GDP: Y = *C* + *I* + *G* + (*EX* – *IM*)

GDP for the US & Singapore in 2005 (est.)
US GDP = $12.5 trillion USD
Y= C + I + G + (EX – IM)
% Shares: 70 + 15 + 20 + (-5)

Current account (*CA*)

CA=Change in Net Foreign Wealth (net foreign investment)=Ex-Im
- – Merchandise/Goods
- – Services:
- – Income Receipts

Savings:

S=Yd-C => S=Y-T-C
Y=C+G+I+CA
S=G-T+I+CA (if G=T)
Saving-Current Account-Investment: S=I+CA

So: a country can save by:
- – 1) building up its own capital stock domestically
- – 2) by acquiring foreign wealth

Twin Deficits:
S=Sp+Sg=I+CA (Not always so)

BoP Accounts: Current, Capital, and Financial
CA+KA+FA=0

Balance of Payments: The bookkeeping offset to the balance of official reserve (i.e. foreign assets hold by Central Bank) transaction. *When a country has a balance of payments deficit, it is running down its international reserve assets*.
Also called:
Official settlement balance, the negative of official reserve transactions ORT)
Sum of CA, KA and non-reserve portion of FA
FA=ORT+non-reserve FA balance
CA+KA+FA=0
CA+KA+(ORT+non-reserve FA balance)=0
CA+KA+(-BoP+non-reserve FA balance)=0
BoP=CA+FA+non-reserve FA balance

Unilateral Transfer: e.g. worker remittances from abroad and direct foreign aid.
Capital transfers: debt forgiveness and migrants' transfers (goods and financial assets accompanying migrants as they leave or enter the country).

Exchange Rate: $E_{\$/¥}$

Appreciation: E↓, Depreciation: E↑

Forex Actors:

1. Commercial Banks, Foreign currency trading among banks (interbank trading) accounts for most of the activity in the forex market.
2. Corporations

3. Nonbank financial institutions
4. Central banks

Foreign Exchange Instruments:
Spot Rates: immediate settlement. "value date"=2nd business day after "deal/trade date"

Forwards: $F = S_0(\frac{1+i_{t+k}}{1+i^*_{t+k}})$ or CIP

- If i* is higher in foreign country, home currency will sell at a premium (stronger in forward than spot).
- **F - S < 0** or (F<S) means a premium on the HOME currency

Swap: over half of the transaction; Combination of a spot sale and a forward purchase transaction (to reduce borrowing cost. E.g. Japanese firm borrow from Japanese bank, swap yan with dollar from a US firm borrowing from US bank. Both get the benefit of lower rates.)

Swap Points = $\frac{F_{t+k} - S_t}{St}$ (Needs both Forward and Spot rates)

Always annualized! $= \frac{F_{t+k} - S_t}{S_t} \times \frac{360}{k}$

Futures: standardized exchange-traded contracts with fixed face amounts and specific delivery dates (where as forwards are arranged via banks, which can mature any day)
Limited markets, currencies and denominations
Long position (future buy, expect appreciation); Short position (the opposite)

Currency Options
A currency option is a contract giving the holder the right, but not the obligation to buy (a call option), or sell (a put option), a specified currency at a pre-agreed price (the strike price) at either:

- A fixed point in time (called a **European** option) or at
- A number of specified times in the future (called a Bermudan option) or at
- A time chosen by the holder up to maturity (called an **American** option)

Foreign Exchange Determination Using "Asset Approach"

- Short run
- No price adjustment
- No expected long-term rate change.

Interest Parity Condition:
Arbitrage: the process of buying a currency cheap and sell it high.
IPC Concept: Foreign exchange market in equilibrium when deposits of all currencies offer the same expected rate of return. Or the interest rate on dollar deposits equals the interest rate on foreign deposits plus

- The rate of expected exchange rate (uncovered interest parity) or
- The forward premium on foreign currency against the dollar (covered interest parity)

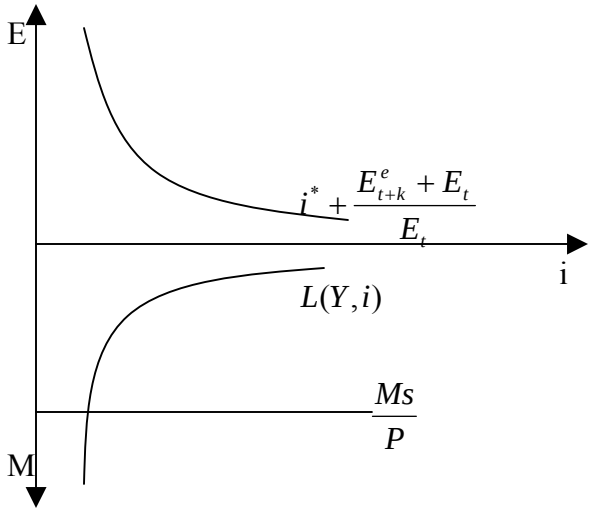
UIP: $i = i^* + \frac{E^e_{t+k} - E_t}{E_t}$

CIP: $i = i^* + \frac{F_{t+k} - E_t}{E_t}$

Forward premium (not forward rate sell at a premium) on foreign currency against dollar: $\frac{F_{t+k} - E_t}{E_t}$

Foreign Exchange Determination Using "Monetary Approach"

- Short run as well as long run
- Price (level) change
- Expected rate change (E^e_{t+k})
- Interest rate change
- Neutrality of money



In the short run:

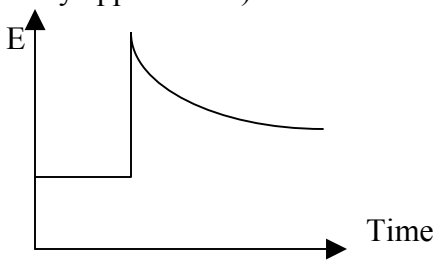
- Only *i* changes given monetary change (nominal Ms increase/decrease);
- E changes (spot rate)
- Expected E may or may not change, depends on whether monetary change is permanent or not.

In the long run:

- P changes, bring back Ms/P
- Expected E change if monetary change is permanent.

Overshooting:

Explanation: Monetary change cause expected future rate change. In order to compensate this change, overreact the spot rate to attract investors (for the opportunity to profit currency appreciation). This is used to explain the foreign exchange rate volatility.



Money Market equilibrium: Aggregate Money Demand = Real Money Supply

$$M^d = M^s$$

$$M^d = P \times L(Y, i)$$

$$\frac{M^s}{P} = L(Y, i)$$

where:

L(Y,i): real money demand function

Ms/P: real money supply

Change in either will cause interest rate to change.
Nominal money supply change: Ms change
(Real) Money demand change: L(Y, i) change
Price level always changes to bring back to equilibrium.

General Model
More long run assumptions:

1. Full employment
2. Instantaneous price adjustment

Law of one price (LOOP): In open economy, free trade (no transportation cost or trade barrier), same goods sold at the same price in the same currency.
Purchasing Power Parity (PPP or **Absolute PPP)**:
All countries' price levels are equal when measured in the same currency.

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

LOOP will generate PPP but PPP does not have to have LOOP.
Relative PPP: the percentage change in exchange rate between two currencies over any period equals the difference between the percentage changes in national price levels.

$$\frac{E_{t+k} - E_t}{E_t} = \frac{P_{t+k} - P_t}{P_t} - \frac{P^*_{t+k} - P^*_t}{P^*_t} = \pi_{us,t+k} - \pi_{eu,t+k}$$ **(check whether it is expected?)**

The fundamental equation of monetary approach:

$$E = \frac{P}{P^*} = \frac{\frac{M_s}{L(Y,i)}}{\frac{M^*_s}{L(Y^*,i^*)}} = \frac{M_s L(Y^*,i^*)}{M^*_s L(Y,i)}$$

Conclusion: E as F(Ms, Ms*, Y, i, Y*, i*)
E.g. 10% Ms increase => 10% price level increase => 10% E depreciation or
An increase in i will cause E to depreciate.

Paradox:
In the short run to meet UIP, increase of i will cause E (spot rate) to appreciate. In the long run, the same change in interest rate cause E to depreciate.
Reason: price adjustment through time.

From relative PPP: $\frac{E_{t+k} - E_t}{E_t} = \pi_{us,t+k} - \pi_{eu,t+k}$ derives:

$i - i^* = \frac{E^e_{t+k} - E_t}{E_t} = \pi^e_{us,t+k} - \pi^e_{eu,t+k}$ (the Fisher Effect: <u>expected inflation</u>)

All else equal, a rise in a country's expected inflation rate will eventually cause an equal rise in the interest rate that deposits of its currency offers.

Why price levels are lower in poor countries?
The Balassa-Samuelson theory: the labor forces of poor countries are less productive than those of rich countries in the tradable sector but that international productivity differences in nontradables are negligible. Lower productivity in trade=>lower wages=>lower cost=>lower nontradable goods prices=>lower general price levels.
The Bhagwati-Kravis-Lipsey theory: Rich countries have high K/L ratio=>higher marginal productivity of labor (MPC_L?)=>higher wage level. Nontradables are mostly labor intensive=>higher price level in general.

General Model: the real exchange rate q

$q = E \times \frac{P^*}{P}$

q captures the demand and supply condition:
An increase in demand of US goods results in dollar **long-run real** appreciation. Equally, A relative expansion of US output causes a **long-run real** depreciation.

The general model function: $E = q \times \frac{P}{P^*} = q \times \frac{M_s / L(Y,i)}{M_s^* / L(Y^*,i^*)} = q \times \frac{M_s L(Y^*,i^*)}{M_s^* L(Y,i)}$

Real interest (the <u>expected</u> real interest) rate: $r^e = i - \pi^e$

Condition/assumption from relative PPP: $\frac{q^e - q}{q} = \frac{E^e - E}{E} - (\pi^e_{us} - \pi^e_{eu})$

When relative PPP is expected to hold (no real exchange rate change is anticipated), real interest rate in all countries are identical.

Real interest parity: $r^e_{us} - r^e_{eu} = \frac{q^e_{t+k} - q_t}{q_t}$

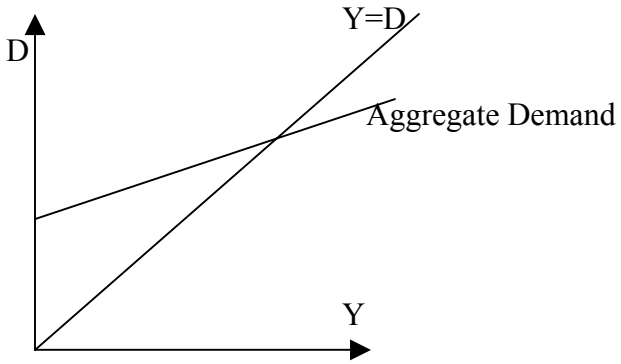
<u>AA-DD-XX Curves</u>

<u>DD Schedule</u>

$$C = C(Y^d)$$

$$D = C(Y - T) + I + T + CA(E\,P^*/P, Y - T)$$

$$D = D(E\,P^*/P, Y - T, I, G)$$



Why AD slop is flatter than 45°: 1 output=1 income, but not all income becomes demand (minus savings).

Factors that change DD position: E, P*, P, T, I, G, C(C_0, C_1), Consumer preference
G: positively linked to AD, DD shift right on increase.
I: Same effect as G.
C: The makeup of domestic consumptions vs. savings and demand on imports.

AA Schedule:

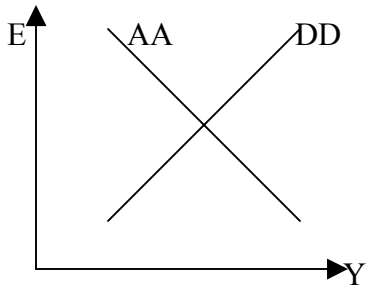
UIP: $i = i^* + \dfrac{E^e_{t+k} - E_t}{E_t}$

Money Supply: $\dfrac{M^s}{P} = L(Y, i)$

⇨ Y and E are negatively related.

Factors that change AA position: M^s, P, E^e, R*, L/P (real money demand)
P: negatively linked to E through reduction in real M^s. AA shifts down on increase.
E^e, R^*: Positively linked to E through UIP.

AA-DD:



Temporary Fiscal and Monetary Policies:

Fiscal: Short-term, no price adjustment, only DD shifts, no AA change.
Monetary: Short-term, no price adjustment, only AA shifts, no DD change.

Policies to Maintain Full Employment:
If Y falls below full employment production level Y^f, what policy to use to restore Y?
Key: **what to restore: Just Y or E too?**
If fall due to AD changes, fiscal policy restores Y *and* E. Monetary changes only restores Y but changes E. Vice versa.

Policy Considerations:
Inflation Bias: expectation of expansion leading to higher price level before any policy can take effect. As a result, separation of Central Bank and government.
Bureaucratic constraints: budgetary and legislative constraints for fiscal policies.

Long-term effects of fiscal, monetary policies:
Production restore to full employment level!

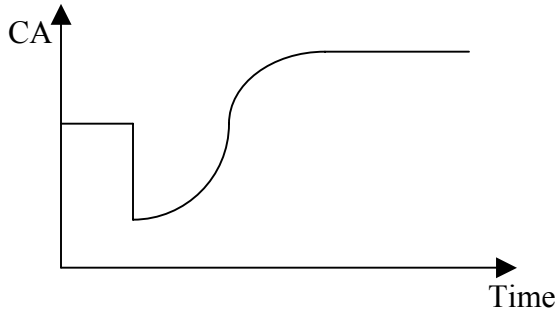
		AA	DD	S	S^e	Ms	P	Ms/P	CA	Y
Monetary Policy	Short-term	Up-Right (2)		↑↑ (3)	↑ (1)	↑ (1)			↑ (3)	↑ (3)
	Long-term	Down-Left (4)	Down-Left (4, CA)	↓ (3)	↑ (1)		↑ (1)	↓ (2)	↓ **(2)**	↓ (3)
Fiscal Policy	Short-term		Up-Right (1)	↑ (1)					↓ (2)	↑ (2)
	Long-term	Down-Left (2, S^e)			↓ **(2)**					↓ (2)

XX Curve

- CA always maintains at the same level along the curve.
- CA slop is positive: increased Y needs increasing E to maintain CA at X.
- Goods market equilibrium along DD curve above equates an improved CA. The points below equates a worsen CA.
- Always flatter than DD. CA=EX-IM (if E increases, EX improves but IM worsens. EX-IM widens. To maintain at the same level X, IM has to improve. E is given, so Y must rise to offset. Y doesn't all go to IM, so Y has to rise faster.)

Current Account Dynamics:

The J Curve:



Delay in CA improvement after initial E increase (currency depreciation): forward trade contracts. Production expansion delays, etc.
Empirical evidence: J curve lasting more than 6 month but less than a year.
A short term depression of production causes L(Y,i) to decrease. Interest rate must overshoot sharper to clear money market.
As a result, **more exchange rate volatility**.

Exchange rate pass-through:
One percent of decrease in E results in X percent of import price rise.
This is about nominal import price after nominal exchange rate change (e.g. import does not raise domestic price)!
Almost never 1: imperfect competition, market segmentation causes price inelasticity.
Dampens J curve (decouples 100% link between E and Q)

Fixed Exchange Rate and Foreign Exchange Intervention

E and expected future rate remains the same. Real interest rates have to be the same.
Adjustment through money supply M^s

When currency is kept strong (artificially), it tends to lead to a deterioration of the current account, CA < 0, corresponding to CB selling off its foreign assets (a credit in the FA, but BoP deficit)

Central Bank Balance Sheet

Assets	Liabilities
Foreign (reserves)	Deposits and Credits (checks)
Domestic (Bonds)	Currency in Circulation

Assumptions: CB has no net worth.

Foreign exchange intervention changes money supply (e.g. using reserve to buy back currency from the market)

Sterilization:
An attempt to insulate domestic money supply from FOREX intervention.

By swapping foreign assets with domestic assets: e.g. after selling foreign currency, using the home currency proceeds to buy domestic assets. Keep the total assets/liabilities unchanged.
Dilemma: does not work under UIP since steady M^s implies no change in expected future exchange rate (S^e).
Only makes sense if:

1. Adding risk premium to UIP. Increase of domestic assets implies reduction in *domestic* debt (bond, etc.), which reduced the RP. UIP curve shifts down. ER changes as a result. **Assumption**: <u>imperfect substitutability of domestic vs. foreign assets</u> (i.e. different risk premiums)
2. CB signal intension to induce S^e change (aka self-fulfilling prophecy). Shifts UIP curve and changes ER. Assuming comparable risks.

<u>Stabilization Policies under a Fixed Exchange Rate</u>

1. **Monetary policy is useless.** Any attempt to increase production through M^s increase will cause currency to depreciate. In order to defend the fixed rate, CB has to sell reserve, which reduces money in circulation.
2. **Fiscal policy is even more effective** than in float rate. Y increases cause currency to appreciate (asset market equilibrium). To defend exchange rate, CB must increase real money supply, thus dampen the "crowding out" effect to keep CA from worsening.

<u>Devaluation/Revaluation:</u>
Only happens in fixed exchange rate country.
Remember: devaluation causes E to increase, but this does SHIFT DD curve. It moves along it.
Process:
E increase=>Y increase=>i increase=>increase money supply to clear money market
Result:

- Better current account balance.
- Better foreign reserve.
- Increased output and employment.

Balance of Payment Crisis and Capital Flight
Capital flight happens in anticipation of devaluation. As a result, CB has to devalue early and hard.
People expecting devaluation, sell home for foreign currency, M^s decreases, Se increases: resulting a sharper devaluation.

Speculative Attack: self-fulfilling currency crisis. When currency buyers suddenly acquire the rest of foreign reserve.

<u>Objectives of Economic Policy: Keeping Internal and External Balance</u>
<u>External Balance</u>: Keeping CA at a "sustainable" level
BoP = 0 (no change in Official Reserve Assets)

Internal Balance
Near full employment and stable price level

Comparisons:
Policy efficacy under fixed and flexible exchange rate regimes – short run:

	Monetary Policy	Fiscal Policy
Fixed	S, Y Unchanged	S unchanged, Y ↑↑
Flexible	S ↑, Y ↑, CA ↑	S ↓, Y ↑, CA ↓ (crowding out)

Fixed Rate vs. Flexible Rate
Fixed:
Pro:

- Nominal anchor to fight domestic inflation. CB cannot increase M^s: always flow back to maintain E. Price level stable as a result.
- More effective fiscal policy.

Con:

- Uncertainty (devaluation/revaluation, attacks, etc.)
- Lost monetary freedom

Flexible:
Pro:

- Automatic stabilizer (i.e. cushion to AD shocks: in recession, Y decreases, DD shift left, ER floats up. If fixed ER, CB has to cut M^s to further decrease production).