Imports and exports of selected countries, 2010

Percent of GDP

- Australia
- China
- Germany
- Greece
- S. Korea
- Mexico
- United States

Exports
Imports
In an open economy,

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

\[ C = C^d + C^f \]
\[ I = I^d + I^f \]
\[ G = G^d + G^f \]

**EX** = exports =
foreign spending on domestic goods

**IM** = imports = \( C^f + I^f + G^f \)
= spending on foreign goods

**NX** = net exports (a.k.a. the "trade balance")
\[ = EX - IM \]
GDP = expenditure on domestically produced G & S

\[
Y = C^d + I^d + G^d + EX \\
= (C - C^f) + (I - I^f) + (G - G^f) + EX \\
= C + I + G + EX - (C^f + I^f + G^f) \\
= C + I + G + EX - IM \\
= C + I + G + NX
\]
The national income identity in an open economy

\[ Y = C + I + G + NX \]

\[ \text{or, } \quad NX = Y - (C + I + G) \]

- net exports
- domestic spending
- output
## Trade surpluses and deficits

### Formula

\[
NX = EX - IM = Y - (C + I + G)
\]

- **trade surplus:**
  
  output > spending \& exports > imports

- **trade deficit:**
  
  spending > output \& imports > exports
International capital flows

- **Net capital outflow** \((S - I)\)
  - \(S - I\) = net outflow of “loanable funds”
  - \(S - I\) = 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*
The link between trade & capital flows

\[ NX = Y - (C + I + G) \]

implies

\[ NX = (Y - C - G) - I = S - I \]

\textit{trade balance} = \textit{net capital outflow}

Thus,

a country with a trade deficit \((NX < 0)\)

is a net borrower \((S < I)\).
Saving, investment, and the trade balance 1960–2012

- **Saving**
- **Investment**
- **Trade Balance (right scale)**

The chart shows the trends of saving, investment, and the trade balance from 1960 to 2012.
U.S.: The world’s largest debtor nation

- Every year since 1980s: huge trade deficits and net capital inflows, i.e. net borrowing from abroad
- As of 12/31/2011:
  - U.S. residents owned $21.1 trillion worth of foreign assets
  - Foreigners owned $25.1 trillion worth of U.S. assets
  - U.S. net indebtedness to rest of the world: $4.0 trillion—higher than any other country, hence U.S. is the “world’s largest debtor nation”
Saving and investment in a small open economy

- An open-economy version of the loanable funds model from Chapter 3:
  - production function
    \[ Y = \bar{Y} = F(K, L) \]
  - consumption function
    \[ C = C(Y - T) \]
  - investment function
    \[ I = I(r) \]
  - exogenous policy variables
    \[ G = \bar{G}, \quad T = \bar{T} \]
National saving: The supply of loanable funds

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

\[ S = Y - C(Y - T) - G \]
Assumptions about capital flows

a. domestic & foreign bonds are perfect substitutes (same risk, maturity, etc.)

b. **perfect capital mobility**: no restrictions on international trade in assets

c. economy is **small**: cannot affect the world interest rate, \( r^* \)

\[ a \ & \ b \ \text{imply} \ r = r^* \]

\[ c \ \text{implies} \ r^* \ \text{is exogenous} \]
Investment: The demand for loanable funds

Investment is still a downward-sloping function of the interest rate, but the exogenous world interest rate... ...determines the country’s level of investment.
If the economy were closed…

…the interest rate would adjust to equate investment and saving:
But in a small open economy…

the exogenous world interest rate determines investment…

…and the difference between saving and investment determines net capital outflow and net exports.
Next, three experiments:

1. Fiscal policy at home
2. Fiscal policy abroad
3. An increase in investment demand (exercise)
1. Fiscal policy at home

An increase in $G$ or decrease in $T$ reduces saving.

Results:

$\Delta I = 0$

$\Delta NX = \Delta S < 0$
NX and the federal budget deficit (% of GDP), 1965–2012

Budget deficit (left scale)

Net exports (right scale)
2. Fiscal policy abroad

Expansionary fiscal policy abroad raises the world interest rate.

Results:

\[ \Delta I < 0 \]
\[ \Delta NX = -\Delta I > 0 \]
Now You Try

3. An increase in investment demand

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

\[ \Delta I > 0, \quad \Delta S = 0, \quad \text{net capital outflow and} \quad NX \quad \text{fall by the amount} \quad \Delta I \]
The nominal exchange rate

\[ e = \text{nominal exchange rate, the relative price of domestic currency in terms of foreign currency (e.g. yen per dollar)} \]
The real exchange rate

\[ \varepsilon = \text{real exchange rate, the relative price of domestic goods in terms of foreign goods (e.g., Japanese Big Macs per U.S. Big Mac)} \]
Understanding the units of $\varepsilon$

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

$$= (\text{Yen per } $) \times (\text{\$ per unit U.S. goods})$$

$$= \frac{\text{Yen per unit U.S. goods}}{\text{Yen per unit Japanese goods}}$$

$$= \frac{\text{Units of Japanese goods}}{\text{per unit of U.S. goods}}$$
~ McZample ~

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

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

To buy a U.S. Big Mac, someone from Japan would have to pay an amount that could buy 1.5 Japanese Big Macs.
How $\text{NX}$ depends on $\varepsilon$

\[ \uparrow \varepsilon \implies \text{U.S. goods become more expensive relative to foreign goods} \]

\[ \implies \downarrow \text{EX}, \uparrow \text{IM} \]

\[ \implies \downarrow \text{NX} \]
U.S. net exports and the real exchange rate, 1973–2012

Trade-weighted real exchange rate index

Net exports (left scale)
The net exports function

- The **net exports function** reflects this inverse relationship between $NX$ and $\varepsilon$:

  $$NX = NX(\varepsilon)$$
The NX curve for the U.S.

When $\varepsilon$ is relatively low, U.S. goods are relatively inexpensive. So U.S. net exports will be high.
At high enough values of $\varepsilon$, U.S. goods become so expensive that we export less than we import.
How $\varepsilon$ 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, $\varepsilon$ must adjust to ensure

$$NX(\varepsilon) = \overline{S} - I(r^*)$$
Neither \( S \) nor \( I \) depends on \( \varepsilon \), so the net capital outflow curve is vertical.

\( \varepsilon \) 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:**
Net capital outflow \((S - I)\) is the supply of dollars to be invested abroad.
Next, four experiments:

1. Fiscal policy at home
2. Fiscal policy abroad
3. An increase in investment demand (exercise)
4. Trade policy to restrict imports
A fiscal expansion reduces national saving, net capital outflow, 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 outflow and the supply of dollars in the foreign exchange market...

...causing the real exchange rate to fall and $NX$ to rise.
Determine the impact of an increase in investment demand on net exports, net capital outflow, and the real exchange rate.
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.
4. Trade policy to restrict imports

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

Trade policy doesn’t affect $S$ or $I$, so capital flows and the supply of dollars remain fixed.
The determinants of the nominal exchange rate

- Start with the expression for the real exchange rate:
  \[ \varepsilon = \frac{e \times P}{P^*} \]

- Solve for the nominal exchange rate:
  \[ e = \varepsilon \times \frac{P^*}{P} \]
The determinants of the nominal exchange rate

\[ e = \varepsilon \times \frac{P^*}{P} \]

- Rewrite this equation in growth rates

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

- For a given value of \( \varepsilon \), the growth rate of \( e \) equals the difference between foreign and domestic inflation rates.
Inflation differentials and nominal exchange rates for a cross section of countries

% change in nominal exchange rate vs. inflation differential