

# **OPEN ECONOMY MACROECONOMICS 2**

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# AGENDA

- ~~International linkage and Balance of payments~~
- ~~Foreign exchange market and Exchange rate determination~~
- **Macroeconomics framework for open-economy**
- **Shocks and propagation under open-economy**
- **Policy effectiveness**

**Reading: Froyen Chapter 15**

# IMPLICATIONS OF OPEN ECONOMY TO MACROECONOMICS FRAMEWORK

- Traditional closed-economy model becomes **incomplete** for the analysis, i.e. needing some **modifications**
- Missing a market that summarizes overall activities in international aspect, i.e. balance of payment.
- Open-economy macroeconomic model: **IS-LM-BP model (Mendell-Fleming model)**

# IS-LM-BP MODEL

➤ Three interconnected markets

- Goods market → IS
- Money market → LM
- International transaction → BP

➤ **Two questions:**

1. Does the relationship between “ $r$ ” and “ $y$ ” *change* under the open-economy?
2. To fix the original idea of IS-LM, how can we characterize the relationship between “ $r$ ” and “ $y$ ” that represent the equilibrium in the overall international activities?

# FOREIGN SECTOR AND IS

- **Net exports ( $X - IM$ )** is now part of aggregate expenditure (AE and IS curve).
- Structure of the goods-market conditions slightly changes.
  - **Exports** are determined by foreign income ( $Y^f$ ) and real exchange rate ( $rer$ ).
  - **Imports** are determined by domestic income ( $Y$ ) and real exchange rate ( $rer$ ).

# PRODUCT MARKET EQUILIBRIUM (IS)

$$Y = C(Y_d, r) + I(Y, r) + G$$

⇓

$$Y = C(Y_d, r) + I(Y, r) + G + X(Y^f, rer) - IM(Y, rer)$$

where  $rer = \frac{eP^*}{P}$

$$\frac{\partial IM}{\partial Y} > 0; \frac{\partial IM}{\partial rer} < 0 \text{ and } \frac{\partial X}{\partial Y^f} > 0; \frac{\partial X}{\partial rer} > 0$$

# OPEN-ECONOMY IS CURVE

## ➤ Still downward sloping.

- For fixing everything else constant, higher “ $r$ ”
- → lower “Investment” and “Consumption”
- → Lower “AE”, and hence output ( $Y$ ).

## ➤ The role of **exchange rate** can now be discussed.

- Higher (lower) “ $e$ ” causes a rise (decline) in exports, for given real interest rate.
- → **IS curve shift right (left).**

# FOREIGN SECTOR AND LM

- Nothing affects money market.
- LM curve remains upward sloping.
  - → **higher Y** causes a higher demand for money,
  - → higher demand for money leads to **rising market interest rate**.

# NEW FEATURE: BALANCE OF PAYMENTS

- International activities can be summarized by the balance of payment (BOP).

$$\begin{aligned} \text{BOP} &= (X - IM) + (F_{in} - F_{out}) \\ &= \text{Net exports} + \text{Net inflows} \\ &= \text{CA} + \text{KA} \end{aligned}$$

# BALANCE OF PAYMENTS: BEHAVIOR

- Behavior of the balance of payments can be analyzed by the behavior of its component.

$$BOP = [X(Y^f, rer) - IM(Y, rer)] + KA(r - r^f - \theta)$$



CA: negatively in “Y”



KA: positively in “r”

$r$  = domestic (real) interest rate;

$r^f$  = foreign (real) interest rate;

$\theta$  = country risk premium

# EQUILIBRIUM IN THE BALANCE OF PAYMENTS

- BOP is in the equilibrium if  $BOP = 0$ .

$$[X(Y^f, r, e) - IM(Y, r, e)] + KA(r - r^f - \theta) = 0$$

- To analyze the balance of payments in equilibrium, “what can be learned about the relationship between “r” and “y” that governs the equilibrium BOP?”
- **BP line:** equilibrium relationship between “r” and “Y” that puts the balance of payments in the equilibrium.

# THE BP LINE

- An upward sloping curve. Why?
- Back to the equilibrium condition, and consider an initial combination  $(r_1, y_1)$  where BOP equilibrium is attained.

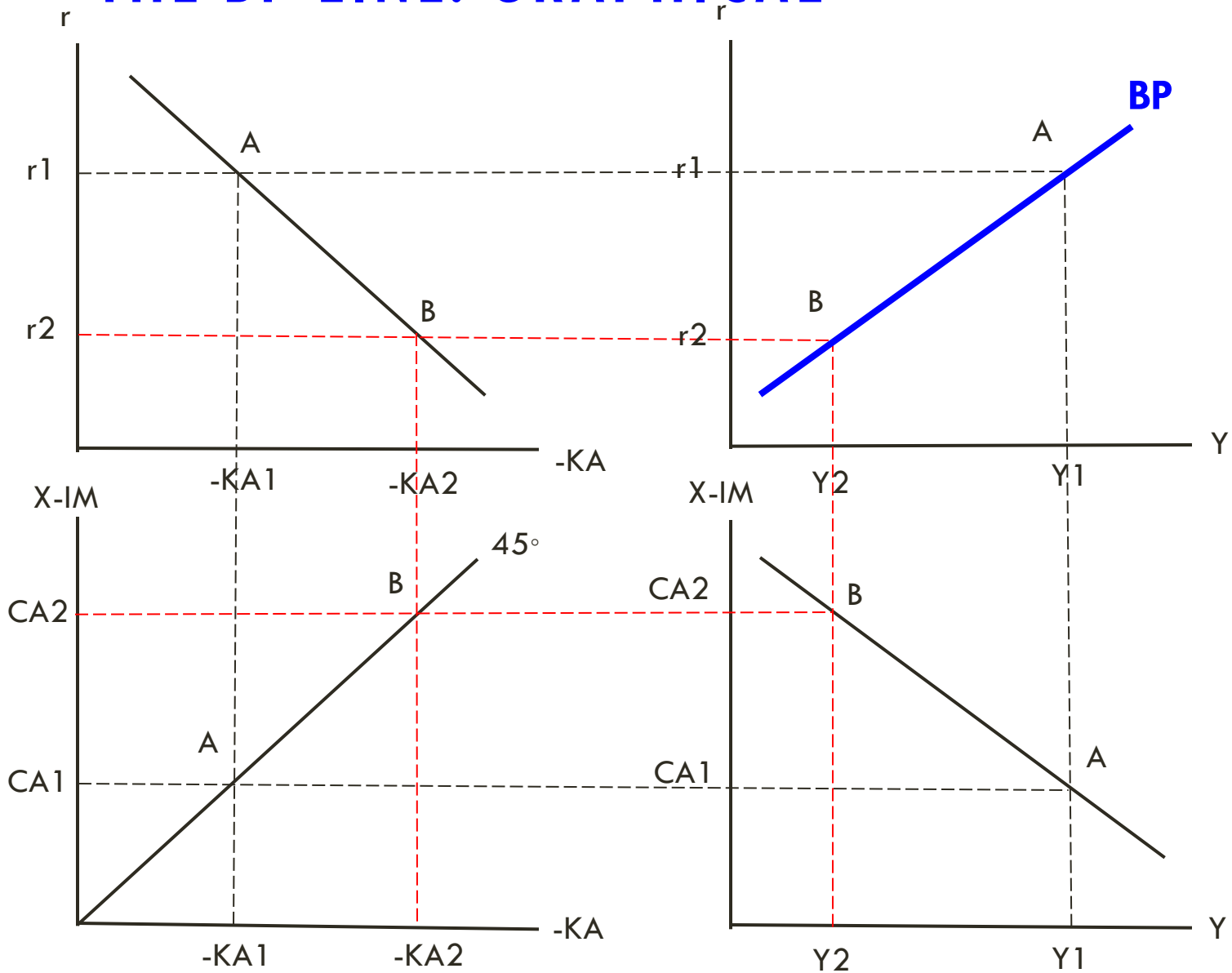
$$[X(Y^f, rer) - IM(Y_1, rer)] = -KA(r_1 - r^f - \theta)$$

**Question:** What happens to the level of “y” if interest rate drops from  $r_1$ ?

# THE BP LINE: INTUITIONS

- Why BP line is upward sloping?
  - **Lower interest rate** reduces net capital inflows (KA worsened)  
→ worsening BOP
  - BOP can be balanced if this is compensated by an increase in net exports (CA improved).
  - Net exports can be improving when **“y” is lower**; lowering imports.
  - Hence, we have positive relationship between “r” and “y” under the BOP equilibrium

# THE BP LINE: GRAPHICAL



# THE BP LINE: MATHEMATICAL

- Suppose linear equation in current account and capital account

$$[X(Y^f, rer) - IM(Y, rer)] = \alpha_0 - \alpha_1 Y + \alpha_2 Y^f + \alpha_3 rer$$

$$KA(r - r^f - \theta) = \beta_0 + \beta_1 (r - r^f - \theta)$$

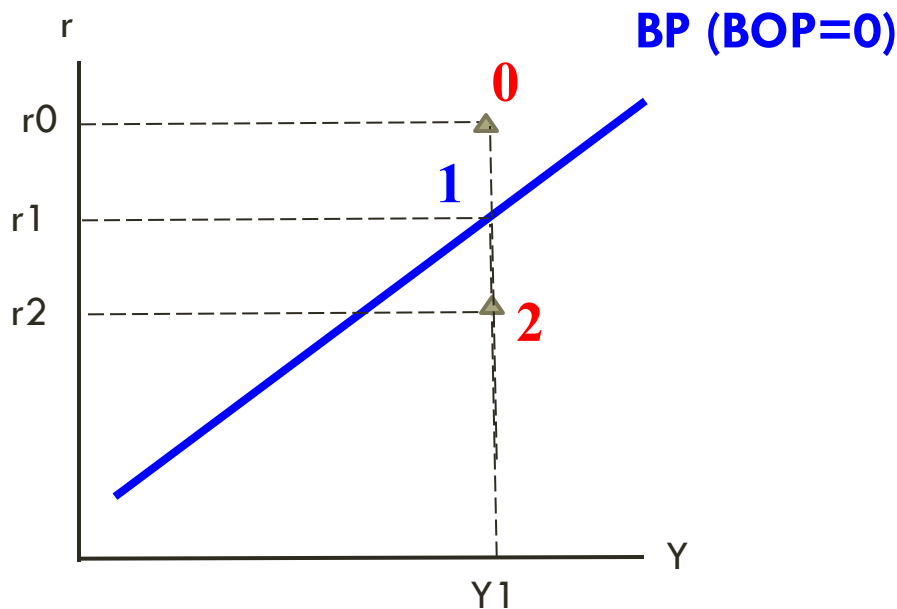
- Equilibrium:

$$\alpha_0 - \alpha_1 Y + \alpha_2 Y^f + \alpha_3 rer + \beta_0 + \beta_1 (r - r^f) = 0$$

- BP equation:

$$r = \theta + r^f + \left(\frac{1}{\beta_1}\right) [\alpha_1 Y - (\alpha_0 + \alpha_2 Y^f + \alpha_3 rer + \beta_0)]$$

# THE BP LINE: DISEQUILIBRIUM



Off the BP line?

**If above the BP, “r” is too high.**

BOP is positive; net capital inflow is better than the level needed to ensure  $BOP = 0$ .

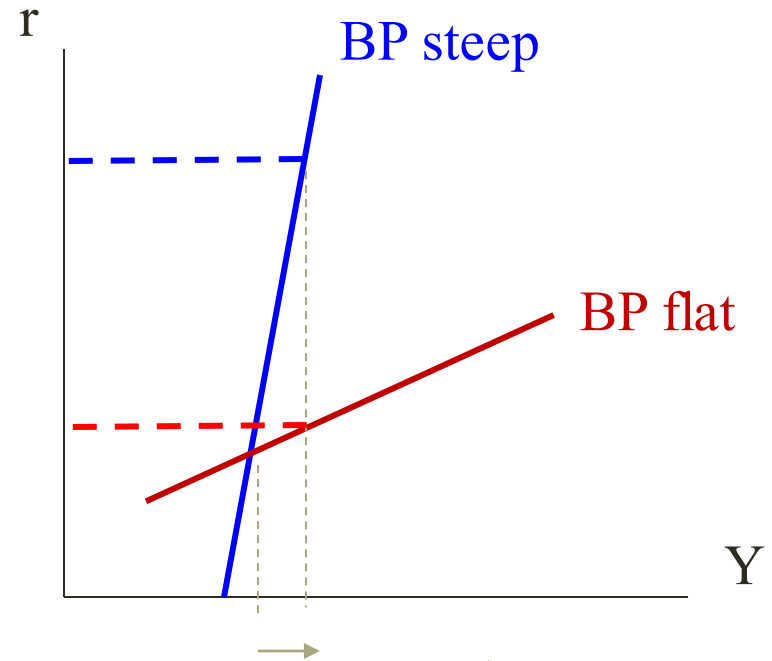
**If below the BP, “r” is too low.**

BOP is negative; net capital inflow is worse than the level needed to ensure  $BOP = 0$ .

# SLOPE OF BP LINE

The slope of BP line depends on

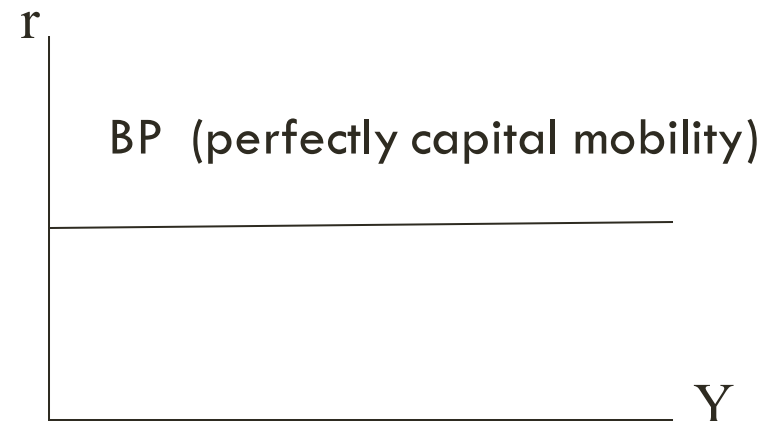
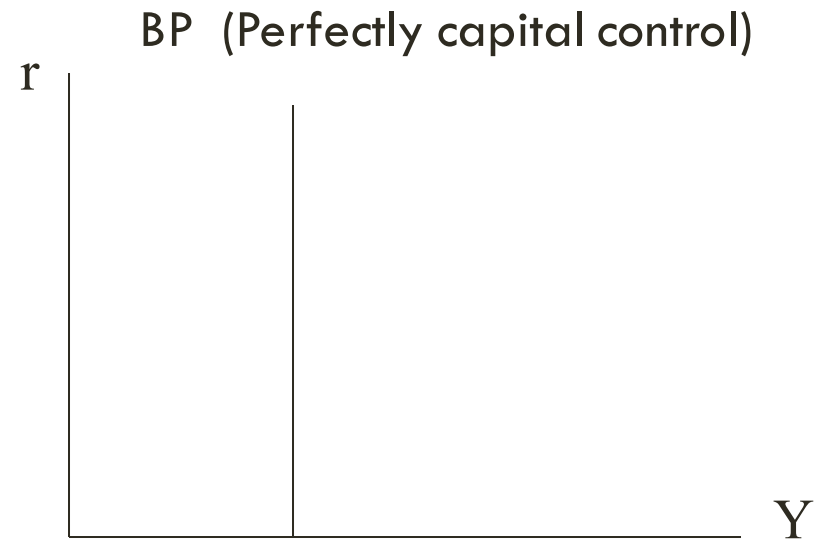
- **Sensitivity of imports to real GDP (Y)**
  - Higher propensity to imports ( $\alpha_1$ ) implies that CA sizably deteriorates when income increases.
  - Other things being equal, “r” must be sizably rising as well, to induce an improvement in KA.
  - SO, highly sensitive of imports to real GDP (Y) → **steeper BP curve.**



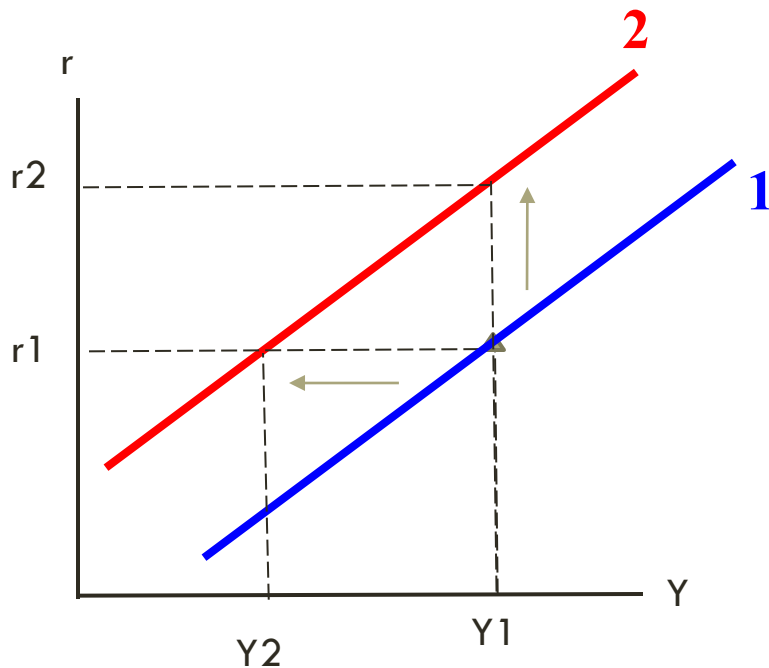
# SLOPE OF BP LINE

The slope of BP line depends on

- Sensitivity of net capital flow (KA) to interest rate differentials ( $r-r^f$ );
- $\beta_1$  measures the degree of capital mobility
  - Low sensitivity → low capital mobility → steep BP.
    - Vertical BP = Perfectly capital control
  - High sensitivity → high capital mobility → flat BP.
    - Horizontal BP = Perfectly capital mobility



# SHIFTING THE BP LINE



➤ Recall our equilibrium condition

$$[X(Y^f, rer) - IM(Y_1, rer)] + KA(r_1 - r^f - \theta) = 0$$

➤ Left shift in the BP line can occur because of

- Higher in  $r^f + \theta$
- Lower in  $Y^f$
- Lower in  $rer$

➤ Develop your own intuition for the right shift.

# OPEN-ECONOMY EQUILIBRIUM

➤ Notions of equilibrium concepts

1. Internal equilibrium (IE)

“ $r$ ” and “ $y$ ” clear goods and money market: IS-LM intersection

2. External equilibrium (EE)

“ $r$ ” and “ $y$ ” clear the balance of payments: on the BP

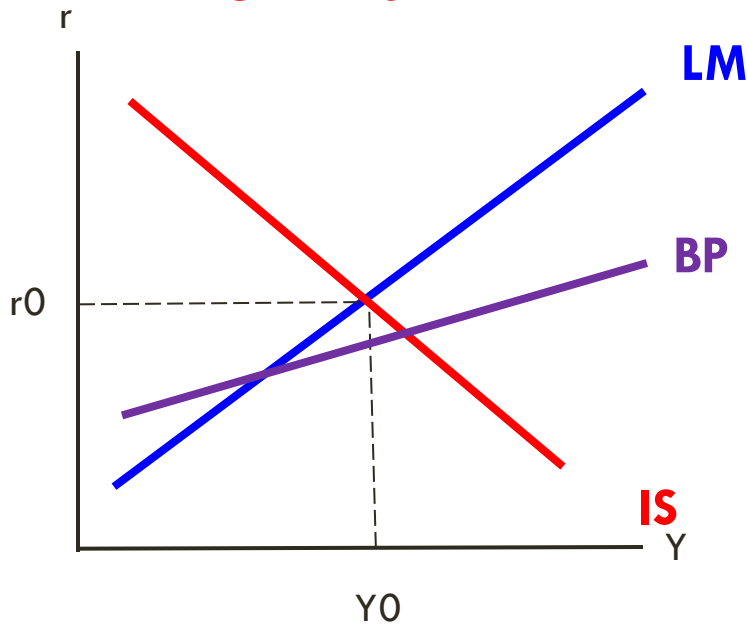
➤ Open-economy equilibrium: **The General equilibrium (GE)**

Internal + External: *intersections among IS-LM-BP.*

# OPEN-ECONOMY (DIS) EQUILIBRIUM

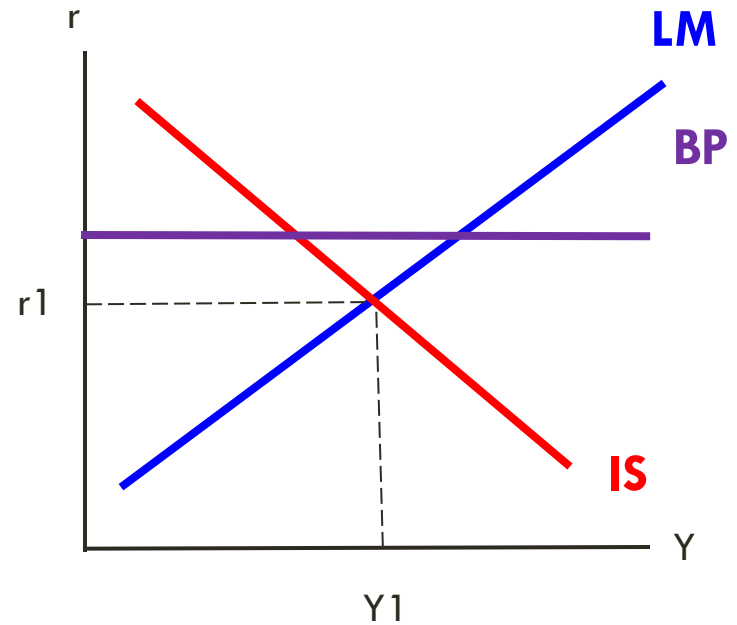
➤  $(r_0, y_0)$ : Internal equilibrium

➤  $BOP > 0$



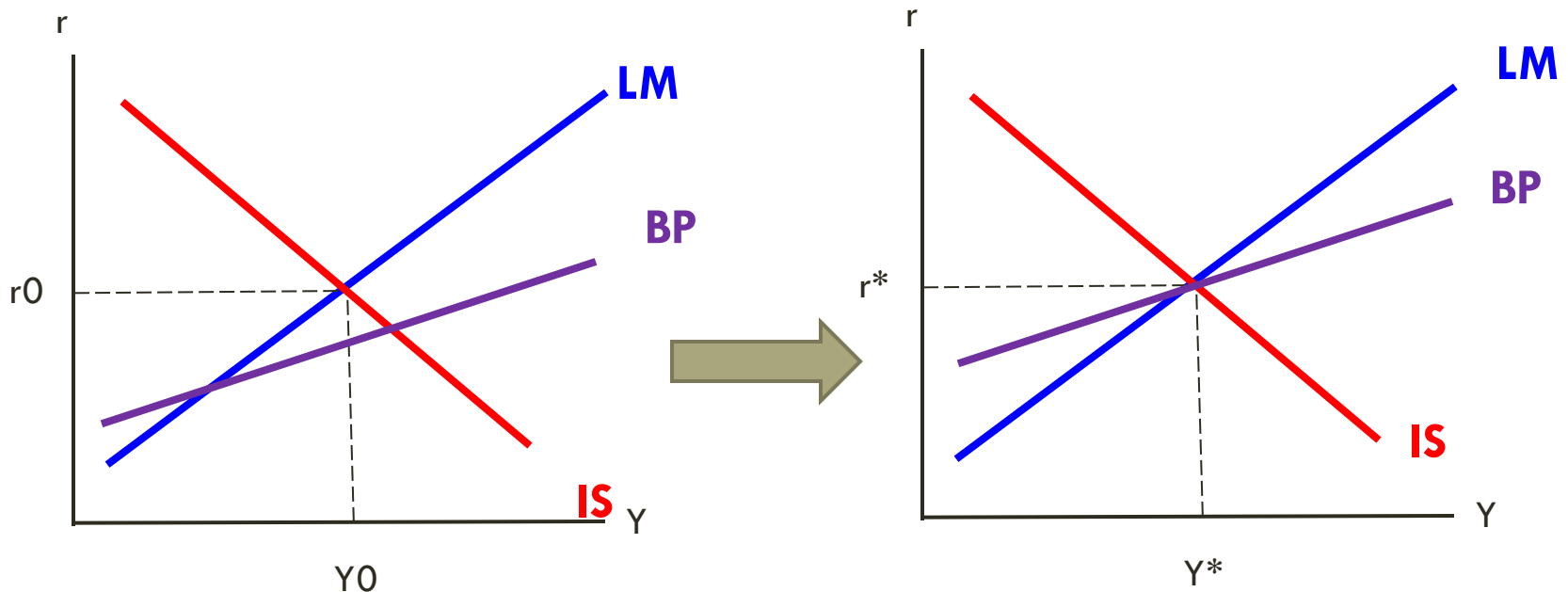
➤  $(r_1, y_1)$ : Internal equilibrium

➤  $BOP < 0$



# OPEN-ECONOMY (DIS) EQUILIBRIUM: ADJUSTMENT PROCESS

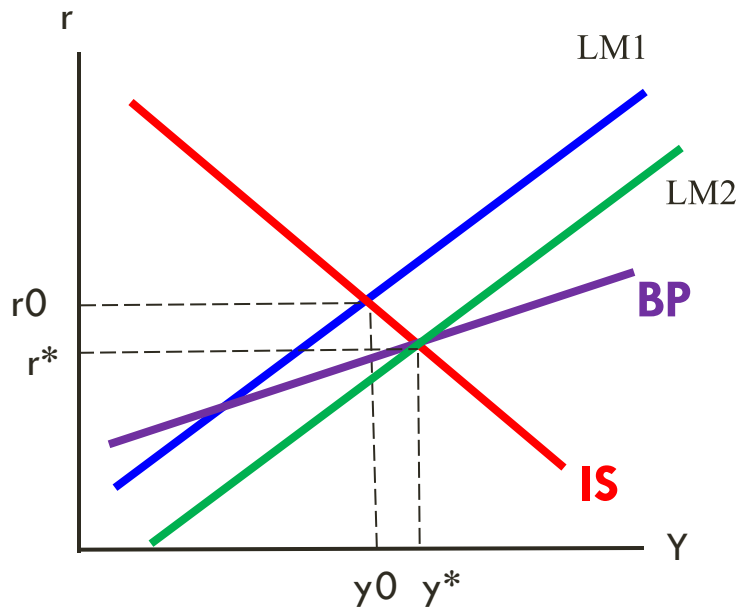
- Given the Internal equilibrium, how does the economy reach the GE? Mechanism?



- Answer depends on the **choice of exchange rate regime!**

# OPEN-ECONOMY (DIS) EQUILIBRIUM: ADJUSTMENT PROCESS

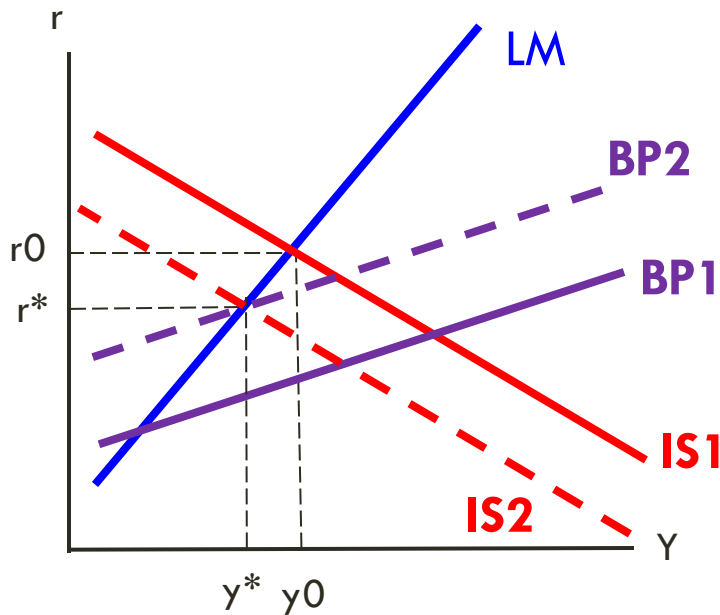
- Under the **fixed exchange rate**, nominal exchange rate is fixed.
- The adjustment mechanism will work through **money supply**.



- $(r_0, y_0)$ : BOP > 0
- To maintain fixed “e”, central bank buys all surplus of forex; this causes money supply to rise, i.e. LM1  $\rightarrow$  LM2.
- Rising M lowers “r” (worsening KA) and increase “y” (causing more import)
- net positive BOP is gradually eliminated while the economy reaches the GE  $(r^*, y^*)$ .

# OPEN-ECONOMY (DIS) EQUILIBRIUM: ADJUSTMENT PROCESS

- Under the flexible exchange rate, “e” will directionally move to clear the imbalance of BOP.
- BOP surplus  $\rightarrow$  “e” falling (appreciate); BOP surplus  $\rightarrow$  “e” rising (depreciate)



- $(r_0, y_0)$ : BOP  $>$  0
- Without any interventions, “e” will fall.
  - Causing deterioration in BOP: BP1  $\rightarrow$  BP2
  - Causing a lower in AE: IS1  $\rightarrow$  IS2
- net positive BOP is gradually eliminated while the economy reaches the GE  $(r^*, y^*)$ .

# AGENDA

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- **Shocks and propagation under open-economy**
- **Policy effectiveness**

# SHOCKS AND PROPAGATION

- Equilibrium occurs where all the three lines intersect.
- Fluctuations in output arise because **shocks** randomly hit the economy, causing the movement of equilibrium.
- In the closed economy, we usually think about **shocks in IS as real shocks** and **shocks in LM as monetary (financial) shocks**.
- Under the opened-economy, shocks can also be classified as **the country origin**.

# SHOCKS AND PROPAGATION

	Real	Monetary
Domestic	<ul style="list-style-type: none"><li>- business/consumer confidence changing</li><li>- Government spending</li></ul>	<ul style="list-style-type: none"><li>- domestic banking panics</li><li>- Money supply</li><li>- Financial deregulation</li></ul>
External	<ul style="list-style-type: none"><li>- world GDP growth</li><li>- Global productivity</li><li>- Oil price</li></ul>	<ul style="list-style-type: none"><li>- Global financial downturn;</li><li>- Global Interest rate trends</li></ul>

# SHOCKS AND PROPAGATION

## Question

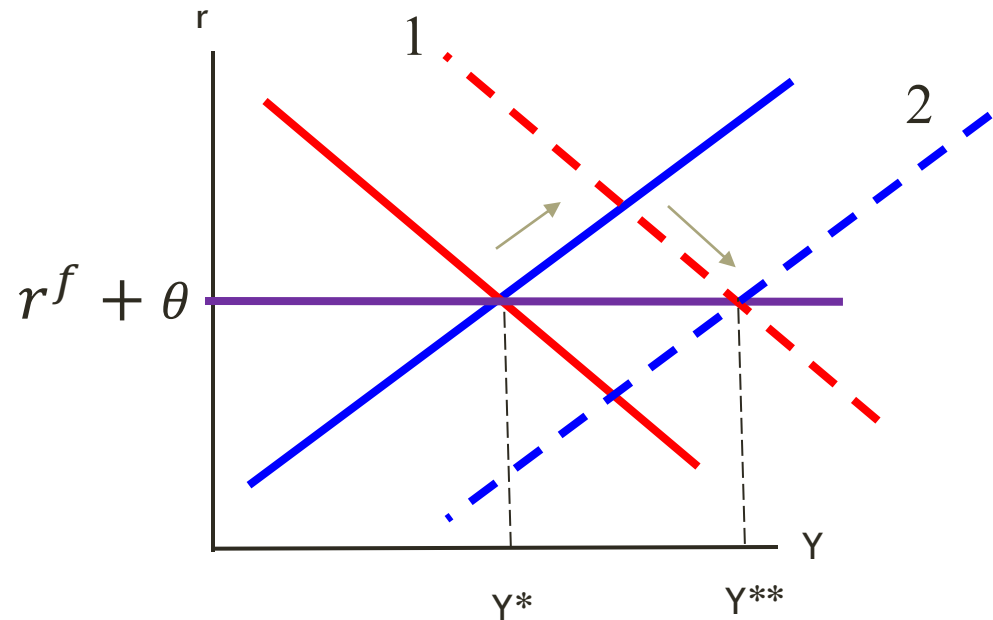
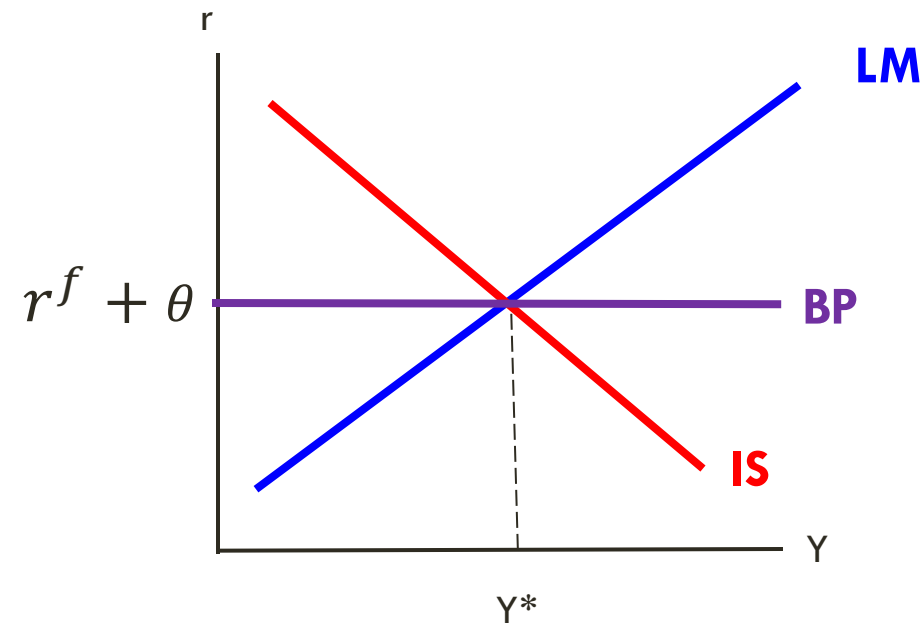
1. How do the different types of shocks work under open-economy; **contraction v.s. expansion?**
2. Can shocks get amplified, i.e. **large or small?**
3. What is the characteristic of the economy that is prone to have high volatility? **Resiliency; self-correcting mechanism?**

# SHOCKS AND PROPAGATION

- We will focus on the analysis under “**small open-economy with perfect capital mobility**”
  - Horizontal BP line. → Mundell-Flemming world
  - Shocks by line.
  
- Answers/Insights to the posted questions are:
  - 1) Nature of shocks: **origin.**
  - 2) Choice of exchange rate regime: **fixed v.s. flexible.**

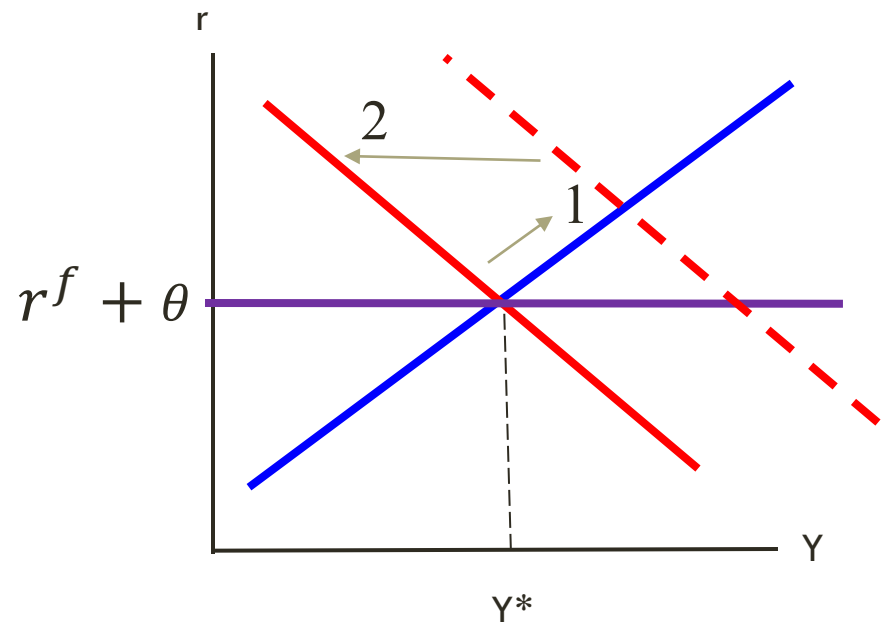
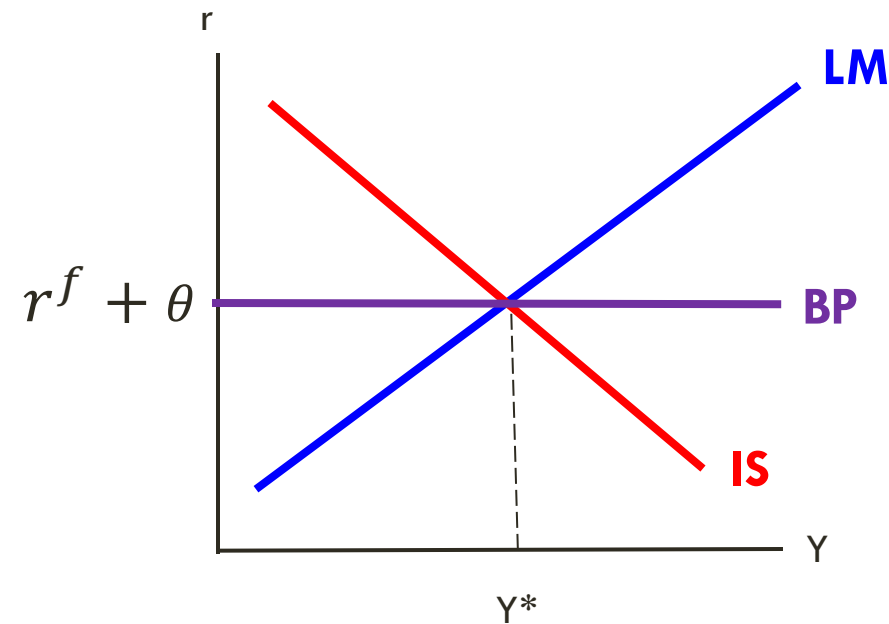
# DOMESTIC SHOCKS: IS SHOCKS

Case 1: Improvement in business sentiments / fixed exchange rate



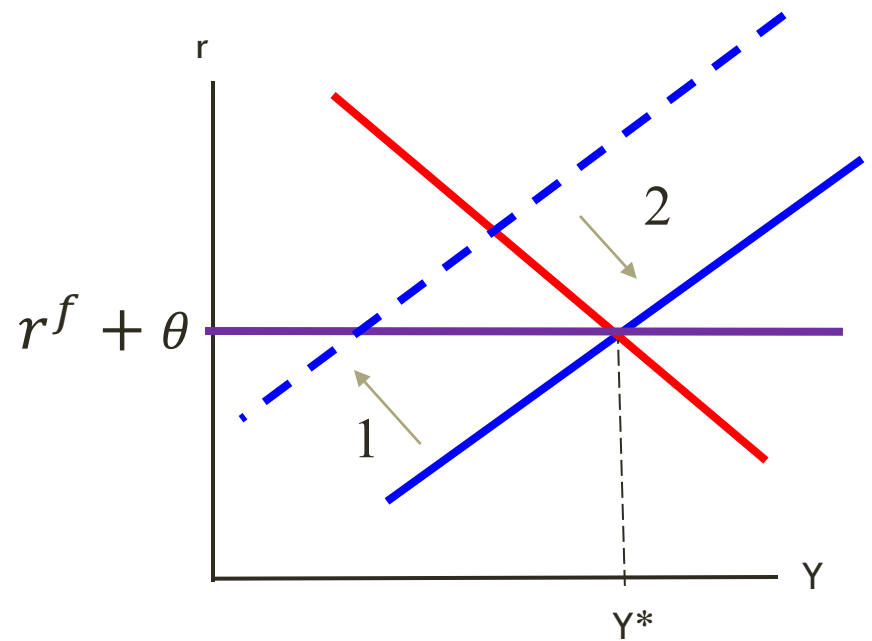
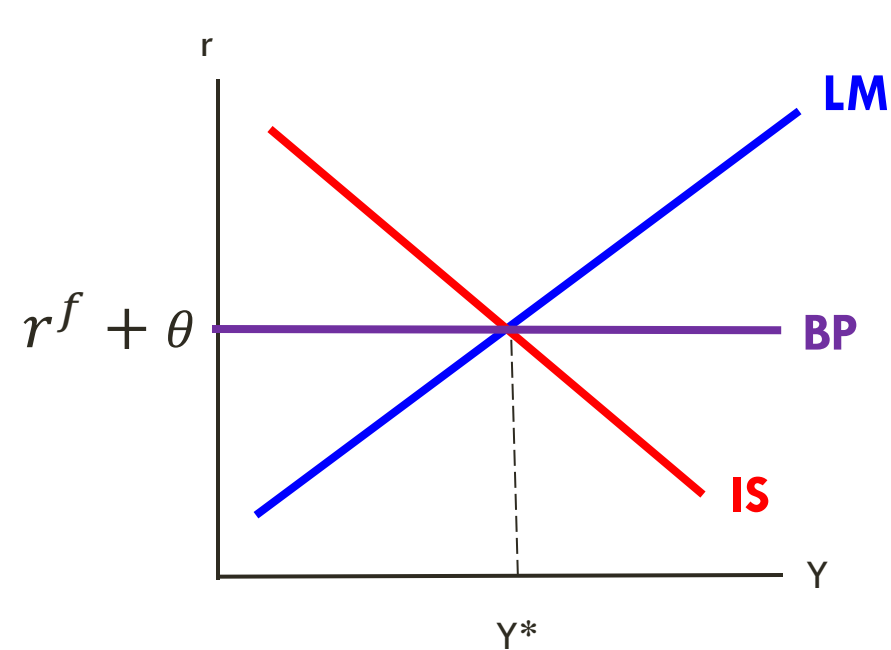
# DOMESTIC SHOCKS: IS SHOCKS

Case 2: Improvement in business sentiments / flexible exchange rate



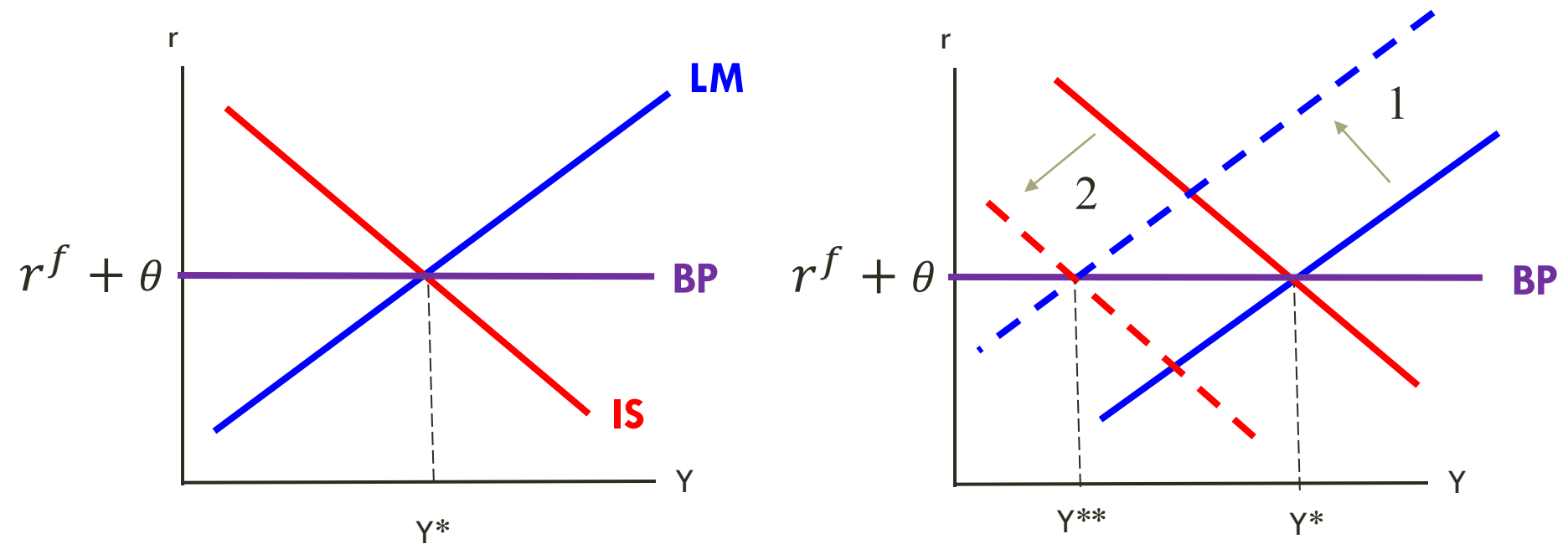
# DOMESTIC SHOCKS: LM SHOCKS

Case 3: Banking panic / fixed exchange rate



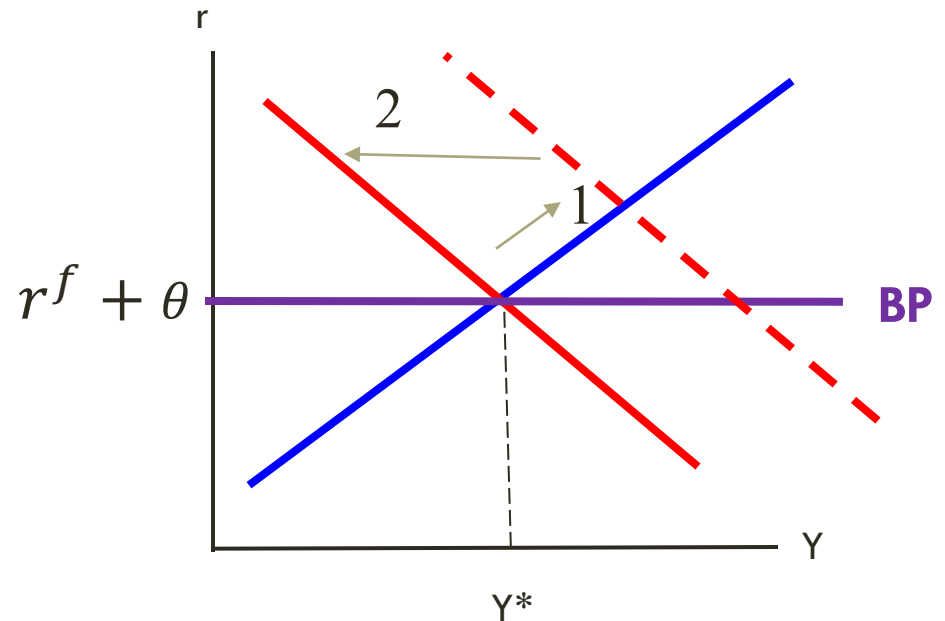
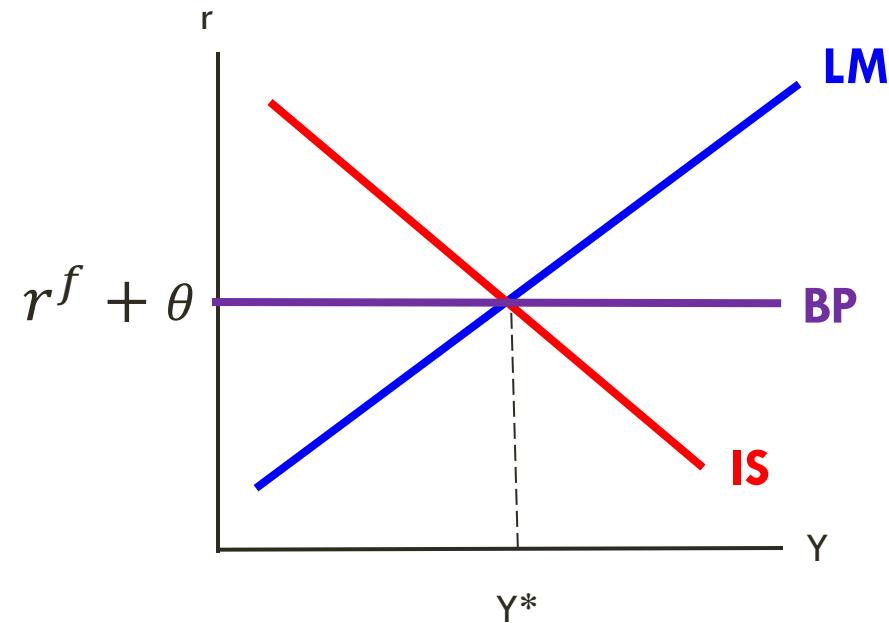
# DOMESTIC SHOCKS: LM SHOCKS

Case 3: Banking panic / fixed exchange rate



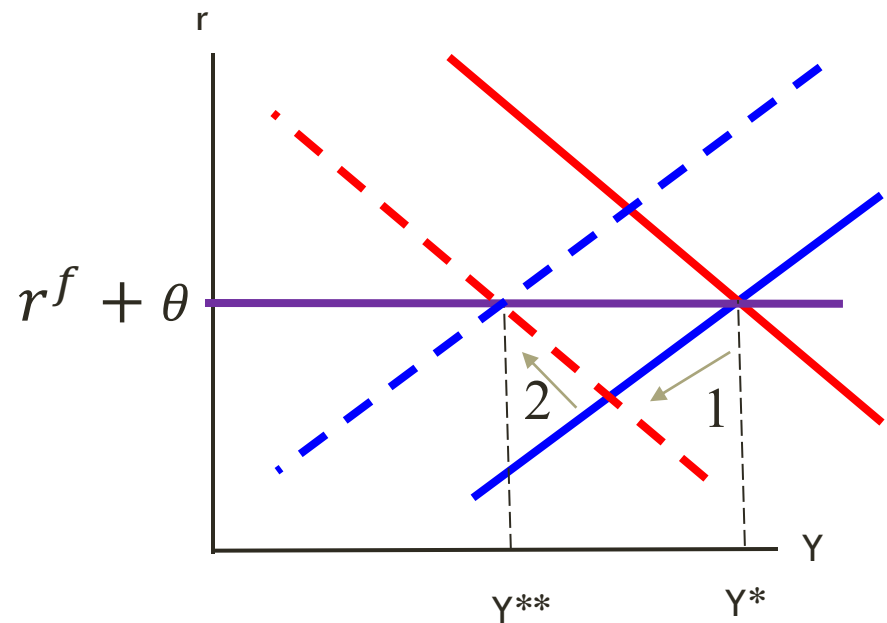
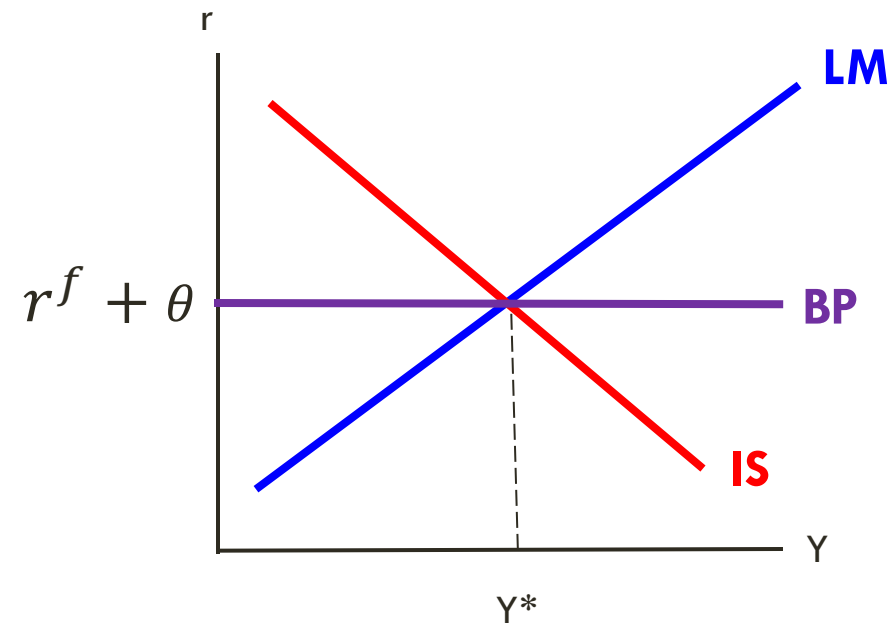
# DOMESTIC SHOCKS: LM SHOCKS

Case 4: Banking panic / flexible exchange rate



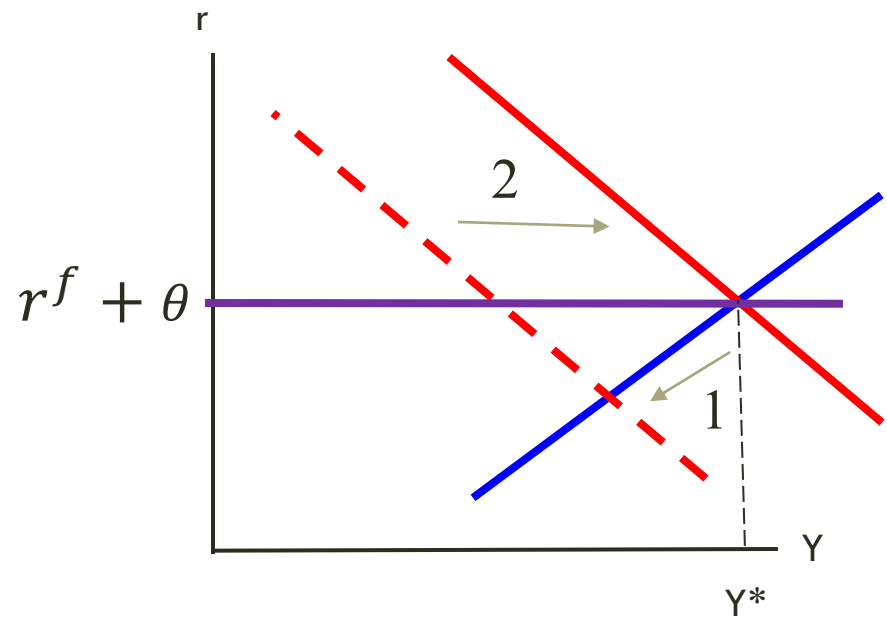
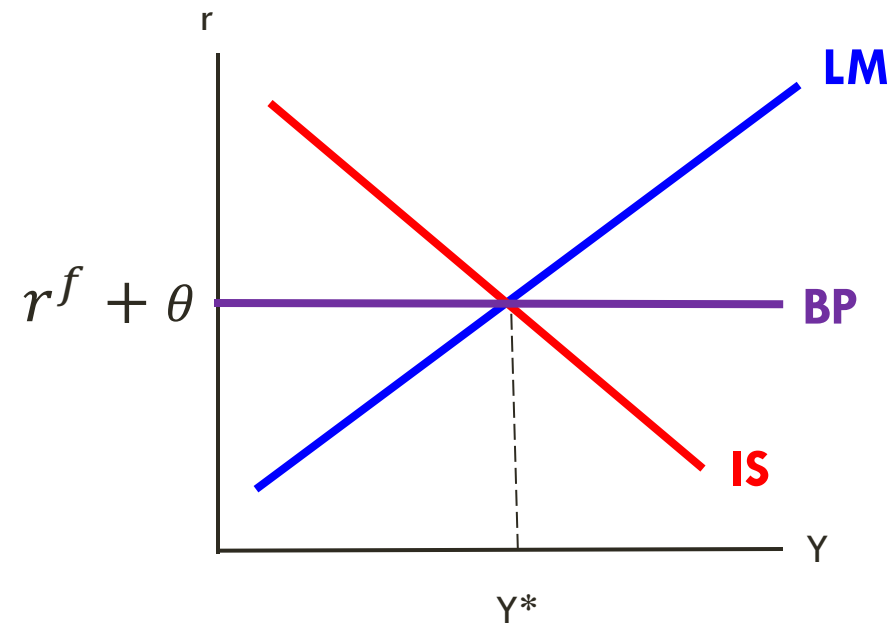
# EXTERNAL SHOCKS: IS SHOCKS

Case 5: Global GDP recession / fixed exchange rate



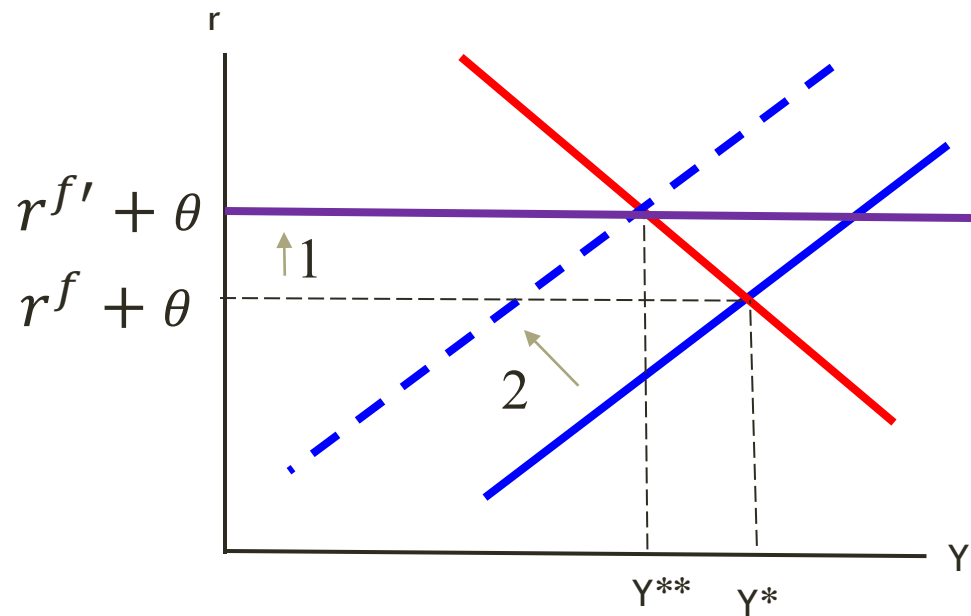
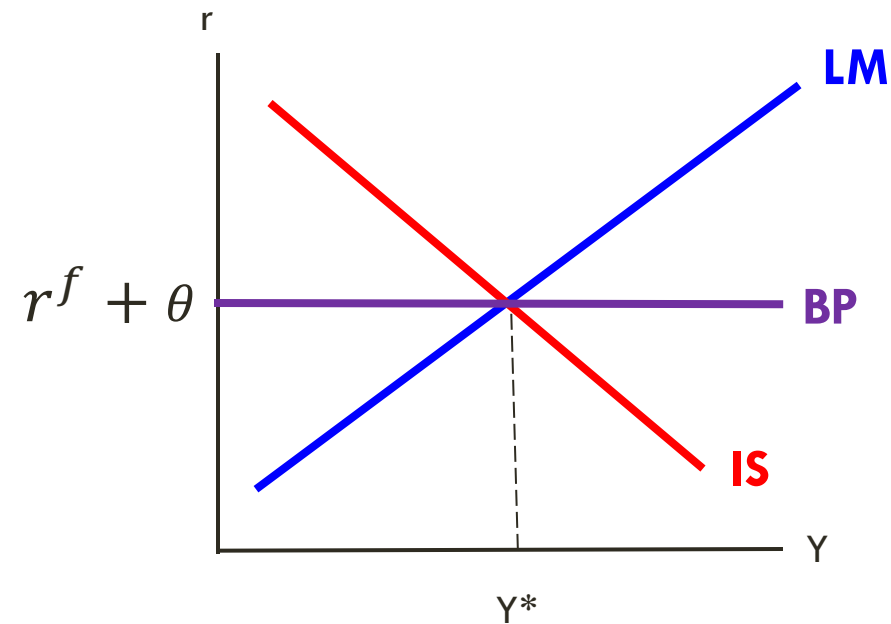
# EXTERNAL SHOCKS: IS SHOCKS

Case 6: Global GDP recession / flexible change rate



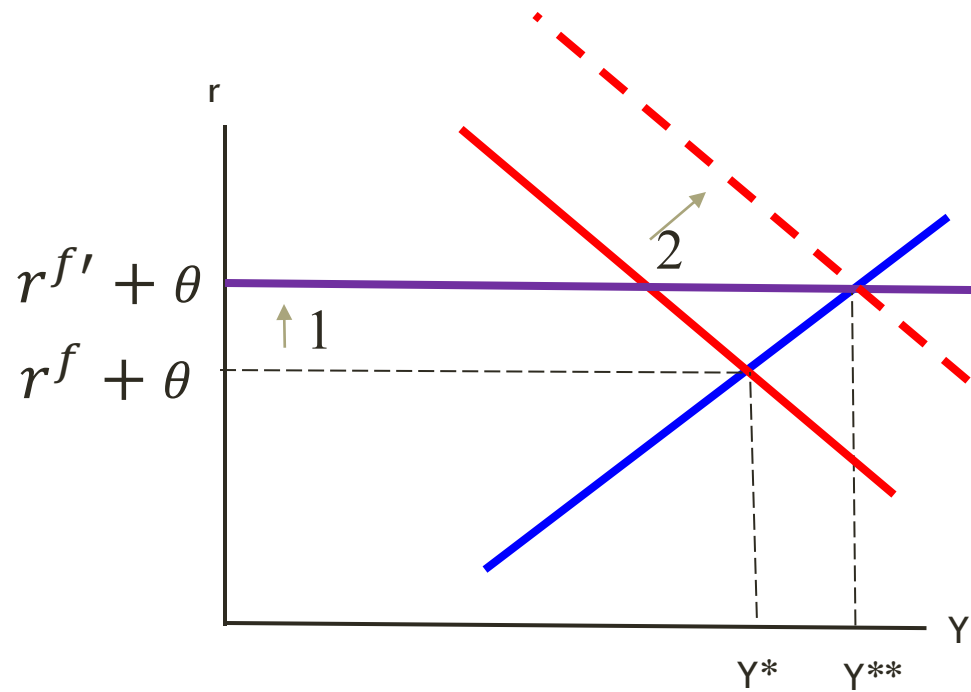
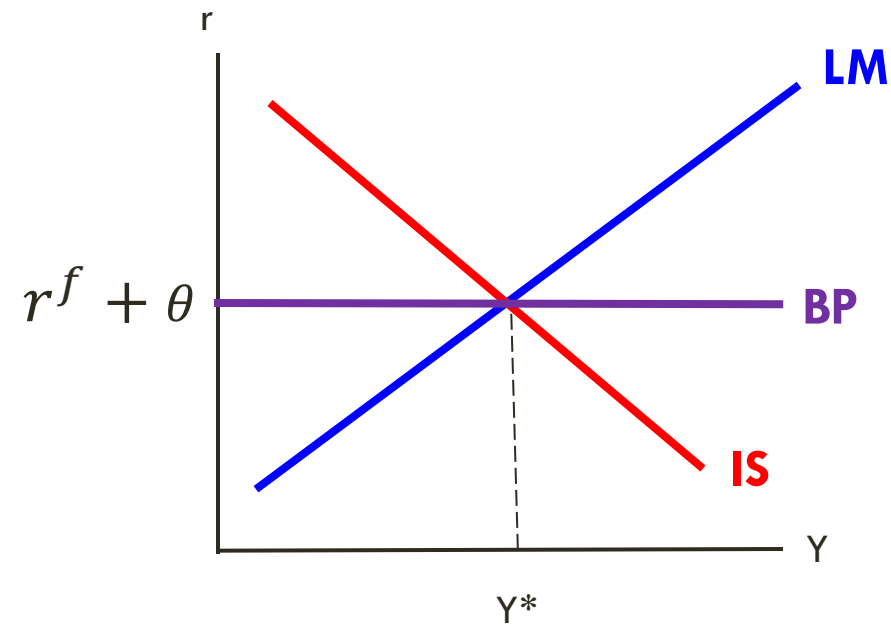
# EXTERNAL SHOCKS: BP SHOCKS

Case 7: Fed raises FED fund/ fixed exchange rate



# EXTERNAL SHOCKS: BP SHOCKS

Case 8: Fed raises Fed fund / flexible exchange rate



# HOW SHOCKS GET AMPLIFIED...

Origin	Fixed	Flexible
1. Domestic shocks		
IS shocks (real)	Amplified (1)	Insulated (2)
LM shocks (financial)	Insulated (3)	Amplified (4)
2. External shocks		
IS shocks (real)	Amplified (5)	Insulated (6)
BP shocks (financial)	Amplified (7)	Amplified (8)

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# POLICY UNDER OPEN-ECONOMY

- Policy can be used to **fix the imbalances.**
  - CA deficits with unemployment → Fixing the imbalances
- Possible choices of policy include
  - Exchange rate policy
  - Fiscal policy and fiscal policy.
- **Policy effectiveness issue revisited.**

# EXCHANGE RATE POLICY

- Usable when country initially adopts the **fixed exchange rate regime**.
- The central bank sets the nominal exchange rate at a fixed (official) level
  - It stands ready to buy or sell foreign currency at the fixed rate using its foreign exchange reserves.
- Overvalue/undervalue currency can occur as the fundamental of macroeconomy has changed, and hence causing some imbalances.

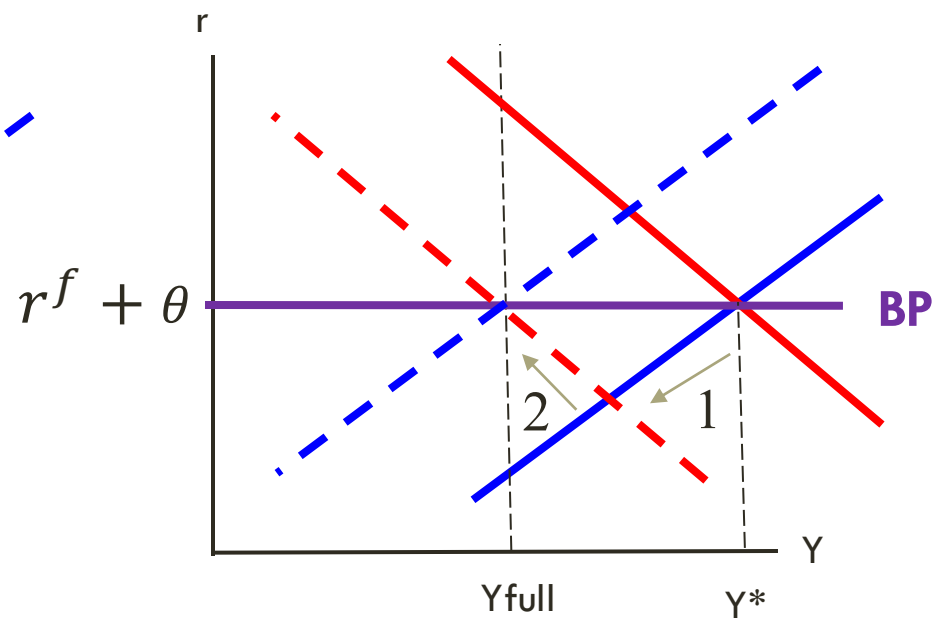
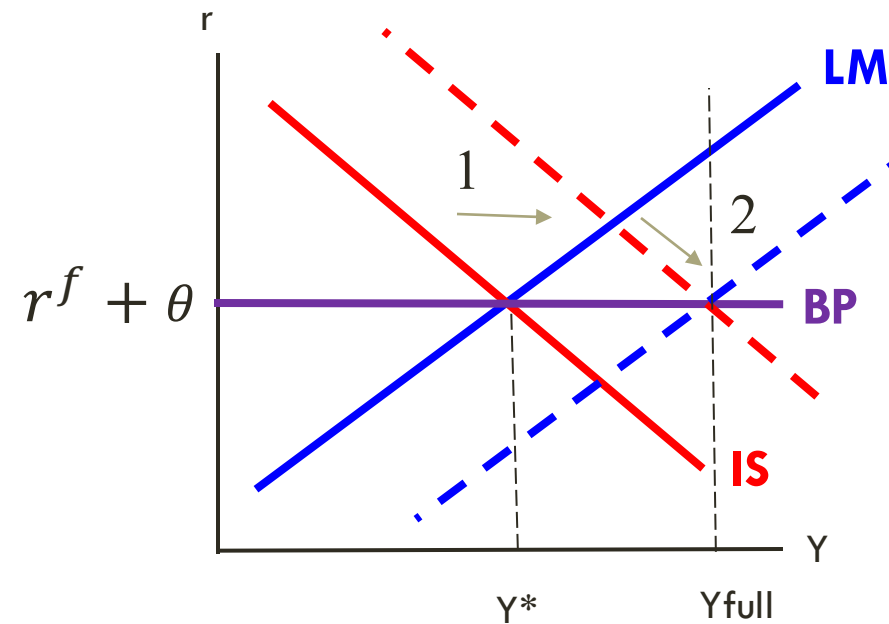
# EXCHANGE RATE POLICY

- Periodic realignments, e.g. **revaluation/devaluation**, can help fixing the imbalance through the so called “**expenditure-switching channel**”.
- Changing the **composition** of net exports, aggregate expenditure, and hence output.

# EFFECTS OF EXCHANGE RATE REALIGNMENT

Overvalued currency → Devaluation

Undervalued currency → Revaluation



# FISCAL AND MONETARY POLICY EFFECTIVENESS

- Unlike the closed-economy, effectiveness of fiscal and monetary policy also depends on the choices of exchange rate regime. (let alone the slope issue.)
- As we had seen before, propagation of shocks would vary across different exchange rate regimes, so the effect of policy as well.
- Policies under fixed exchange rate → policies under flexible exchange rate.

# POLICY EFFECTIVENESS

Perfect capital mobility world (BP horizontal)

Policy	Fixed exchange rate	Flexible exchange rate
Fiscal policy	Effective	<i>Ineffective</i>
Monetary policy	<i>Ineffective</i>	Effective

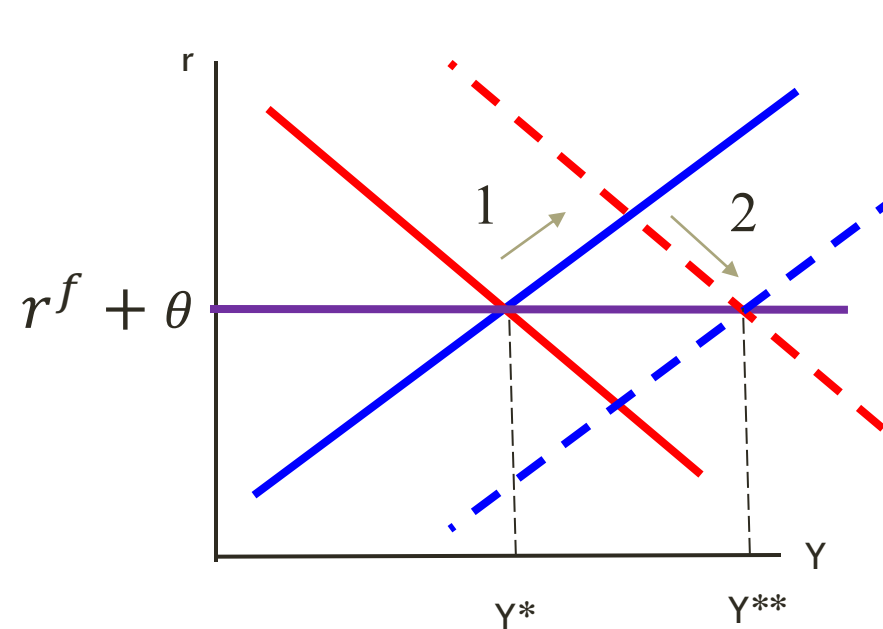
Imperfect capital mobility world (BP positive slope; **See Froyen**)

Policy	Fixed exchange rate	Flexible exchange rate
Fiscal policy	???	???
Monetary policy	???	???

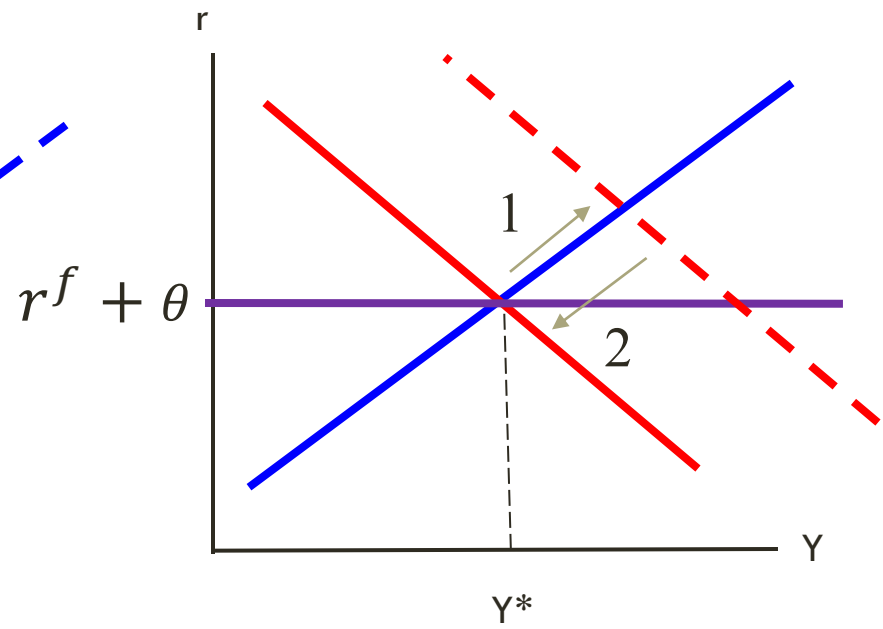
# FISCAL POLICY

Fiscal instruments:  $G$ ,  $T$

Changes in  $G$  (or  $T$ ) cause a shift in IS curve. (ex. expansionary fiscal policy)



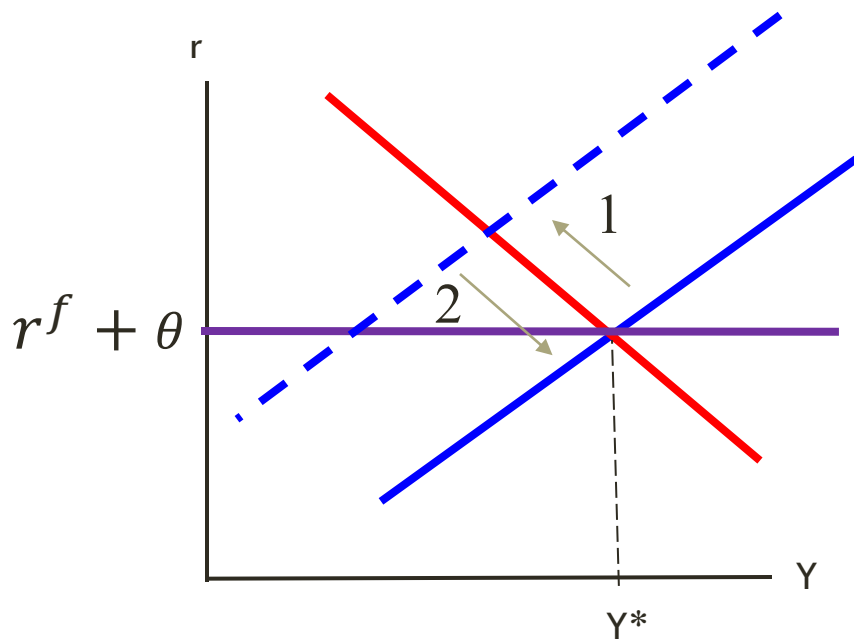
Fixed exchange rate



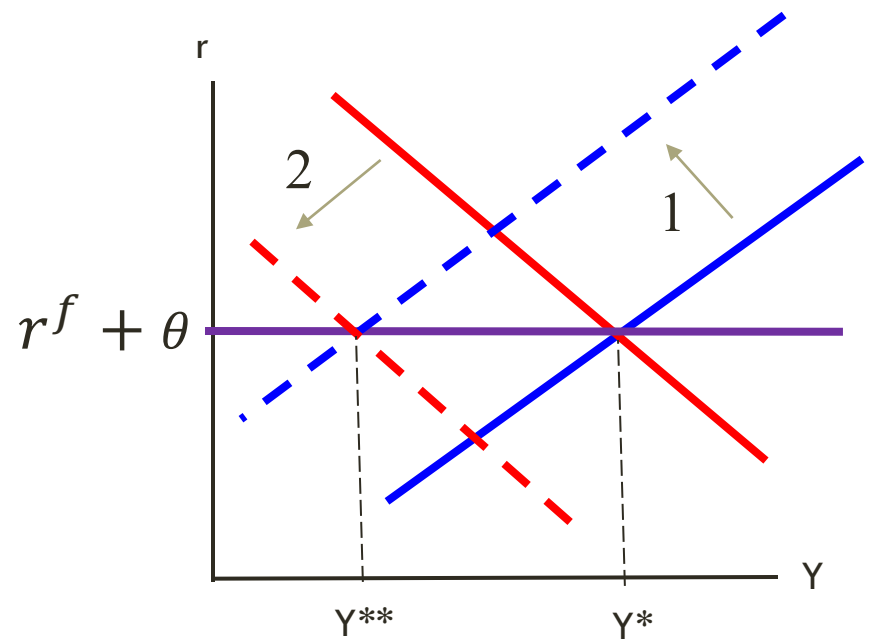
Flexible exchange rate

# MONETARY POLICY

Restrictive monetary policy



Fixed exchange rate



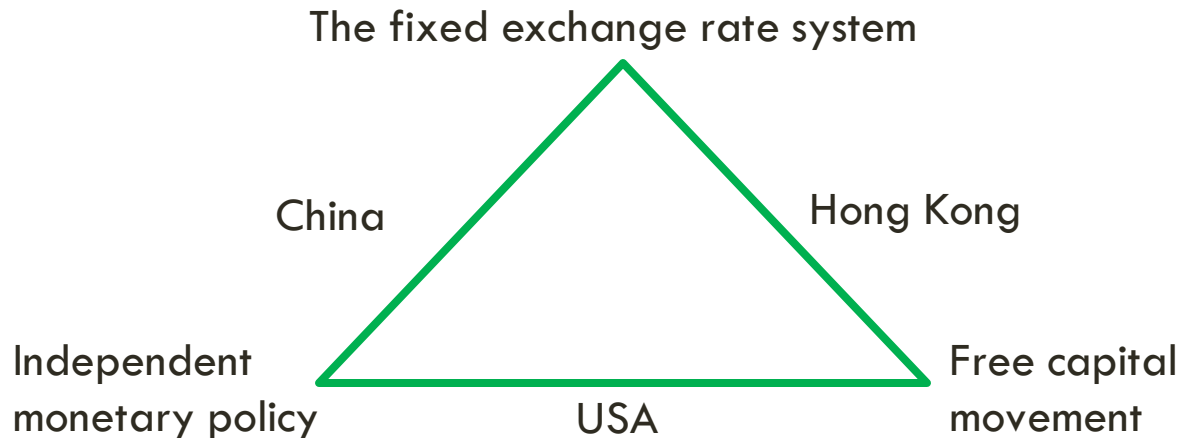
Flexible exchange rate

# STERILIZATION POLICY

- The central bank may prevent the expansion of the money supply by draining domestic currency back from the circulation.
  - Selling bonds to the public.
  - Forcing domestic interest rate above  $r^f + \theta$
  - But, the CB will keep accumulating FX --- rising FX reserves.
- Sounds not a problem, but **policy is actually costly**.
  - Most central bank keeps their foreign reserve in terms of hard-currency government bond.
  - Implicitly, CB is swapping high-return assets for low-return assets.
- An independent monetary policy is **self-defeating**.

# IMPOSSIBLE TRINITY

- **Trilemma:** it is impossible to conduct all three policies at the same time:



- **Ex:** Mexican peso crisis (1994-95), **Asian financial crisis (1997-98)**, Argentinian financial collapse (2001-2002).

# ASIAN FINANCIAL CRISIS (1997-98): THE GOLDEN ERA

- When things looked GREAT before 1990.
  - Adopting the Pegged exchange rate, particularly basket currency.
  - The fifth Tiger of Asia: Double digits growth in GDP
  - Current account surplus; Government Budget surplus; low inflation; stock market boom.

# ASIAN FINANCIAL CRISIS (1997-98): THE PHANTOM MENACES OF THE IMPOSSIBLE TRINITY

- The phantom menaces: *Financial liberalization in 1993*
  - Growth slowdown; financial hubs → capital account liberalization.
  
- *Consequence of the liberalization policy in 1993*
  - Massive capital influx; external debt rose rapidly.
  - Credit easing; private credit growth rose dramatically.
  - Real-estate boom

# ASIAN FINANCIAL CRISIS (1997-98): WHEN THINGS TURNED SOUR

- External imbalances
  - Huge amount of current account deficit
  - Huge amount of external debt, esp. short-term
- Domestic imbalances
  - Real-estate bubble
  - Banking NPLs rise

# ASIAN FINANCIAL CRISIS (1997-98): THE FALLS OF EVERYTHING

- Fundamentally weak → speculative attack
- BOT had tried very hard to prevent the speculation as they were worried about all the short-term US-denominated borrowing.
- Depletion in Foreign reserve had continued.
- Decided to abandon the fixed exchange rate regime in July 2<sup>nd</sup>, 1997.
- Currency depreciation; Capital reversal; Financial Crunch
- Resulting in the worst ever experienced economic contraction in Thailand: AFC.