \times \frac{\boldsymbol{P}^*}{\boldsymbol{P}}$$

$\boldsymbol{NX}(\boldsymbol{\varepsilon}) = \bar{\boldsymbol{S}} - \boldsymbol{I}(r^*)$

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

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

Note: Lines in the original image connect the $\boldsymbol{\varepsilon}$ term to the NX equation and the $\frac{\boldsymbol{P}^}{\boldsymbol{P}}$ term to the M/P and M*/P* equations.*

The Determinants of the Nominal Exchange Rate

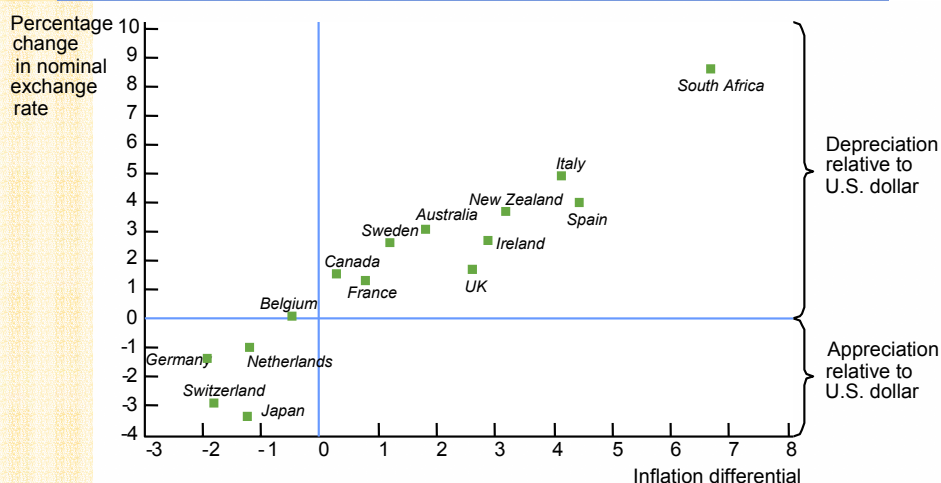
$$e = \varepsilon \times \frac{P^*}{P}$$

- We can rewrite this equation in terms of growth rates (see "arithmetic tricks for working with percentage changes," Chap 2):

$$\frac{\Delta e}{e} = \frac{\Delta \varepsilon}{\varepsilon} + \frac{\Delta P^*}{P^*} - \frac{\Delta P}{P} = \frac{\Delta \varepsilon}{\varepsilon} + \pi^* - \pi$$

- For a given value of ε , the growth rate of e equals the difference between foreign and domestic inflation rates.

Inflation and nominal exchange rates



Purchasing Power Parity (PPP)

- def1: a doctrine that states that goods must sell at the same (currency-adjusted) price in all countries.
- def2: the nominal exchange rate adjusts to equalize the cost of a basket of goods across countries.
- Reasoning: arbitrage, the law of one price

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.

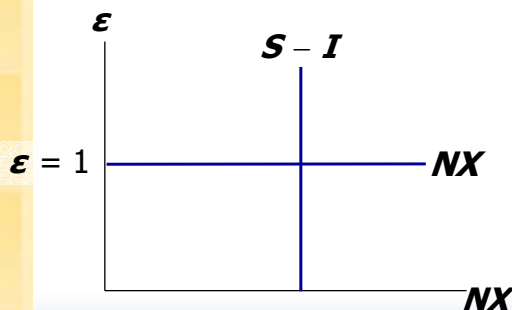
Cost of a basket of domestic goods, in domestic currency.

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

Purchasing Power Parity (PPP)

- If $e = P^*/P$,
then $\epsilon = e \times \frac{P}{P^*} = \frac{P^*}{P} \times \frac{P}{P^*} = 1$

and the NX curve is horizontal:



Under PPP, changes in $(S - I)$ have no impact on ϵ or e .

Does PPP hold in the real world?

No, for two reasons:

1. International arbitrage not possible.
 - nontraded goods
 - transportation costs
2. Goods of different countries not perfect substitutes.

Nonetheless, PPP is a useful theory:

- It's simple & intuitive
- In the real world, nominal exchange rates have a tendency toward their PPP values over the long run.

The U.S. as a large open economy

- So far, we've learned long-run models for two extreme cases:
 - closed economy (chapter 3)
 - small open economy (chapter 5)
- A large open economy---like the U.S.---is in between these two extremes.
- The analysis of policies or other exogenous changes in a large open economy is a mixture of the results for the closed & small open economy cases.
- For example...

A fiscal expansion in three models

A fiscal expansion causes national saving to fall.
The effects of this depend on the degree of openness:

	<i>closed economy</i>	<i>large open economy</i>	<i>small open economy</i>
<i>r</i>	rises	rises, but not as much as in closed economy	no change
<i>I</i>	falls	falls, but not as much as in closed economy	no change
<i>NX</i>	no change	falls, but not as much as in small open economy	falls

Chapter summary

1. Net exports - the difference between
 - exports and imports
 - a country's output (Y) and its spending ($C + I + G$)
2. Net capital outflow equals
 - purchases of foreign assets minus foreign purchases of the country's assets
 - the difference between saving and investment
3. National income accounts identities:
 - $Y = C + I + G + NX$
 - trade balance $NX = S - I$ net capital outflow

Chapter summary

4. 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
5. 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

6. 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
7. 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.