

OPEN ECONOMY MACROECONOMICS 1

Kittichai Saelee
Semester 1/2018
Faculty of Economics
Thammasat university

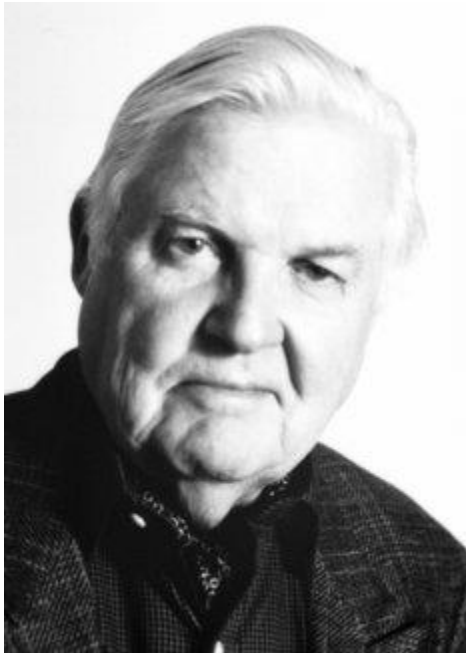
AGENDA

- 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 Ch. 14

This lecture slide will be focusing on the first two agendas.

HOW CAN A COUNTRY BECOME OPENED?



Robert A. Mundell (1956)

“The world is still closed, but countries have become increasingly opened.”

Countries become opened in two dimensions: **Trade and Finance**

Nobel 1999

RECORD OF INTERNATIONAL TRANSACTIONS

- Officials have recorded all the international activities (trade/finance) by using international accounting standard.
 - Current account (CA)
 - Capital account (KA)
 - Balance of payments account (BOP)
 - Foreign reserve account (FRA)

RECORD OF INTERNATIONAL TRANSACTIONS: *CURRENT ACCOUNT*

- **Current account (CA):** record activities related to international trade in goods and services.

$$CA = \text{Exports} - \text{Imports}$$

CA > 0; Exports > Imports → Current account surplus

CA < 0; Exports < Imports → Current account deficit

THE CURRENT ACCOUNT (CA): DETAILS

		Credit (+)	Debit (-)
	Merchandise exports	+	
	Merchandise imports		-
(1)	Merchandise trade balance	Surplus	Deficit
(2)	Service balance	+	-
(3)	Transfers	+	-
	CA balance (1)+(2)+(3)	Surplus	Deficit

RECORD OF INTERNATIONAL TRANSACTIONS: *CAPITAL ACCOUNT*

- **Capital account (KA):** record activities related to international financial flows, i.e. **borrowings, portfolios and FDIs.**

$KA = \text{Financial inflows} - \text{Financial outflows}$

$KA > 0$; → Capital account surplus

$KA < 0$; → Capital account deficit

THE CAPITAL ACCOUNT (KA): DETAILS

	Credit (+)	Debit (-)
Public Borrowing	+	
Lending		-
Private Borrowing	+	
Lending		-
Investment Portfolio investment	+	-
Direct investment	+	-
Capital account balance	Surplus	Deficit

RECORD OF INTERNATIONAL TRANSACTIONS: *BALANCE OF PAYMENTS*

- The overall balance, representing the **net position to the rest of the world (ROTW)**, is summarized by **the balance of payments (BOP)**.

$$\text{BOP} = \text{CA} + \text{KA}$$

BOP > 0 → Balance of payment surplus

BOP < 0 → Balance of payment deficit

RECORD OF INTERNATIONAL TRANSACTIONS: *FOREIGN RESERVE ACCOUNT (FRA)*

- Net position in the balance of payments will determine the change in **international reserve account**.
 - $BOP > 0 \rightarrow$ FRA rises
 - $BOP < 0 \rightarrow$ FRA depletes.
- Practically, FRA will be recorded as the **asset of the central bank**.

FOREIGN RESERVE ACCOUNT AND THE CENTRAL BANK BALANCE SHEET

A simplified balance sheet of the central bank.

Asset	Liability	
Government bond (Govt Bond) Gold	Currency in circulations	} Monetary Base or High-powered money
Foreign currency reserve (FRA) - Foreign-denominated assets - Foreign currencies - SDRs	Commercial bank reserve	
	Capital + Net Worth	

- Rising in FRA, due to $BOP > 0$
- Depletion in FRA, due to $BOP < 0$

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

INTERNATIONAL PAYMENTS AND FOREIGN EXCHANGE MARKET

- International transactions require the payments, and hence foreign currency.
 - Each country has their own **national currency**.
- Foreign currency market is where people obtain foreign currency, i.e. trading/converting one currency into another currency.
 - Example: Thai baht traded into USD, Euro traded into JPY etc.
- **Foreign exchange rate** is determined in the foreign currency market.

FOREIGN EXCHANGE RATE: NOMINAL V.S. REAL

- **The nominal exchange rate (e):** the price of one unit of foreign currency in terms of domestic currency; rising 'e' means depreciation in local currency.
 - P = the price of domestic goods in the unit of domestic currency.
 - P^* = the price of foreign goods in the unit of foreign currency.
 - eP^* = the price of foreign goods in the unit of domestic currency.
- **The real exchange rate** (rer: the terms of trade) is the price of foreign goods in terms of domestic goods:

$$\text{real exchange rate} = \frac{eP^*}{P}$$

EFFECTIVE EXCHANGE RATE

- **Nominal effective exchange rate (NEER):** an index constructed to measure the relative (nominal) value of a national currency against other trading partners.

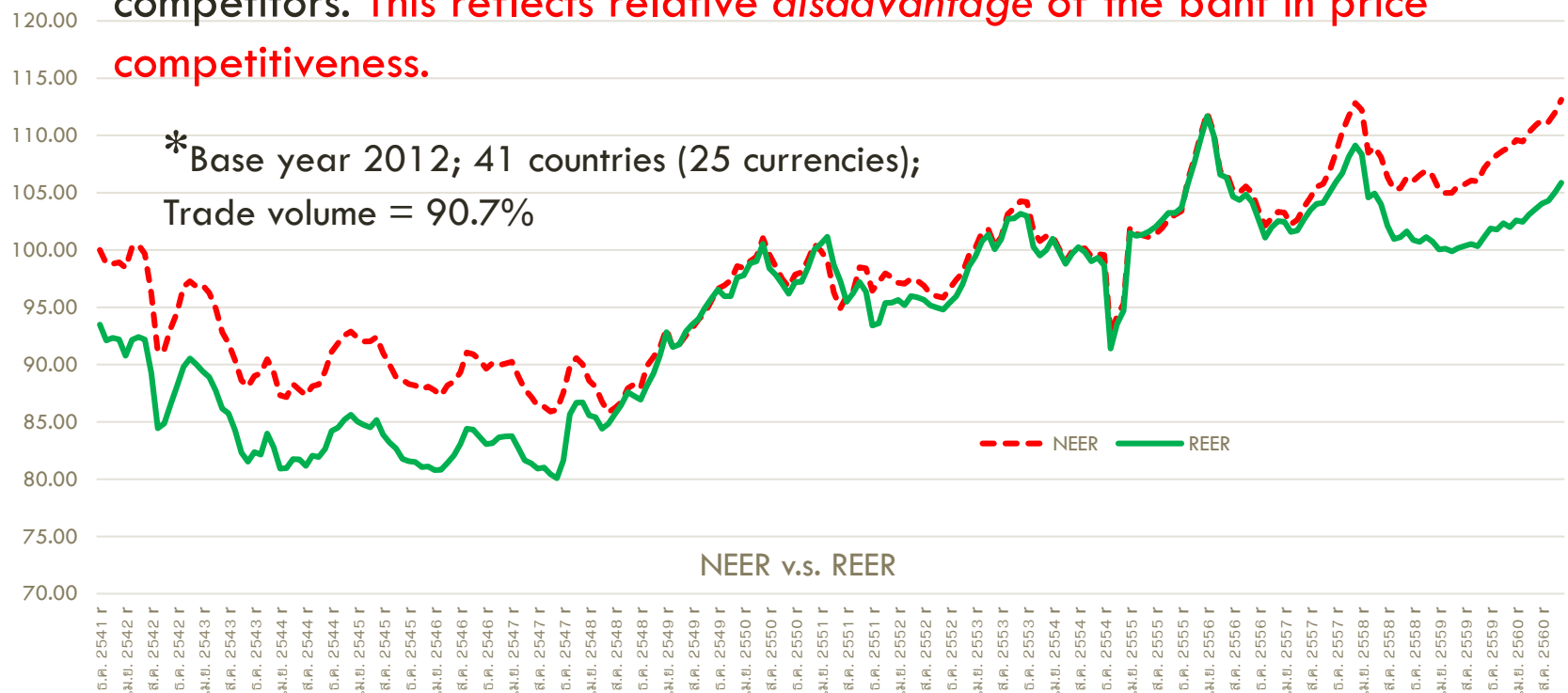
$$NEER_t = \frac{\sum_{i=1}^N w_{i,0} e_{i,t}}{\sum_{i=1}^N w_{i,0} e_{i,t=0}} * 100$$

- $w_{i,0}$: trading basket (bilateral trade share with country i)
- **The real exchange rate (REER):** an index constructed to measure the relative (real) value of a national currency against other trading partners.

$$REER_t = \frac{\sum_{i=1}^N w_{i,0} rer_{i,t}}{\sum_{i=1}^N w_{i,0} rer_{i,t=0}} * 100$$

NEER V.S. REER IN THAILAND

By the way official series are constructed*, **an increase** in NEER refers to the **baht appreciation** against Thailand's major trading partners and competitors. **This reflects relative disadvantage of the baht in price competitiveness.**



EXCHANGE RATE DETERMINATION

- Long-run v.s. Short-run theory
- Institutional details and how a country run its **exchange rate regime.**
 - Flexible Exchange Rate
 - Fixed or Pegged Exchange Rate
 - Managed Float

LONG-RUN THEORY: THE PURCHASING POWER PARITY (PPP)

- Accounting for the **long-run movement of nominal exchange rate** is often referred to the theory of purchasing power parity, i.e. PPP.
- The theorem is founded upon one the most important concepts in international trade theory so called “**the law of one price (LoP)**”
- **LOP: an identical product should be priced the same across countries.**
 - Holds under (i) zero transport cost and (ii) no trade barriers.

THE PURCHASING POWER PARITY (PPP)

- **The law of one price: $P_i = eP_i^*$.**
- If the condition doesn't hold, we are under the **arbitrage condition**.
 - Profit-making with no risk!
- If $eP_i^* > P_i$, domestic good-i is cheaper.
 - Foreigners buy more domestic good-i; P_i is rising.
- If $eP_i^* < P_i$, foreign good-i is cheaper.
 - Domestic consumers buy more foreign good-i; P_i is falling.

THE PURCHASING POWER PARITY (PPP)

- The idea is extended to the aggregate level.

$$e = \frac{P}{P^*}$$

where P and P^* are the consumer price index (CPI).

- This version is called an **“absolute”** PPP.
- An alternative version is called a **“relative”** PPP.

$$\hat{e} = \hat{P} - \hat{P}^*$$

where \hat{x} is the growth rate of x .

THE PURCHASING POWER PARITY (PPP)

- Following the relative version, **domestic currency should be depreciating if domestic inflation rate exceeds the inflation rate of foreign country.**
- Question is: **“what are the determinants of inflation rate?”**

THE PURCHASING POWER PARITY (PPP)

- Inflation occurs when **too much money** chasing **too few goods**.
 - Output does not grow as fast as the rate at which money grows.
- In the long-run, **money growth and productivity growth** matters for the exchange rate movement – e.g.,
 - A high money growth country should be experiencing a depreciation in its national currency.
 - A fast-growing productive economy (such as China) should have its national currency appreciate.

TRADED AND NON-TRADED GOODS

- PPP holds in the case of **traded goods** with low transport cost, e.g., crude oil.
- PPP may not hold with **non-traded goods** (due to physical and legal barriers), e.g., services.
- In the long-term, strong market forces push foreign and domestic prices towards PPP.
 - Physical and legal barriers tend to be overcome by consumers and firms as the technology has become more advanced.

DEVIATION FROM PPP

- If PPP holds, **the real exchange rate is fixed over time.**
- The nominal exchange rate deviates from the level implied by PP because:
 - Some inputs are non-traded goods.
 - Labor is immobile.
 - Existing trade barriers.
 - Prices are sticky.

THE IMPLIED PPP EXCHANGE RATE / OVERVALUATION AND UNDERVALUATION

- The nominal exchange rate implied by PPP is treated as *the long-run equilibrium rate*.
- **Ex:** Item X is an **internationally-traded** good.
 - **The US:** the price of X is \$10.
 - **Thailand:** the price of X is THB200.
 - The PPP rate: $\text{THB}200/\$10 = \text{THB}20/\1 .
 - But the nominal rate is THB30/\$1.
 - So the Thai baht is **undervalued** by 33%!
- **The Big Mac Index** by *the Economist*.

BURGERNOMIC INDEX

The Big Mac index

Country	2000—2018	Under/over valued, %
New Zealand NZ\$		-23.2
Britain Pound		-23.2
Colombia Peso		-24.9
Chile Peso		-26.5
South Korea Won		-26.8
Costa Rica Colón		-26.8
UAE Dirham		-30.8
Sri Lanka Rupee		-33.9
Thailand Baht		-34.9
Honduras Lempira		-35.7
Japan Yen		-36.4
Kuwait Dinar		-37.0

Choose a base currency

US dollar

Show index at

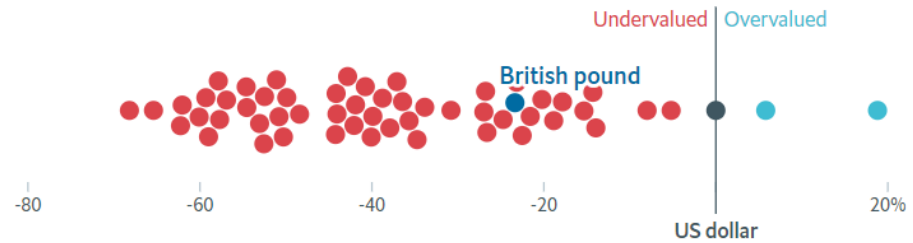
Jul 2018

Adjust the index to account for GDP per person

Raw index GDP-adjusted

The British pound is 23% undervalued against the US dollar

July 2018



A Big Mac costs £3.19 in Britain and US\$5.51 in the United States. The implied exchange rate is 0.58. The difference between this and the actual exchange rate, 0.75, suggests the British pound is 23.2% undervalued

2000-2018



BURGERNOMIC INDEX

The Big Mac index

Country	2011 — 2018	Under/over valued, %
Brazil	Real	34.7
Colombia	Peso	33.3
Chile	Peso	15.6
Thailand	Baht	15.0
Sweden	Krona	11.5
Pakistan	Rupee	6.7
Euro area	Euro	5.1
Canada	C\$	4.3
Peru	Sol	2.6
Switzerland	Franc	1.3
Israel	Shekel	0.8
United States	US\$	BASE CURRENCY

Choose a base currency
US dollar

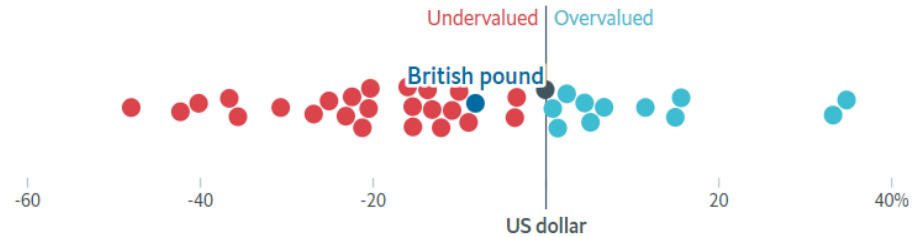
Show index at
Jul 2018

Adjust the index to account for GDP per person

Raw index GDP-adjusted

The British pound is 8% undervalued against the US dollar

July 2018



A Big Mac costs 23% less in Britain (US\$4.23) than in the United States (US\$5.51) at market exchange rates. Based on differences in GDP per person, a Big Mac should cost 16% less. This suggests the pound is 8.4% undervalued

2011-2018

150%

EXCHANGE RATE DETERMINATION: SHORT-RUN THEORY

➤ Determined by demand and supply for foreign currency in the foreign exchange rate market.

➤ Notation:

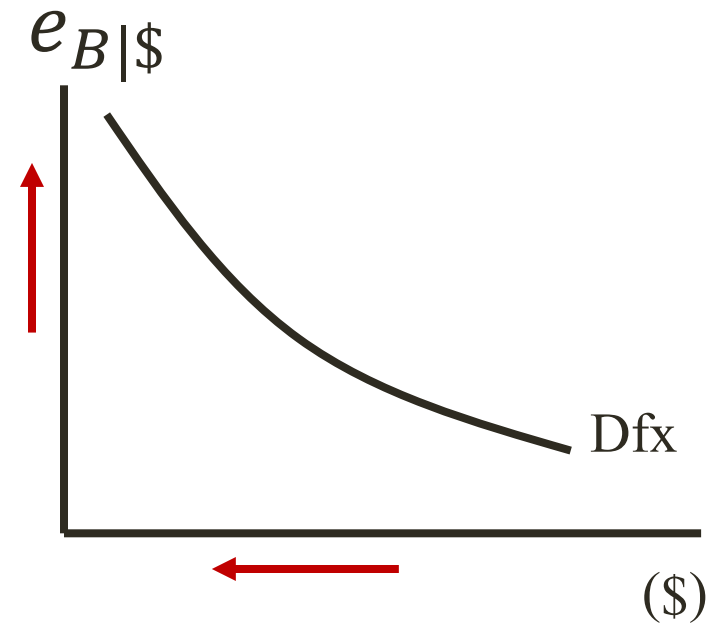
$e_{B|\$}$ = units of baht required for a USD dollar

- If $e_{B|\$}$ rises (falls), more (less) baht is required for a USD.
- USD dollar appreciates (depreciates); Thai baht depreciates (appreciates).

Demand for foreign currency is downward sloping in $e_{B|\$}$.

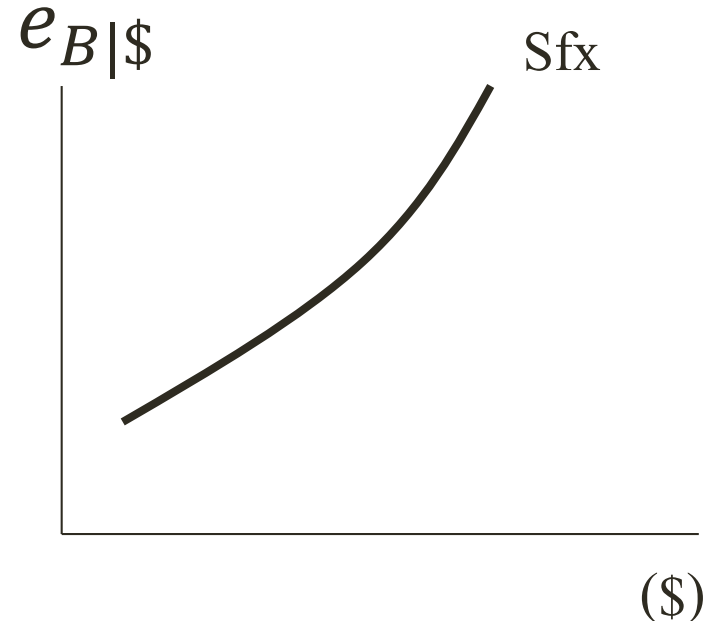
Supply for foreign currency is upward sloping in $e_{B|\$}$.

FX DEMAND

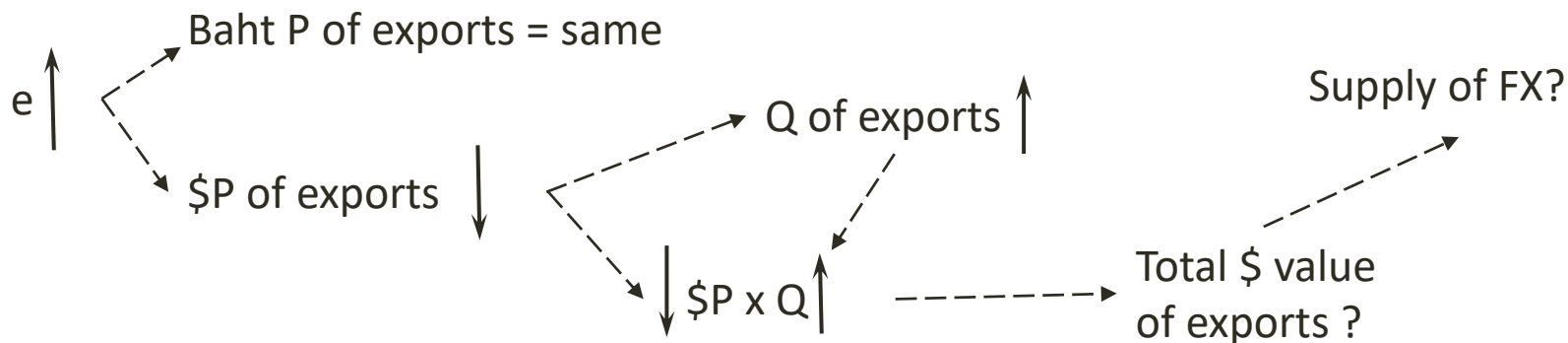


- Rising e (= domestic depreciation)
 - higher value of imported product (in terms of Thai Baht) $rer = \frac{e * P^*}{P} \rightarrow$ lower quantity demanded for imports
 - higher foreign asset value (in terms of Thai Baht) \rightarrow lower relative return on foreign asset: $(1 + r) - \frac{(1+r^*)e_{t+1}}{e_t} \rightarrow$ lower demand for foreign assets.
- Less USD needed \rightarrow **Downward sloping demand**

FX SUPPLY



- Rising e (= foreign appreciation) \rightarrow
 - Lower value of domestic product (in terms of USD) $rer = \frac{e^*P^*}{P} \rightarrow$ higher quantity demanded for domestic product from ROTW
 - Lower domestic asset value (in terms of USD) \rightarrow higher relative return on domestic asset: $(1 + r) - \frac{(1+r^*)e_{t+1}}{e_t} \rightarrow$ higher quantity demanded for domestic asset from ROTW.
- Always more USD supplied? (More Thai Baht needed?) **Upward sloping supply?**
 - **Quantity v.s. Value!**
- Turn out to be **yes if elasticity of exports is greater than one.**



If $|\epsilon_x^d| < 1$ ----- $\Delta Q < \Delta \$P$ ----- Total \$ value of exports \downarrow ----- Supply of FX \downarrow

If $|\epsilon_x^d| > 1$ ----- $\Delta Q > \Delta \$P$ ----- Total \$ value of exports \uparrow ----- Supply of FX \uparrow

The famous elasticity condition: Marshall-Lerner condition

FX MARKET EQUILIBRIUM

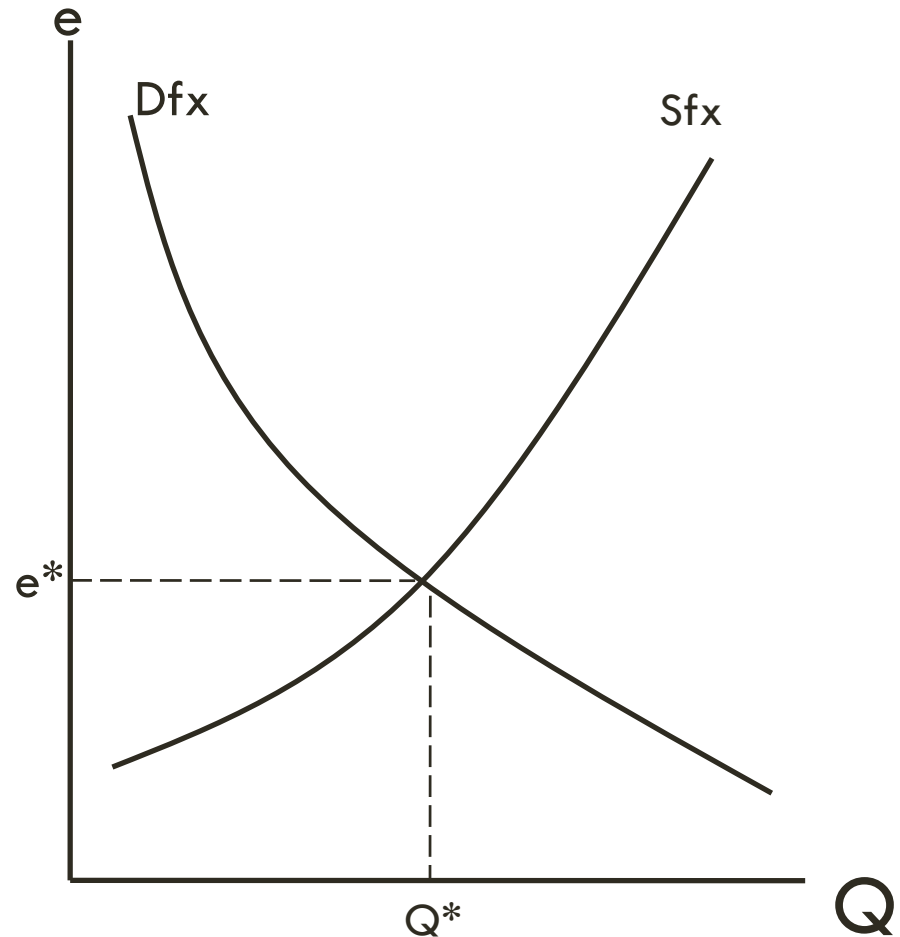
$$Q_{FX}^s = Q_{FX}^d$$

$$X + F_{in} = IM + F_{out}$$

$$(X - IM) + (F_{in} - F_{out}) = 0$$

$$CA + KA = 0$$

➤ BOP = 0 when $e = e^*$ and FX market is in equilibrium.

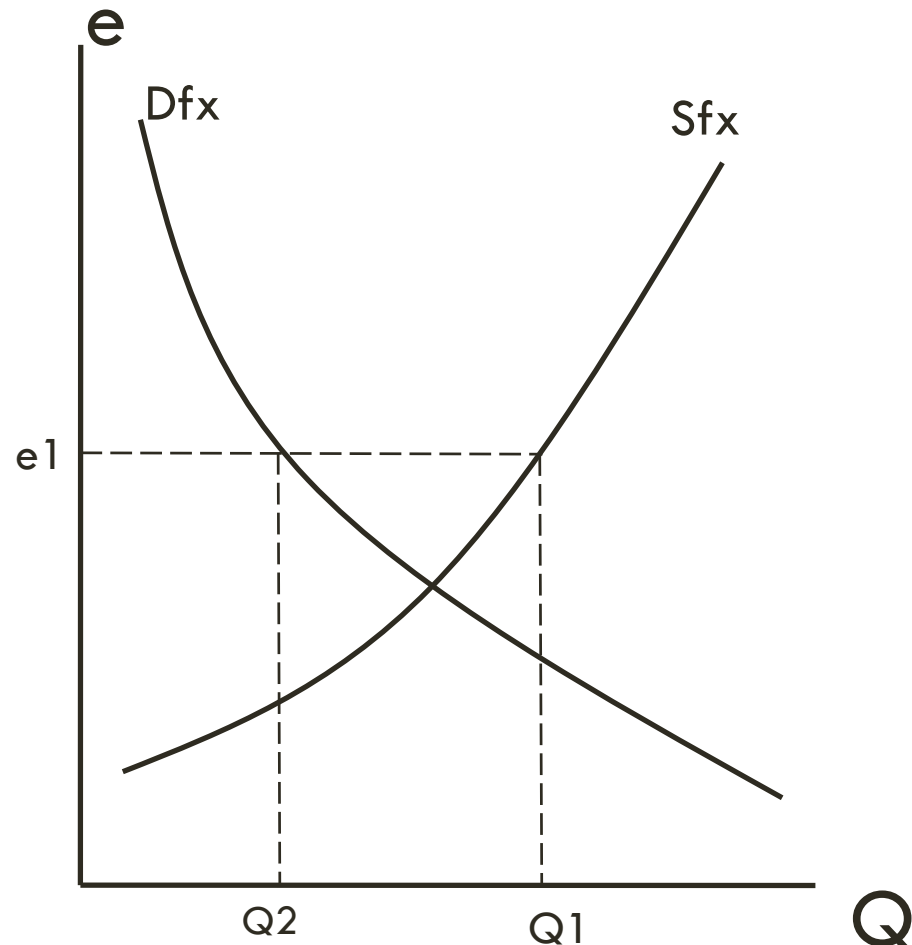


A BOP SURPLUS AND EXCESS SFX

At e_1 , excess supply of FX.

$$(CA) + (KA) > 0$$

BOP registers a **surplus** ($BOP > 0$).

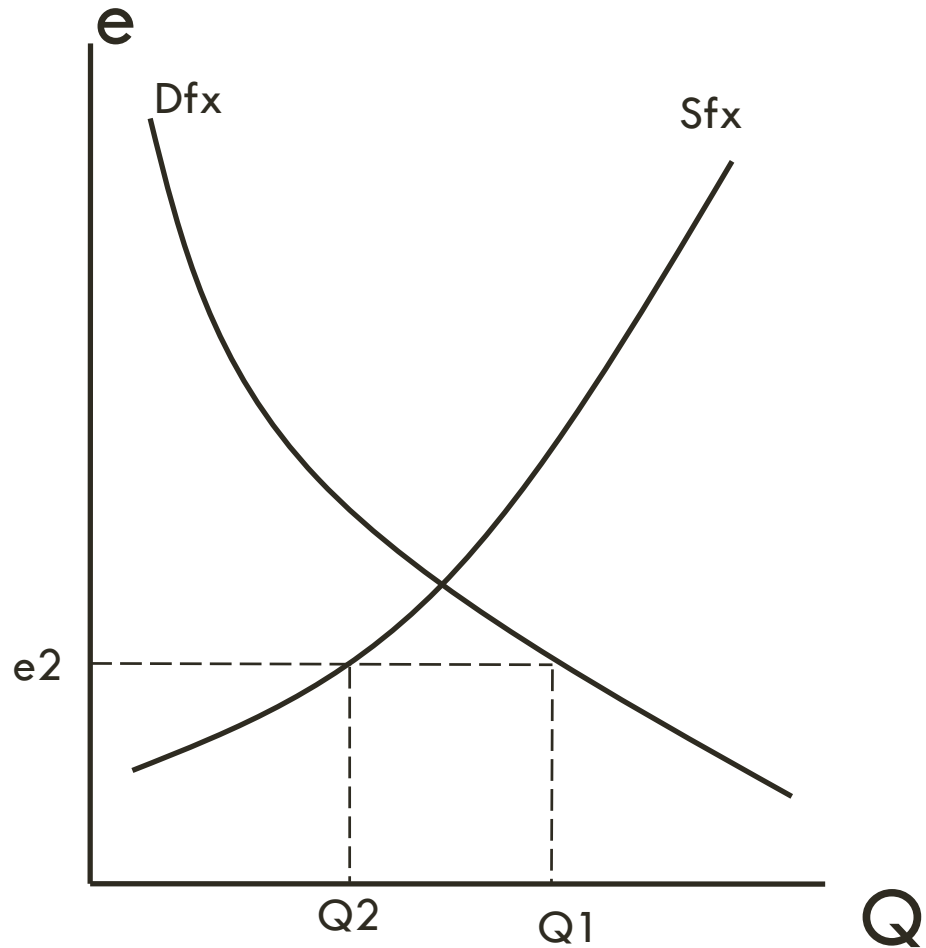


A BOP DEFICIT AND EXCESS DFX

At e_2 , excess demand of FX.

$$(CA) + (KA) < 0$$

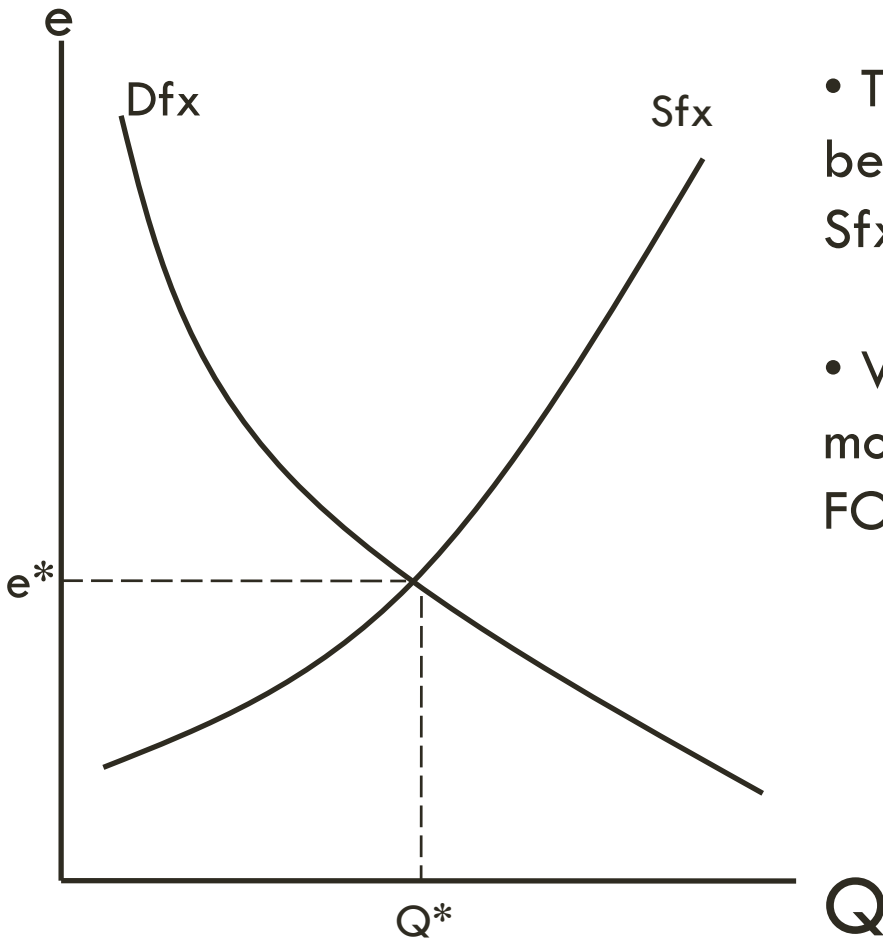
BOP registers a **deficit** ($BOP < 0$).



EXCHANGE RATE REGIME

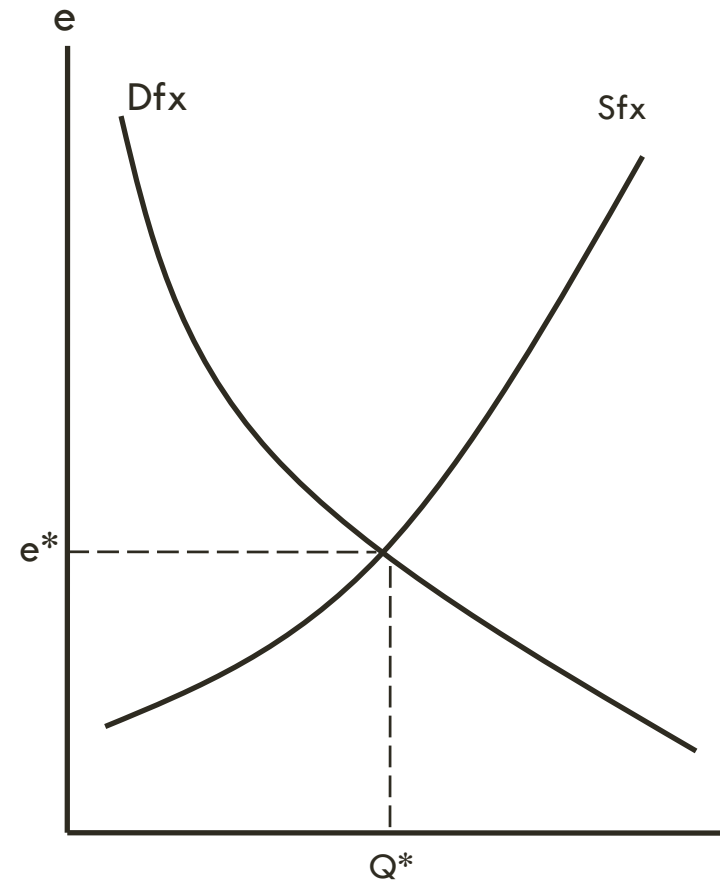
- Institutional details and how a country run its **exchange rate regime** affect the way exchange rate is actually determined.
- Three regimes:
 - Flexible Exchange Rate
 - Fixed or Pegged Exchange Rate (Exchange rate anchor)
 - Managed Float

FLEXIBLE EXCHANGE RATE REGIME: FEATURES



- The exchange rate can **freely** move because of the shift/variation in the D_{fx} and S_{fx} .
- What are the factors that cause the movement in the demand and supply of FOREX?

FLEXIBLE EXCHANGE RATE REGIME: FEATURES



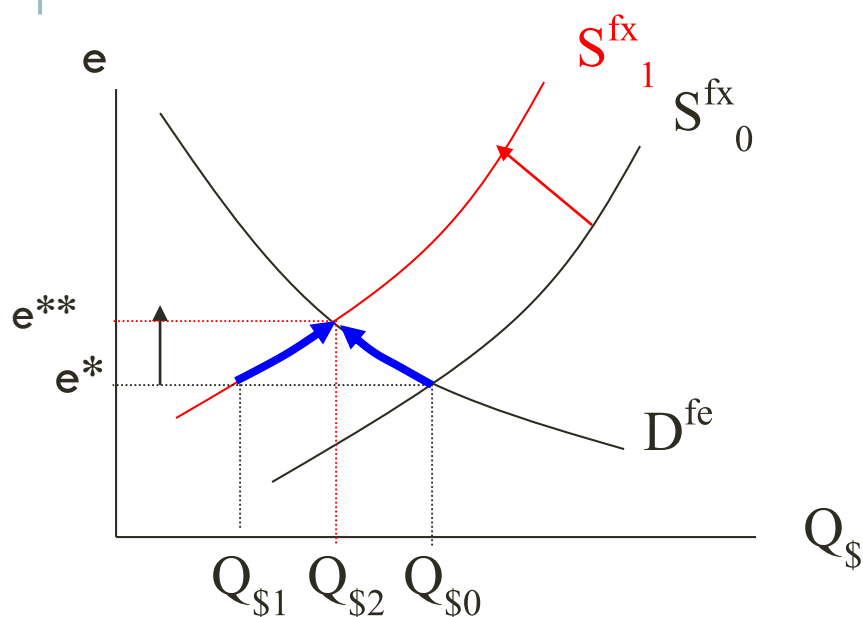
• Factors Affecting S_{fx} - e.g.,

- Change in the demand for domestic goods (exports): **domestic price, ROTW income**
- Change in the demand for domestic asset (inflows): **relative return, relative risk** etc.

• Factors Affecting D_{fx} - e.g.,

- Change in the demand for foreign goods (imports): **foreign price, domestic income**
- Change in the demand for foreign asset (outflows): **relative returns, relative risks** etc.

FLEXIBLE EXCHANGE RATE REGIME: EXAMPLE



Question: what would happen to the exchange rate if GDP growth of major trading partners is expected to slowdown?

- Initial level e^*
- Slowdown growth will result in a short-fall of export, causing the **supply for USD to shift left**.
- Excess demand will be eliminated by having the foreign currency price appreciated, i.e. depreciation in Thai baht.
- Exchange rate becomes e^{**} .

FIXED EXCHANGE RATE REGIME: FEATURES

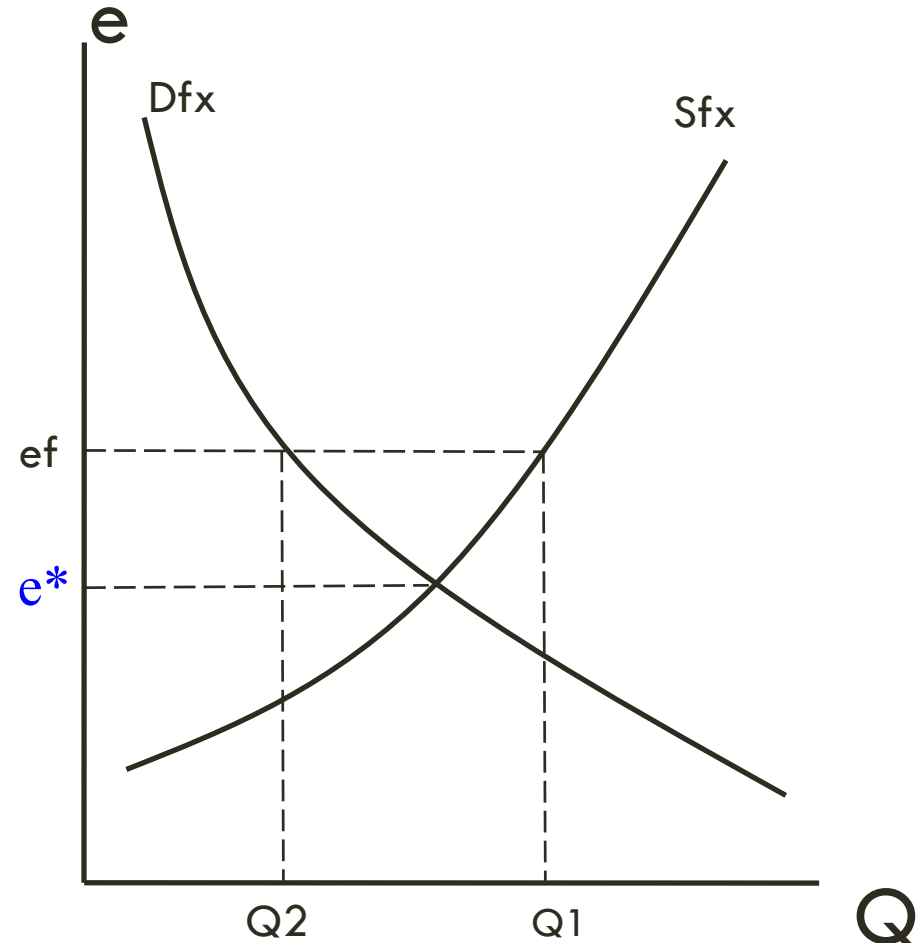
- Authority makes an **announcement in advance** for a targeted level of exchange rate, i.e. anchoring.
- The rate can be different from the rate the would arise under the flexible exchange rate regime, i.e. **shadow rate**.
- To make a public commitment, authority (central bank) must be standing ready to **intervene/support** the market so that the targeted rate can be attained.

OFFICIAL RATE E_f ABOVE E^* : IMPLEMENTATION

Domestic currency (e_f) is undervalued.

- Excess S_{fx} ; $BOP > 0$.
- Central bank buys FX to fix e_f .
- Accumulation of FX.
- Problem?

Revaluation of domestic currency; making domestic currency value stronger.

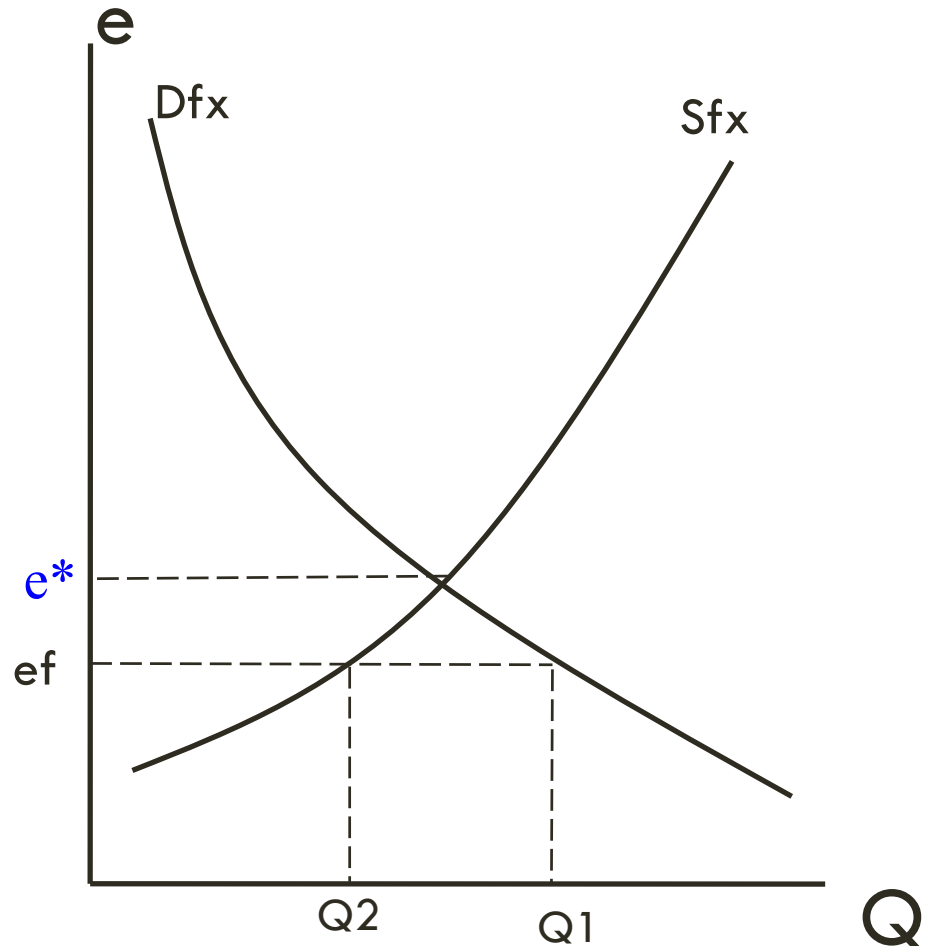


OFFICIAL RATE e_f UNDER e^* : IMPLEMENTATION

Domestic currency (e_f) is overvalued.

- Excess D_{fx} ; $BOP < 0$.
- Central bank must sell FX to fix e_f .
- But official reserves are not unlimited?

Devaluation of domestic currency; making domestic currency value weaker.



SPECTRUM OF THE FIXED EXCHANGE RATE REGIME

- **Hard pegs:** the value of domestic currency is fixed relative to foreign currency for the **indefinite** future.
 - **Dollarization:** use foreign currency as the national medium of exchange (East Timor, Ecuador, El Salvador, Panama).
 - **Currency board:** central bank fixes the nominal exchange rate, then buys and sells foreign-denominated assets to maintain the rate (Bosnia, Bulgaria, Denmark, Hong Kong, Lithuania)

SPECTRUM OF FIXED EXCHANGE RATE REGIME

- **Soft pegs:** no permanent fixed rate.
 - The nominal rate is fixed for a long time period.
 - *Periodic adjustment* to correct imbalances: devaluation (raising e) or revaluation (reducing e).

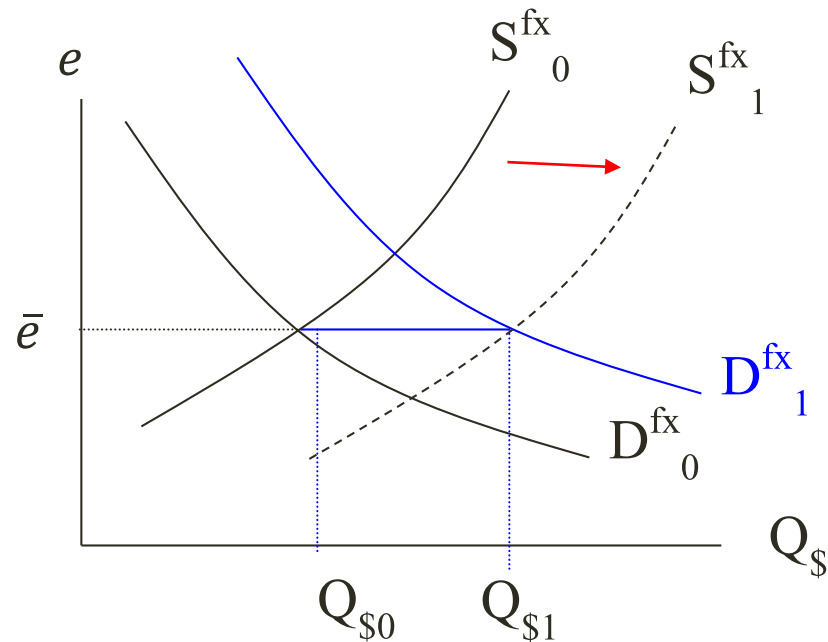
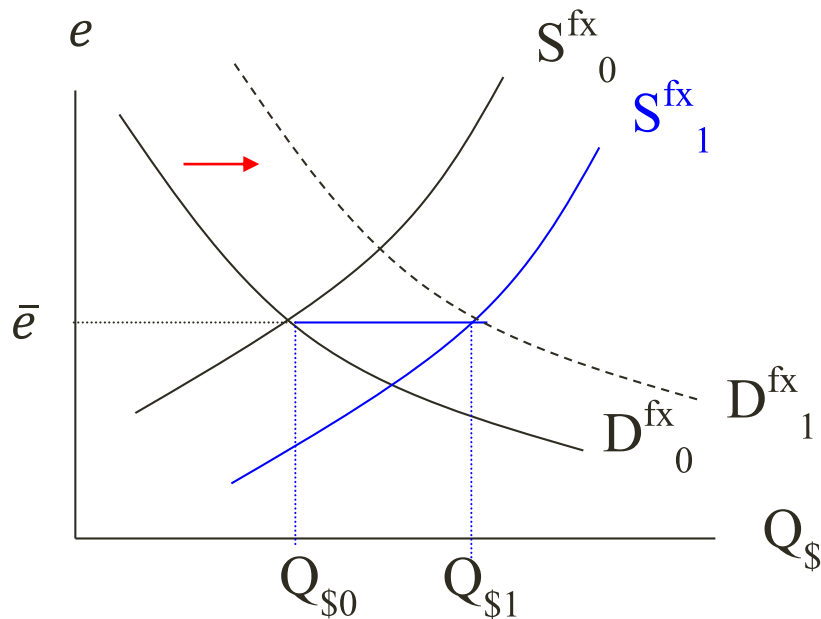
FIXED AND FLEXIBLE: CONS AND PROS

	Fixed exchange rate	Flexible exchange rate
Advantage	No uncertainty in exchange rate.	Reflecting fundamental of economy
Disadvantage	Likely to invite a financial crisis; slow to respond to imbalances.	Prone to subject to high volatility; resulting in unnecessarily high cost for hedging the exchange rate risk.

- **Managed float regime is more popularized regime.**
- Occasional intervention if rate changes at a very dramatic pace.
- So, what is the difference between soft pegged v.s. managed float?

MANAGED FLOAT REGIME

Suppose the authority needs to *stabilize* the exchange rate at \bar{e}



- \bar{e} → Excess demand (more buy than the sell) → Central bank must supply USD to eliminate the excess demand in USD by $\$Q_{\$0}Q_{\$1}$.
- \bar{e} → Excess supply (more sell than buy) → Central bank must buy USD to clear the excess supply in USD by $\$Q_{\$0}Q_{\$1}$.

FOREIGN RESERVE ACCOUNT AND THE CENTRAL BANK BALANCE SHEET

A simplified balance sheet of the central bank.

Asset	Liability
Government bond (Govt Bond) Gold	Currency in circulations
Foreign currency reserve (FRA) - Foreign-denominated assets - Foreign currencies - SDRs	Commercial bank reserve
	Capital + Net Worth

} Monetary Base

- Rising in FRA → **MB rises, and hence money supply**
- Depletion in FRA → **MB falls, and hence money supply**