Intermediate Macroeconomics

L1: National Income in Closed and Open Economies

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Topics

- The relationship between
  - Saving and investment in a closed economy
  - Saving, investment and the current account in an open economy
  - Fiscal deficits and the real interest rate
  - Fiscal deficits and the current account
  - The real exchange rate and the current account

- Contemporary trade imbalances

Literature: Mankiw, Chapters 3 and 6, EEAG (2014), Ch. 1.
The closed economy

\[ Y = F(K, L) \]
\[ K = \bar{K} \]
\[ L = \bar{L} \]
\[ Y = C + I + G \]
\[ C = C(Y - T) \]
\[ I = I(r) \]
\[ G = \bar{G} \]
\[ T = \bar{T} \]

Production function
Given capital stock
Given labour force
Goods market equilibrium
Consumption function
Investment function
Given government expenditure
Given lump sum tax
Equilibrium

Goods market:

$$\bar{Y} = C(\bar{Y} - \bar{T}) + I(r) + \bar{G}$$

$$\bar{G} \uparrow \Rightarrow r \uparrow \Rightarrow I \downarrow$$

Credit market (market for "loanable funds"):

$$\bar{S} = \bar{Y} - C(\bar{Y} - \bar{T}) - \bar{G} = I(r)$$

Saving = Investment

$$\bar{S} = [\bar{Y} - \bar{T} - C(\bar{Y} - \bar{T})] + [\bar{T} - \bar{G}] = I(r)$$

Private saving + Government saving = Investment

$$\bar{G} \uparrow \Rightarrow r \uparrow \Rightarrow I \downarrow$$

Analysis of tax cuts: similar
Fig 3-6: The consumption function

Consumption, $C$

Disposable income, $Y - T$

Consumption function

MPC
Fig 3-7: The investment function

Real interest rate, $r$

Quantity of investment, $I$

Investment function, $I(r)$
Fig 3-8: Saving, investment and the interest rate

Real interest rate, $r$

Equilibrium interest rate

$\text{Saving, } S$

$\bar{S}$

$\text{Desired investment, } I(r)$

Investment, Saving, $I, S$
Fig 3-9: A reduction in saving

1. A fall in saving...

2. ...raises the interest rate...
Fig 3-10: Military spending and the interest rate in the United Kingdom
The current situation

- Fiscal deficits in many countries
  - Insufficient fiscal restraint in good times
  - Fall in tax revenue during the crisis
  - Support to financial sector
  - Fiscal stimulus programmes
- High interest rates in countries with solvency problems
- So far low interest rates in countries that do not suffer from credibility problems
### Table 1.2, EEAG Report 2014

#### Public finances

<table>
<thead>
<tr>
<th></th>
<th>Gross debt</th>
<th>Fiscal balance</th>
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<tr>
<td>Germany</td>
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<td>France</td>
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<td>Estonia</td>
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<td>Euro area</td>
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<td>Japan</td>
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<tr>
<td>Switzerland</td>
<td>63.3</td>
<td>50.1</td>
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</table>

*a* As a percentage of gross domestic product. For the European countries, definitions according to the Maastricht Treaty. For the United States, Japan and Switzerland, definitions according to the IMF. — *b* Before 2008 the European Union does not include information on Croatia.

Sources: European Commission, Autumn 2013; IMF World Economic Outlook, October 2013.
Figure 1.21

10-year government bond yields

- United Kingdom
- United States
- Switzerland
- Euro area
- Japan

a) The synthetic euro area benchmark bond refers to the weighted average yield of the benchmark bond series from each European Monetary Union member. Source: Datastream, last accessed on 31 January 2014.
Fig 3-11: An increase in the demand for investment

1. An increase in desired investment...

2. ...raises the interest rate.
Fig 3-12: An Increase in investment demand when saving depends on the interest rate

1. An increase in desired investment...
2. ...raises the interest rate...
3. ...and raises equilibrium investment and saving.
Equilibrium in the open economy

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

\[ C = C^d + C^f \Rightarrow C^d = C - C^f \]

\[ I = I^d + I^f \Rightarrow I^d = I - I^f \]

\[ G = G^d + G^f \Rightarrow G^d = G - G^f \]

\[ Y = (C - C^f) + (I - I^f) + (G - G^f) + EX \]
Equilibrium in the open economy cont’d.

\[ Y = C + I + G + EX - \left( C^f + I^f + G^f \right) \]

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

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

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

where \( A = \) absorption (domestic spending).
Saving-investment balance in an open economy

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

Two types of saving: accumulation of real capital \((I)\) or accumulation of financial claims on the rest of the world resulting from net exports \((NX)\)

\[ S - I = NX \]

- Net exports are the difference between saving and investment
- Net exports = trade balance
- Saving minus investment = net capital outflow (net foreign investment)

- Net capital outflow
  - Lending to foreign banks
  - Purchases of foreign assets (bonds, equity, real estate)
Saving-investment balance in an open economy cont’d.

\[ Y = C + I + G + NX \]
\[ GDP = C + I + G + NX \]
\[ GNP = GDP + NFIA \]

- NFIA = Net Factor Income from Abroad = Factor payments from abroad - Factor payments to abroad
A model of a small open economy

\[ r = r^* \]
\[ Y = \overline{Y} = F(\overline{K}, \overline{L}) \]
\[ C = C(Y - \overline{T}) \]
\[ I = I(r) \]
\[ NX = (Y - C - \overline{G}) - I = S - I \]

Reduced form:

\[ NX = \left[ \overline{Y} - C \left( \overline{Y} - \overline{T} \right) - \overline{G} \right] - I \left( r^* \right) \]
\[ NX = \overline{S} - I \left( r^* \right) \]

Net exports are given by the difference between saving and investment at the world market real interest rate.
Fig 6-2: Saving and investment in a small open economy

- Real interest rate, $r$
- Trade surplus
- $r^*$
- World interest rate
- Interest rate if the economy were closed
- Investment, Saving, $I, S$
Fig 6-3: A fiscal expansion at home in a small open economy

1. This economy begins with balanced trade, ...

2. ... but when a fiscal expansion reduces saving ...

3. ... a trade deficit results.
Fig 6-4: A fiscal expansion abroad in a small open economy

1. An increase in the world interest rate ...

2. ... reduces investment and leads to a trade surplus.
Fig 6-5: A shift in the investment schedule in a small open economy

1. An increase in investment demand...
2. ...leads to a trade deficit.

Real interest rate, $r$

Investment, Saving, $I, S$
Fig 6-6: The trade balance, saving, and investment: the US experience
The Current Account

The current account balance = Net exports + Net return on foreign assets:

\[ CA = NX + rNFA \]

\( CA = \) current account
\( NX = \) net exports
\( r = \) interest rate
\( NFA = \) net foreign assets = foreign assets - foreign debt

Mankiw simplifies the analysis by neglecting the return on foreign assets
The real exchange rate

The relative price between domestic and foreign goods

\( p = \) Swedish product price in SEK

\( p^* = \) foreign product price in \( \$ \)

\( e = \) nominal exchange rate (units of \( \$ \) per \( SEK \))

\( \epsilon = \) real exchange rate

\[ \epsilon = \frac{ep}{p^*} \]

\[ \frac{\Delta \epsilon}{\epsilon} \approx \frac{\Delta e}{e} + \frac{\Delta p}{p} - \frac{\Delta p^*}{p^*} \]

Percentage change in the real exchange rate \( \approx \) percentage change in nominal exchange rate + percentage change in Swedish product price - percentage change in foreign product price
The real exchange rate cont’d.

\[ \epsilon \downarrow: \text{real depreciation (relative price of domestic goods decreases)} \]
\[ \epsilon \uparrow: \text{real appreciation (relative price of domestic goods increases)} \]

\[ NX = NX(\epsilon) \]

Net exports are negatively related to the real exchange rate

\[ \epsilon \uparrow \implies NX \downarrow \]

A real depreciation causes an improvement of the trade balance:

\[ \epsilon \downarrow \implies NX \uparrow \]
Fig 6-7: Net exports and the real exchange rate

Real exchange rate, $\epsilon$  

Net exports, $NX$
Fig 6-8: How the real exchange rate is determined

Real exchange rate, $\epsilon$

Net exports, $NX$

$S - I$

Equilibrium real exchange rate
Fig 6-9: The impact of expansionary fiscal policy at home on the real exchange rate

1. A reduction in saving reduces the supply of domestic currency, ...

2. ... which raises the real exchange rate ...

3. ... and causes net exports to fall.
Fig 6-10: The impact of expansionary fiscal policy abroad on the real exchange rate

1. An increase in world interest rates reduces investment, which increases the supply of domestic currency, ...

2. ... causes the real exchange rate to fall, ...

3. ... and raises net exports.
Fig 6-11: The impact of an increase in investment demand on the real exchange rate

1. An increase in investment reduces the supply of domestic currency, ...

2. ... which raises the exchange rate ...

3. ... and reduces net exports.
Causes for global imbalances

- Global imbalances in recent years: large US current account deficit and Chinese current account surplus
- Low US savings (both governments and households)
- "Saving glut" in ROW (China and other Asian countries)
- "Export-led growth" in China and other Asian countries
- Elimination of the US current account deficit requires large US real exchange rate depreciation
Global current account balances 2001-2010

Source: International Monetary Fund, World Economic Outlook (October 2010).
Current account balances 2005-2010

Source: Eurostat, Ifo Institute calculations.
Current account balances 1995-2011
Elimination of current account deficits

- Requires real exchange rate depreciations

- Sweden ran large current account deficits prior to the crisis in the 1990s
  - Eliminated by large nominal (and real) depreciation when the fixed exchange rate was abandoned 1992
  - Large current account surpluses in Sweden from the mid 90s onwards
  - Largely due to fiscal consolidation

- Greece, Portugal, Ireland, Spain and Italy have had current account deficits after large real exchange rate appreciations
  - Real depreciations difficult to achieve when the exchange rate is fixed as within the EMU
  - Lower inflation (wage and price cuts) needed to achieve real depreciation
  - Lower inflation in crisis countries, and higher inflation in Germany and other surplus countries, desirable
Unit labour cost and the real exchange rate

- Define unit labour cost (ULC), the labour cost of producing one unit of output:
  \[ ULC = \frac{WL}{Y} \]
  where \( W \) is the wage, \( L \), employment and \( Y \) is output.

- Instead of \( \epsilon = \frac{e}{p^*} \), one often uses relative unit labour costs (RULC) as a measure of the real exchange rate:
  \[ RULC = e \frac{ULC}{ULC^*} \]
  where \( ULC^* \) is foreign unit labour cost.
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