Foundations of Modern Macroeconomics Third Edition

Chapter 2: The open economy

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Outline

Getting started

- Learning objectives for this chapter:
  - To open up the IS-LM model to international trade in goods and assets: Mundell-Fleming
  - To study the effects of fiscal and monetary policy in the small open economy
  - To investigate the role of the degree of (financial) capital mobility
    - Immobile
    - Imperfectly mobile
    - Perfectly mobile
  - To investigate the role of the type of exchange rate system
    - Fixed exchange rates
    - Managed exchange rates
    - Flexible exchange rates

National income and monetary accounting (1)

- For the open economy we have from the national accounts:

$$Y \equiv C + I + G + (EX - IM) \tag{S1}$$

  - Y is aggregate output
  - C is private consumption
  - I is investment
  - G is government consumption
  - EX is exports (demand by RoW for our products)
  - IM is imports (demand by us for RoW's products)

- We often write:

$$Y \equiv A + (EX - IM)$$

  - A is absorption; $EX - IM$ is *net* exports

National income and monetary accounting (2)

- Remember output measurement:
  - Gross Domestic Product (GDP): output produced within the country ("produced where?")
  - Gross National Product (GNP): output produced by the country's residents domestic ("produced by whom?")
  - Difference: net factor payments from abroad
- We can add transfers (TR) and deduct taxes (T) from (S1) to get:

$$\underbrace{Y + TR - T}_{(a)} \equiv C + I + (G - T) + (\underbrace{EX + TR - IM}_{(b)}) \quad \text{(S2)}$$

  - (a) Disposable income of residents
  - (b) Current account CA (of the BoP)

National income and monetary accounting (3)

- Private sector saving:

$$S \equiv Y + TR - T - C \tag{S3}$$

- Combining (S2) and (S3):

$$(S - I) + (T - G) \equiv (EX + TR - IM) \equiv CA$$

  - Current account surplus is sum of saving surpluses of private and public sectors
  - CA measures additions to net external assets ($CA > 0$ means that domestic country is **lending to** RoW):

$$\begin{aligned} \Delta NFA &\equiv CA \\ &\equiv (S - I) + (T - G) \end{aligned}$$

National income and monetary accounting (4)

- Now some monetary accounting: how does ΔNFA affect the monetary side of the economy?
  - Look at ΔNFA^{cb} (cb stands for Central Bank)
  - Stylized balance sheet:

Balance Sheet of the Central Bank

Assets		*Liabilities*	
Net foreign assets	NFA^{cb}		
Domestic credit	DC	High powered money	H

National income and monetary accounting (5)

- . . . continued . . .
  - NFA^{cb}: foreign exchange reserves less liabilities to foreign official holders
  - DC: securities held by CB (e.g. government bonds), loans, other credit
  - H: stock of high-powered money ("base money"):

$$H \equiv C^P + RE$$

    where C^P is currency and RE is commercial bank deposits held at CB
  - by definition we get in first differences:

$$\Delta NFA^{cb} \equiv \Delta H - \Delta DC \tag{S4}$$

National income and monetary accounting (6)

- Expression (S4) yields important insights:
  - If CB intervenes in foreign exchange market then, barring changes in DC, this will affect (base) money supply: $\Delta NFA^{cb} \equiv \Delta H$
  - But CB can break link between NFA^{cb} and H temporarily by *sterilization*: manipulate DC to keep base money supply unchanged ($\Delta NFA^{cb} \equiv -\Delta DC$ so that $\Delta H = 0$). **Example**: sale of forex by CB $\Longrightarrow \Delta NFA^{cb} < 0$, expansionary *open market operation* (purchase of domestic bonds) $\Longrightarrow \Delta DC > 0$.
- Final remark: in fractional reserve system we have that money supply is proportional to base money, i.e. $M^S = \mu H$ and thus $\Delta M^S = \mu \Delta H$

Open economy IS-LM-BP model (1)

- The IS curve for the open economy can be written as follows:

$$Y = A(\underset{-}{R}, \underset{+}{Y}) + G + X(\underset{-}{Y}, \underset{+}{Q})$$

$$Q \equiv \frac{EP^*}{P}$$

  - $A(R, Y)$ is part of domestic absorption depending on R and Y; partial derivatives $A_R < 0$ (investment) and $0 < A_Y < 1$ (MPC)
  - $X(Y, Q)$ is net exports; partial derivatives $X_Y < 0$ (import demand) and $X_Q > 0$ (Marshall-Lerner condition)
  - Q is the relative price of foreign goods:
    - E is nominal exchange rate (dimension Euro/US$)
    - P is domestic price level (dimension Euros)
    - P^* is foreign price level (dimension US$)

Open economy IS-LM-BP model (2)

- The LM curve for the open economy is represented by:

$$M^D/P = L(\underset{-}{R}, \underset{+}{Y})$$

$$M^S = \mu \left[NFA^{cb} + DC \right]$$

$$M^D = M^S = M$$

- "Supply side" Horizontal aggregate supply curves:

$$P = P^* = 1$$

Capital mobility and economic policy (1)

- Alternative assumptions regarding "financial openness" of an economy:
  - Capital immobility: no trade in financial assets at all (1940s, early 1950s)
  - Perfect capital mobility: no barriers; equalization of yields (1980s onward)
  - Imperfect capital mobility: intermediate case
- Balance of payments:

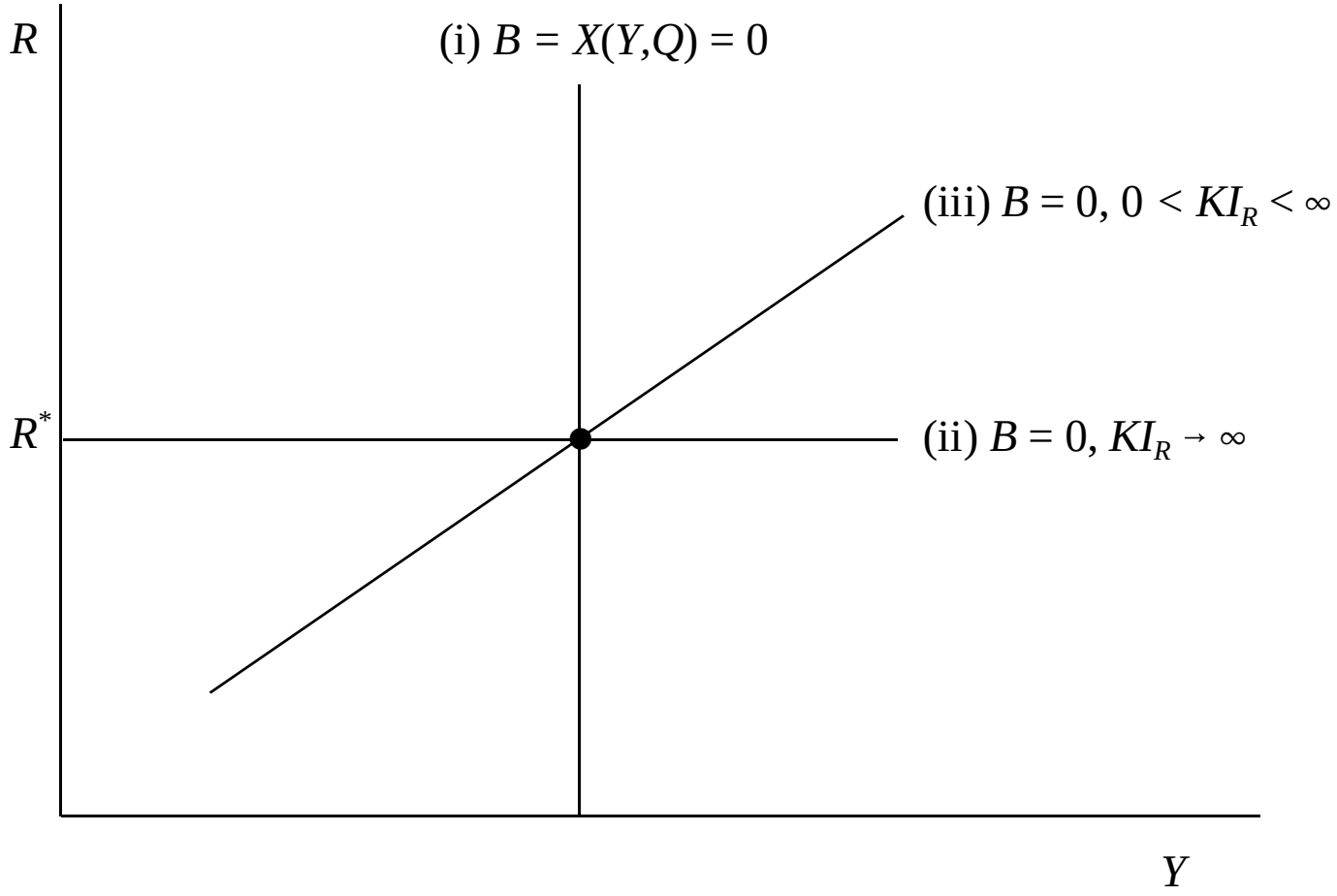
$$B \equiv X(Y, Q) + KI(R - R^*) \equiv \Delta NFA^{cb}$$

  - B is balance of payments
  - X is trade account (ignoring international transfers, TR)
  - KI is net capital inflow: if $KI > 0$ then domestic agents sell more assets to RoW than RoW is buying from us; net borrowing from RoW
  - R^* is interest rate in RoW

Capital mobility and economic policy (2)

- Cases as captured in the model:
  - Capital immobility:
    - $KI(R - R^*) \equiv 0$ regardless of R and R^*
    - BoP equilibrium ($B = 0$) identical to trade balance equilibrium ($X(Y, Q) = 0$)
  - Perfect capital mobility:
    - Arbitrage ensures that $R = R^*$ (represented by $KI_R \to +\infty$)
  - Imperfect capital mobility:
    - Differences in R and R^* can persist (represented by $0 < KI_R \ll +\infty$)
  - Note: In latter two cases, BoP equilibrium is such that $X(Y, Q) = -KI(R - R^*)$
- Three cases are drawn in **Figure 2.1**

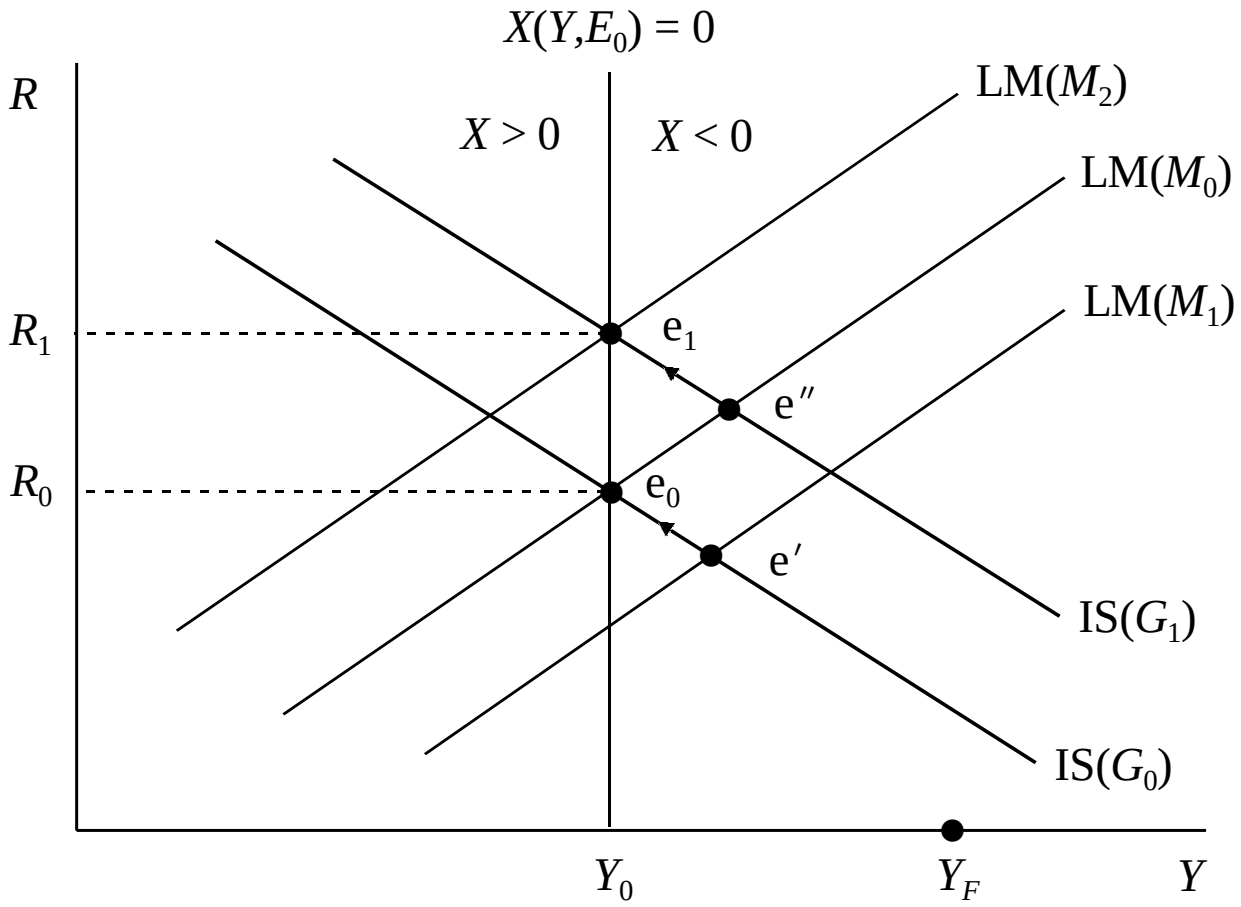
Figure 2.1: The degree of capital mobility and the balance of payments



Immobile capital and fixed exchange rates (1)

- Assumptions:
  - Capital immobile: $KI(R - R^*) \equiv 0$
  - Monetary authority maintains exchange rate at E_0
- Case is drawn in **Figure 2.2**
  - IS downward sloping, LM upward sloping, $X\,(Y, E_0) = 0$ line vertical
  - To right (left) of $X\,(Y, E_0) = 0$ imports too high (low) and $B = X < 0$ (> 0)
  - Initial equilibrium at point e_0

Figure 2.2: Monetary and fiscal policy with immobile capital and fixed exchange rates



Immobile capital and fixed exchange rates (2)

- Monetary policy
- How? Open market operation, purchase of bonds by CB
- Chain of effects:
  - Domestic credit rises, $\Delta DC > 0$
  - Money supply goes up (from M_0 to M_1)
  - LM to the right; economy to point e$'$
  - At e$'$ there is excess demand for forex
  - To keep exchange rate constant, CB must intervene (sell forex)
  - Money supply *gradually* falls; LM shifts to left
  - Economy back to e_0
- Conclusions:
  - Temporary decrease in R and increase in Y
  - No long-run effect on R and Y

Immobile capital and fixed exchange rates (3)

- Fiscal policy
- How? Bond financed increase in government consumption
- Chain of effects:
  - IS to the right; economy to point e″
  - At e″ there is excess demand for forex
  - To keep exchange rate constant, CB must intervene (sell forex)
  - Money supply gradually falls; LM shifts to left
  - Economy moves to e_1
- Conclusions:
  - Temporary increase in output
  - No long-run effect on Y but R higher
  - Crowding out of investment

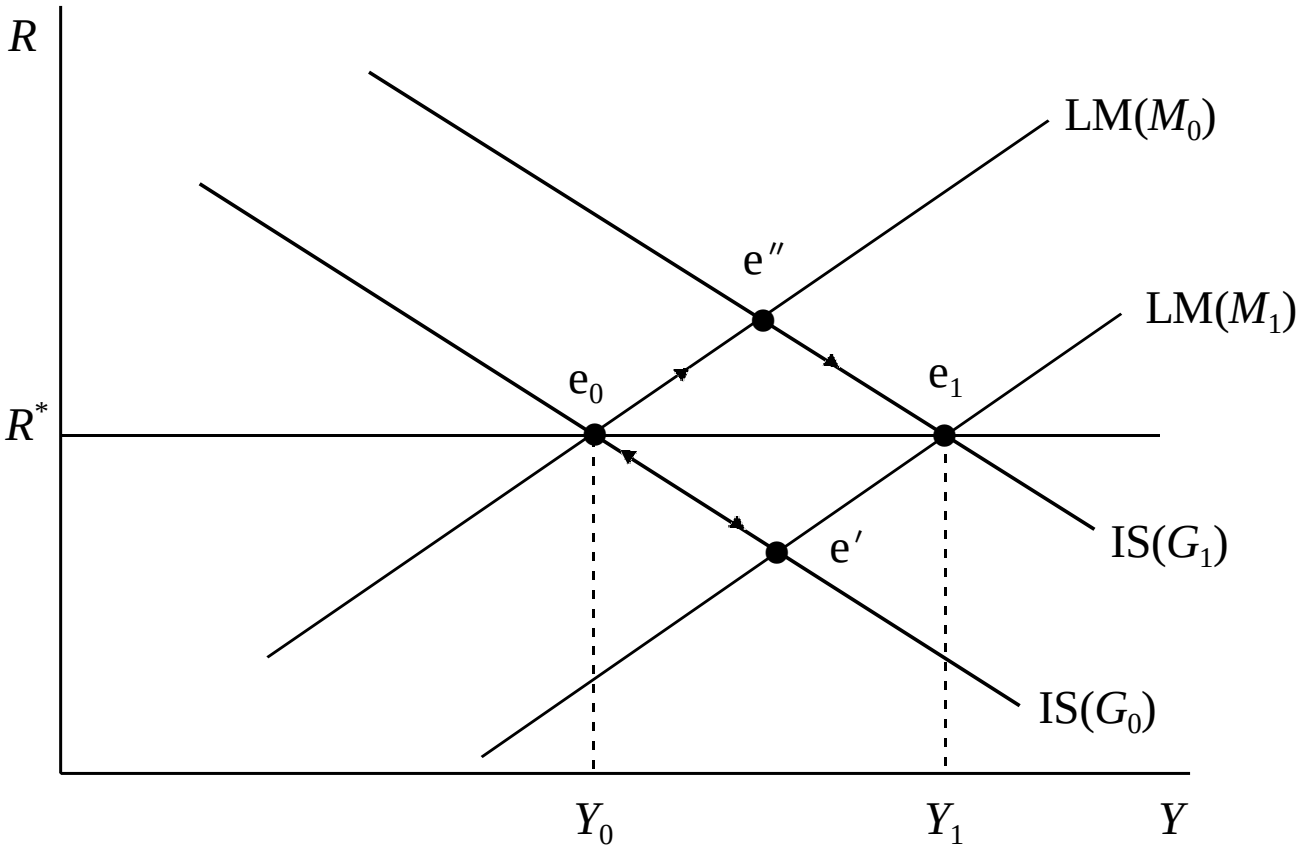
Perfectly mobile capital and fixed exchange rates (1)

- Assumptions:
  - Capital perfectly mobile: $R = R^*$
  - Monetary authority maintains exchange rate at E_0
  - BP curve is horizontal in **Figure 2.3**
  - Economy initially at e_0
- Monetary policy:
  - OMO increases DC and money supply; LM to right
  - At e' excess demand for forex (investors want to buy foreign assets)
  - CB intervenes and loses its foreign reserves; LM back
  - Adjustment is *instantaneous*, so monetary policy ineffective even in short run

Perfectly mobile capital and fixed exchange rates (2)

- Fiscal policy:
  - Bond financed increase in government consumption
  - IS to the right; economy to point e''
  - At e'' there is excess supply of forex (investors dump foreign assets)
  - To keep exchange rate constant, CB must intervene (buy forex)
  - Money supply increases; LM to the right, economy moves to e_1
  - Adjustment is *instantaneous*: no effect on R but Y higher
  - Fiscal policy highly effective

Figure 2.3: Monetary and fiscal policy with perfect capital mobility and fixed exchange rates



Perfect capital mobility and flexible exchange rates (1)

- The flexible exchange rate ensures BoP equilibrium:

$$B \equiv \Delta NFA^{cb} = 0 \qquad \Leftrightarrow$$

$$X(Y, E) + KI(R - R^*) = 0$$

  - Imports: cause demand for forex
  - Exports: cause supply of forex
  - Capital imports: cause supply of forex
  - Recall: no exchange rate intervention by CB, so stock of forex in hands of CB constant. Change in DC affects money supply. Money supply can be controlled.
- Focus on case with perfect capital mobility (PCM)

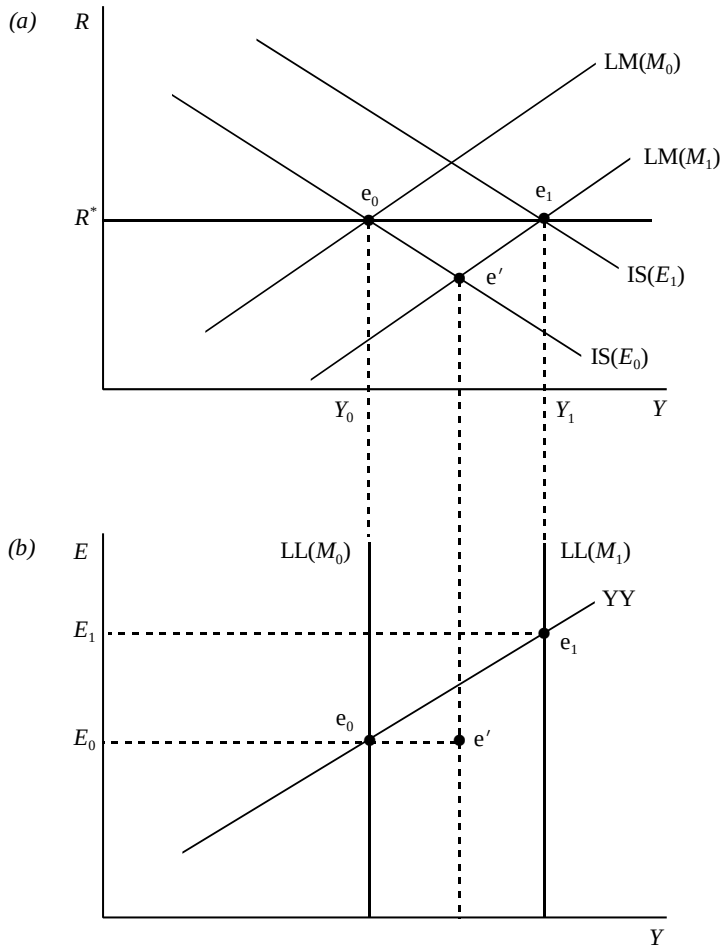
Perfect capital mobility and flexible exchange rates (2)

- PCM implies $R = R^*$ so model simplifies to:

$$Y = A(R^*, Y) + G + X(Y, E) \quad \text{(YY)}$$
$$M = L(R^*, Y) \quad \text{(LL)}$$

- Monetary policy:
  - See **Figure 2.4**
  - OMO increases DC and money supply; LM to right
  - At point e′ there is excess demand for forex
  - Domestic currency depreciates; IS to right
  - Hence: *instantaneous* adjustment from e_0 to e_1
  - Monetary policy highly effective!

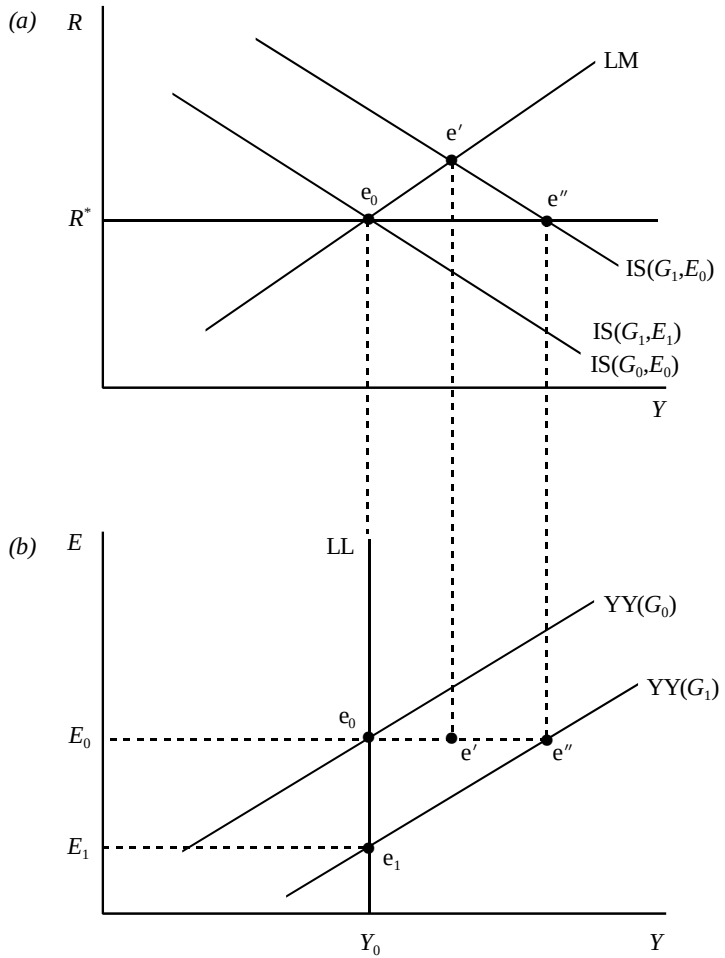
Figure 2.4: Monetary policy with perfect capital mobility and flexible exchange rates



Perfect capital mobility and flexible exchange rates (3)

- Fiscal policy:
  - See **Figure 2.5**
  - Bond financed increase in government consumption; IS to right
  - At point e' there is excess supply of forex
  - Domestic currency appreciates; IS to left
  - Hence: in panel (a) the economy stays at e_0; in panel (b) it moves from e_0 to e_1
  - fiscal policy completely ineffective at influencing output!

Figure 2.5: Fiscal policy with perfect capital mobility and flexible exchange rates



Perfect capital mobility and flexible exchange rates (4)

- Insulation property:
  - Flexible exchange rates insulate small open economy from foreign shocks (provided R^* is unaffected)
  - Example: RoW spending boom. Our exports rise, YY curve to the right, exchange rate appreciates, no effect on output. Shock not transmitted to quantities.
- For global shocks no insulation property:
  - Example: boost in RoW driving up world interest rate, R^*
  - See **Figure 2.6**
  - LL to right; YY up; domestic currency depreciates; output increases

Figure 2.6: Foreign interest rate shocks with perfect capital mobility and flexible exchange rates