EE312 Chapter 6
Framework for Open-economy Business Cycle Analysis

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1 An open-economy macroeconomics model: IS-LM-BP framework

- Three interconnected markets

  1. Goods Market = IS
  2. Money Market = LM
  3. International Transaction = 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-LM

- Open economy IS:

$$
\begin{aligned}
C &= a + b(Y - T) \\
I &= I_0 - i_1 r + i_2 Y \\
G &= G_0 \\
X &= X_0 \\
Z &= u + vY \\
Y &= C + I + G + (X - Z)
\end{aligned}
$$

$$
\Rightarrow r^* = \frac{a + I_0 + G_0 + X_0 + u - bT}{i_1} - \frac{1 - b - i_2 + v}{i_1} Y
$$

Multiplier:

Rotation:

Shift:

- Open economy LM
  - Nothing in foreign sector directly 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.

1.2 Open economy BP

- BP: Balance of Payments

$$BP = X(e, P, Y^f) - Z(e, P, Y) + F(r - r^f)$$

$X(P, Y^f, e) =$ Export

$Z(P, Y, e) =$ Import

$F(r - r^f) =$ Capital inflow/outflow

- Derivation

Intuition:

Lower r reduces net capital inflows (KA worsened), worsening BP. BP can be balanced if this is compensated by an increase in net exports (CA improved). $X - Z$ can be improving when "y" is lower; lowering imports. Hence, we have positive relationship between "r" and "y" under the BP equilibrium

Slope:

Shift:

- Degree of capital mobility and slope of BP
  - Perfect capital mobility $\frac{dF}{dr} = \infty$
  - Perfect capital immobility $\frac{dF}{dr} = 0$
  - Capital relatively mobile $\frac{dF}{dr} >> 0$

  - Capital relatively immobile $\frac{dF}{dr} > 0$

- Effect of 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 $\epsilon_e^M > 1$) - imports (M) falls.
  - DAE increases; IS curve shifts right.

2 Disequilibrium and adjustments towards equilibrium

- Simultaneous Equilibrium
  - Internal equilibrium (IE): "r" and "y" clear goods and money market: IS-LM intersection
  - 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.

- Given the Internal equilibrium, how does the economy reach the general equilibrium? Mechanism?
  - The 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
  - 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 $= 0$.

- Under the fixed exchange rate, nominal exchange rate is fixed. The adjustment mechanism will work through the level of money supply.
  - (r_0, y_0): $BP > 0$ (Internal but not external equilibrium)
  - To maintain fixed "e", central bank buys all surplus of forex; this causes money supply to rise, i.e. $LM_1 \Rightarrow LM_2$.
  - Rising M lowers "r" (worsening KA) and increase "y" (causing more import)
  - Net positive BP is gradually eliminated while the economy reaches the GE (r^*, y^*).

- Under the flexible exchange rate, "e" will directionally move to clear the imbalance of BP. BP surplus ⇒ "e" falling (appreciate); BP surplus ⇒ "e" rising (depreciate)
  - (r_0, y_0): $BP > 0$ (Internal but not external equilibrium)
  - Without any intervention, "e" will fall
    - Directly causing a deterioration in BP: $BP_1 \Rightarrow BP_2$
    - Causing a lower in AE: $IS_1 \Rightarrow IS_2$; indirectly solving the surplus in BP.
  - The initial net positive BOP is gradually eliminated while the economy reaches the GE (r^*, y^*).

3 Macroeconomic shocks and open-economy propagation mechanism

- Equilibrium occurs where all 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 IS shocks and shocks in LM as monetary (financial) shocks.
- Under the open-economy, shocks can also be classified on the basis of country origin (domestic v.s. external).

Type	IS	Monetary/Finance
Domestic	- Business/consumer confidence changing - Government spending	- Domestic banking panics - Money supply (CB's policy) - Financial deregulation
External	- World GDP growth - Global productivity - Oil price - Geopolitical risk	- Global financial downturn - Global Interest rate trends

- Questions

  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? Resilience; self-correcting mechanism?

- We will focus on the analysis under "small open economy with perfect capital mobility"

  – Horizontal BP line ⇒ Mundel-Flemming model
  – Shocks by line.
  – Characteristics of small open economy (Mundel-Flemming world):
    * 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.

- Answers/Insights to the posted questions are:

  1) Nature of shocks: origin (country/type).
  2) Choice of exchange rate regime: fixed v.s. flexible.

- Example

    1. Improvement in business sentiments with fixed exchange rate

    2. Improvement in business sentiments with flexible exchange rate

3. Banking panic with fixed exchange rate

4. Banking panic with flexible exchange rate

5. Global GDP recession with fixed exchange rate

6. Global GDP recession with flexible exchange rate

7. Fed raises FED fund with fixed exchange rate

8. Fed raises FED fund with flexible exchange rate

- How shocks get amplified:

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

4 Policy Effectiveness

- Policy can be used to fix the imbalances. For example, if CA deficits with too high unemployment, policy to fixing the imbalances
- Possible policy choices include exchange rate, fiscal, and monetary policies.
- 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 and 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.
  - 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.

- Fiscal Policy and Monetary Policy
  - Unlike the closed-economy, effectiveness of fiscal and monetary policy also depends on the choices of exchange rate regime.
  - As we have seen before, propagation of shocks would vary across different exchange rate regimes, so the effect of policy as well.
  - Polices under fixed exchange rate Vs policies under flexible exchange rate.

Degree of capital mobility	Fixed-Fiscal	Fixed-Monetary	Flex-Fiscal	Flex-Monetary
Perfect capital mobility	large ΔY^* (full)	no ΔY^*	no ΔY^*	$\uparrow Y^*$
Capital relatively mobile	large ΔY^* (partial)	no ΔY^*	small ΔY^*	$\uparrow Y^*$
Capital relatively immobile	small ΔY^*	no ΔY^*	large ΔY^*	$\uparrow Y^*$
Perfect capital immobility	no ΔY^*	no ΔY^*	large ΔY^*	$\uparrow Y^*$

- In conclusion
  - Under fixed exchange rate system,

    1) Fiscal policy is the most effective under perfect capital mobility and become less and less effective as capital become immobile

    2) Monetary policy is ineffective.
  - Under flexible exchange rate system

    1) Fiscal Policy is the most effective as capital become less mobile

    2) Monetary policy is effective.
- Example: Monetary policy under fixed exchange rate

- Example: Fiscal policy under fixed exchange rate

- Example: Monetary policy under flexible exchange rate

- Example: Fiscal policy under flexible exchange rate

5 Case Study: Impossible trinity

- Designing macroeconomic landscape and policies were aimed at ensuring the "Ideal conditions":
  - Stable exchange rate: exchange is not volatile – Fixed exchange rate
  - Stable/efficient financial sector: enjoy benefit from world financial market – Fully financial integration/capital mobility
  - Monetary stability: having sovereign authority to control money supply and hence inflation – having ability to control domestic interest and hence inflation.
- Can we really achieve all these?
  - Robert A. Mundell (1963) "theoretically" showed a long time ago that these three choices of control are not feasible at the same time
  - Getting two out of three!
  - However, policymakers thought that they could resist the natural force by the management so called sterilization policy
  - Practical experiences had showed that they failed!
- Example: Sterilization policy at work: suppose an emerging market country is running a surplus BP, due to a high interest rate 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; keep the interest rate high

    As the domestic interest rate remains above r^f, CB will have to keep accumulating FX — rising FX reserves.
  - Sounds good, but policy is actually costly.

    Most central banks keep their foreign reserve in terms of hard-currency government bond: CB is swapping high-return assets for low-return assets.
  - In many cases, CB needs to issue CB?s bond to absorb the liquidity; incurring cost!
  - At the end, an independent monetary policy is self-defeating;

- Trilemma: it is impossible to conduct all three policies at the same time; Mundell (1963)

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