Chapter 18

The Balance of Payments in the Short Run: Output, Exchange Rates, and Macroeconomic Policies
Where Are We Coming From?

• Thus far our study of exchange rates has been largely disconnected from the rest of the economy.
  • In chapters 13–15: we had a simple theory of exchange rates, but we treated output level as given. (Y was fixed.)
  • Now we address the case where both exchange rates and output can fluctuate in the short run.
Where Are We Going?

- We develop a model that explains the relationships between all major macroeconomic variables in the short run.
- The model we study is an open-economy variant of the well-known IS-LM model.
- The Key assumption of this type of Keynesian model is that prices are “sticky” in the short run, so that output is determined by shifts in demand in the goods market.
- Use model to see how monetary and fiscal policy affect the economy.
- One key lesson is that the feasibility and effectiveness of macroeconomic policies depends on the type of exchange rate regime.
Preliminaries and Assumptions

To simplify the analysis we assume:

- Two countries: home and foreign (ROW, denoted by * on variables)
- Prices fixed in the short run. (so $\pi^e = 0$)
  - Thus, expected inflation is fixed at zero.
  - And there is no distinction between real and nominal variables.
- Government spending $G$ and taxes $T$ are exogenously set by government.
- Foreign variables (output and interest rate) are taken as given.
- For simplicity, set $KA=0$, $NUT=0$, and $NFIA=0$. (Note that CA= TB then)

- Fixed exogenous variables:
  \[
  \bar{P} \quad \bar{P}^* \quad \bar{\pi}^e = 0 \quad \bar{G} \quad \bar{T} \quad \bar{Y}^* \quad \bar{i}^*
  \]
1) The Role of Demand

- First goal: understand the determination of the output or income in the Home economy. Driven here by demand.
  - As we learned in Chapter 16, output (supply of goods) must equal total expenditure (demand for goods).
  - In turn, the demand for goods and services is made up of four components: consumption, investment, government consumption, and the trade balance.

  - Demand = C + I + G + TB

- We examine each component of demand in turn and seek to understand its short-run determinants.
a) Consumption Function

We here take the Keynesian approach to consumption: Level of consumption $C$ fluctuates to some degree according to the level of current income $Y$ net of taxes $T$.

Consumption function $C(Y - T)$

The marginal propensity to consume MPC is the amount by which consumption increases when disposable income increase by $1$. 
MPC

- The slope of the consumption function is called the **marginal propensity to consume** (MPC)
  - It tells us how much of every extra $1 of disposable income received by households is spent on consumption.
  - We generally assume that $0 < \text{MPC} < 1$: when consumers receive an extra unit of disposable income (whether it’s a euro, dollar or yen), they will consume only a fraction of it and save the remainder.
  - For example, if you elect to spend $0.75 of every extra $1 of disposable income you receive, your MPC is 0.75.
  - We can also define the **marginal propensity to save** (MPS) as $1 - \text{MPC}$, so in this example MPS = 0.25, meaning that $0.25 of every extra $1 of disposable income is saved.
b) Investment

- The simplest model of aggregate investment: firms face an array of possible investment projects with differing real returns. A firm will invest capital in a project only if the real returns exceed the firm’s cost of borrowing capital.

Borrowing cost is the expected real interest rate, which equals the nominal interest rate $i$ minus the expected rate of inflation.

- However, under our simplifying assumption, the expected real interest rate is equal to the nominal interest rate $\pi = 0$.
- When the expected real interest rate falls we
Hence, our model assumes that investment \( I \) is a decreasing function of the interest rate \( i \).

\[
\text{Investment} = I = I(i)
\]
c) G & T

- Government collects taxes $T$ from private households and spends an amount $G$ on government consumption of goods and services.
  - Note that $G$ includes only actual spending on actual goods and services; Exclude government transfer programs (will appear later as consumption expenditure).
- If $G = T$ exactly, government spending exactly equals taxes and we say that the government has a **balanced budget** $G = \overline{G}$ $T = \overline{T}$
  - If $T > G$ : **budget surplus**
  - If $G > T$, **budget deficit** (equivalently, a negative surplus of $T - G$).
- Fiscal policy sets these at levels indicated by overbar;
d) The Trade Balance

- We consider two things that affect the trade balance:
  1) **Exchange rate**: each of the following will lead to expenditure switching away from foreign goods toward home goods:
     - rise in $P^*$: imported goods become more expensive
     - fall in $P$: home goods get cheaper
     - rise in $E$: more expensive to buy the foreign currency to buy foreign goods.
     - Putting together, a rise in the real exchange rate $(EP^*/P) \rightarrow \uparrow TB$.
  2) **Income**:
     - We argued earlier that a rise in home country income raises overall home consumption. Some of this consumption expenditure falls on imported goods. $\uparrow Y \rightarrow \uparrow IM \rightarrow \downarrow TB$
     - Similarly, a rise in income abroad leads to a rise in foreign expenditure on our exports. $\uparrow Y^* \rightarrow \uparrow IM^* = \uparrow EX \rightarrow \uparrow TB$.
Income and The Trade Balance

- Impact of changes in income on the trade balance can also be thought of in terms of the marginal propensity to consume.
  - Suppose home output rises by an amount $\Delta Y = $1, all else equal, and this leads to an increase in home imports of $\Delta IM = MPC_F$, where $MPC_F > 0$.
  - We refer to $MPC_F$ as the marginal propensity to consume foreign imports. For example, if $MPC_F = 0.1$ this means that out of every additional $1 of income $0.10 = 10$ cents are spent on imports.

- How does $MPC_F$ relate to the MPC seen earlier?
  - After a $1 rise in income, any additional goods consumed have to come from somewhere, home or abroad.
  - Let $MPC_H$ be the marginal propensity to consume home goods.
  - Thus, $MPC = MPC_H + MPC_F$.
  - For example, if $MPC_F = 0.10$ and $MPC_H = 0.65$, then $MPC = 0.75$; for every extra dollar of disposable income, home consumers spend 75 cents, 10 cents on imported foreign goods and 65 cents on home goods.
The Trade Balance

Putting this together: \( TB = TB\left( \frac{EP^*}{P}, Y - T, Y - T^* \right) \)

- Increasing function
- Decreasing function
- Increasing function

When home income increases, all else equal, the trade balance will decrease (move toward deficit) as imports increase.

Real exchange rate, \( q = \frac{E}{P} \)
CASE STUDY
The Trade Balance and the Real Exchange Rate in US

Real effective exchange rate (Nov. 2005=100)

Real effective exchange rate (left scale)

Trade balance (% of GDP)

Trade balance (right scale)


real depreciation

increasing trade surplus
CASE STUDY
The Trade Balance and the Real Exchange Rate

- J-curve: response of TB to a currency deprecation may be an initial decline followed by a delayed rise

\[ \text{TB (in $)} = \text{EX($)} - \text{E($/€)} \times \text{IM(€)} \]

Suppose drop in E($/€) induces a gradual drop in future import orders. But the dollar value of existing €-imports goes up.
1. A nominal depreciation occurs at time $T$; prices are sticky so this is also a real depreciation.

2. Orders for home exports are boosted by the depreciation but only after a lag during which export orders adjust.

3. Home imports are immediately affected by a price increase (foreign goods cost more in terms of home output) but eventually, after a lag during which import orders adjust the value of imports declines relative to its initial level.

4. The trade balance initially falls after the depreciation due to the price effect (more expensive imports, with unchanged import and export quantities). Gradually quantities adjust and the trade balance rises. This is the J-Curve
Exogenous Shocks to C, I, and TB

- Shocks can affect each part of demand
- **Consumption**: wealth shift: stock market raises household wealth, raising consumption relative to current income.
- **Investment**: optimism about investment opportunities in tech sector in 1990s
Goods Market Equilibrium
DEMAND = SUPPLY FOR HOME GOODS

- **Equilibrium** concept: all goods produced must be willingly demanded and purchased.
  - If there is excess supply, then firms will produce less.
  - If excess demand draws down inventories, then firms will start producing more.
- Recall: Demand equals C+I+G+TB
- We now require Output (Y) = D:
  \[
  Y = C(Y - \bar{T}) + I(i) + G + TB \left( \frac{EP^*}{P}, Y - \bar{T}, Y^* - \bar{T}^* \right)
  \]
- Note that we use Y to represent output (supply) and also income (which affects consumption and import demand).
- Plot this on axes for Demand v. output: Keynesian Cross diagram.
The Keynesian Cross

EQUILIBRIUM

When income rises by $1, total spending on all goods rises by $MPC, but total spending on domestic goods rises by only $MPC_H < 1; this is the slope of the demand function.

Goods demand equals goods supply at
The Keynesian Cross

Equilibrating process: Note that Firms are willing to supply at the preset price, and quantities adjust to restore equilibrium.

- At point 2, demand D exceeds supply Y; as inventories fall, firms expand production and output rises towards Y1.
- At point 3, supply Y exceeds demand D; as inventories rise, firms cut production and output falls towards Y1.
- To the right of point 1, output tends to fall; to the left of point 1, output tends to rise.
- Only at point 1 are firms in an equilibrium in which production levels are stable in the short run.
The Keynesian Cross

- The Keynesian Cross also allows us to examine the impact of the other factors on goods market equilibrium.

- Let’s look at four important cases:
  - 1. A fall in taxes (all else equal)
  - 2. A rise in government purchases (all else equal)
  - 3. A fall in the interest rate $i$ (all else equal)
  - 4. A rise in the real exchange rate (all else equal)

- To understand these cases all we have to do is figure out what they do to demand. Turns out they are 4 versions of the same case: D shifts up in all cases
The Keynesian Cross
SHIFTS IN DEMAND

1. After an increase in demand $D$ ...

2. ... income or output $Y$ must rise in equilibrium
Our analysis of demand shows how the level of output in the economy adjusts to ensure a goods market equilibrium, given the levels of each component of demand.

But there is more than one market in the economy and a general equilibrium requires equilibrium in all markets: that is, equilibrium in the goods market, the money market, and the forex market.

Bring these last two markets into the analysis, and we do that next by using a tool of macroeconomic analysis known as the IS-LM diagram.

Analyzing equilibria in three markets simultaneously may seem like a tall order, but we shall proceed one step at a time.
The IS curve shows combinations of output $Y$ and the interest rate $i$ where the goods and forex markets are in equilibrium.

Derivation: use 3 diagrams
A) Keynesian cross diagram
B) IS diagram
C) Forex market diagram
Deriving the IS Curve

- **Start with considering a fall in the Interest Rate i**
  - Forex market
    - Domestic deposits have a lower return. The exchange rate faces depreciation pressure, and UIP tells us that to maintain forex market equilibrium the exchange rate must rise.
  - Keynesian cross
    - What happens to demand? In panel (a) demand must shift up, for two reasons
      - First, the lower interest rate encourages investment demand.
      - Second, the domestic currency depreciation increase demand D via the trade balancedue to expenditure switching.

- **A rise in output Y**
  - So: \[
  \begin{align*}
  \downarrow i & \rightarrow \begin{cases}
    \uparrow E & \rightarrow \uparrow TB & \rightarrow \uparrow D \\
    \uparrow I & \rightarrow \uparrow D
  \end{cases} \\
  \rightarrow \uparrow Y
  \end{align*}
\]
Deriving the IS Curve

- Conclude: The IS curve is a downward sloping relationship between the interest rate $i$ and output $Y$.

  - Note: In the open economy, lower interest rates not only stimulate demand via the traditional closed-economy investment channel; they also stimulate demand via the trade balance, since lower interest rates cause a nominal exchange rate depreciation, which in the short run is also a real depreciation, which stimulates external demand via the trade balance.
The IS Curve

1. A fall in the interest rate…

2. …leads to an exchange rate depreciation…

3. A lower interest rate and an exchange rate depreciation shift demand D up for any level of Y.

4. Income must rise in equilibrium…

5… which traces out the IS curve.

\[
D = C(Y - T) + I(i_1) + G + TB(E_1P^* / P, Y - T, Y^* - T^*)
\]

\[
D = C(Y - T) + I(i_2) + G + TB(E_2P^* / P, Y - T, Y^* - T^*)
\]

\[
D = Y
\]

\[
D = Y
\]
Factors that Shift the IS Curve

- In deriving the IS curve, we treated various demand factors as exogenous.
- The following things shift the IS curve right, because they raise demand for a given interest rate:
  - rise G.
  - Fall in T.
  - rise in the foreign interest rate $i^*$.
  - Fall in the given level $P$, or rise in $P^*$.

$$\text{IS} = \text{IS}(G, T, i^*, E^e, P^*, P)$$
Factors that Shift the IS Curve

(a) Goods Market (Keynesian Cross)

(b) IS diagram
Money Market Equilibrium: Deriving The LM Curve

- **LM curve is the combinations of Y and i that ensure equilibrium in the money market.**
- The LM curve is more straightforward to derive than the IS curve, since it is based on material in ch 14 nd 15, and is the same as in past closed economy classes.
- Story: consider a rise in income, Y:
  - This raise money demand
  - Under the assumption of sticky prices, this bids up the equilibrium interest rate in the money market.

\[
\frac{M}{P} = \frac{L(i)Y}{Y} \quad \uparrow Y \rightarrow \uparrow \text{real money demand} \rightarrow \uparrow i
\]
Money Market

The LM Curve

1. A rise in income...

2. ...shifts the money demand curve to the right.

3. The interest rate rises...

4. ...tracing out the LM curve.

(a) Money market

(b) LM diagram
Money Market
Change in Money Supply shifts LM Curve

What shifts LM curve right:
- Rise in money supply
- Fall in exogenous money demand for reason other than change in Y

(a) Money market
(b) LM diagram
IS-LM-FX Diagram
Shows equilibrium in 3 markets

(a) IS-LM Model
(b) Forex market
What’s the point?
Time to do policy analysis

- Two sets of questions
  - We look at temporary policy changes
  - Why? Long run changes rules out by
    - Government budget constraint (fiscal policy)
- What is the impact of Monetary Policy
  - Under floating rates?
  - Under fixed rates?
- What is the impact of Fiscal Policy
  - Under floating rates?
  - Under fixed rates?
Monetary Policy with Floating Rates

(a) IS-LM Model

1. An increase in the money supply shifts the LM curve right,...

2. …lowers the interest rate (stimulating investment demand),…

3. …and depreciates the exchange rate (raising demand via expenditure switching),…

4. …as the equilibrium shifts along the IS curve causing income to rise.

(b) Forex Market

Output, income $Y$

Exchange rate, $E$
Monetary Policy with Fixed Rates

(a) IS-LM Model

1. An increase in the money supply shifts the LM curve right, which would tend to lower the interest rate...

2. ...which would tend to lower the interest rate...

3. ...which would tend to depreciate the exchange rate, violating the fixed rate; so the monetary authority must intervene to prevent this, reversing its policy change;...

4. ...the monetary policy change is undone. The economy remains at the same equilibrium; autonomous monetary policy is impossible.

(b) Forex Market
Fiscal Policy with Floating Rates

(a) IS-LM Model

1. An increase in the government spending shifts the IS curve right…

2. …raises the domestic interest rate (crowding out investment),…

3. …and appreciates the exchange rate (reducing demand via expenditure switching),…

4. …as the equilibrium shifts along the LM curve causing income to rise.

(b) Forex Market

Output, income, Y

Exchange Rate, E

Interest rate, i

IS(LM(M/P))

IS(G, T, i*, E, P, P)

IS(G, T, i*, E, P, P)

IS(G, T, i*, E, P, P)

IS(G, T, i*, E, P, P)

IS(G, T, i*, E, P, P)

IS(G, T, i*, E, P, P)
Fiscal Policy with Fixed Rates

**IS-LM Model**

1. An increase in the government spending shifts the IS curve right,...

2. ...which would tend to raise the domestic interest rate, ...

3. ...which shifts the LM curve to the right until the initial interest rate is restored.

4. Income increases dramatically.

**Forex Market**

3. ...which would tend to appreciate the exchange rate, violating the fixed rate; so the monetary authority must intervene to prevent this, by expanding the money supply and lowering the home interest to its initial level.
**Policy Summary**

**Monetary and Fiscal Policy Impacts in the Open Economy IS-LM Model** The table shows the effect of a monetary or fiscal expansion on five key variables in the IS-LM model: the interest rate, exchange rate, investment, trade balance, and income (output). The effects depend on whether a country is operating with a fixed or floating exchange rate.

“↑” indicates that the variable rises; “↓” that the variables falls; “0” indicates no effect. The effects would be reversed for contractionary policies.

<table>
<thead>
<tr>
<th>Exchange Rate Regime</th>
<th>Policy</th>
<th>i</th>
<th>E</th>
<th>I</th>
<th>TB</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floating</td>
<td>Monetary Expansion</td>
<td>↓</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Fiscal Expansion</td>
<td>↑</td>
<td>↓</td>
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<td>↑</td>
</tr>
<tr>
<td>Fixed</td>
<td>Monetary Expansion*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fiscal Expansion</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>↑</td>
</tr>
</tbody>
</table>

* This policy is not feasible.
CASE STUDY

- Monetary policy
  - High inflation in the 1970s is deeply unpopular
  - Appoints Volcker as Fed chair to tackle it
  - Volcker tightens monetary policy a lot (into 1980s)
- Fiscal policy
  - tax cuts
  - more government spending (especially military spending)
- How do we represent this in our model?
- What are the predictions? What was the reality?
CASE STUDY

(a) IS-LM Model

1. A monetary tightening by the U.S. Federal Reserve tends to raise interest rates and lower output in the short run…

2. An increase in U.S. government spending would tend to raise output, but also raise the interest rate further.

3. Home income falls if fiscal expansion is outweighed by monetary contraction.

(b) Forex Market

4….but the exchange rate appreciates dramatically, as the interest rate rises.
CASE STUDY

(a) Monetary and Fiscal Policies


(b) Exchange Rates

3. Pronounced nominal and real appreciation

4. Sharp downturn in investment

5. With a lag, the trade balance moves markedly from surplus towards deficit.
CASE STUDY
Aus/NZ Stabilization Policy after 1997

• Asian economics crisis in 1997
  - Korea, Indonesia, Thailand, Malaysia all suffer economic crises (including exchange rate crises); big recessions
  - Damage on a smaller scale in rest of the region

• Impact in Australia and New Zealand
  - Pac-rim includes many major trading partners for Australia and NZ
  - All of these were hit by big recessions
  - Their demand for Aus and NZ imports collapsed

• If you are in charge in macro policy in Aus or NZ, what would you do?
  - Use the IS/LM model
  - Fiscal v Monetary?
  - Predictions? reality?
CASE STUDY
Aus/NZ Stabilization Policy after 1997

IS-LM Model

1. A temporary decrease in foreign income shifts the IS curve to the left, which tends to reduce home income, lower home interest rates, and depreciate the home currency…

2. …home central bank responds with monetary expansion, shifting LM curve right, causing an even lower interest rate, even more depreciated currency…

3. Home income remains stable despite the external shock…

Forex Market

4. …but the exchange rate depreciates dramatically; the external shock to export demand has been neutralized by a real depreciation that boosts the current account and by an interest rate reduction that stimulates home investment demand.
CASE STUDY
Aus/NZ Stabilization Policy after 1997

(a) Monetary Policies
Central Bank Interest Rate (annual)

(b) Nominal Exchange Rates
Nominal Exchange Rate (local currency/U.S. $)

(c) Real Exchange Rates
Real Exchange Rate (versus U.S., 2000=100)

(d) Trade Balances
Current Account (Relative to National Income)
The theory shows that policy makers have the power theoretically to keep output steady at its full-employment level with no unemployed resources and no inflation pressure.

But there are reasons why policy makers should be cautious about using this power.

1. Policy constraints. Policymakers constrained by fixed exchange rates or balanced budgets.
2. Inside lag: it takes time to collect the necessary information and make a decision about policy. (fiscal policy in US is slow)
3. Outside lag: it takes time for policy action to affect behavior of people in the economy and have the desired effect. (Monetary policy takes 6 months.)
4. Policy might only affect short term interest rates and exchange rates, but firms plan investment based on long-term
5. Nominal exchange rates might not affect relative prices and import decisions if firms adjust prices to maintain their market share.