MSc in Economics for Development

Macroeconomics for Development

Week 4 Class

Sam Wills

Department of Economics, University of Oxford

samuel.wills@economics.ox.ac.uk

Consultation hours: Friday, 2-3pm, Weeks 1,3-8 (MT)

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Week 3 Review

- CES utility function limits
  - CES utility function:
  - Limit as σ →1: Cobb Douglas
  - Limit as σ →∞: Perfect substitutes
  - Limit as σ →0: Perfect complements (Leontief)

$$u = \left(\sum_{i=1}^{n} \beta_i q_i^{-\rho} \right)^{-1/\rho} \qquad \rho = \frac{1-\sigma}{\sigma} < 1$$

Week 4 References

- Heijdra, B. J., Van der Ploeg, F., 2002, *Foundations of Modern Macroeconomics,* OUP, Ch 11.1
  - Brief late undergrad/graduate level look at IS-LM model

- Dornbusch, R., Fischer, S., Startz, R., 2008, *Macroeconomics*, McGraw Hill, Ch 12 and 20
  - Early undergrad look at IS-LM with plenty of diagrams and intuitive link to national accounts

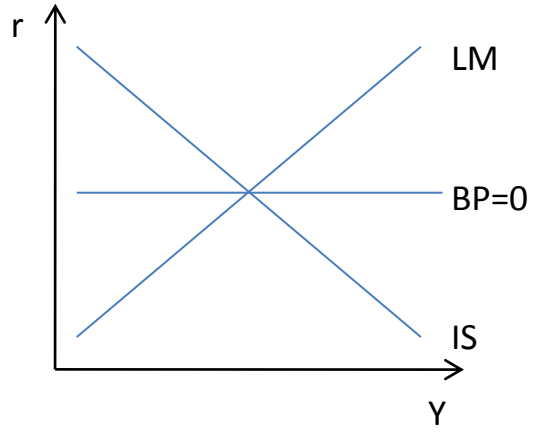
- Also try any other undergrad text

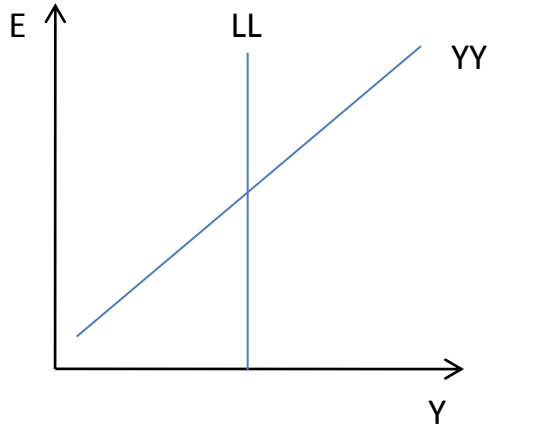
Overview: The Mundell-Fleming Model

- The Mundell-Fleming model is a simple graphical model of general equilibrium in an open economy
- The role of the Mundell-Fleming model is to simply model changes in the national accounts
- We now introduce the central bank to the analysis of the balance of payments in wk 1
- The Mundell-Fleming model consists of four components:
  a. Goods market
  b. Asset market
  c. Balance of payments
  d. Foreign currency market
- We consider the effects of monetary and fiscal policy under three different sets of assumptions:
  1. Immobile capital, fixed exchange rates
  2. Perfectly mobile capital, fixed exchange rates
  3. Perfectly mobile capital, flexible exchange rates
- However, the Mundell-Fleming model remains a simple model, and should only be used for back-of-the-envelope calculations
- Next week's class

The Mundell-Fleming model is a simple graphical model of general equilibrium in an open economy

Graphical Overview





Simple

•This model makes a number of simplifying assumptions including:

- fixed prices
- single domestic good
- ignores expectations

Graphical

• The great benefit of the model is the use of simple graphs to explain complex interactions. As a result we'll try to steer clear of too many equations this week

General Equilibrium

• It succinctly describes equilibrium in good, asset and currency markets, providing an understanding of how they interact

The role of the Mundell-Fleming model is to simply model changes in the national accounts

Consistency accounting matrix

Current Account

	Sources (rows) and Uses (columns)	A National Accounts	B Government	C Financial System	D Nonfinancial Private Sector	E External Sector
1	National Accounts		C^g		C^p	X
2	Government	$T_I - SUB + OS^g$			T_D	NT^{gf}
3	Financial System					
4	Nonfinancial Private Sector	$W + \Pi + Y_s$	$NT^{pg} + INT^{pg}$			$NT^{pf} + NFP^{pf}$
5	External sector	J	INT^{fg}		INT^{fp}	

Capital Account

	F Government	G Financial System	H Nonfinancial Private Sector	I External Sector	J Total Investment	Total
1	I^g		I^p		$I = I^p + I^g$	$Y = C^g + C^p + X - J + I$
2						$T^g = T_I - SUB + OS^g + T_D + NT^{gf}$
3						
4						$Y^p = W + \Pi + Y_s + NT^{pg} + INT^{pg} + NT^{pf} + NFP^{pf}$
5						$J + INT^{fg} + INT^{fp}$

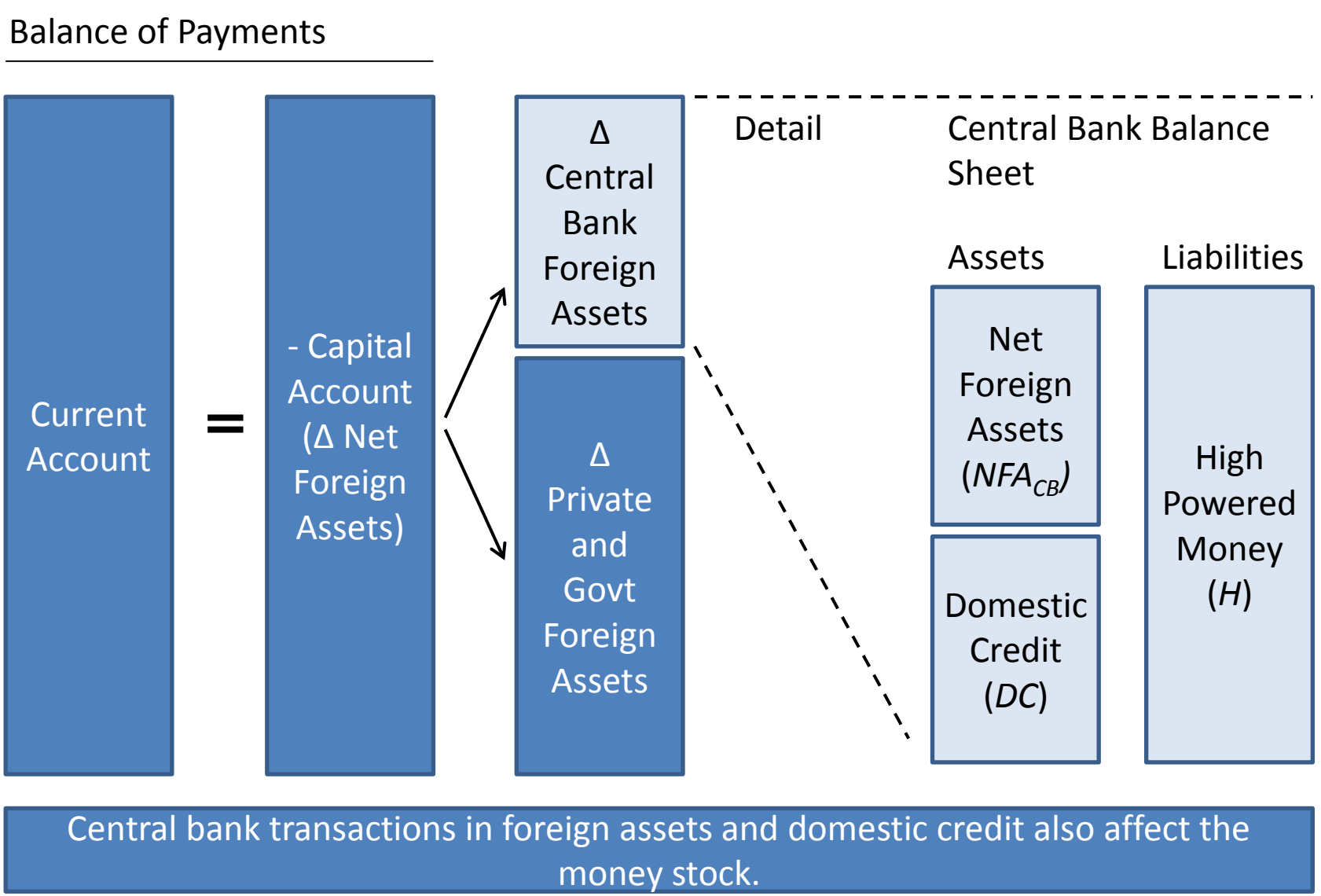
Savings and Borrowings

6	Government		S^g				ΔL^{gb}	ΔB^p	ΔFB^g		$S^g + \Delta L^{gb} + \Delta B^p + \Delta FB^g$
7	Financial system							ΔM			ΔM
8	Nonfinancial Private sector				S^p		ΔL^{pb}		ΔFB^p		$S^p + \Delta L^{pb} + \Delta FB^p$
9	External sector					CA	ΔR^*				$CA + \Delta R^*$
10	Total Savings (Sum of previous 4 rows)		S^g		S^p	CA					$S^g + S^p + CA = I$
	Total	$Y + J = TI - SUB + OS^g + (W + \Pi + Y_s) + J$	$G + S^g = T^g$		$CC^p + S^p = Y^p$	$X + NT^{gf} + NT^{pf} + NFP^{pf} = CA$	I^g	$\Delta L + \Delta R^*$	$I^p + \Delta B^p + \Delta M$	$\Delta FB^g + \Delta FB^p$	$I = I^p + I^g$	

Notes: G in column B is defined as $G = C^g + NT^{pg} + (INT^{pg} + INT^{fg})$. CC^p in column D is defined as $CC^p = C^p + T_D + INT^{fp}$. ΔL in column G is defined as $\Delta L = \Delta L^{gb} + \Delta L^{pb}$.

Source: Week 1 class, Agenor.

We now introduce the central bank to the analysis of the balance of payments in week 1

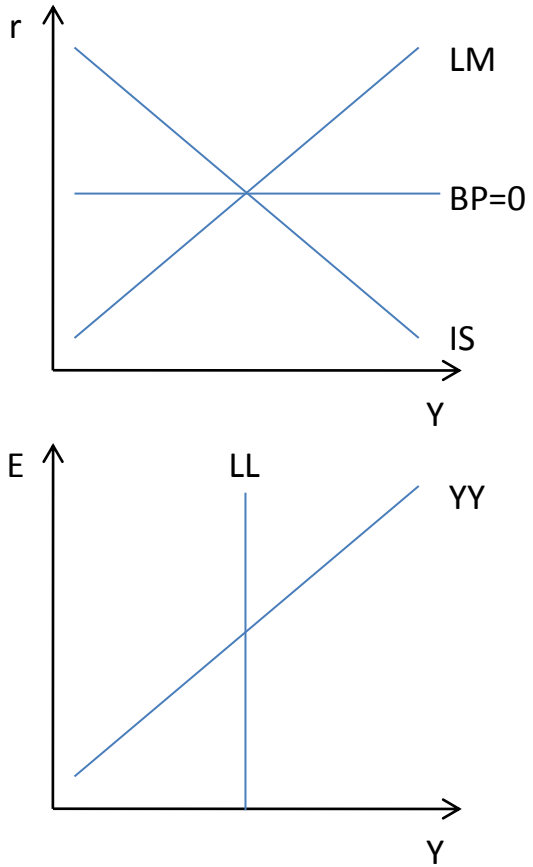


Central bank transactions in foreign assets and domestic credit also affect the money stock.

The Mundell-Fleming model consists of four components

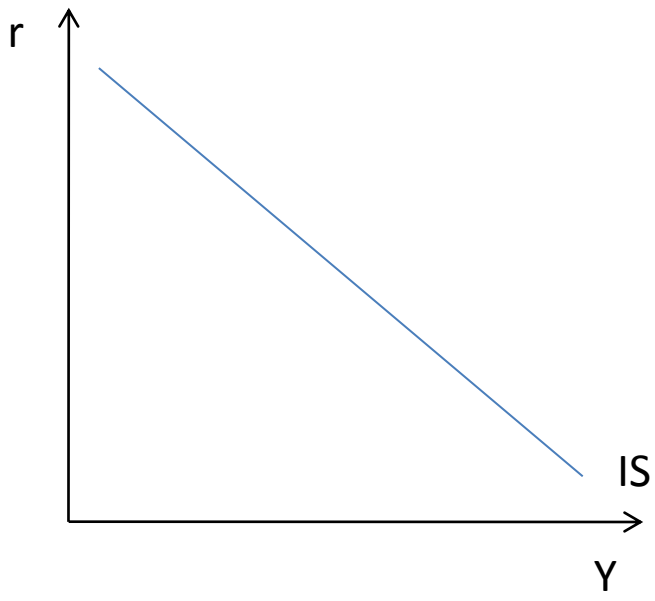
a.Goods Market	IS Curve: $Y = A(r,Y) + G + NX(Y,E)$ $A(r,Y) = C(Y) + I(r,Y)$
b.Asset Market	LM Curve: $M/P = L(r,Y)$
c.Balance of Payments	BP Curve $BP = NX(Y,E) + KA(r-r^*)$
d. Foreign Currency Market	Fixed: $E=E^*$ LL: $M = L(r,Y)$ YY: $Y = A(r,Y) + G + NX(Y,E)$

Graphical Overview of the Mundell-Fleming Model



a. Goods Market

The IS Curve



IS: $Y = A(r,Y) + G + NX(Y,e)$

Absorption: $A(r,Y) = C(Y) + I(r,Y)$

Real exchange rate: $e = EP^*/P$

Prices: $P=P^*=1$

Details

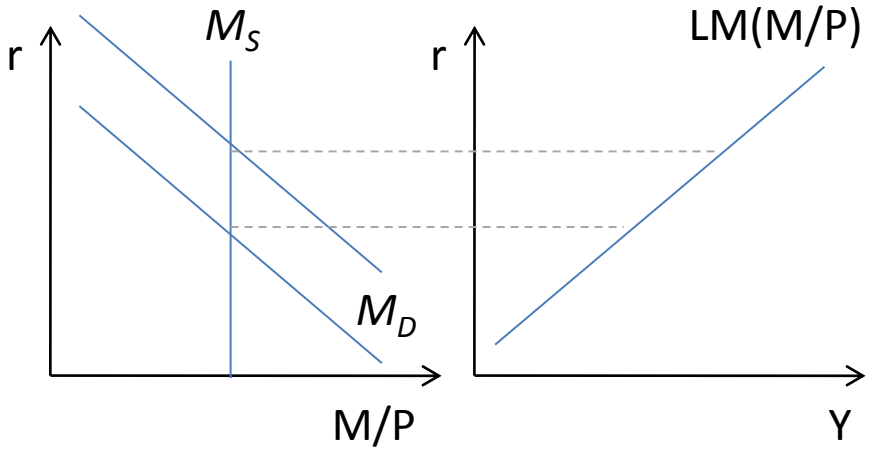
- The IS curve describes the "Investment and Saving Equilibrium"
  - All points where total investment equals total savings – no unplanned inventory
  - Describes the "real economy" in this model
- From Week 1 this is equivalent to the points where aggregate output is:

$$Y = C + I + G + NX$$

- The IS curve describes how this behaves
- The IS curve has the following properties:
  - $A_r<0$ Defer C and I
  - $0<A_Y<1$ Keynesian multiplier
  - $NX_Y<0$ Imports
  - $NX_e>0$ Marshall - Lerner

b. Money Market

The LM Curve



Money Demand: $M_D/P = L(r,Y)$

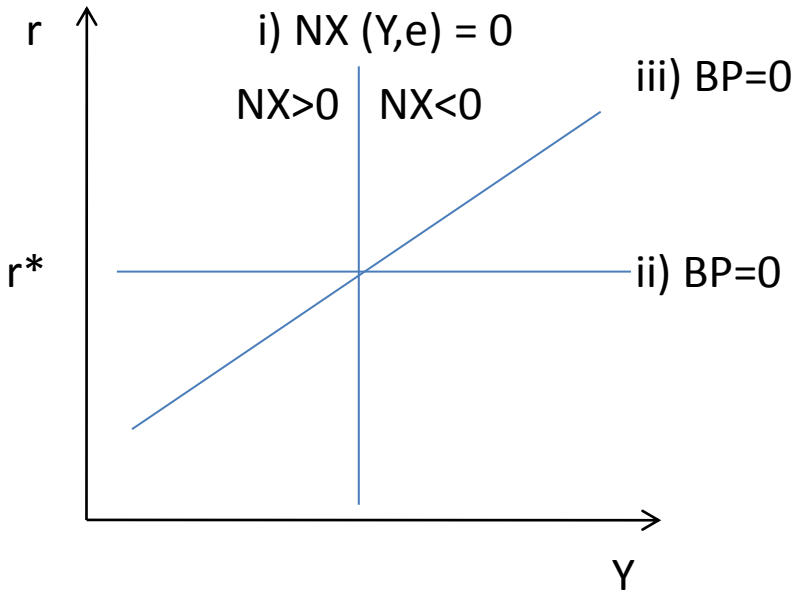
Money Supply: $M_S = \mu[NFA_{CB} + DC]$

Details

- The LM curve describes the "Liquidity Preference and Money Supply Equilibrium"
  - At each point the demand and supply for money is in equilibrium for a given level of output
- Money demand L(r,Y) has the following properties:
  - $L_r < 0$ Speculative
  - $L_Y > 0$ Transactions
- In this analysis we allow money supply to potentially be endogenous to actions of the central bank in FX markets
- To close the model we assume P=P*=1

c. Balance of Payments

The Balance of Payments



Balance of Payments:

$$BP = NX(Y,E) + KA(r-r^*) = \Delta NFA_{CB}$$

Capital mobility:

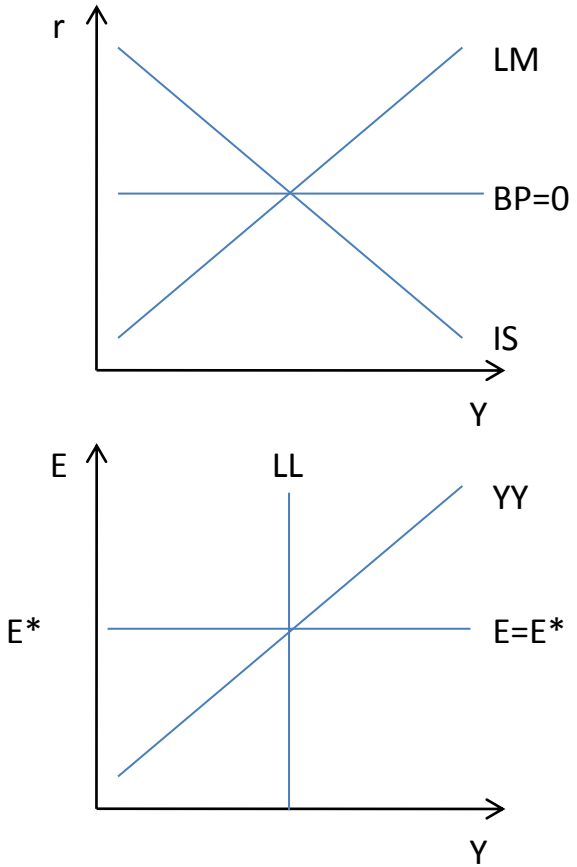
i) Immobile	$KA(r-r^*) = 0$
ii) Perfectly mobile	$r=r^*$
iii) Imperfectly mobile	$0<KA_r<$ ifty

Details

- The Balance of Payments describes all the transactions with the rest of the world.
- It is comprised of:
  - Current Account - assume CA=NX
  - Capital Account - KA(r-r*). When KA>0, selling bonds to world (borrowing)
- When E is fixed, ΔNFA_{CB} must set BP=0
- When E is flexible, BP = 0 automatically:
  - If NX<0, excess demand for foreign currency
  - This depreciates the domestic currency
  - Capital flows in to buy cheap bonds, supplying foreign currency
  - E adjusts until $NX(Y,E) = - KA(r-r^*)$

d. Foreign Currency Market

The Mundell-Fleming Model



Details

Fixed exchange rates

- We ignore the second diagram as E=E*
- The central bank must adjust the money supply, shifting LM, to ensure BP=0.

Floating exchange rates

- We introduce the second diagram as output and exchange rates are linked via *NX(Y,E)*.
- We only do this with mobile capital:
  - With immobile capital E adjusts so NX=0
  - With mobile capital, changes in E automatically ensure that BP=0:

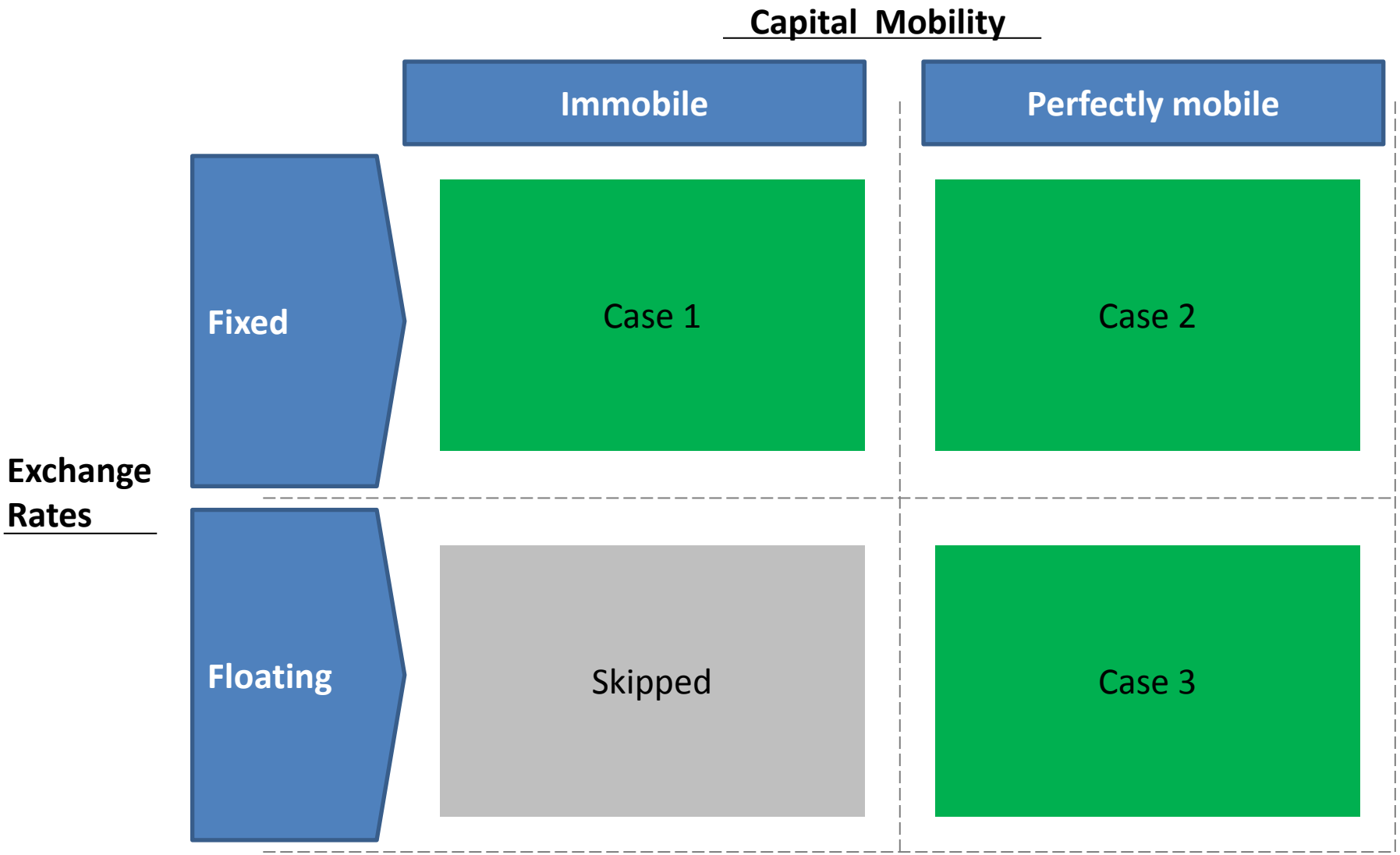
    $BP = NX(Y,E) + KA(r-r^*) = \Delta NFA_{CB} = 0$
- The model is now a system of 3 equations in 3 variables: *r, Y, E*. These can be plotted as simultaneous equilibria. In *(E,Y)* space, high E stimulates X and thus Y.

  LL: $M = L(r,Y)$

  YY: $Y = A(r,Y) + G + NX(Y,E)$

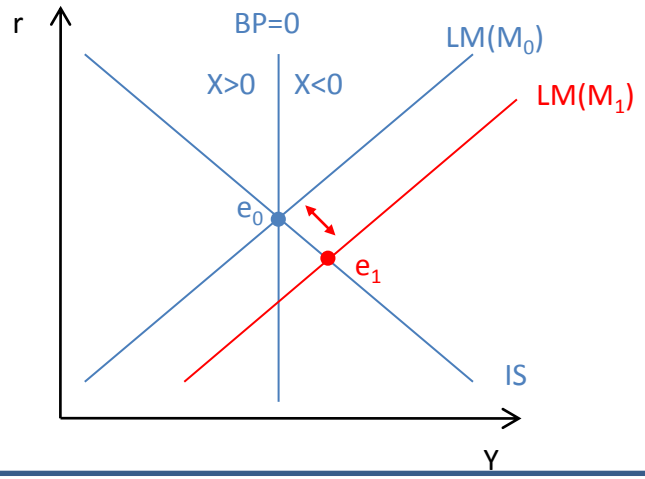
  r: $r=r^*$

We consider the effects of monetary and fiscal policy under three different sets of assumptions:



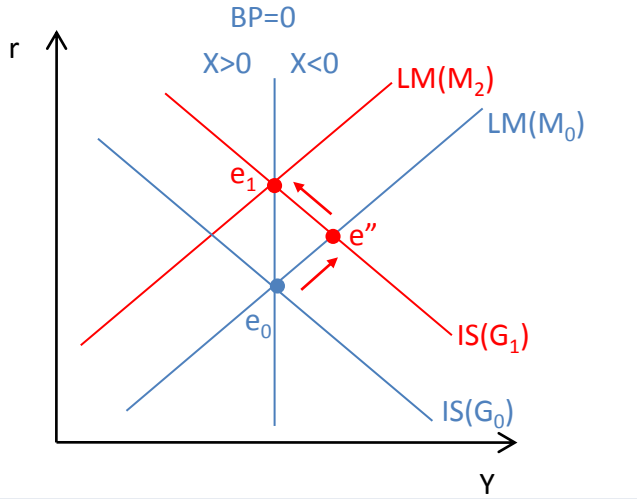
Case 1: Immobile capital, fixed exchange rates

Monetary Expansion



- Start at e_0
- CB increases domestic credit: $\Delta M_S = \mu\, \Delta DC > 0$
- $M_0 \rightarrow M_1$
- At e', NX<0, imbalance in the market for foreign currency.
- The central bank must $\Delta NFA_{CB} < 0$ to decrease the money supply and keep E fixed.
- Increase in DC exactly offset by loss of NFA_{CB}. Only composition of CB portfolio changes.

Fiscal Expansion

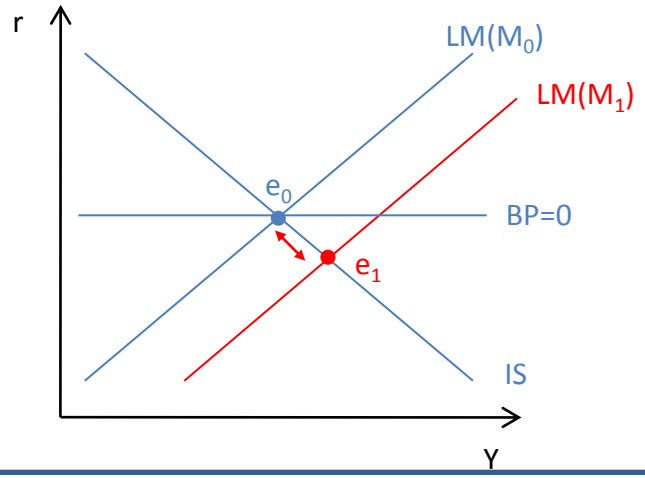


- Start at e_0
- Government increases spending $G_0 \rightarrow G_1$
- At e", NX<0, imbalance in the market for foreign currency.
- CB must $\Delta NFA_{CB} < 0$ to reduce money supply $M_0 \rightarrow M_2$ to keep E fixed

Monetary and Fiscal policy cannot permanently raise income with fixed e and immobile capital

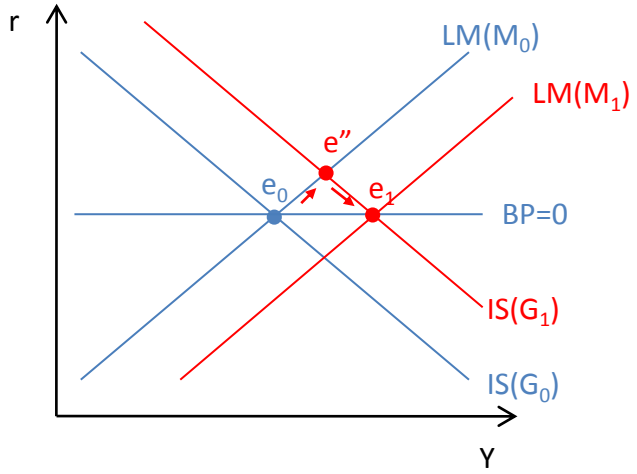
Case 2: Perfectly mobile capital, fixed exchange rates

Monetary Expansion



- Start at e_0
- CB increases domestic credit: $\Delta M_S = \mu\, \Delta DC > 0$
- $M_0 \rightarrow M_1$
- At e', r<r*, causing mobile capital to flow out, meaning less demand for domestic currency.
- CB must sell foreign assets to reduce supply of domestic currency ($\Delta NFA_{CB} < 0$).

Fiscal Expansion

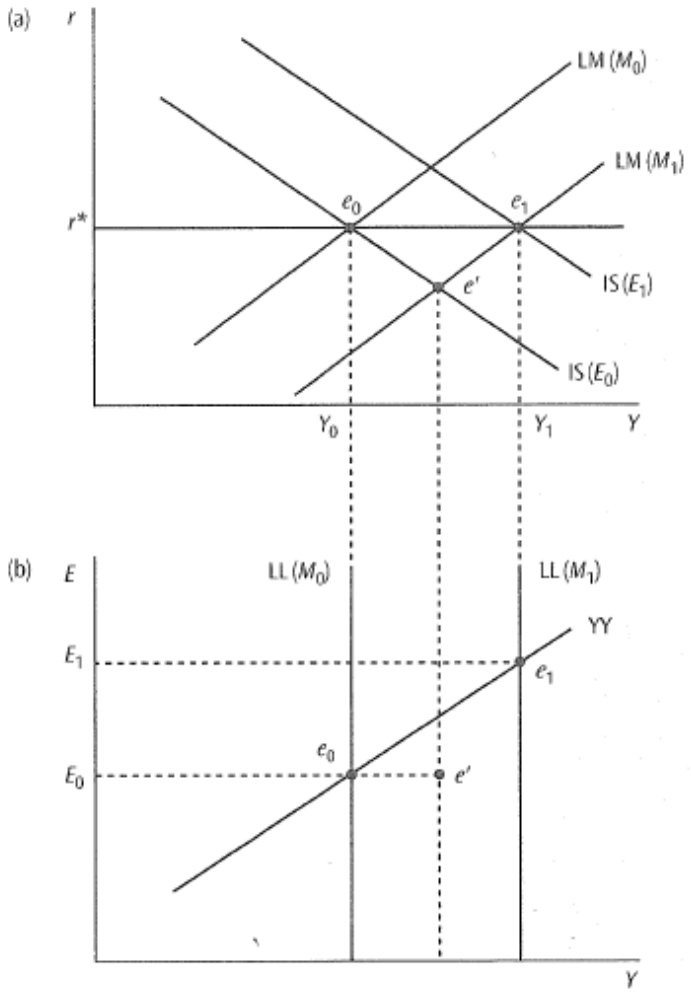


- Start at e_0
- Government increases spending $G_0 \rightarrow G_1$
- At e", ', r>r*, causing mobile capital to flow in, meaning more demand for domestic currency.
- CB must buy foreign assets $\Delta NFA_{CB} > 0$ to increase money supply $M_0 \rightarrow M_1$ to keep E fixed

When exchange rates are fixed, monetary policy is ineffective but fiscal policy is effective

Case 3: Perfectly mobile capital, flexible exchange rates

Monetary Expansion

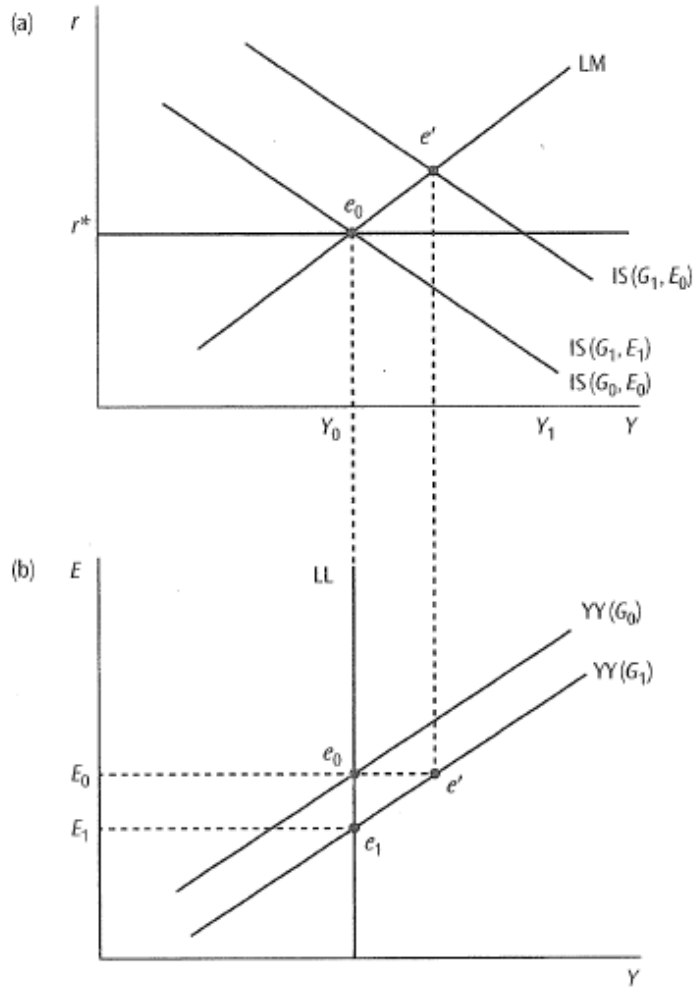


- Start at e_0
- CB increases domestic credit: $\Delta M_S = \mu \Delta DC > 0$
- $M_0 \rightarrow M_1$ for both LM and LL
- At e', r<r* and capital flows out
- The currency must depreciate from $E_0 \rightarrow E_1$ to stimulate net exports so that the market for foreign currency is in equilibrium
- This shifts the IS curve until r=r*

Monetary policy effective

Case 3: Perfectly mobile capital, flexible exchange rates

Fiscal Expansion



- Start at e_0
- Government increases spending from $G_0 \rightarrow G_1$
- This shifts the IS curve to the right (more demand for goods at each r), and the YY curve to the right to e'
- At e', r>r* so capital flows in, providing supply of foreign currency
- E appreciates from $E_0 \rightarrow E_1$, causing exports to fall and imports to rise
- This offsets the increase in G so everything returns to e_0

Fiscal policy ineffective

However, the Mundell-Fleming model remains a simple model, and should only be used for back-of-the-envelope calculations

Limitation	Extension
Fixed prices	• Endogenise aggregate supply: • See Heijdra and Van der Ploeg (2002), Ch 11.1.4

Ignores expectations	• Introduce rational expectations and uncovered interest parity:
	  •Dornbusch (1976)
	  • Changes $r = r^* + E[\Delta e]$
	  • Considers flexible e and sticky P

Focuses on money markets	• Introduce simple, explicit monetary policy rules instead of the LM curve:
	  • Taylor Rule (1993)
	  • Romer (2000)

Single good	• Disaggregation of traded and non-traded sectors: see lecture notes

No microfoundations	• New Keynesian open economy macro:
	  • Obstfeld and Rogoff (1996): Textbook
	  • Goodfriend and King (1997): New neoclassical synthesis
	  • Lane (2001): Survey

Next week's class

- Hand back problem sets
- Extended consultation session – bring questions!