

Chapter 6 : Framework for Open-Economy Business Cycle

EE312 (for Section 046402)

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1 Foreign sector and IS-LM-BP Framework

- Three interconnected markets
 1. Goods Market = IS
 2. Money Market = LM
 3. International Transation = BP

Equilibrium takes place for (r, Y) that satisfy equilibrium in all three markets

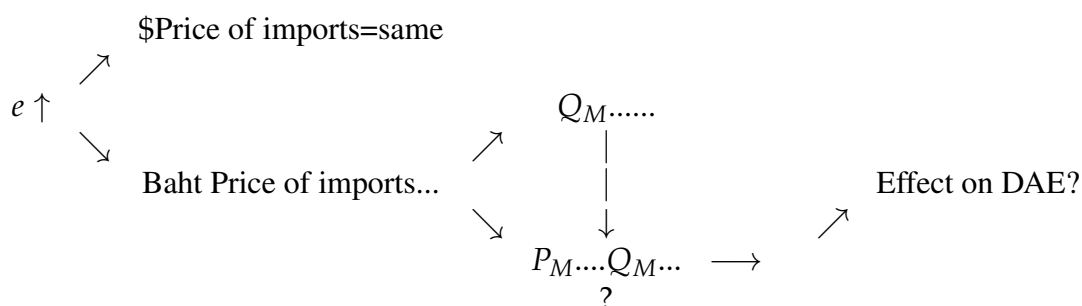
- $X - M$ and F (net capital flow) have **no direct** effect on the money market (and LM curve).
- Net exports $(X - M)$ is part of aggregate expenditure (DAE and IS curve).
 - An increase in $(X - M)$ raises DAE and shifts IS right.
 - Exports are determined by foreign income (Y^f) and exchange rate (e) .
 - Imports are determined by domestic income (Y) and exchange rate (e) .

1.1 Open-Economy IS cuve

$$\begin{aligned}
 C + S + T &= C + I + G + (X - M) = Y \\
 S + T &= I + G + (X - M) \\
 S + T + M &= I + G + X \\
 &=
 \end{aligned}$$

Where $\frac{\partial M}{\partial Y} \dots 0$; $\frac{\partial M}{\partial e} \dots 0$, when $|\epsilon_M^d| > 1$

and $\frac{\partial X}{\partial Y} \dots 0$; $\frac{\partial X}{\partial e} \dots 0$



- $e \uparrow \Rightarrow$ If $|\epsilon_M^d| > 1 \Rightarrow P_M Q_M \dots \Rightarrow$ DAE $\dots \Rightarrow$ IS $\dots$

1.2 Open-Economy LM curve : same as closed-economy case, but it will be affected by BP position.

1.3 The BP line

1.3.1 Developing BP line

- Combinations of the real interest rate and output which keep the balance of payments in equilibrium.
- The balance of payments is in equilibrium when Balance of Payments = 0.

$$BP = X - M + F$$

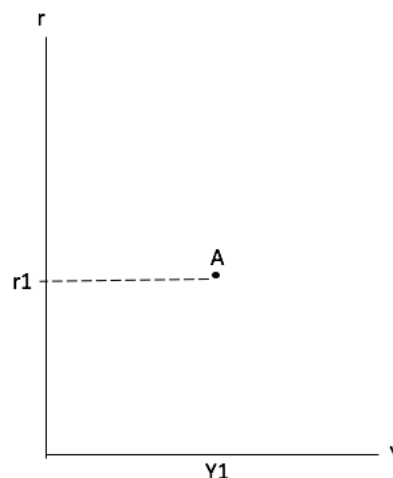
$$= X(Y^f, e) - M(Y, e) + F(r - r^f)$$

- where $\frac{dF}{dr} > 0$, given r^f .
- Small open economy: the country's economic activity has no influence on the world prices of goods.

BP equation : $X - M + F = 0$; where $\frac{dF}{dr} > 0$, given r^f .

$r \uparrow \Rightarrow$ Net Capital Inflow $F(r, r^f) \dots \dots \Rightarrow (X - M) + F = BP = 0 \Rightarrow M \text{ must} \dots \leftarrow Y \dots$

- On BP : $X(Y^f, e) - M(Y, e) + F(r, r^f) = 0$, BOP is equal to zero.
- Above BP : $X(Y^f, e) - M(Y, e) + F(r, r^f) \dots \dots 0$, BOP $\dots \dots$
 - the same X-M as A (with same Y_1)
 - $r > r^*$, has more F.
 - So at B, $BP > 0$.
- Below BP : $X(Y^f, e) - M(Y, e) + F(r, r^f) \dots \dots 0$, BOP $\dots \dots$



1.3.2 Slope of BP line

- The slope of BP line depends on the sensitivity of capital flow (F) with respect to the domestic interest rate (r), given the foreign rate (r^f).

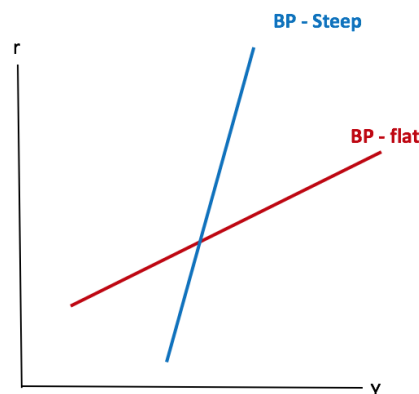
– Sensitivity = degree of capital mobility

– High degree of capital mobility

$r \uparrow \Rightarrow \text{Net Capital Inflow } F(r, r^f) \uparrow \dots \Rightarrow (X - M) + F = BP = 0 \Rightarrow M \text{ must } \uparrow \dots \Rightarrow Y \uparrow \dots \Rightarrow \text{BP is } \dots$

– Low degree of capital mobility

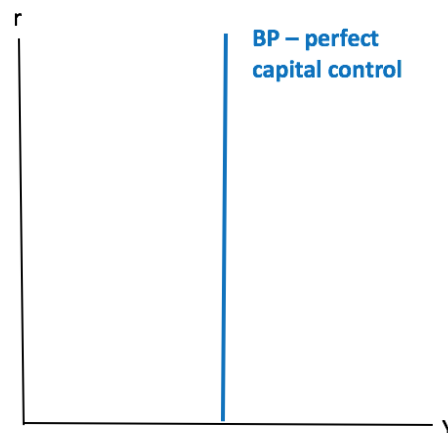
$r \uparrow \Rightarrow \text{Net Capital Inflow } F(r, r^f) \uparrow \dots \Rightarrow (X - M) + F = BP = 0 \Rightarrow M \text{ must } \uparrow \dots \Rightarrow Y \uparrow \dots \Rightarrow \text{BP is } \dots$



- High sensitivity = high degree of capital mobility = flat BP.
- Low sensitivity = low degree of capital mobility = steep BP.

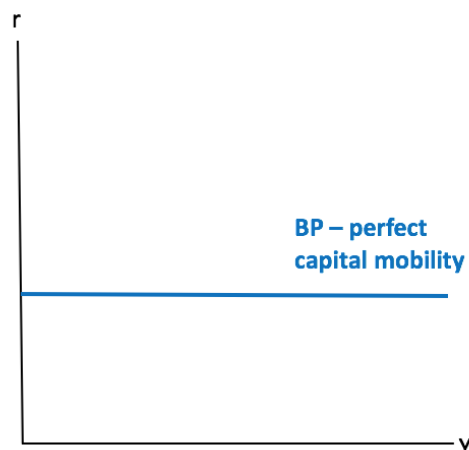
• **Perfect capital control : BP is vertical**

- Whenever $r > r^f \Rightarrow \dots \Rightarrow r \dots$
- Whenever $r < r^f \Rightarrow \dots \Rightarrow r \dots$
- At A, $BP = 0$.
- At B, $BP \dots 0$, infinite capital inflow
- At C, $BP \dots 0$, infinite capital outflow



• **Perfect capital mobility : BP is horizontal**

- Whenever $r > r^f \Rightarrow \text{infinite capital } \dots \Rightarrow \dots \text{ domestic bonds} \Rightarrow r \dots \text{ until } \dots$
- Whenever $r < r^f \Rightarrow \text{infinite capital } \dots \Rightarrow \dots \text{ domestic bonds} \Rightarrow r \dots \text{ until } \dots$
- On BP, $BP = 0$.
- Above BP, $BP \dots 0$, infinite capital inflow
- Below BP, $BP \dots 0$, infinite capital outflow



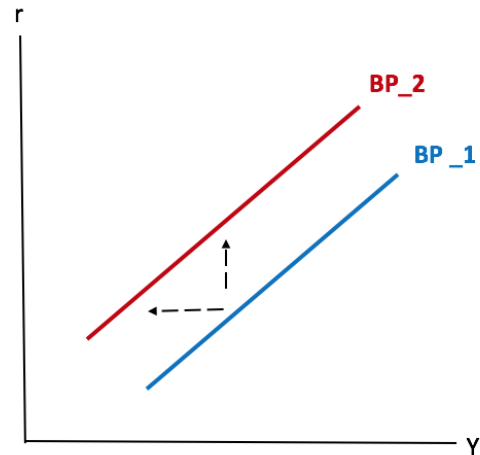
1.3.3 Shifting BP line

BP equation : $X - M + F = 0$; where $\frac{dF}{dr} > 0$, given r^f .

$r \uparrow \Rightarrow$ Net Capital Inflow $F(r, r^f)$ $\Rightarrow (X - M) + F = BP = 0 \Rightarrow M$ must..... $\Rightarrow Y$

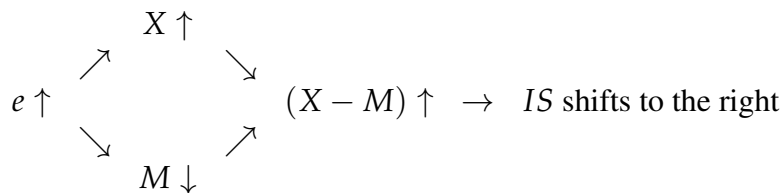
Leftward Shift

- *** higher r^f , Y for all r , or r for all Y . ***
- lower Y^f , Y for all r , or r for all Y .
- lower $REER = \frac{eP^*}{P}$, or import for all Y and export,
 Y for all r , r for all Y .



1.4 Exchange rate on IS curve

- Higher exchange rate (rising e):
 - The \$ price of exports is lower; more foreign demand for exports — exports (X) increases.
 - The domestic price of imports is higher; less demand for imports (assuming $|\varepsilon_M^d| > 1$) — imports (M) falls.
 - DAE increases; IS curve shifts right.



2 The Mundell-Fleming model

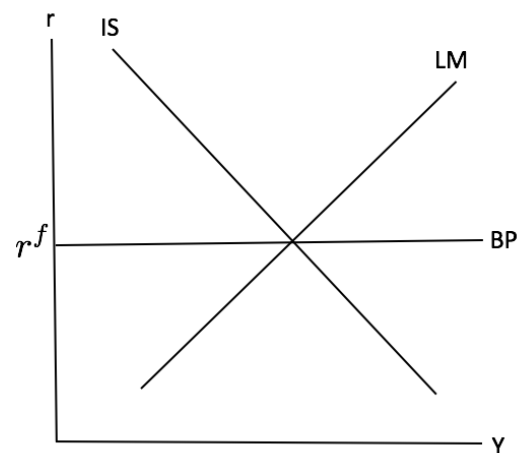
- Robert A. Mundell (1963), “Capital mobility and stabilization policy under fixed and flexible exchange rates,” Canadian J of Economics and Political Science 29, 475-85.
- Marcus J. Fleming (1962), “Domestic financial policies under fixed and under floating exchange rates,” IMF Staff Papers 9, 369-79.

A small-open economy and the shape of BP line

- The economy has no impact on the world.
- Perfect capital mobility; no barrier to capital movement.
- Assume price is constant.
- The domestic real interest rate is the same as the world rate ($r = r^f$).
- Any deviation causes huge capital movement. If $r > r^f$, huge capital inflow. If $r < r^f$, huge capital outflow.

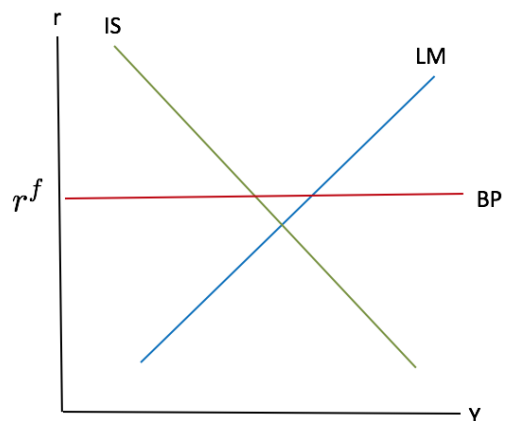
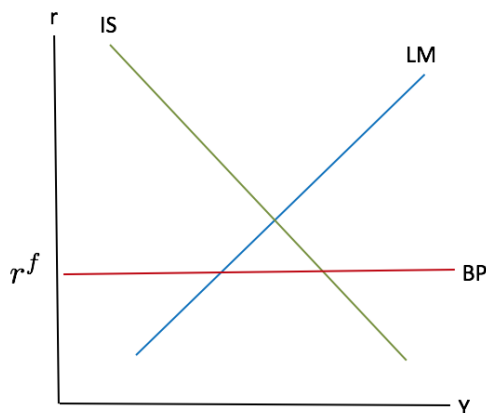
Notions of equilibrium concepts

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



- Internal Equilibrium : BOP 0

- Internal Equilibrium : BOP 0



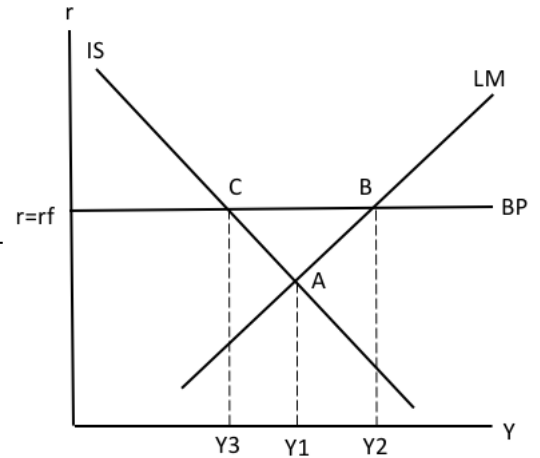
- **Given the Internal equilibrium, how does the economy reach the GE? Mechanism?**

- Answer depends on the choice of exchange rate regime.

- Under the fixed exchange rate, nominal exchange rate is fixed.
 - * The adjustment mechanism will work through money supply.
- Under the flexible exchange rate, nominal exchange rate is flexible.
 - * “e” will directionally move to clear the imbalance of BOP.

● **Internal/External balance conflict :**

- Y_1 is desirable, but $BP < 0$; CB is losing FX reserves.
- Y_2 is too high (inflation) and Y_3 is too low (unemployment) although $BP = 0$.

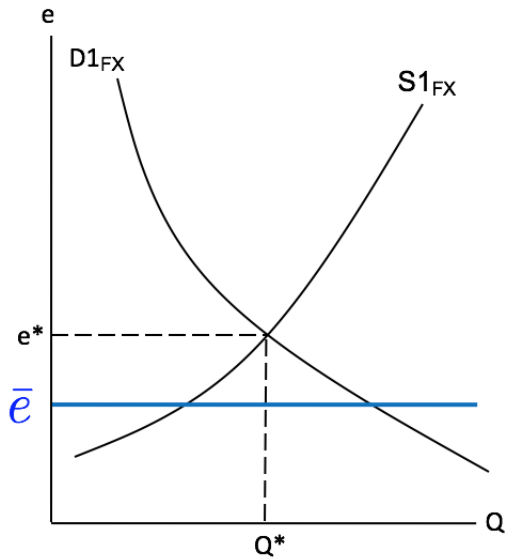


3 Policy Effectiveness

3.1 Policy Effectiveness under the fixed exchange rate regime

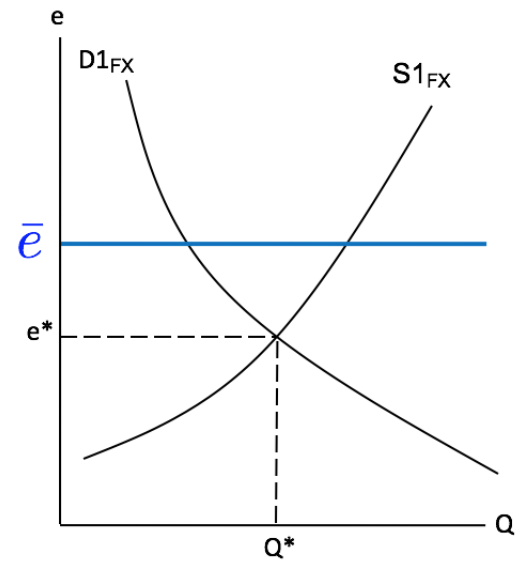
- Exchange Rate Market and Money Supply

Official rate e^f under e^*

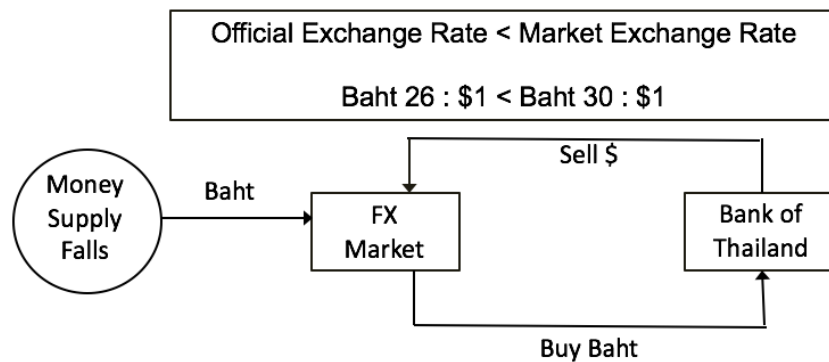


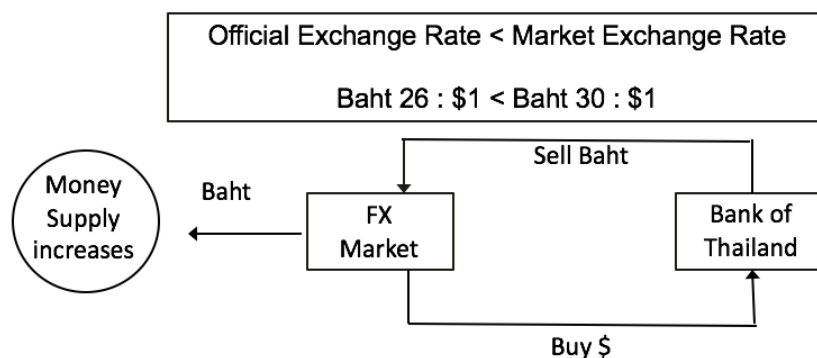
- Domestic currency is overvalued.
- Excess D for FX ; $BP < 0$.
- Central bank must sell FX to keep e^f .
- Domestic money supply falls.

Official rate e^f above e^*



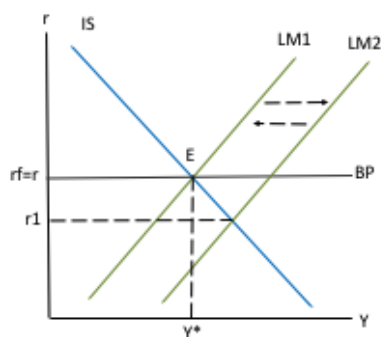
- Domestic currency is undervalued.
- Excess Supply for FX ; $BP < 0$.
- Central bank must buy FX to keep e^f .
- Domestic money supply rises.





$\bar{e} < e^*$,	Excess Demand	Central Bank sells FX	Money Supply ↓	BOP deficits
$\bar{e} > e^*$,	Excess Supply	Central Bank buys FX	Money Supply ↑	BOP Surplus

3.1.1 Monetary Policies under fixed exchange rate



- Initially the economy is at E. All three markets are clear. $\bar{e} = e^*$, real money supply is constant.
- Monetary policy: The central bank expands the money supply (LM shifts right).
- Domestic interest rate drops below the world rate (r^f) — huge capital outflow and $BP < 0$.
- More demand for FX; market exchange rate (e) tends to rise above the official rate.
- At new e^* , there is Excess Demand for FX
- The central bank must sell FX and buy domestic currency — the money supply decreases..
- LM shifts left.
- The domestic interest rate returns to $r = r^f$.
- $BP = 0$ at the same initial output (Y^*).

Notice:

1. Sterilization policy

- The central bank may prevent the contraction of the money supply by putting the domestic currency back into circulation.
- Buying bonds from the public.
- Forcing domestic interest rate below r^f with larger output ($Y > Y^*$).
- But the CB will keep losing FX — limited FX reserves.

2. Loss of money supply control

- The central bank cannot pursue an independent monetary policy under the fixed exchange rate regime.
 - If it increases M_s , the nominal exchange rate rises, forcing it to sell foreign currency and reduce M_s .
 - If it decreases M_s , e drops, forcing it to buy foreign currency and increase M_s .
- An independent monetary policy is self-defeating.

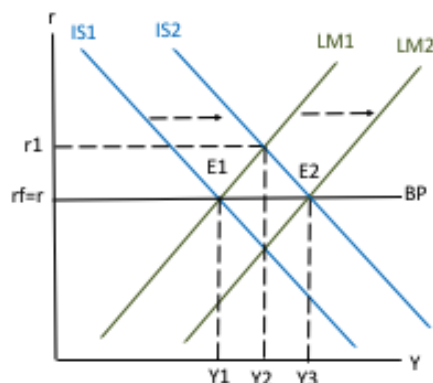
3. Impossible trinity

- Trilemma: it is impossible to conduct all three policies at the same time:
 - (1) The fixed exchange rate system
 - (2) Free capital movement
 - (3) Independent monetary policy

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

Monetary policy is ineffective under fixed exchange rate.

3.1.2 Fiscal policy with fixed ER



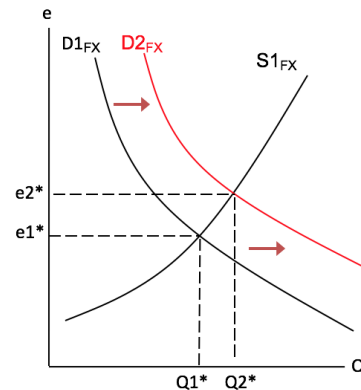
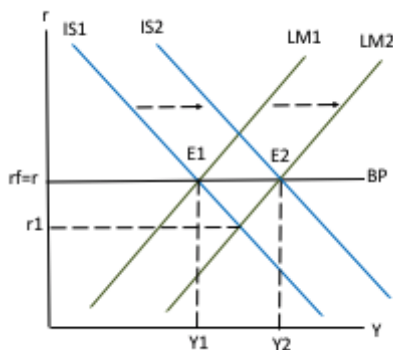
- Initially the economy is at E. All three markets are clear. $\bar{e} = e^*$, real money supply is constant.

- Government increases spending (G). IS shifts right.
- Aggregate expenditure and output increase ($AE = Y$), inducing more money demand (M^d).
- Domestic interest rate rises above r^f , causing huge capital inflow ($BP > 0$).
- More supply of FX forces the market exchange rate to fall below the official rate.
- Central bank buys FX and sells domestic currency. Money supply increases.
- LM shifts right.
- The domestic interest rate returns to $r = r^f$. $BP = 0$ at the same initial output (Y^*).

Fiscal policy is effective under fixed exchange rate.

3.2 Policy effectiveness under flexible exchange rate regime

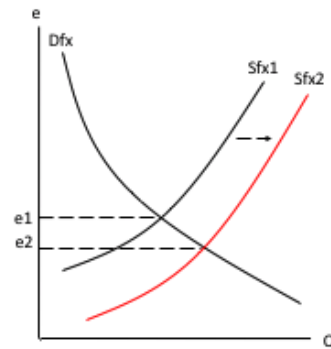
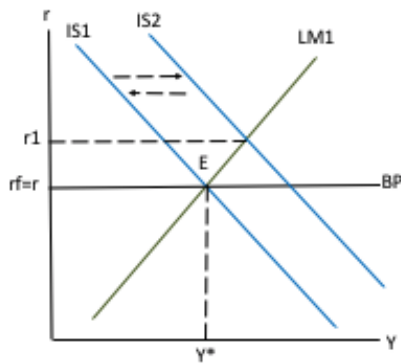
3.2.1 Monetary Policies under flexible exchange rate



- Initially the economy is at E. All three markets are clear. $e = e_1^*$, real money supply is constant.
- Monetary policy: The central bank expands the money supply (LM shifts right).
- Domestic interest rate falls below r^f . Huge capital outflow ($BP < 0$); more demand for FX and nominal exchange rate (e) rises.
- Net exports ($X-M$) and AE increase (IS shifts right).
- Output increases from Y_1 to Y_2 .
- Higher income raises money demand.
- Domestic interest rate rises to r^f .
- At E_2 , $BP = 0$ with higher income and higher exchange rate.
- More demand for FX**
 - Easy-money policy causes $BP < 0$ and more demand for FX.
 - The domestic currency depreciates.

Monetary policy is effective under flexible exchange rate regime.

3.2.2 Fiscal Policies under flexible exchange rate



- Initially the economy is at E. All three markets are clear. $e = e1^*$, real money supply is constant
- Government increases spending (G). IS shifts right.
- Aggregate expenditure (AE) and output (Y) increase.
- Money demand rises, raising domestic interest rate above r^f .— huge capital inflow and $BP > 0$.
- More supply of FX; exchange rate falls. Net exports and AE decrease. Output drops back; money demand falls.
- Domestic interest rate falls to r^f . $BP = 0$ at the same level of income (Y^*).
- Exchange rate is lower (appreciation of domestic currency).
- Higher G results in $BP > 0$ and more supply of FX.
- The domestic currency appreciates.

Fiscal policy is ineffective under flexible exchange rate regime.

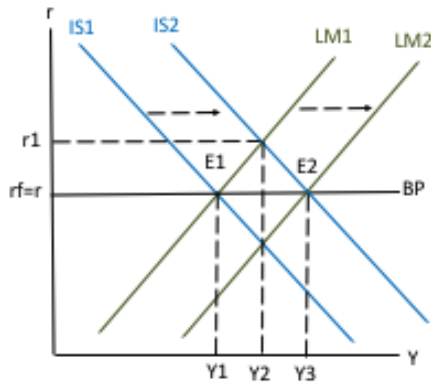
4 Shocks and Propagations

- Shocks :
 - Domestic shocks
 - Real shocks (IS)
 - Financial shocks (LM)
 - External shocks
 - Real shocks (IS)
 - Financial shocks (BP)

4.1 Domestic Real Shocks

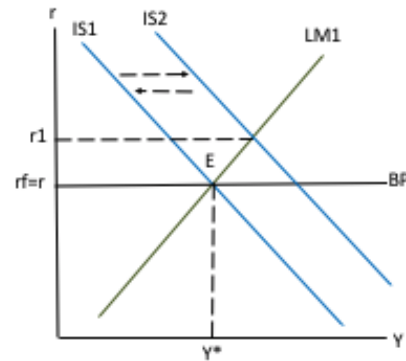
- IS shifts to the right : example , an improvement in business sentiment

Fixed Exchange Rate



Amplified/Insulated

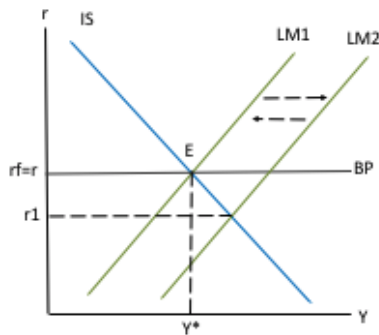
Flexible Exchange Rate



Amplified/Insulated

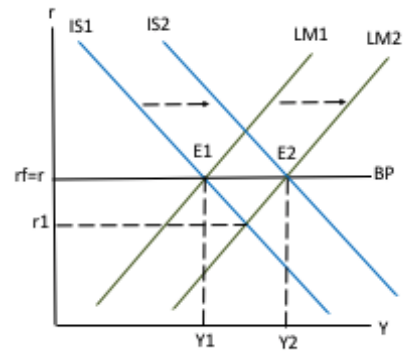
4.2 Domestic Financial Shocks

Fixed Exchange Rate



Amplified/Insulated

Flexible Exchange Rate

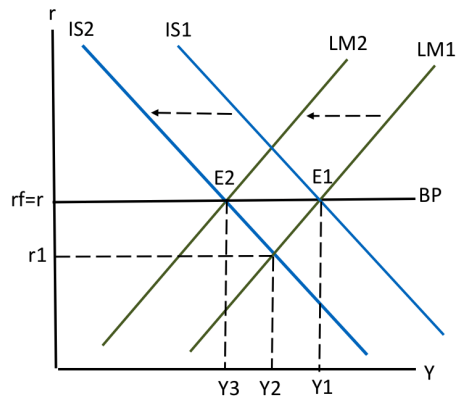


Amplified/Insulated

4.3 External Real Shocks

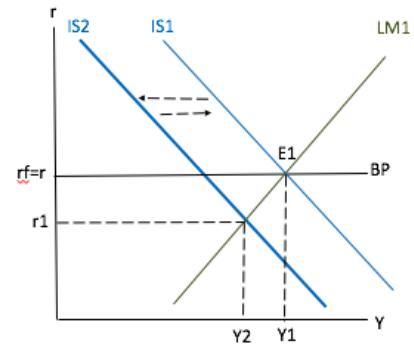
- World recession (falling world output) reduces foreign demand for exports (X).
 - Net exports ($X-M$) and DAE fall; IS shifts left.
 - Output drops and money demand decreases.
 - Domestic interest rate drops below r^f ; huge capital outflow and $BP < 0$.
 - More demand for FX; central bank sells FX and buys domestic currency.

Fixed Exchange Rate



Amplified/Insulated

Flexible Exchange Rate

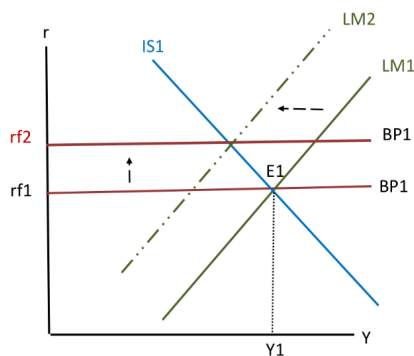


Amplified/Insulated

4.4 External Financial Shocks

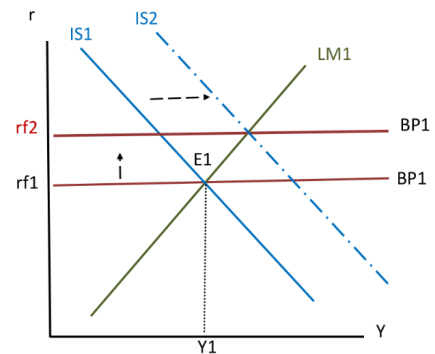
- Fed raises FED fund rate

Fixed Exchange Rate



Amplified/Insulated

Flexible Exchange Rate



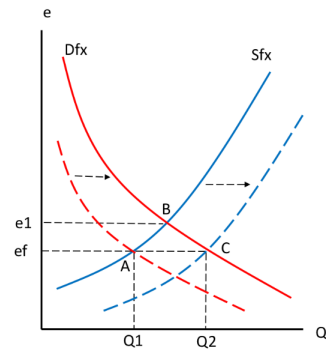
Amplified/Insulated

4.5 Required policy response to shocks

- When $r < r^f$ and $BP < 0$, government increases spending, shifting IS back to $Y1$.
- But how to know the magnitude of falling $X-M$ and DAE

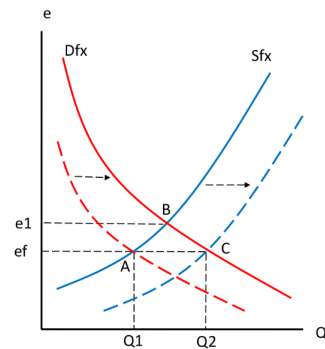
4.5.1 Official rate e^f under e^*

- More D_{fx} ; $BP < 0$; $e^f < e^1$
- Central bank must sell FX to keep e^f .
- Domestic money supply falls.
- Loss of official reserves = Q_1Q_2 .



Currency devaluation

- The shock is so large that FX losses are huge against limited FX reserves.
- Central bank devalues the currency to prevent FX reserves loss.



Cost of devaluation

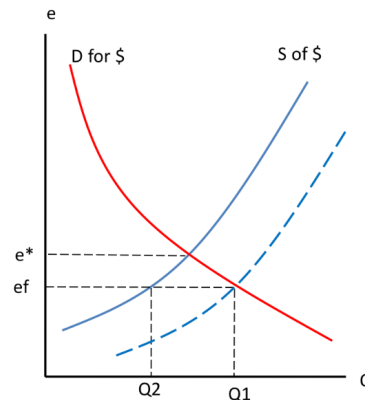
- Currency devaluation might reduce a current account deficit in the short run.
- Future shocks may cause the CA deficit to resume.
- The CA deficit is caused by real factors: Excessive government spending — spending cut.
- Costs of devaluation — foreign debt!

4.6 Evaluation: flexible ER regime

- Policy independence: Central bank can pursue internal policy independently.
- The FX market clears and $BP = 0$ by flexible FX adjustment.
- Insulation from real foreign shocks.
- External shocks affect the exchange rate w/o effects on domestic output.

4.6.1 Real foreign shock affects FX market

- Net exports drop. AE and Y are falling.
- M_d decreases; $r < r_f$, capital outflows and $BP < 0$.
- Less supply of FX; e rises.
- Net exports increase; IS_2 returns to IS_1 and Y_1 .



4.6.2 Criticism: Flexible ER

- Exchange rate risk and uncertainty in trade
 - FX Hedging is costly.
 - FX speculation exists.
- Exchange rate fluctuations:
 - Resources move in/out export sectors constantly.
 - Rising exchange rate means higher domestic inflation (rising import prices).
 - Falling exchange rate reduces competitive exports.

Fixed Exchange Rate Regime	Flexible Exchange Rate Regime
* No exchange rate risk, no FX hedging in trade. * No currency speculation.	* Policy independence * The FX market clears and $BP = 0$ * Insulation from real foreign shocks
* Potential conflict between internal and external balances. * No insulation from external shocks ⇒ required policy response to shocks ⇒ loss of foreign exchange reserve ⇒ cost of devaluation	* Exchange rate risk and uncertainty in trade * FX Hedging is costly. * FX speculation exists. * Exchange rate fluctuations : Resources move in/out export sectors constantly. // Rising exchange rate means higher domestic inflation (rising import prices)// Falling exchange rate reduces competitive exports.