

OPEN ECONOMY MACROECONOMICS 1

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AGENDA

- International linkage and Balance of payments
 - Foreign exchange market and Exchange rate determination
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- 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**

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 FDI**s.

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

$KA > 0$; → 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)**.

$$BOP = CA + KA$$

$BOP > 0 \rightarrow$ Balance of payment surplus

$BOP < 0 \rightarrow$ 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
Foreign currency reserve (FRA) - Foreign-denominated assets - Foreign currencies - SDRs	Commercial bank reserve
	Capital + Net Worth

Monetary Base
or
High-powered
money

- 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

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- 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.

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

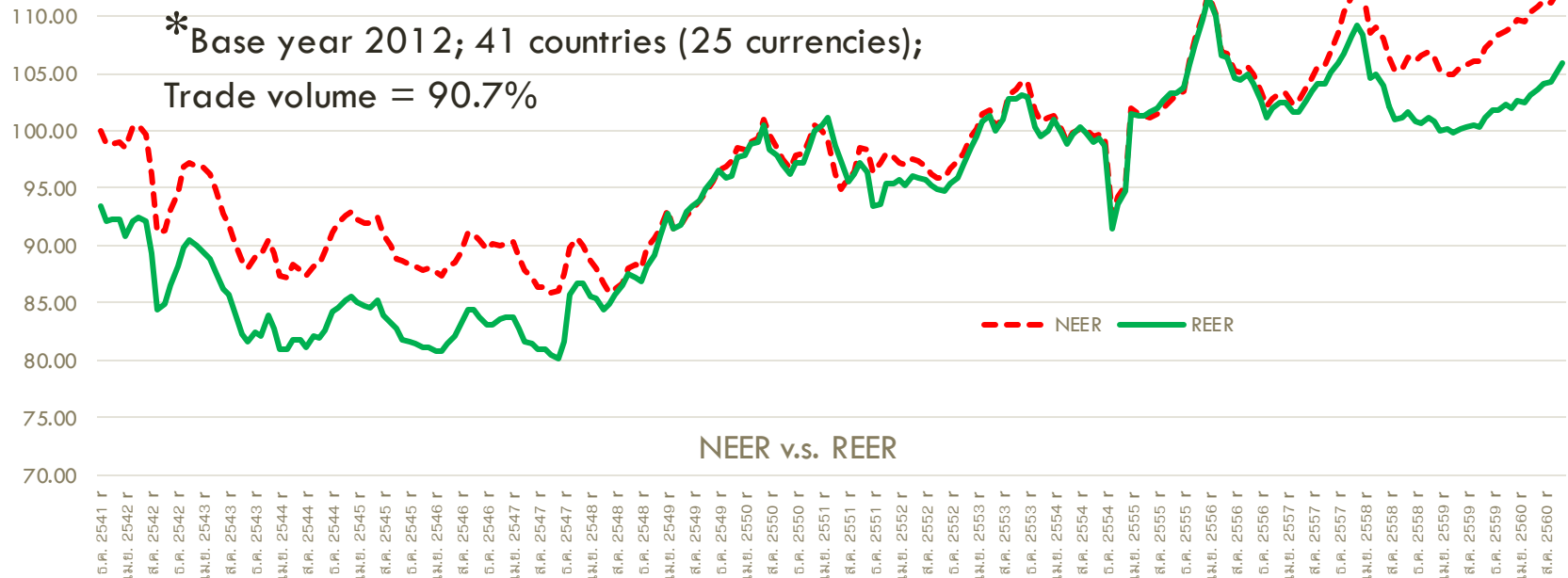
- $w_{i,0}$: trading basket (bilateral trade share with country i)

- **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.
- In the long-run, **productivity** matters for the exchange rate movement
 - 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.

DEVIATION FROM PPP

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

THE IMPLIED PPP EXCHANGE RATE

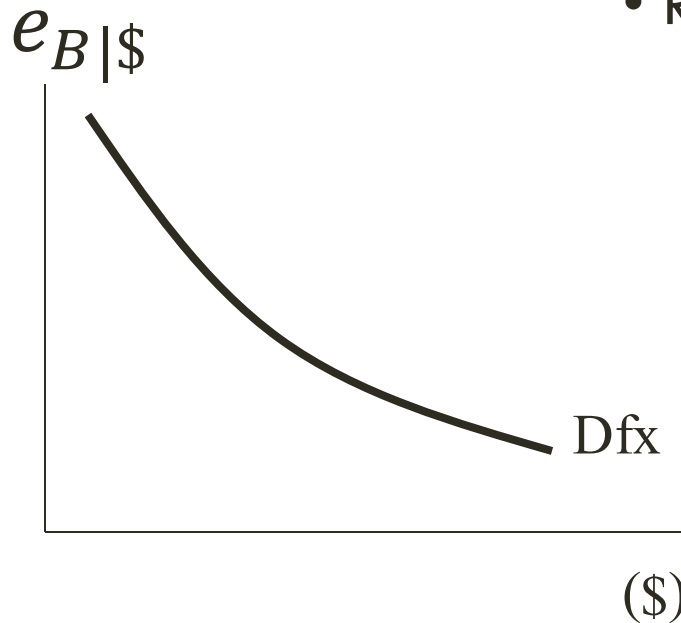
- The nominal exchange rate implied by PPP is treated as *the long-run equilibrium rate*.
- **Ex:** Item X is an internationally-traded good.
 - **The US:** the price of X is \$10.
 - **Thailand:** the price of X is THB200.
 - The PPP rate: $\text{THB}200/\$10 = \text{THB}20/\1 .
 - But the nominal rate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

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).

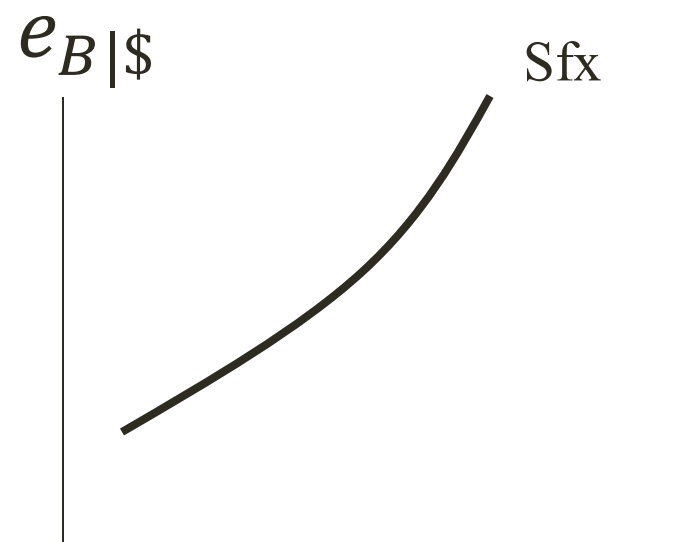
Demand for foreign currency is downward sloping in $e_{B|\$}$
Supply for foreign currency is upward sloping in $e_{B|\$}$

FX DEMAND

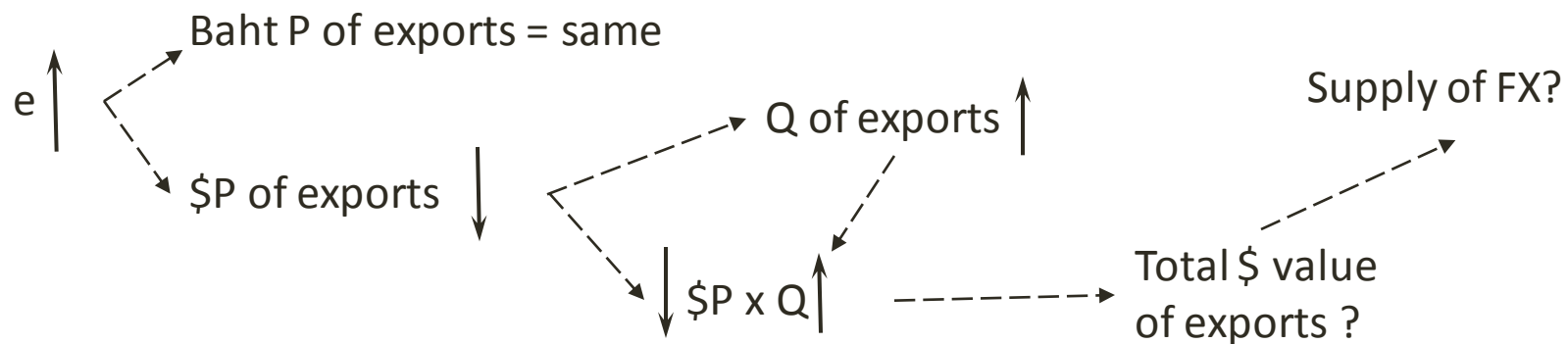


- Rising e (= domestic depreciation)
 - higher value of imported product (in terms of Thai Baht) $rer = \frac{e^*P^*}{P} \rightarrow$ lower demand for imports
 - higher foreign asset value (in terms of Thai Baht) $\rightarrow$ lower relative return on foreign asset: $(1 + r) - \frac{(1+r^*)e_{t+1}}{e_t}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



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

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

FX MARKET EQUILIBRIUM

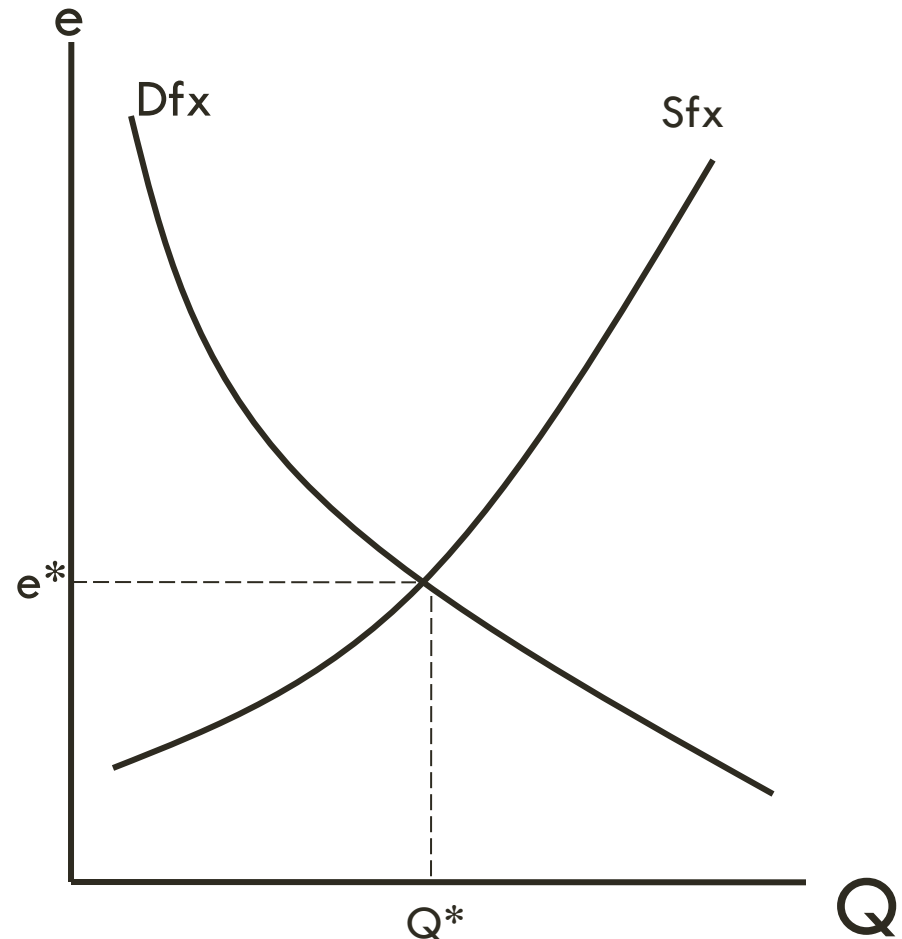
$$Q_{FX}^s = Q_{FX}^d$$

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

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

$$CA + KA = 0$$

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

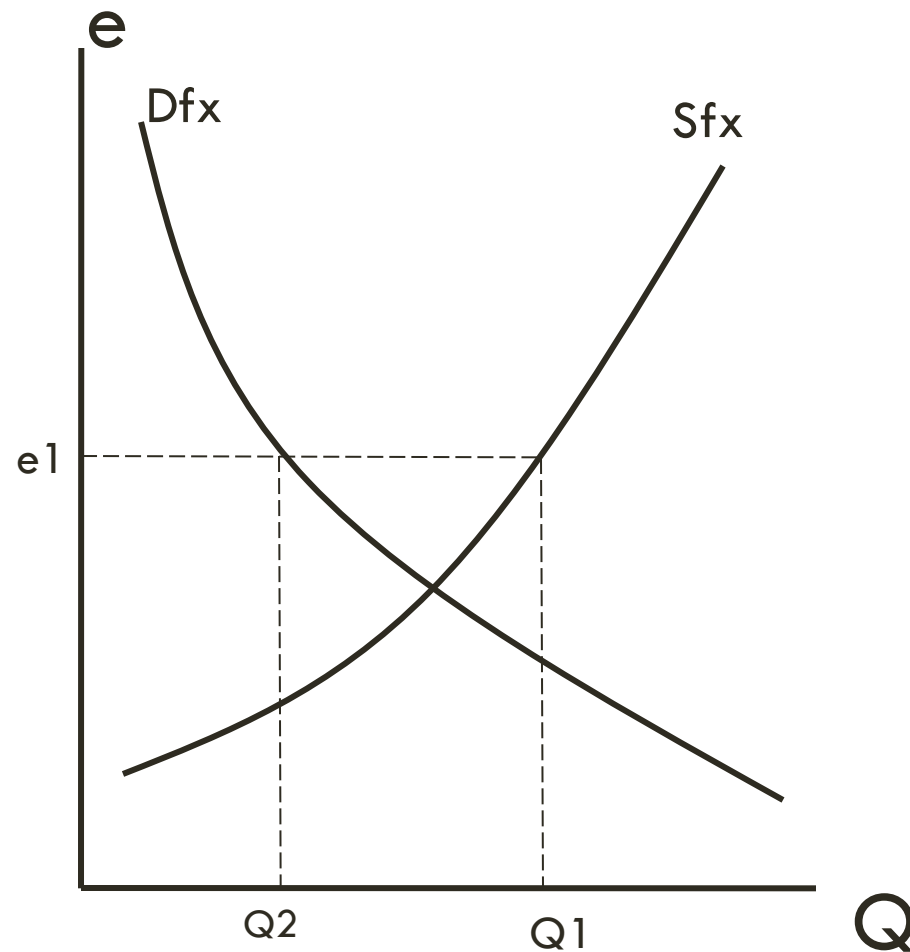


A BOP SURPLUS AND EXCESS SFX

At $e1$, excess supply of FX.

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

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

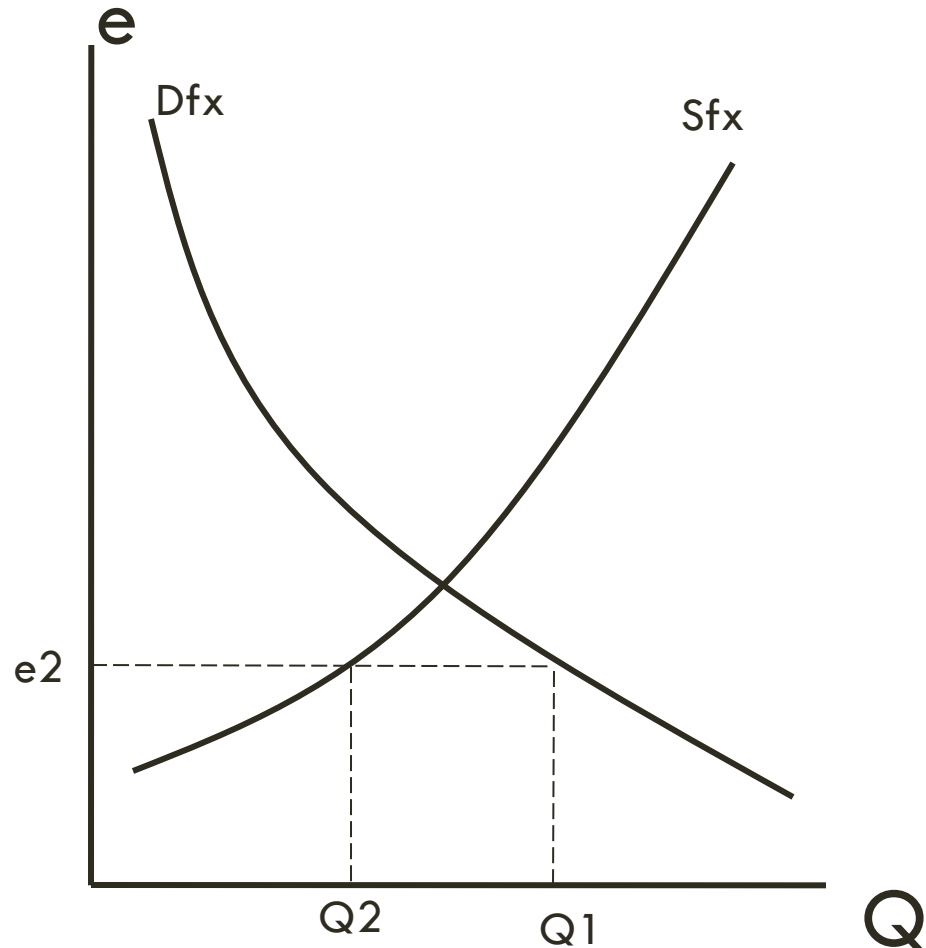


A BOP DEFICIT AND EXCESS DFX

At e_2 , excess demand of FX.

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

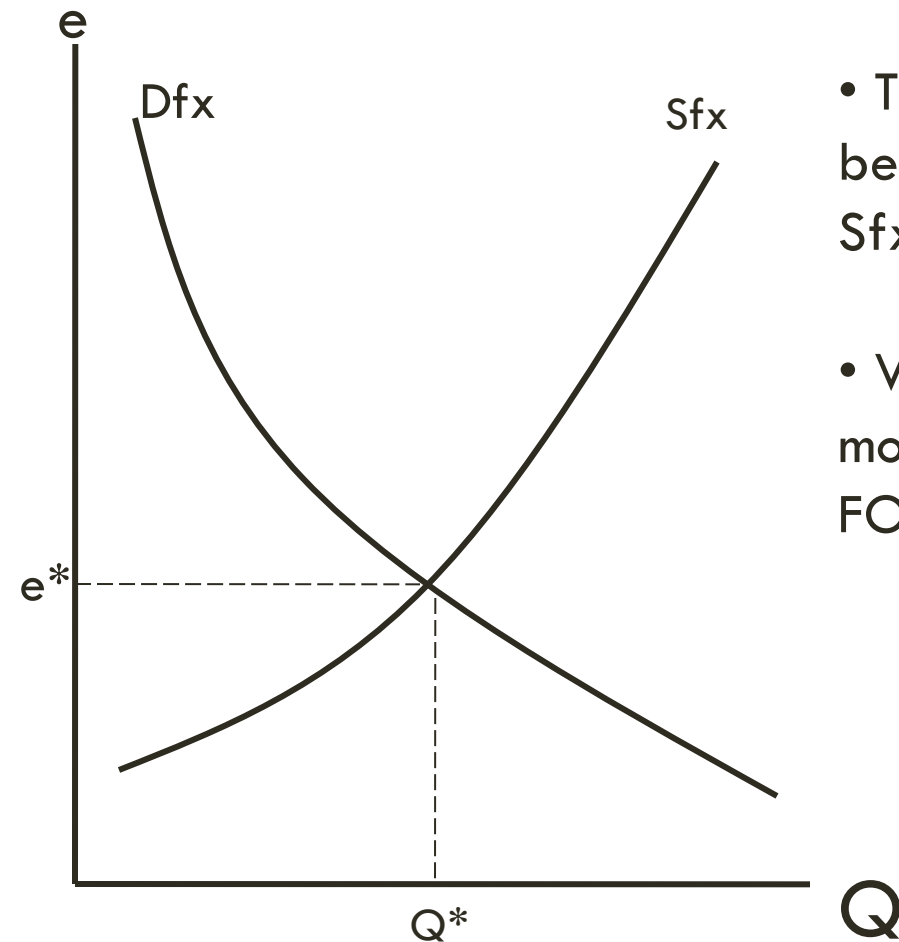
BOP registers a **deficit** ($BOP < 0$).



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?

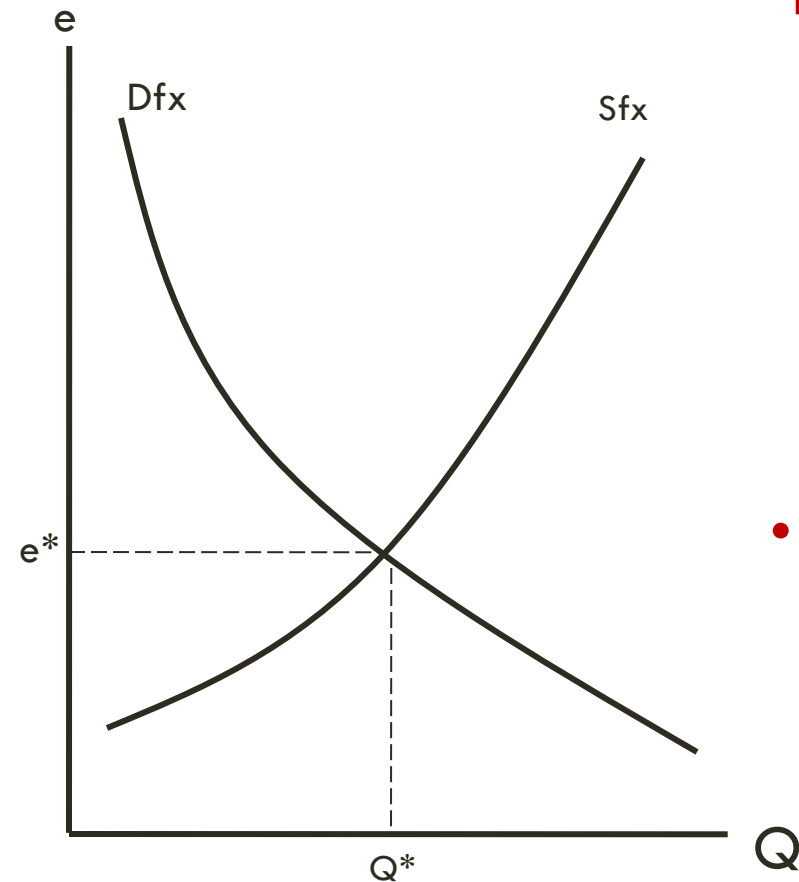
FLEXIBLE EXCHANGE RATE REGIME: FEATURES

• Factors Affecting S_{fx}

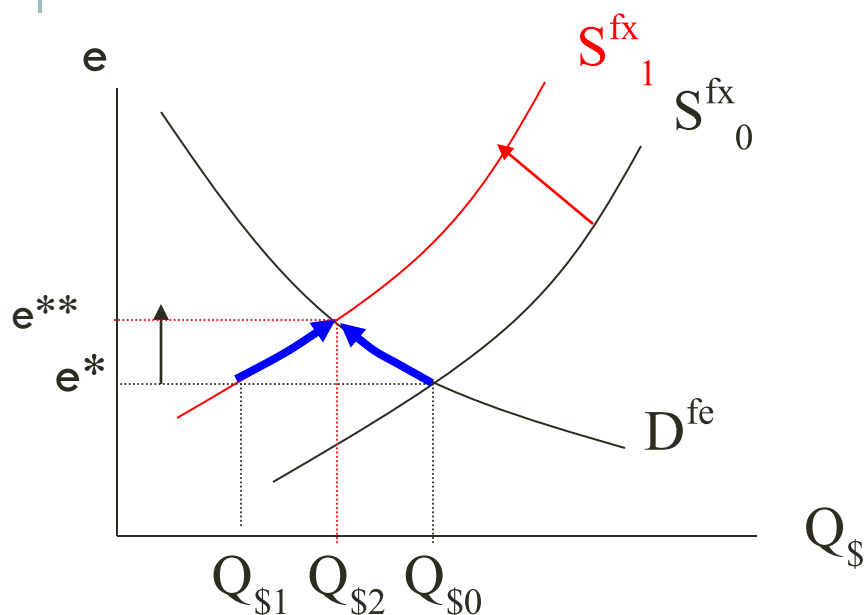
- Change in the demand for domestic goods (exports): domestic price, ROTW income
- Change in the demand for domestic asset (inflows): relative return, relative risk etc.

• Factors Affecting D_{fx}

- Change in the demand for foreign goods (imports): foreign price, domestic income
- Change in the demand for foreign asset (outflows): relative return, relative risk 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

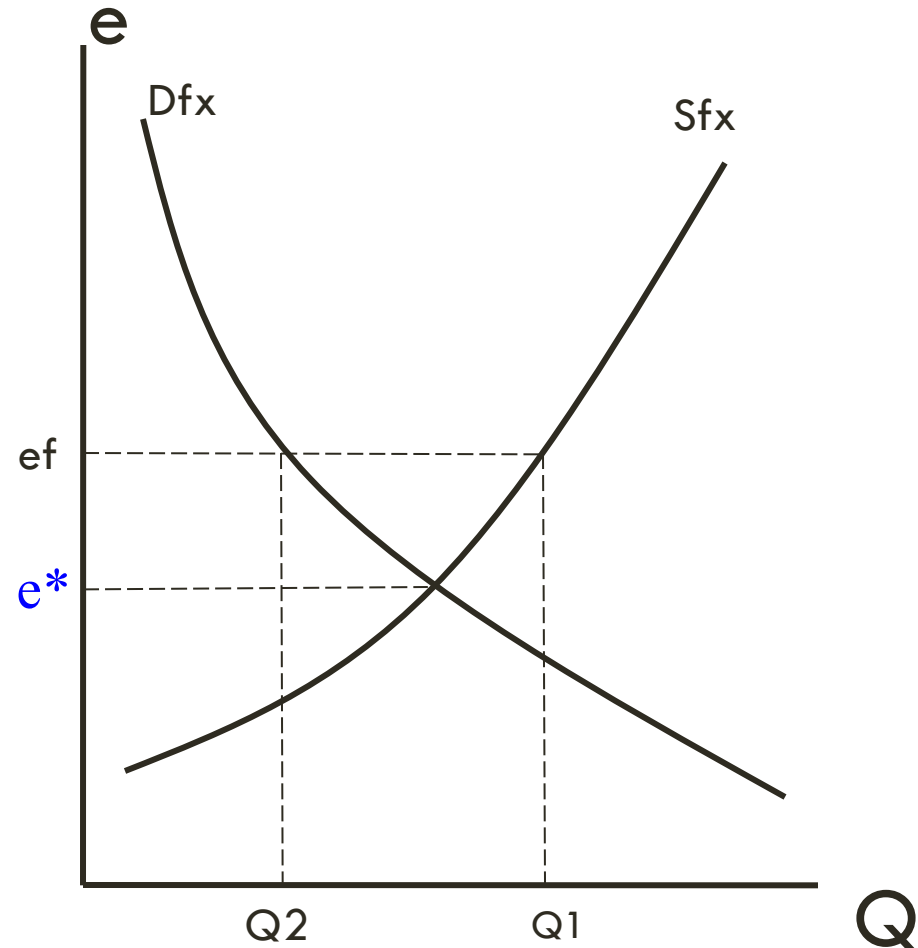
- Authority makes an **announcement in advance** for a targeted level of exchange rate, i.e. anchoring.
- The rate can be different from the rate the would arise under the flexible exchange rate regime, i.e. **shadow rate**.
- To make a public commitment, authority (central bank) must be standing ready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

OFFICIAL RATE E_f ABOVE E^* : IMPLEMENTATION

Domestic currency is undervalued.

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

Revaluation of domestic currency; making domestic currency value stronger.

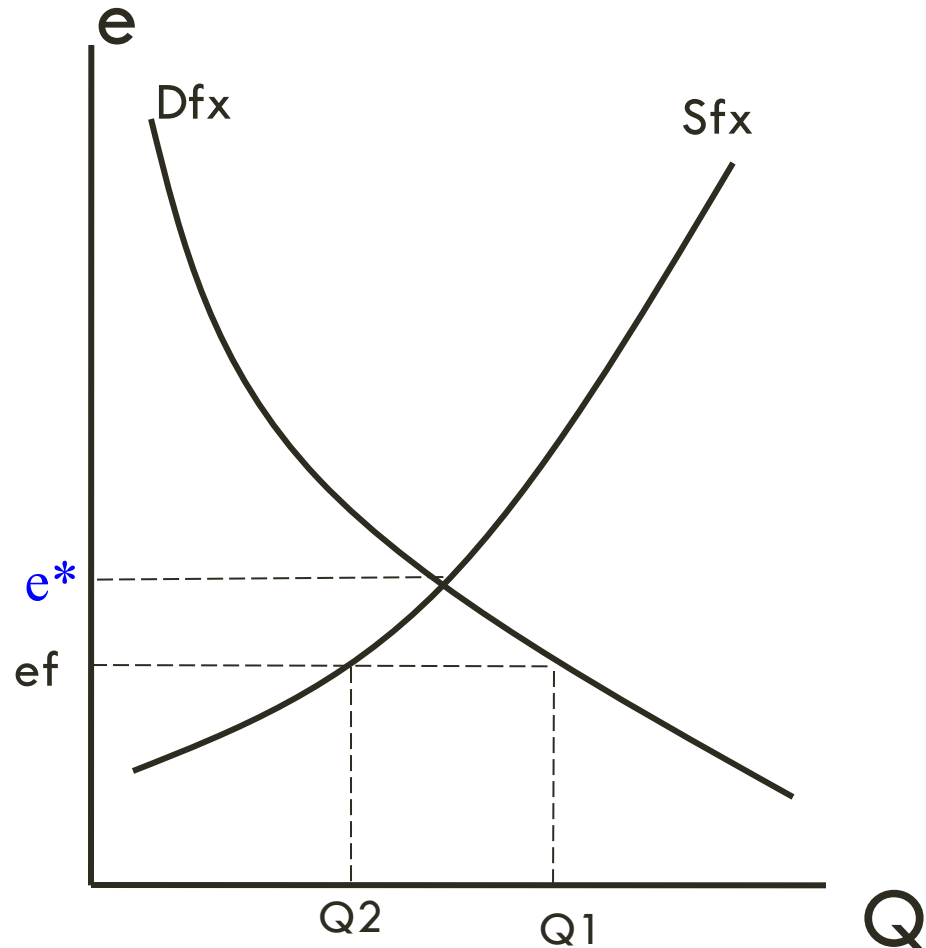


OFFICIAL RATE e_f UNDER e^* : IMPLEMENTATION

Domestic currency 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).

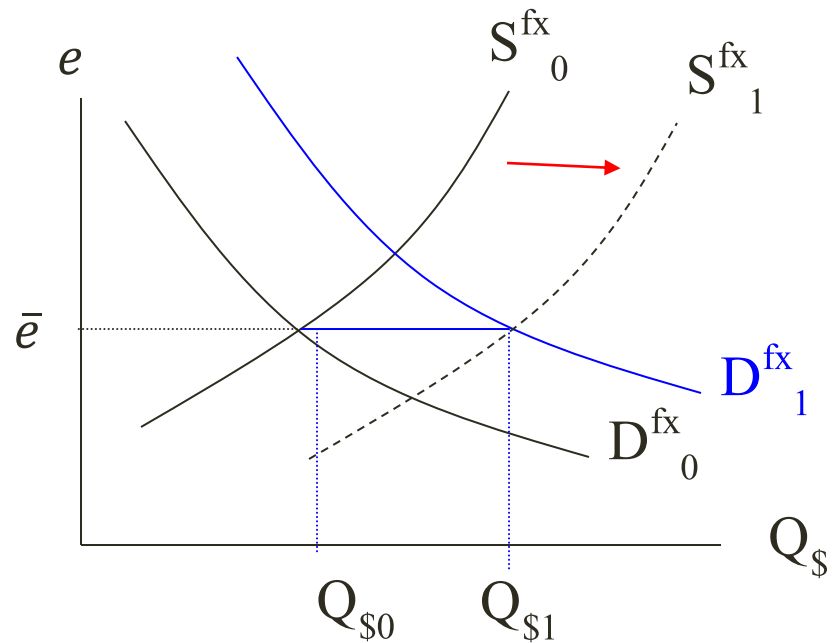
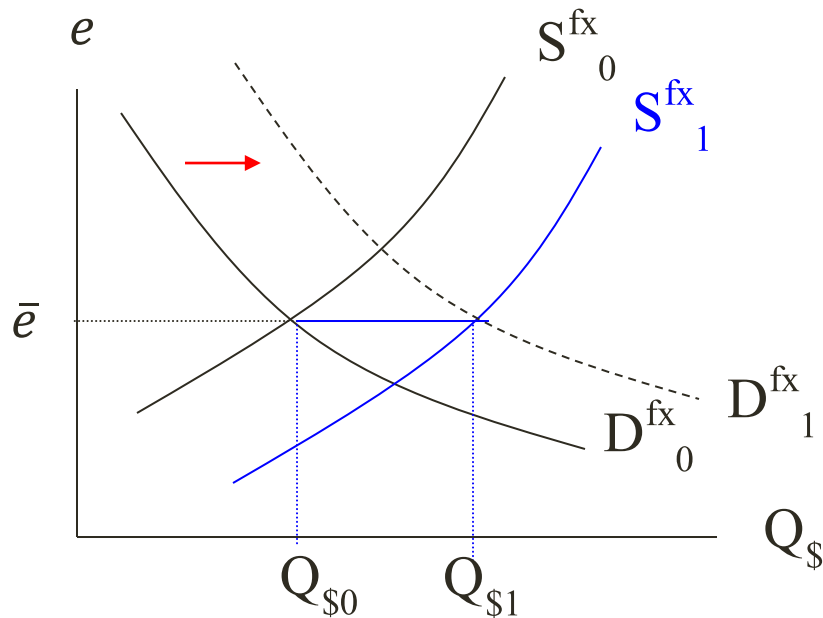
FIXED AND FLEXIBLE: CONS AND PROS

	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 $\bar{e}$



- $\bar{e} \rightarrow$ Excess demand (more buy than the sell) $\rightarrow$ Central bank must supply USD to eliminate the excess demand in USD by $Q_{\$0}Q_{\$1}$.
- $\bar{e} \rightarrow$ Excess supply (more sell than buy) $\rightarrow$ 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	} Monetary Base
Foreign currency reserve (FRA) - Foreign-denominated assets - Foreign currencies - SDRs	Commercial bank reserve	
	Capital + Net Worth	

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