Chapter 5

The Open Economy

October 10, 2012
In this Chapter, you will learn...

✓ accounting identities of the open economy
✓ The Small Open Economy Model
✓ Exchange Rates
✓ Large vs. Small Open Economy
Primary Indicators to Understand the Openness of an Economy

![Bar chart showing imports and exports as a percentage of output for various countries in 2007.](chart)

Figure 5.1 Imports and Exports as a Percentage of Output, 2007
1. THE INTERNATIONAL FLOWS OF CAPITAL AND GOODS

An Open Economy Differs from Closed Economy by

- Spending need not equal output
- Saving need not equal investment

Open economy measurement: net exports, balance of payments and national accounting identities.

Domestic production (GDP) equals domestic expenditure (absorption):

\[ Y = C^D + I^D + G^D + EX \]

Where, \( C^D, I^D \) and \( G^D \) indicate expenditure on domestic production only — that is, excluding expenditure on imports.
Total Consumption, Investment, and Government spending:

\[ C = C^D + C^F \]
\[ I = I^D + I^F \]
\[ G = G^D + G^F \]

where \(^F\) indicates spending on foreign goods, Then

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

**The Standard Nation Income Identity**

\(NX > 0\) or \(NX < 0\), that is domestic spending need not equal to domestic production:

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

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

- **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 = \(-NX\)

- **Balanced trade:** \( NX = 0 \)
Now, Saving and Investment in an open economy: Capital Flows

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

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

\[ S - I = NX \]

The net domestic saving \((S-I)\), is also referred as *net foreign investment* or *net capital outflow*

Net Capital Outflow = Trade Balance

\[ S - I = NX \]

when \( S > I \), country is a **net lender**

when \( S < I \), country is a **net borrower**
“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 12/31/2009:

- U.S. residents owned $18.4 trillion worth of foreign assets
- Foreigners owned $21.1 trillion worth of U.S. assets
- U.S. net indebtedness to rest of the world: $2.7 trillion—higher than any other country, hence U.S. is the “world’s largest debtor nation”
Relationship between Savings, Investment, and Net Exports

Recall Gross National Product (GNP):

\[ GNP = Y + NFI \]

Domestic production = domestic expenditure:

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

In terms of GNP:

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

Rewrite:

\[ GNP - C - G - I = NX + NFI \]

\[ S - I = NX + NFI \]
Balance of Payments

Consists of two components: (1) current account, and (2) capital account.

1. Current Account:

   \[ CA = NX + Net \, Foreign \, Income \]

2. Capital Account:

   \[ KA = Net \, Capital \, Inflow: \, Private \, Sector + Net \, Capital \, Inflow: \, Official \]
Net Capital Inflow: Private Sector — sale/purchase of assets overseas by private agents.
  - Capital inflow: sale of assets overseas (borrowing, raising capital).
  - Capital outflow: purchase of assets overseas (lending/investing).

Example: purchase of equity in US company — capital outflow

Net Capital Inflow: Official — sale/purchase of assets overseas by the central bank.

By definition,

\[ \text{Balance of Payments} = CA + KA = 0 \]

Equivalently, since \( CA = S - I \)

\[ KA = -(S - I) \]

If \( S > I \), we are lending overseas — a capital outflow.

If \( I > S \), we are borrowing from overseas — a capital inflow.
**TABLE 5-1**

**International Flows of Goods and Capital: Summary of the Three Outcomes an Open Economy Can Experience**

<table>
<thead>
<tr>
<th>Trade Surplus</th>
<th>Balanced Trade</th>
<th>Trade Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports &gt; Imports</td>
<td>Exports = Imports</td>
<td>Exports &lt; Imports</td>
</tr>
<tr>
<td>Net Exports &gt; 0</td>
<td>Net Exports = 0</td>
<td>Net Exports &lt; 0</td>
</tr>
<tr>
<td>$Y &gt; C + I + G$</td>
<td>$Y = C + I + G$</td>
<td>$Y &lt; C + I + G$</td>
</tr>
<tr>
<td>Saving &gt; Investment</td>
<td>Saving = Investment</td>
<td>Saving &lt; Investment</td>
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<tr>
<td>Net Capital Outflow &gt; 0</td>
<td>Net Capital Outflow = 0</td>
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</tbody>
</table>
2. SMALL OPEN ECONOMY MODEL

⇒ Open economy version of the classical long run model of Chapter 3.

⇒ A small open economy is an economy smaller enough such that the actions of the economy do not influence the world interest rate.

Economy is *small* - faces a given real world interest rate, $r^*$.

**Capital markets are perfect:**

$$r = r^* + \theta$$

where, $\theta$ is an (exogenous) risk premium. Assume this is zero for the most part. So,

$$r = r^*$$
Figure: Canadian and US Interest rates
The model:

Three assumptions:
\[ Y = \bar{Y} = F(\bar{K}, \bar{L}) \]
\[ I = I(r) \]
\[ C = C(Y - T) \]

The accounting identities:
\[ Y = C + I + G + NX \]
\[ r = r^* \]

Solving the model:
\[ \bar{S} - I(r^*) = NX \]
the exogenous world interest rate determines investment...

...and the difference between saving and investment determines net capital outflow and net exports

**Figure**: Saving and investment in a small open economy
Policies affect the Trade Balance

Expansionary Fiscal Policy at Home

Figure: Impact of fiscal expansion at home economy

An increase in government spending (taxes constant) reduces public saving ($\Delta S^G < 0$). Reduces trade balance ($\Delta NX < 0$)
Expansionary Fiscal Policy Abroad

If the foreign country is large enough fiscal expansion causes deficit and pushes the world interest rate up.

Interest rate increases from \( r_1^* \) to \( r_2^* \) \( \Rightarrow \) \( NX > 0 \), trade surplus
Shift in Investment Demand

Due to incentives, invest demand is now $I(r)_2 \rightarrow$ saving unchanged$\rightarrow$ borrowing abroad to finance investment $\rightarrow$ $NX < 0$
Evaluation of Economic Policy

Trade deficits or surpluses are not themselves (generally) a problem.

They may be a symptom of (important) underlying problems:

Too little domestic saving (either private or public) relative to domestic investment, reducing the consumption of future generations

Too much speculative and unproductive investment
3. EXCHANGE RATES

The exchange rate between two countries is the price at which residents of those countries trade with each other.

a) Nominal and Real Exchange Rates

The nominal exchange rate is the relative price of domestic currency in terms of foreign currency, usually denoted by $e$.

For example, $e$(CAD/USD) is the Canadian dollar price of US dollar. That is, how many CAD you can buy by one US dollar (i.e., 0.99 CAD$/US$).

So, what is the price of Canadian dollar?
The **real exchange rate**, $\varepsilon$, the relative price of domestic goods in terms of foreign goods (*e.g.* Japanese Big Macs per Canadian Big Mac).

The **real exchange rate** is sometimes called the *terms of trade*.

*Real Exchange rate,*

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

$$= \text{nominal exchange rate} \times \text{ratio of price levels}$$

$$= \frac{(\text{Yen per CAN$}) \times (\text{CAN$ per unit \text{ Canadian goods})}}{\text{Yen per unit \text{ Japanese goods)}}}$$

$$= \frac{\text{Yen per Unit \text{ Canadian goods}}}{\text{Yen per unit \text{ Japanese googs}}$$
One good: Big Mac

price in Japan: $P^* = 200$ Yen

price in Canada: $P = \$3.00$

nominal exchange rate, $e = 90$ Yen/CAN$

What is $e$?

To buy a Canadian Big Mac, someone from Japan would have to pay an amount that could buy 1.35 Japanese Big Macs.

Ans.: CAN$ 1.35
**Change in nominal exchange rate: \( e(\text{USD/CAD}) \)**

\( e \) rising is an appreciation of the CAD

\( e \) falling is a depreciation of the CAD

**Different types of exchange rate regimes**

- **Floating exchange rate** – \( e \) is determined in the foreign exchange market with little or no intervention by central banks;

- **Managed exchange rate** – \( e \) is managed by central banks according to some rule;

- **Fixed exchange rate** – central bank(s) set a price and enter the market to support the price as required;

- **Currency Board/Common currency** - strong types of fixed exchange rates
In the real world: We can think of $\epsilon$ 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, $\epsilon$ is the relative price of one country’s output in terms of the other country’s output.
b) Trade Balance and the Real Exchange Rate

If real exchange rate rises (an appreciation), then domestic goods are relatively expensive and there is switching away from domestic to foreign goods - NX falls.

\[ \uparrow \varepsilon \Rightarrow \text{Canadian goods become more expensive relative to foreign goods} \]
\[ \Rightarrow \downarrow EX, \uparrow IM \Rightarrow \downarrow NX \]

If real exchange rate falls (a depreciation), then domestic goods are relatively cheap and there is switching away from foreign to domestic goods - NX rises.
The **net exports function** reflects this inverse relationship between $NX$ and $\epsilon$: $$NX = NX(\epsilon)$$
The NX curve for Canada

⇒ When $\varepsilon$ is relatively low, Canadian goods are relatively inexpensive

⇒ Canadian net exports will be high
At higher values of $\varepsilon$, Canadian goods become so expensive that Canada exports less than import.
c) How $\varepsilon$ is determined?

The accounting identity says $NX = S - I$

We saw earlier how $S - I$ is determined:

- $S$ depends on domestic factors ($Y$, fiscal policy variables, etc)
- $I$ is determined by the world interest rate $r^*$

So, $\varepsilon$ must adjust to ensure

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

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

\[ S_1 - I(r^*) = NX(\varepsilon) \]
Effects of Policies on the Real Exchange Rate

1. Fiscal policy at home

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
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.
3. An 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.
4. Trade policy to restrict imports

At any given value of $\varepsilon$, 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.
Results:
- $\varepsilon > 0$
  (demand increase)
- $NX = 0$
  (supply fixed)
- $IM < 0$
  (policy)
- $EX < 0$
  (rise in $\varepsilon$)
d) How $e$ is determined?

The real exchange rate:  
$$\varepsilon = \frac{e \times P}{p^*}$$

Solve for the nominal exchange rate:  
$$e = \frac{\varepsilon \times p^*}{p}$$

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:

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

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

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

$$\frac{M}{p} = L(r^* + \pi, Y)$$
Taking log and doing first order derivative, the nominal exchange rate equation implies:

\[
\frac{de}{e} = \frac{d\epsilon}{\epsilon} + \frac{dP^*}{P^*} - \frac{dP}{P} \\
= \frac{d\epsilon}{\epsilon} + \pi^* - \pi
\]

For a given value of \( \epsilon \), the growth rate of \( e \) equals the difference between foreign and domestic inflation rates.

*Alternatively,*

The nominal exchange rate over the long-run is determined by the relative rate of inflation between two countries.
Inflation differentials and nominal exchange rates: empirical evidence
**e) Purchasing Power Parity**

A doctrine that states that goods must sell at the same (currency-adjusted) price in all countries.

- The purchasing power of one dollar is the same in every country.

- In Canada, 1 CAD buys $1/P$ bundle of goods;
- In US, 1 CAD buys $e$ USD which buys $1/P^*$ bundle of goods;
- If the purchasing power is the same, then: \[ \frac{1}{P} = \frac{e}{P^*} \]

or, \[ P^* = eP \]
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- **PPP**: \( P^* = e \times P \)
  - Cost of a basket of domestic goods, in domestic currency.
  - Cost of a basket of foreign goods, in foreign 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.

- Or
  \[
  \frac{de}{e} = \frac{dP^*}{P^*} - \frac{dP}{P}
  \]
If \( e = \frac{p^*}{P} \),

then \( e = e \times \frac{P}{P^*} = \frac{P^*}{P} \times \frac{P}{P^*} = 1 \)

and the \( NX \) curve is horizontal:

Under PPP, changes in \((S - I)\) have no impact on \( \varepsilon \) or \( e \).
Does PPP hold in the real world?

No, for two reasons:

1. International arbitrage not possible.
   - nontraded goods
   - transportation costs
2. 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.
5. LARGE VERSUS SMALL OPEN ECONOMY

So far, we’ve learned long-run models for two extreme cases:

– closed economy (chap. 3)

– small open economy (chap. 5)

A large open economy – like the U.S. – falls between these two extremes.

The results from large open economy analysis are 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 openness & size:

<table>
<thead>
<tr>
<th></th>
<th>Closed economy</th>
<th>Large open economy</th>
<th>Small open economy</th>
</tr>
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<tbody>
<tr>
<td>$r$</td>
<td>rises</td>
<td>rises, but not as much as in closed economy</td>
<td>no change</td>
</tr>
<tr>
<td>$I$</td>
<td>falls</td>
<td>falls, but not as much as in closed economy</td>
<td>no change</td>
</tr>
<tr>
<td>$NX$</td>
<td>no change</td>
<td>falls, but not as much as in small open economy</td>
<td>falls</td>
</tr>
</tbody>
</table>
Chapter Summary

- Net exports--the difference between
  - exports and imports
  - a country’s output \((Y)\) and its spending \((C + I + G)\)

- Net capital outflow equals
  - purchases of foreign assets minus foreign purchases of the country’s assets
  - the difference between saving and investment

- National income accounts identities:
  - \(Y = C + I + G + NX\)
  - trade balance \(\Rightarrow NX = S - I \Leftrightarrow\) 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 $I$.

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.

How the real exchange rate is determined
- $NX$ depends negatively on the real exchange rate, *ceteris paribus*
- The $\varepsilon$ adjusts to equate $NX$ with net capital outflow