INTERNATIONAL ECONOMICS

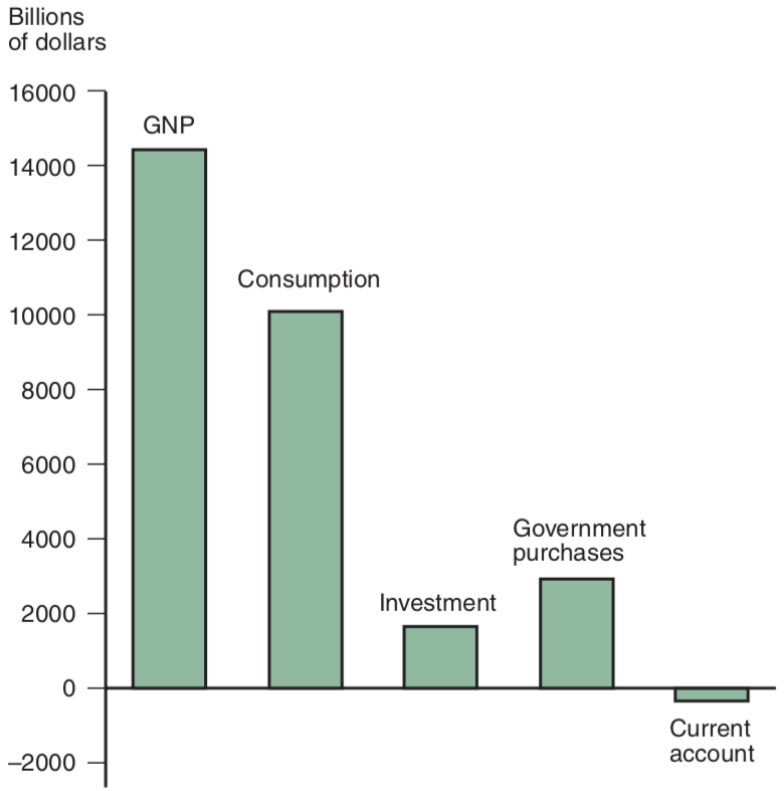
PART II - International Finance

The National Income Account

National Product and National Income

- The GNP is the value of all final goods produced by the country's factors of production and sold on the market in a given time period.
- The GNP of a country must be equal to its **national income**, the income earned in that period by its factors of production.
- When you buy a car the price of that car enter the GDP, but at the same time enter the income of the owner of the productive factors: the salespeople, the factory's workers, the stockholders, real estate owners, etc.
- Gross Domestic Product (GDP) is used to calculate the total value of the goods and services produced within a country's borders, while Gross National Product (GNP) is used to calculate the total value of the goods and services produced by the residents of a country, no matter their location
- GDP = GNP – net receipts of factor income from rest of the world (income residents earn on wealth they hold in other countries minus payments to foreign owner)

US GNP ant its Components



The National Income Account

National Product and National Income

- The national income in open economy is

$$Y = C + I + G + EX - IM$$

- The current account is

$$CA = EX - IM$$

If IM (import) exceeds EX (export) we have a CA deficit, if $EX > IM$ we have a CA surplus.

- National saving is $S = Y - C - G$. Since in a Closed Economy $Y = C + I + G$, which can be re-written $I = Y - C - G$, then $S=I$.

- In a Open Economy $Y - C - G = CA + I = S$

$S - I = CA$ $\quad S > I$ CA surplus $\quad S < I$ CA deficit

- In an Open economy a country can build up a stock of capital without rising its saving. That implies that with CA deficit is necessary to borrow from abroad. <u>An excess of national spending over income must be covered by net borrowing from foreigners.</u>

The National Income Account
Private and government saving

- The disposable income is given by Y – T, income minus tax (T).

- Private saving can be expressed as

$$S_p = Y - T - C$$

And the government saving as

$$S_g = T - G$$

$$S_p + S_g - I = CA = EX - IM$$

National saving (private saving + government budget (surplus or deficit) – Investment = Export - Import

- **Twin Deficit.**

When a government runs a policy of high expenditures (g) or large tax cut (See Ronald Regan policy in the 80s) we observe the twin deficit: budget deficit and current account deficit. This hold if there are not offsetting change in private saving.

The National Income Account
Balance of Payment Accounts

- Any international transaction enters the balance of payments twice: one as a credit and once as a debit.
- If a buy a Toyota car from Japan this is registered as a import in **Current Account** (debit) and a sale of of bank deposit deposit to Toyota (Italy) by a domestic bank (Intesa-San Paolo) which is registered in the **Financial Account** as a credit.
- Certain activities resulting of transfers of wealth between countries are recorded in the **Capital Account.** (they differ from financial account: acquisition or disposal of trade marks, copyrights, etc.)

  Current Account + Capital Account = Financial Account
- From the example we see that Official reserve rose $52 bl and Foreign Central Banks purchased $450 bl to add to their reserves. This net position (-$397 bl) can be thought as the efforts of Central banks to cover the US current account deficit.
- **The balance of Current Account + Capital Account balances – non reserve portion of Financial Account = BALANCE OF PAYMENT**
- A negative balance of payment may signal a crisis for it means that a country is running down its reserves or incurring debts to foreign monetary authorities. *Developing countries* needs to have a buffer of reserves to avoid to be cut off from foreign loans.

U.S. Balance of Payments (2009)

Current Account	
(1) Exports	**2,159.0**
Of which:	
Goods	1,068.5
Services	502.3
Income receipts (primary income)	588.2
(2) Imports	**2,412.5**
Of which:	
Goods	1,575.4
Services	370.3
Income payments (primary income)	466.8
(3) Net unilateral transfers (secondary income)	−124.9
Balance on current account [(1) + (2) + (3)]	**−378.4**
Capital Account	
(4)	**−0.1**
Financial Account	
(5) Net U.S. acquisition of financial assets, excluding financial derivatives	**140.5**
Of which:	
Official reserve assets	52.3
Other assets	88.2
(6) Net U.S. incurrence of liabilities, excluding financial derivatives	**305.7**
Of which:	
Official reserve assets	450.0
Other assets	−144.3
(7) Financial derivatives, net	**−50.8**
Net financial flows [(5) − (6) + (7)]	**−216.0**
Net errors and omissions [Net financial flows less sum of current and capital accounts]	162.5

The National Income Account

Balance of Payment Accounts

	Credit	Debit
Fax machine purchase (Current account, U.S. good import)		$1,000
Sale of bank deposit by Citibank (Financial account, U.S. asset sale)	$1,000	

	Credit	Debit
Meal purchase (Current account, U.S. service import)		$200
Sale of claim on First Card (Financial account, U.S. asset sale)	$200	

	Credit	Debit
Uncle Sid's purchase of a share of BP (Financial account, U.S. asset purchase)		$95
BP's deposit of Uncle Sid's payment at Second Bank of Chicago (Financial account, U.S. asset sale)	$95	

	Credit	Debit
U.S. banks' debt forgiveness (Capital account, U.S. transfer payment)		$5,000
Reduction in banks' claims on Bygonia (Financial account, U.S. asset sale)	$5,000	

The Foreign exchange Market

FX and International transactions

- The price of one currency in terms of another currency is the exchange rate. Since it affects the current account and other macroeconomic variables is one of the most important prices of an open economy.

- An appreciation (depreciation) of one country's currency means that are required more (less) units of the foreign currency to buy one unit of its currency. All else equal, an appreciation (depreciation) of a country's currency makes its goods more (less) expensive for foreigners.

- Changes in the in FX changes the relative prices of the export goods in terms of the imports goods. All else equal, an appreciation (depreciation) of a country's currency raises (decreases) the relatives prices of its exports and lowers (increases) the relative prices of its imports.

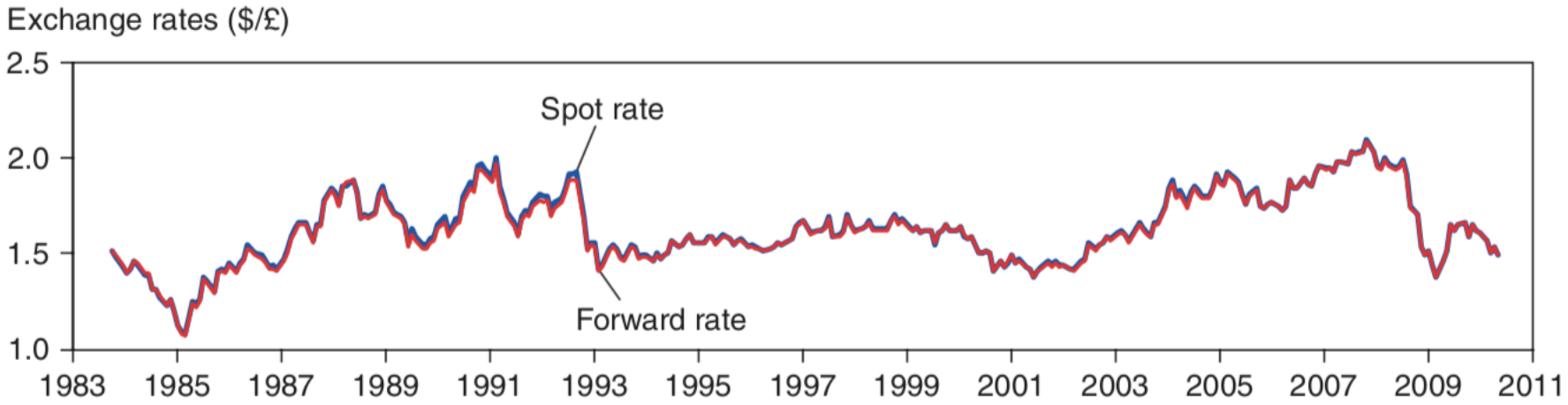
The Foreign exchange Market

FX market: the Actors

- **Commercial Banks**. These are the most important actors. They enter the market to meet the needs of their customers.
- **Corporations**. Corporation with operation in several countries may enter directly the FX markets.
- **Non bank financial institutions**. Hedge funds, mutual funds, pension funds trade actively in the FX.
- **Central bank.** The are active in the market for policy reasons.

The Foreign exchange Market

FX market: Spot and Forward rate



- **Forward Rates**. Corporations to avoid the risk due to FX movements they enter Forward market. Spot and Forward rate do move closely together.

- **FX swaps.** A FX swap is a spot sale combined with a forward repurchased. For example is a company receive today 5 ml Yen and she knows that will need that amount of money for purchasing good at a given date in the future will enter a FX swap.

- **Future and Options**. With a future contract you can buy a promise that a certain amount of currency will be delivered to you at a given rate. A future can be traded any moment in organized markets. An option gives to its owner the right to buy (call) or sell (put) a specified amount of money at a specific rate.

The Foreign exchange Market

The Demand of Foreign Currency assets

- The demand for a foreign currency is determined by the same considerations for the demand for any assets.

Rate of return = real interest rate + expect inflation + risk premium + liquidity premium

$R_€$ = today's interest rate on one-year euro deposits,
$E_{\$/€}$ = today's dollar/euro exchange rate (number of dollars per euro),
$E^e_{\$/€}$ = dollar/euro exchange rate (number of dollars per euro) expected to prevail a year from today.

The expected rate of return on a euro deposit is

$$R_€ + (E^e_{\$/€} - E_{\$/€})/E_{\$/€}.$$

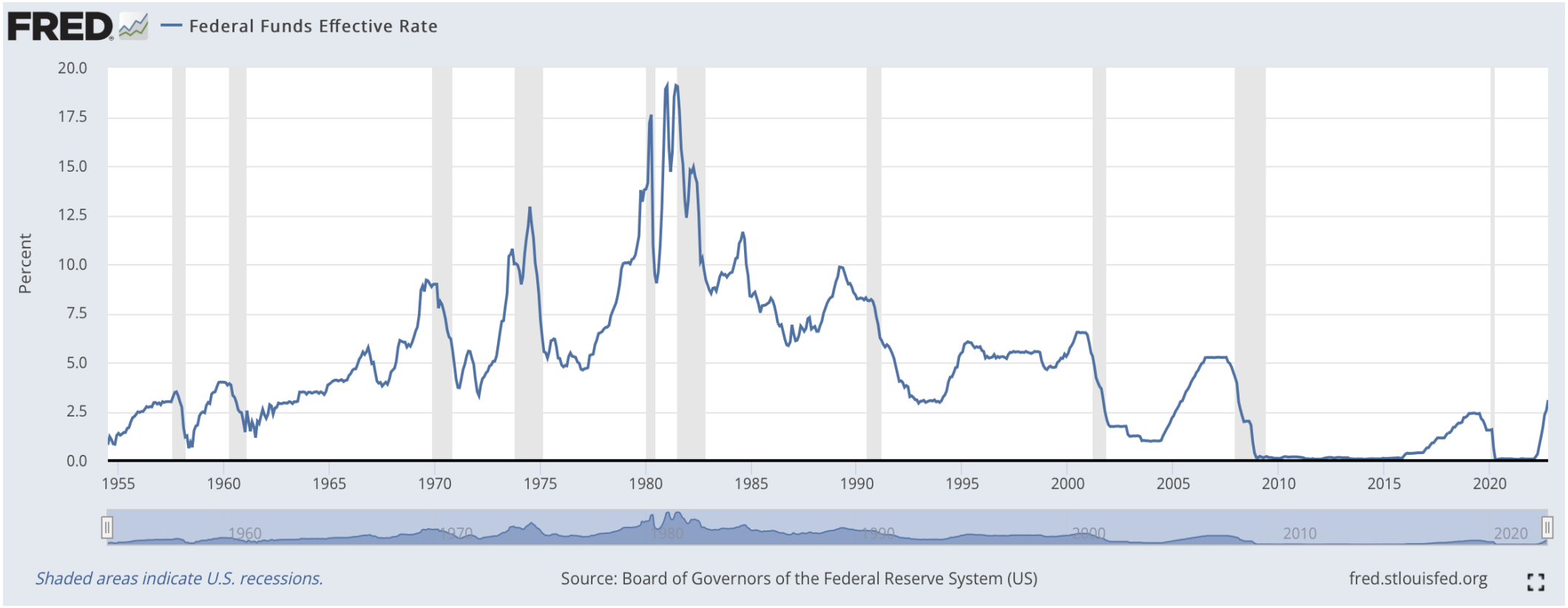
The expected rate of return difference between dollar and euro deposit is

$$R_\$ - [R_€ + (E^e_{\$/€} - E_{\$/€})/E_{\$/€}] = R_\$ - R_€ - (E^e_{\$/€} - E_{\$/€})/E_{\$/€}.$$

we are assuming that risk and liquidity premia play no role in the investor decision to hold an asset denominated in Euro or in Dollar.

The Foreign exchange Market

United States Fed Funds Rate



The Foreign exchange Market

The Equilibrium in the FX market

- The exchange rate at which the market settles is the one that makes markets participants content to hold existing supplies of deposits of all currencies.

Interest Parity Condition. *The foreign market is in equilibrium when deposits of all currencies offer the same expected rate of returns.*

$$R_{\$} - R_{€} = (E^{e}_{\$/€} - E_{\$/€}) / E_{\$/€}$$

Example. Suppose that interest rate in dollar deposits is 4% and in euro deposits is 2% and that the dollar is expected to depreciate of 3%. In this case is more advantageous to hold euro deposits: the expected return in euro would be 5%, higher than the one in dollar. There will be therefore an excess supply of dollar deposits and an excess demand of euro deposits. That will bring about an immediate depreciation of the dollar ($E_{\$/€}$ will go up such that the expected depreciation will be 2%).
On the contrary suppose that the interest rate on the dollar deposit is 5% and the interest in the euro deposit is 7% and the dollar is expected to appreciate 3%. In this case every body wants to hold dollar deposits. We will see an excess supply of euro deposits and an excess demand of dollar deposits and consequently the dollar will appreciate ($E_{\$/€}$ will go down).

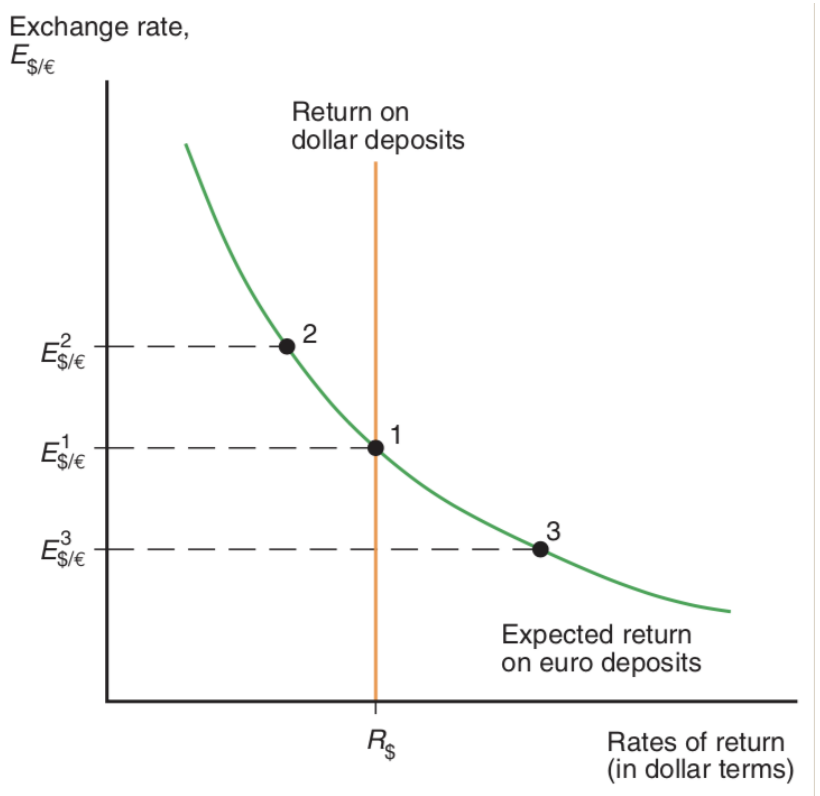
The Foreign exchange Market
The Equilibrium in the FX market

- The equilibrium of the exchange rate is given by the intersection of the two schedules, where the interest parity condition is satisfied (expected exchange rate, interest on deposits are given).

$$R_{\$} = R_{€} + (E^{e}_{\$/€} - E_{\$/€})/ E_{\$/€}$$

- At point 2 people holding euro deposits will get a return that is lower than the return on dollar deposits. As a result an excess demand of dollar deposits will push down the exchange rate from $E^{2}_{\$/€}$ to $E^{1}_{\$/€}$.

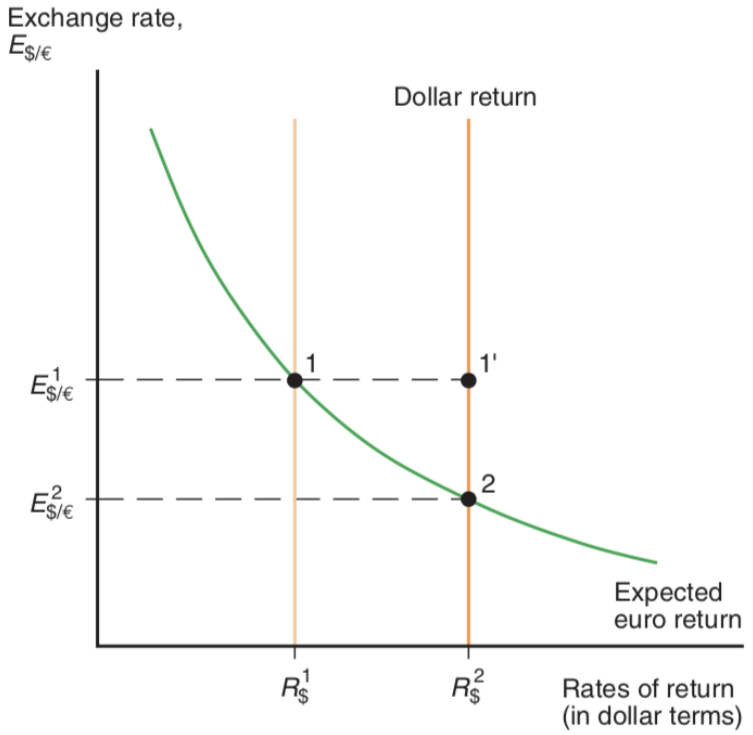
- At point 3 people holding euro deposit will get a return that is higher that the return on dollar deposits. As a result an excess supply of dollar deposits will push up the exchange rate from $E^{3}_{\$/€}$ to $E^{1}_{\$/€}$.



$E\$/€ = E^{e}_{\$/€} / (1 + R\$ - R€)$

The Foreign exchange Market
The Equilibrium in the FX market (2)

- We look now how changes in interest rate affects current exchange rates.
- A rise in interest rate offered y dollar deposits from $R_{\$}^{1}$ to $R_{\$}^{2}$ causes the dollar to appreciate from $E_{\$/€}^{1}$ to $E_{\$/€}^{2}$ other things equal.
- *An increase in the interest rate paid on deposits of a currency causes that currency to appreciate against foreign currency.*

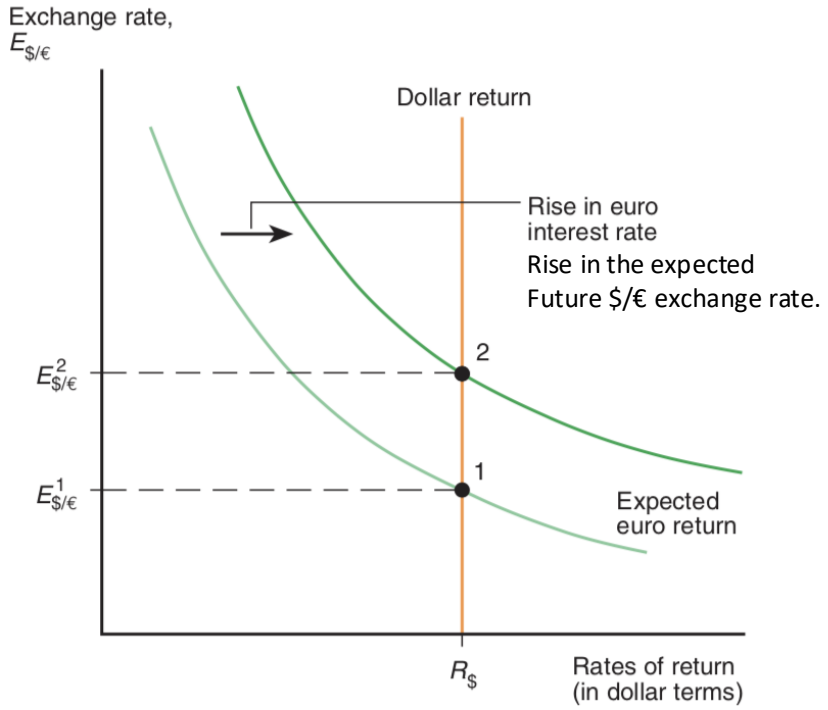


$E\$/€ = E_{\$/€}^{e} / (1 + R\$ - R€)$

The Foreign exchange Market

The Equilibrium in the FX market (3)

- We look now how changes in expected exchange rate affects current exchange rates.
- An increase in the expected depreciation of the dollar makes less profitable to hold dollar deposits. As a result an excess demand for euro deposits will bring about a depreatiation of the $/€ exchange rate until $E^1_{\$/€}$ goes to $E^2_{\$/€}$ (point 2).
- *A rise in the expected future exchange rate causes a rise the current exchange rate.*



$E\$/€ = E^e_{\$/€} / (1 + R\$ - R€)$

The Foreign exchange Market

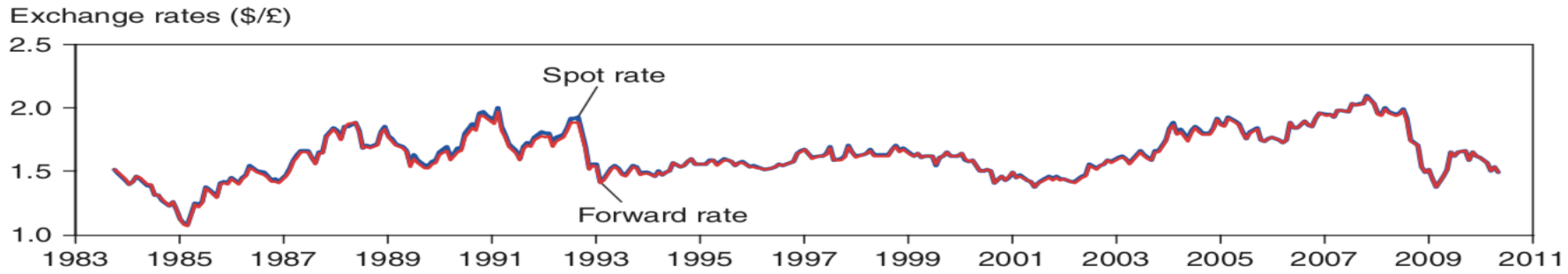
The Covered Interest Parity

- The connection between the forward foreign exchange rate, interest on deposits and foreign exchange is given by the *covered interest parity*:

$$R_{\$} - R_{€} = (F_{\$/€} - E_{\$/€})/ E_{\$/€}$$

  - The right hand side of the equation is called *forward premium* on euros against dollars. The interest rate on dollar deposits is equal the interest rate on euro deposits plus the forward premium on euros against the dollar.

  - The theory of covered interest parity explain why the forward and the spot exchange rate are so correlated: the unexpected economic events that affects the exchange rates often do not have immediate effects on the deposit interest rates. To maintain covered interest parity, spot and forward rate must change in proportion to each other.



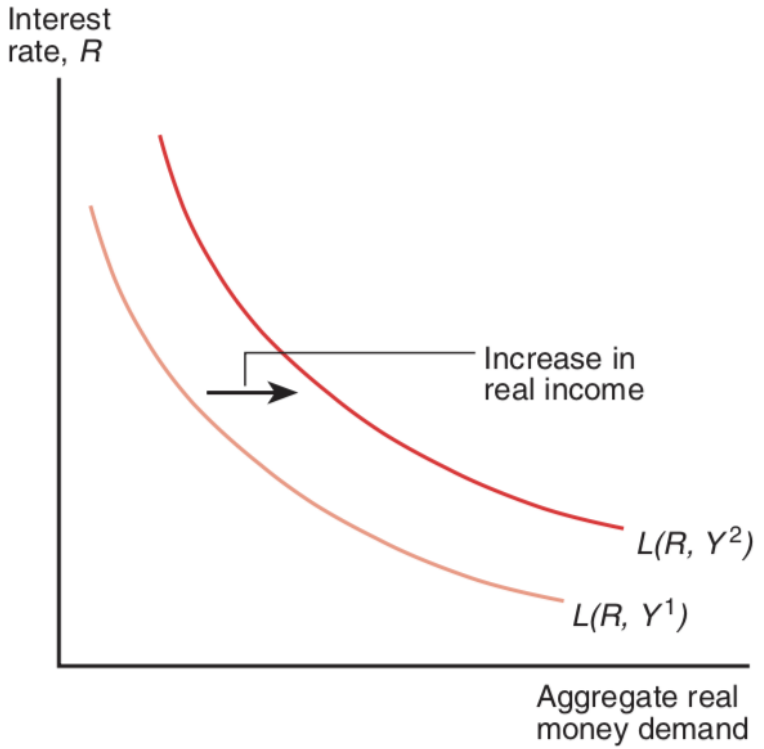
Money, Interest Rates, and Exchange Rate

Money: Aggregate demand

- Medium of Exchange
- Unit of Account
- Store of Value

We define money: (currency + demand deposits) (M1) – 10-15% of GDP
Eurozone - cash/GDP = 4.5% * US –cash/GDP = 2%)

$$M^d/P = L(R, Y),$$

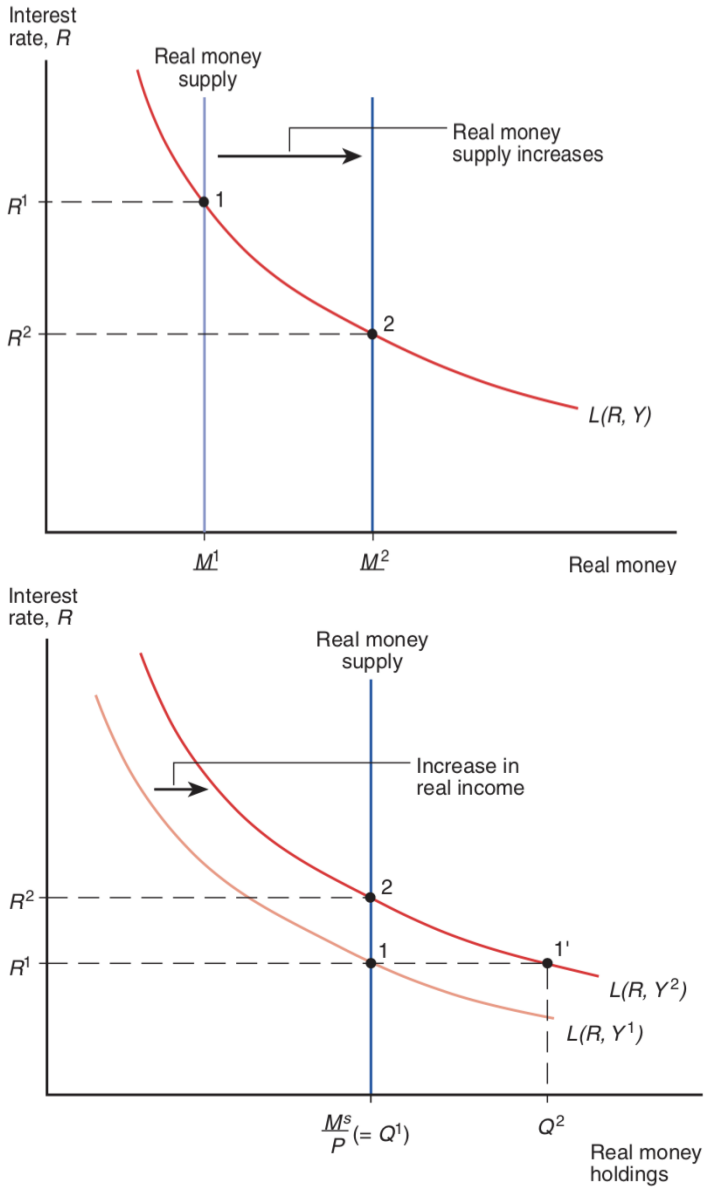


- For a given real income level real money demand rises as the interest rate falls
- An increase in real income rises the demand for money at every level of interest rate.

Money, Interest Rates, and Exchange Rate

Interaction of Money Supply and Demand

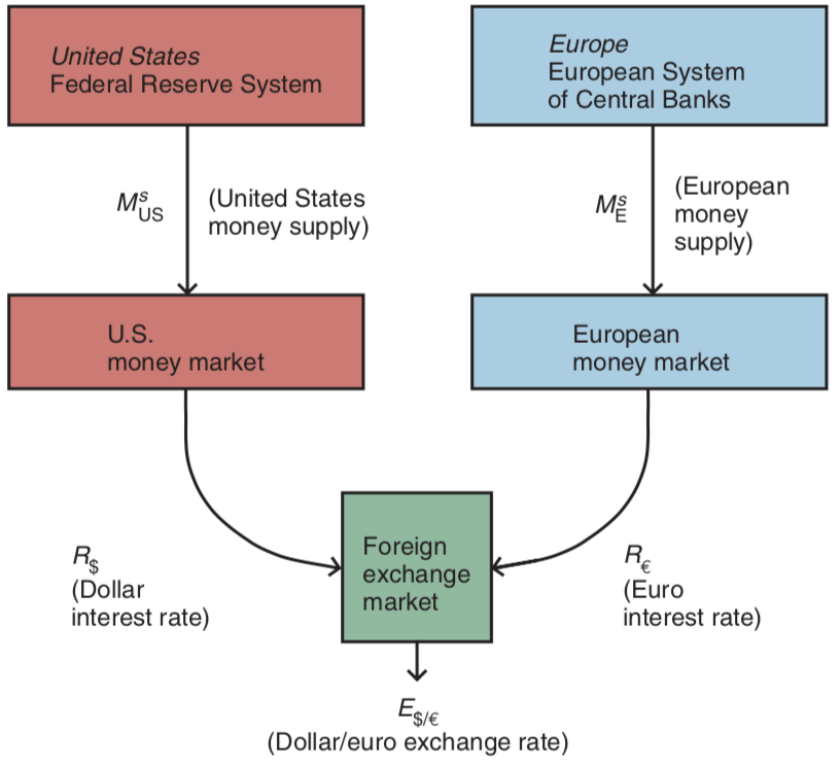
- The supply of money is controlled by the Central Bank through open market operation that change the banks' reserves and the money markets interest rate (Fed fund rate).
- For a given real income and and price level an increase of the money supply reduces the interest rate.
- Given the money supply an increase in the real income raises the interest rate.

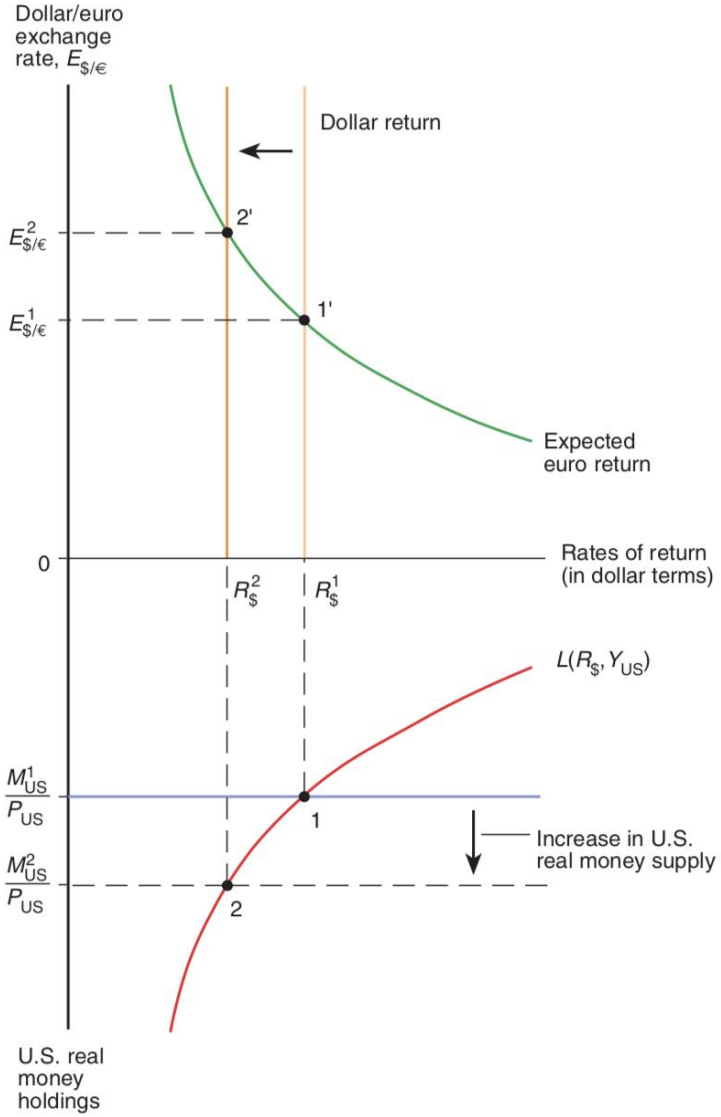


Money, Interest Rates, and Exchange Rate

Money Market and Foreign Exchange Market

- An increase (decrease) of the money supply induces a reduction (increase) of the interest rate and a depreciation (appreciation) of the currency \





Money, Interest Rates, and Exchange Rate

The Neutrality of Money in the Long Run

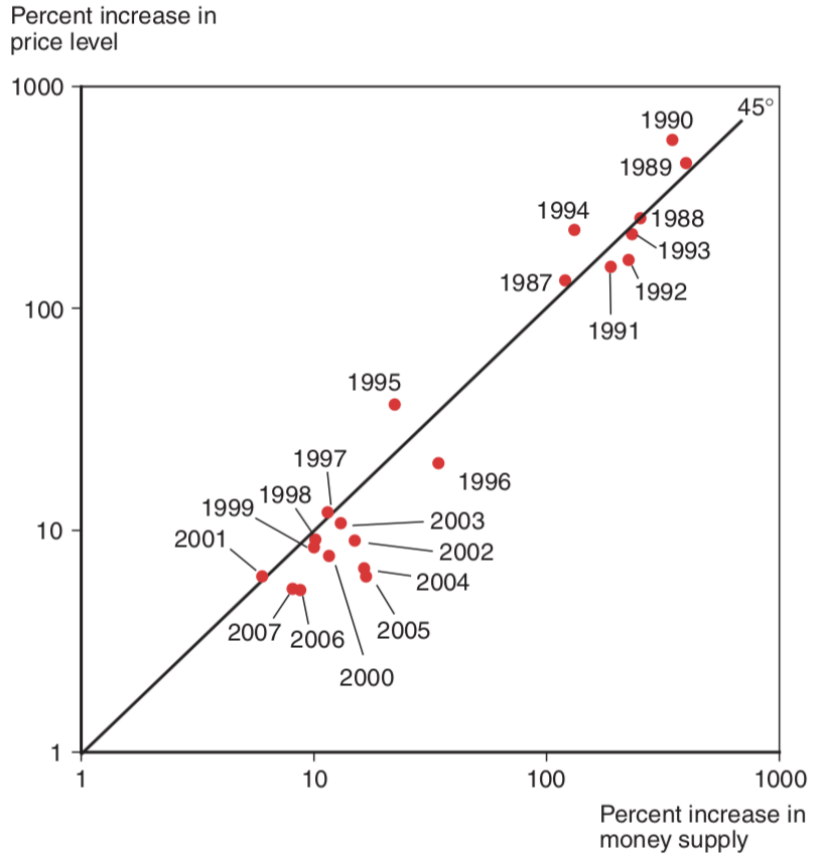
- In the long run we have to drop the assumption that the income and the Price level are fixed. The long run equilibrium price level is given by $P = M^s/L(R, Y),$

  - All else equal an increase in a country's money supply causes a proportional increase in its price level. If the money supply doubles the price level must also double. **Quantity Theory of money.**

  - The money demand is a demand for real balances. If P and M double nothing changes in real term. When for example we have a monetary reform that redefine the unit of account we do not have any change in the interest rate and the real income (change from Lira to Euro).

  - *A permanent increase in the supply of money causes a proportional increase in the price level's long-run value.*

Latina American M1 growth and Inflation 1987-2007



Money, Interest Rates, and Exchange Rate

The Neutrality of Money in the Long Run

- In the long run we have to drop the assumption that the income and the Price level are fixed. The long run equilibrium price level is given by $P = M^s/L(R, Y),$

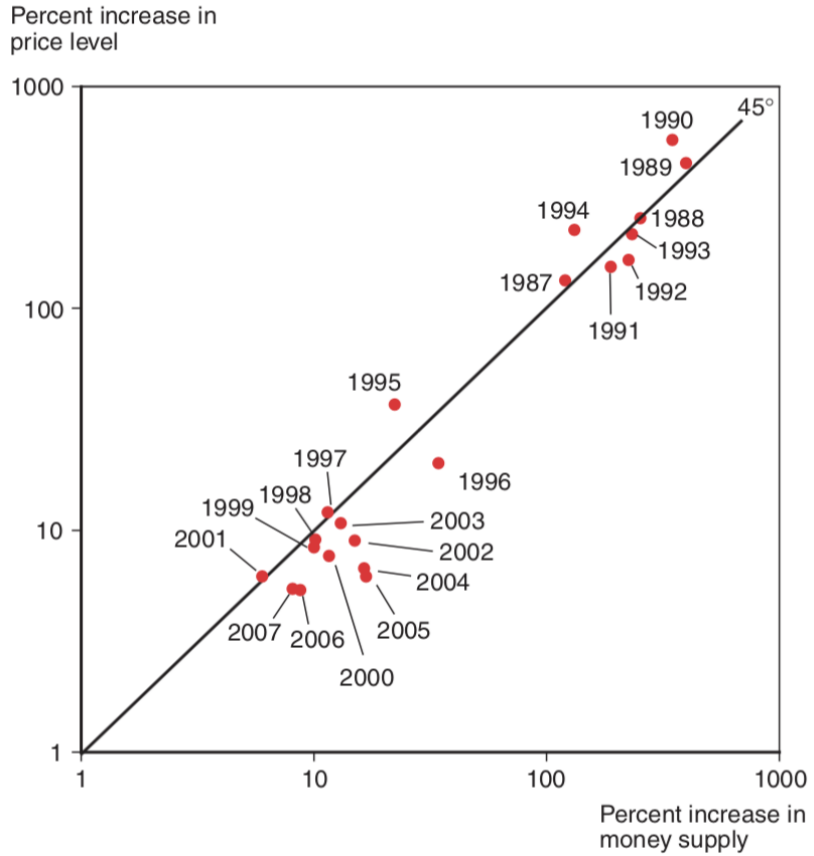
- The money demand can be expressed using the The Cambridge equation which is: $\mathbf{M_d = k\ y\ P}$, where k is the fluidity, y is the real income and P the price level. The money supply is exogenously determined by the Central BanK, $\mathbf{M_S = M.}$ In equilibrium $\mathbf{M_S = M_D}$

- Applying the rule on the growth rate of a product yield the dynamic Cambridge equation:

$$\mathbf{gM_t = gy_{yt} + gP_{pt}}$$

- The growth of money is equal to the growth of real income plus the growth of price (inflation). We assume that the fluidity remains constant over time

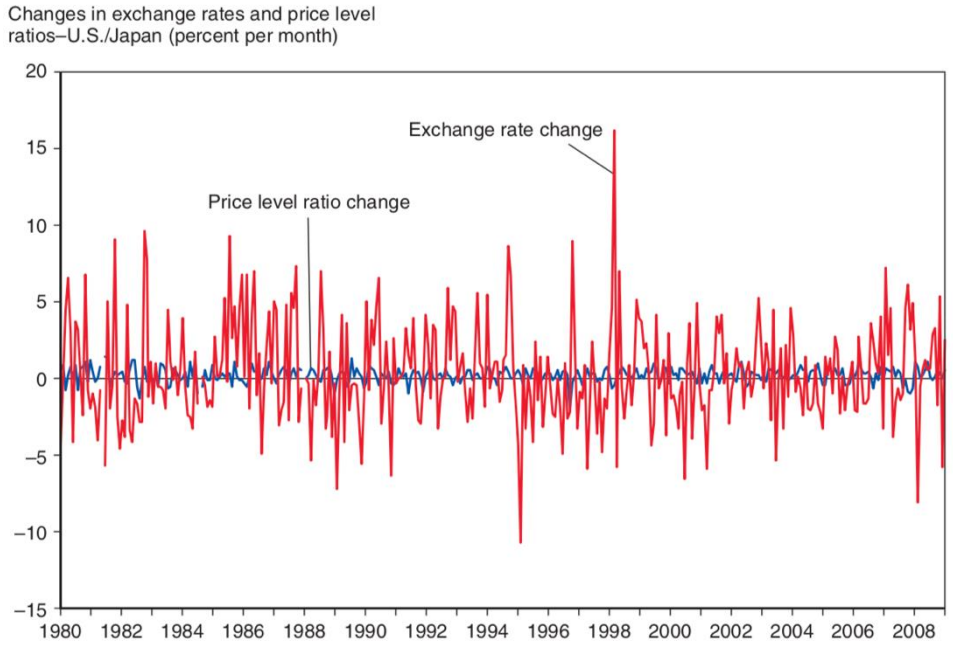
Latina American M1 growth and Inflation 1987-2007



Money, Interest Rates, and Exchange Rate

Short Run Rigidity vs Long Run Price Flexibility

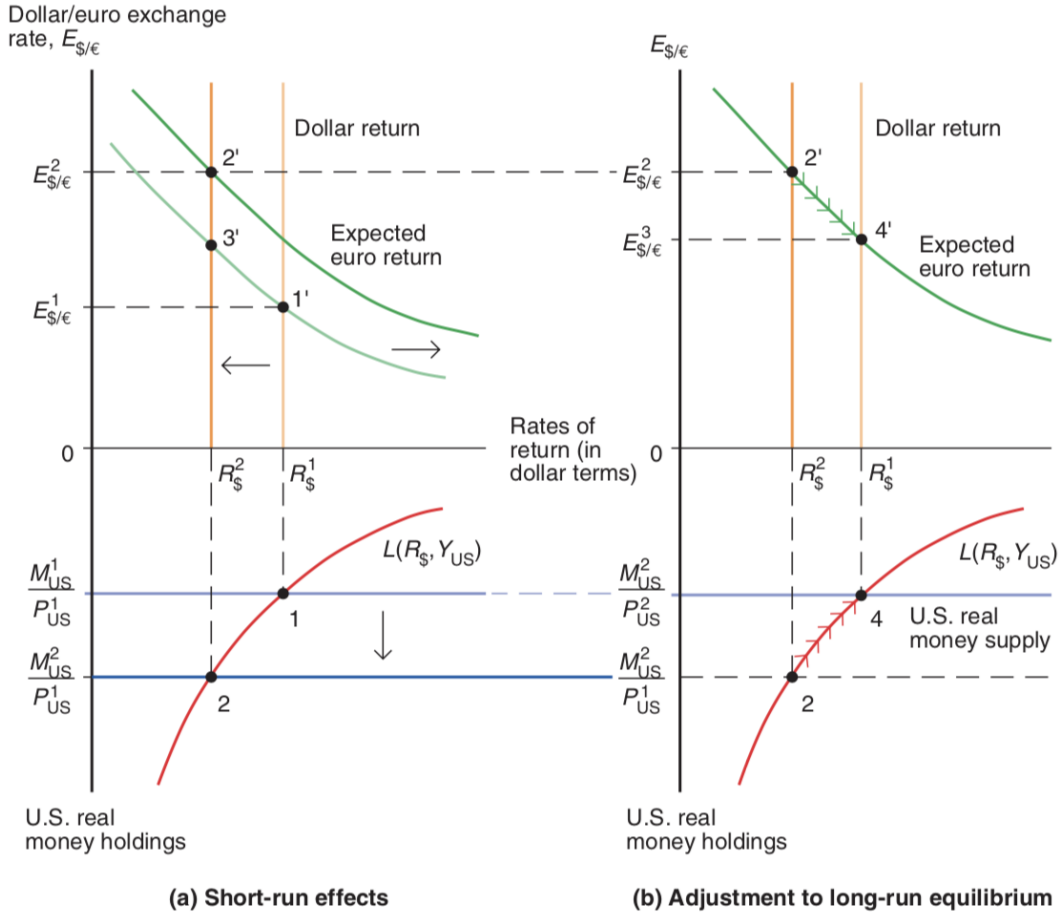
- An increase in money supply create an excess demand in many markets, but the speed of reaction change according to the features of each market.
- Labor markets have long term contracts, but prices in commodity and raw material markets adjust on daily basis.
- FX markets are more volatile than price level index.
- However, in countries that experience high inflation long term contracts go out of use and prices adjust very fast.



Money, Interest Rates, and Exchange Rate

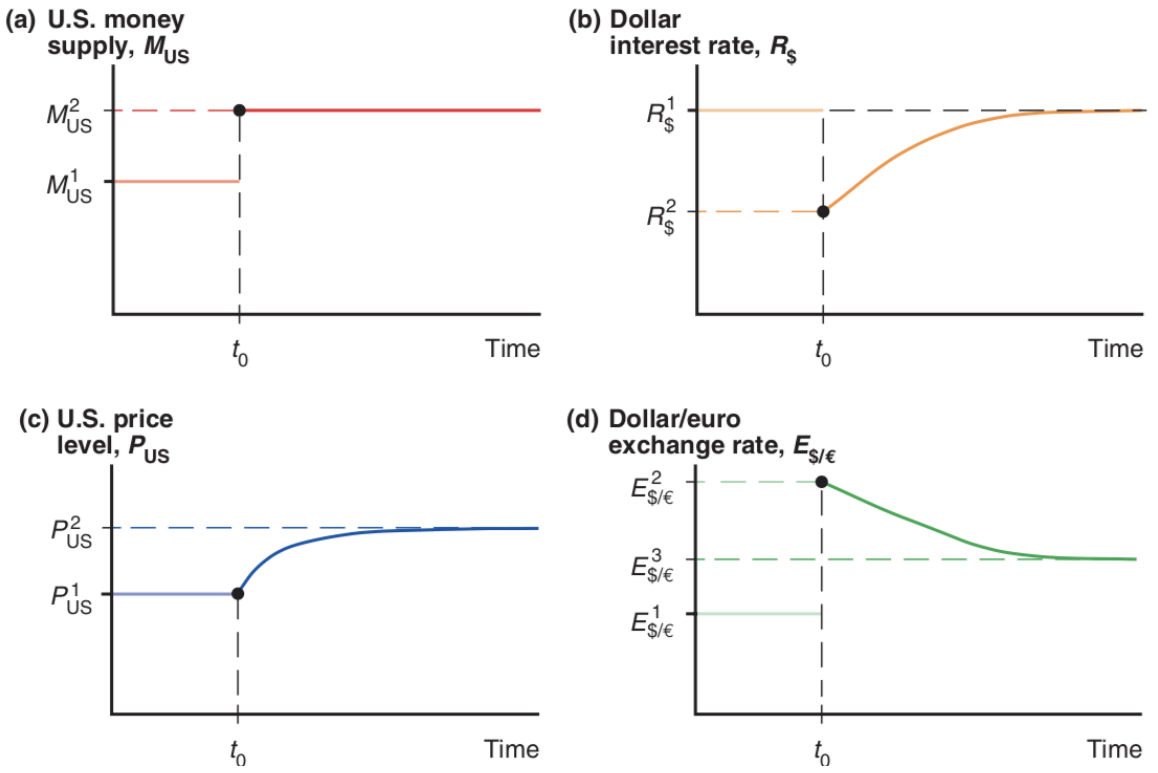
Permanent Change in Money supply and FX dynamics Overshooting Model

- The price level is initially at P_{US}^1. An increase in the US money supply reduces $R_\$^1$ to $R_\$^2$.
- The permanent increase in money supply affects *exchange rate expectation* . This shift the green schedule to the right in the first quadrant.
- The equilibrium condition in the FX market $R_\$ = R_€ + (E^e_{\$/€} - E_{\$/€})/ E_{\$/€}$ forces the exchange rate to overshoots its equilibrium level consistent with the increase in money supply.
- The permanent increase in the money supply will bring a proportional increase in the price level. As prices increase the real money supply goes back to its original level and so does the interest rate. The exchange rate consistent with the new price level and nominal money supply is $E^3_{\$/€}$



Money, Interest Rates, and Exchange Rate
FX Overshooting

- Exchange rate is said to overshoot because its depreciation is greater than its long run depreciation.
- The Overshooting model is an explanation why FX change so rapidly from day to day.
- It is a consequence of the rigidity of the price level and the parity condition that holds at every moment. The term ($R_{\$}$ - $R_{€}$) decrease as US money supply increase, $E^{e}_{\$/€}$ increases to the new long term equilibrium and as a result the current exchange rate $E_{\$/€}$ increases more than its level consistent with new money supply.
- If prices would adjust immediately the US interest rate would not fall because the real money supply would not increase.



Prices Levels and FX in the Long Run

The Law of One Price

- In competitive markets free of barriers identical goods sold in different markets must sell for the same prices when prices are expressed in the same currency, then the price of good *i* is the same wherever is sold:

$$P^i_{\text{US}} = (E_{\$/€}) \times (P^i_{\text{E}}).$$

- Equivalently, the dollar/euro exchange rate is the ratio of good *i*'s US and European money prices:

$$E_{\$/€} = P^i_{\text{US}}/P^i_{\text{E}}.$$

- The law of one price applies by definition only to the traded goods. It does not applies to non-traded goods. Its validity is guaranteed by the arbitrage forces. Traders will close the gap is the same good is sold at different prices in different locations.

Prices Levels and FX in the Long Run

Purchasing Power Parity

- PPP theory states that the exchange rate between two countries' currencies is equal to the ratio of the countries' price levels.

$$E_{\$/€} = P_{\text{US}}/P_{\text{E}}.$$

- If for example a basket of goods is sold at $ 366 in the US, and the same basket is sold at € 300 in Europe, the $E_{\$/€}$ is $ 1.22.

$$P^{i}_{\text{US}} = (E_{\$/€}) \times (P^{i}_{\text{E}}).$$

- PPP asserts that all countries' price level are the same when measured in terms of the same money. If the law of one price applies to one good, PPP applies to the general price level that is representative of a basket of goods. Arbitrage and market forces should guarantee as in the case of the law of one price the validity of the theory, especially, as long-run theory.

Prices Levels and FX in the Long Run
Absolute PPP and relative PPP

- Relative PPP theory states that the percentage change in the exchange rates between two countries over any period equals the difference between the percentage changes in national prices (inflations):

$$(E_{\$/€,\,t} - E_{\$/€,\,t-1})/E_{\$/€,\,t-1} = \pi_{\mathrm{US},\,t} - \pi_{\mathrm{E},\,t}$$

- If US inflation rises by 4% over the year and European inflation over the year is 2% the theory predict that the dollar depreciates of 2% against the euro over the year. Unlike (absolute) PPP, relative PPP can be defined only with respect to the time interval over which FX and price levels change. Relative PPP might be valid also when absolute PPP does not hold.

Prices Levels and FX in the Long Run
The Monetary Approach to the Exchange Rate

- The Monetary Approach combines the framework of the money supply and demand with PPP. The MA can be thought as a long-run theory for the exchange rate determination, although the proponents of this theory believe that prices adjust very fast to clear the markets and therefore the MA has validity also in the short-run.

- FX markets sets the rate so that PPP holds:

$$E_{\$/€} = P_{US}/P_{E}.$$

- Domestic prices are explained in terms of money demand and supply:

$$P_{US} = M^{s}_{US}/L(R_{\$}, Y_{US}),$$

$$P_{E} = M^{s}_{E}/L(R_{€}, Y_{E}).$$

- *The MA predicts that the relative price of American and European money is determined by the relative supplies of those money and the relative real demands for them. Shifts in interest rates and output affects the exchange rate through their influences on the money demand.*

Prices Levels and FX in the Long Run
The Monetary Approach to the Exchange Rate (2)

- The Monetary Approach makes a number of specific predictions:

    1. **Money supplies**. A permanent increase in the money supply causes a proportional change in the Price level and a devaluation of the exchange rate.

    2. **Interest rates**. A rise in the interest rate lower the real money demand. As a consequence the Price level increases and thus the the exchange rate depreciates.

    3. **Output level**. A rise in the real income raises the real demand which leads to a fall of the Price level. As a result the exchange rate appreciates.

- Prediction 2 apparently contradicts what we have seen so far where an increase in interest rates causes an appreciation of the currency. In that setting the increase of the interest rate was induced by a reduction of the money supply ("liquidity effect"). In the MA a reduction of money supply causes a reduction of the price level and thus an appreciation of the exchange rate without having a liquidity effect.

Prices Levels and FX in the Long Run

Inflation, interest rate and PPP

- In the real economy Central Banks let the money supply to growth steadily, 5% or 8% per year. *Other things equal, money supply growth at constant rate yields an inflation rate at the same rate, but changes in in the growth of money do not affect real variable or real output*. However, inflation above 10% might have serious impact as long terms contracts are not anymore feasible, uncertainty in the investments prevails, menu costs, etc. (cost of inflation)

- However, while change in level of money supply do not have an impact on the long term level of the interest rate, a change in money growth affects the interest rate.

- If PPP holds, then also relative PPP holds (it is not necessarily true the reverse). Given the parity condition and relative PPP:

$$R_{\$} = R_{€} + (E^{e}_{\$/€} - E_{\$/€})/E_{\$/€} \qquad \text{(parity condition)}$$

$$(E^{e}_{\$/€} - E_{\$/€})/E_{\$/€} = \pi^{e}_{\mathrm{US}} - \pi^{e}_{\mathrm{E}}. \qquad \text{(relative PPP)}$$

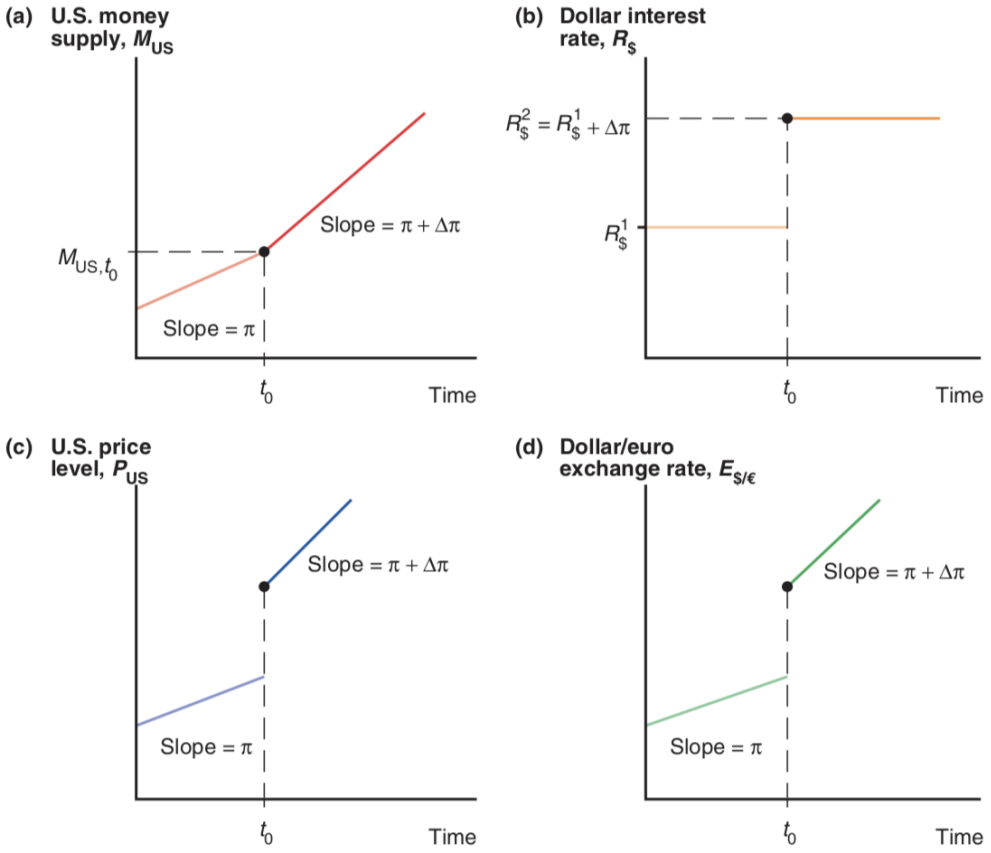
$$R_{\$} - R_{€} = \pi^{e}_{\mathrm{US}} - \pi^{e}_{\mathrm{E}}.$$

- If relative PPP holds, the difference between the interest in deposits between US and Europe is equal to the difference between the expected inflation rate between the two countries. The increase in the expected inflation, say in the US, will cause an increase in the interest rate in the US to keep that difference invariant.

Prices Levels and FX in the Long Run

The Fisher Effect

- **interest rate = real interest rate + expected inflation**
- If a country moves from a steady 5% inflation to a steady 8% inflation, with a constant **real rate** of 2% the interest rate will increase from 7% to 10%. The relationship between inflation and interest rate is called the **Fisher Effect**.
- Imagine that a t_0 money growth is increased by $\Delta\pi$. Under PPP the dollar will depreciate at the rate $\pi + \Delta\pi$. The interest will jump up consequently as people expect a higher inflation.
- The US Price level adjusts immediately as it does the current exchange rate.



Prices Levels and FX in the Long Run

Empirical Evidence on PPP

- All version of PPP theory do badly in explain the facts. Studies on absolute PPP and relative PPP concludes that PPP is way off the mark.

- Even studies on the law of one price has not fared well. (see the Big Mac case in the table where the exchange rate that would have equalized US and Foreign countries burger prices are calculated, *EX/$ X P$ / Px*).

Factors that explain these negative results are:

- Trade barriers and non-tradables
- Departures from Free Competition
- Differences in Consumption Patterns

- However, PPP remains a valid reference theory for explain long term tendencies for exchange rates.

"The BIG MAC PPP"

	Big Mac prices		Implied PPP* of the dollar	Actual exchange rate: Jan 30th	Under (–)/over(+) Valuation against the dollar,%
	in local currency	in dollars			
United States†	$3.54	3.54	-	-	
Argentina	Peso 11.50	3.30	3.25	3.49	–7
Australia	A$3.45	2.19	0.97	1.57	–38
Brazil	Real 8.02	3.45	2.27	2.32	–2
Britain	£2.29	3.30	1.55‡	1.44‡	–7
Canada	C$4.16	3.36	1.18	1.24	–5
Chile	Peso 1.550	2.51	438	617	–29
China	Yuan 12.5	1.83	3.53	6.84	–48
Czech Republic	Koruna 65.94	3.02	18.6	21.9	–15
Denmark	DK 29.5	5.07	8.33	5.82	43
Egypt	Pound 13.0	2.34	3.67	5.57	–34
Euro areas§	€3.42	4.38	1.04**	1.28**	24
Hong Kong	HK$13.3	1.72	3.76	7.75	–52
Hungary	Forint 680	2.92	192	233	–18
Indonesia	Rupiah 19.800	1.74	5,593	11,380	–51
Israel	Shekel 15.0	3.69	4.24	4.07	4
Japan	¥290	3.23	81.9	89.8	–9
Malaysia	Ringgit 5.50	1.52	1.55	3.61	–57
Mexico	Peso 33.0	2.30	9.32	14.4	–35
New Zealand	NZ$4.90	2.48	1.38	1.97	–30
Norway	Kroner 40.0	5.79	11.3	6.61	63
Peru	Sol 8.06	2.54	2.28	3.18	–28
Philippines	Peso 98.0	2.07	27.7	47.4	–42
Poland	Zloty 7.00	2.01	1.98	3.48	–43
Russia	Ruble 62.0	1.73	17.5	35.7	–51
Saudi Arabia	Riyal 10.0	2.66	2.82	3.75	–25
Singapore	S$3.95	2.61	1.12	1.51	–26
South Africa	Rand 16.95	1.66	4.79	10.2	–53
South Korea	Won 3,300	2.39	932	1,380	–32
Sweden	SKR 38.0	4.58	10.7	8.30	29
Switzerland	CHF 6.50	5.60	1.84	1.16	58
Taiwan	NT$75.0	2.23	21.2	33.6	–37
Thailand	Baht 62.0	1.77	17.5	35.0	–50
Turkey	Lire 5.15	3.13	1.45	1.64	–12

*Purchasing power parity: local price divided by price in United States; †Average of New York, Atlanta, Chicago, and San Francisco; ‡Dollars per pound; §Weighted average of prices in euro area; **Dollars per euro

Sources: McDonald's; the *Economist*, February 4, 2010. Exchange rates are local currency per dollar, except where noted.

BIG MAC

Country		2000 —— 2022	Under/over valued, %
Switzerland	Franc		30.3
Norway	Krone		21.6
Uruguay	Peso		18.1
Sweden	Krona		8.5
Canada	C$		2.0
United States	**US$**		**BASE CURRENCY**
Lebanon	Pound		-1.4
Israel	Shekel		-4.0
UAE	Dirham		-4.8
Euro area	Euro		-7.5
Australia	A$		-10.2
Argentina	Peso		-11.3
Saudi Arabia	Riyal		-12.1
Britain	Pound		-13.8
New Zealand	NZ$		-14.0
Brazil	Real		-17.5
Bahrain	Dinar		-17.6
Singapore	S$		-17.7
Kuwait	Dinar		-17.9
Czech Rep.	Koruna		-22.9
Costa Rica	Colón		-24.1
Nicaragua	Córdoba		-24.8
Sri Lanka	Rupee		-27.7
Oman	Rial		-28.4
Croatia	Kuna		-28.5
Chile	Peso		-28.9
Honduras	Lempira		-29.8
Poland	Zloty		-30.3
Peru	Sol		-30.7
Qatar	Riyal		-30.7
China	Yuan		-30.9
South Korea	Won		-32.0
Thailand	Baht		-32.1
Colombia	Peso		-32.4
Mexico	Peso		-33.4
Guatemala	Quetzal		-34.7
Jordan	Dinar		-37.1
Pakistan	Rupee		-38.7
Moldova	Leu		-39.6
Vietnam	Dong		-42.8
Japan	Yen		-45.1
Azerbaijan	Manat		-46.3
Philippines	Peso		-46.5
Turkey	Lira		-48.0
Hong Kong	HK$		-48.1
Hungary	Forint		-48.6
Taiwan	NT$		-51.3
Malaysia	Ringgit		-52.4
Egypt	Pound		-52.9
India	Rupee		-53.6
South Africa	Rand		-54.5
Indonesia	Rupiah		-54.6
Romania	Leu		-55.7

Prices Levels and FX in the Long Run

The Real Exchange Rate

- The real exchange rate is broad measure of of the prices of one country's goods and services relative to the other country. We can express the real exchange rate as the dollar value of Europe 's price level divide by the US price level:

$$q_{\$/€} = (E_{\$/€} \times P_{E})/P_{US}.$$

- A rise in the real dollar/euro rate (which we call a real depreciation of the dollar against the euro) shows a fall of the PP of the dollar within the Europe's borders relative to its PP within the US. American goods become cheaper than European goods. This can be caused either by a change in the relative prices or a change in the exchange rate.

- At unchanged price levels in the two countries a nominal depreciation implies a real depreciation.

- Il PPP holds any change in the nominal exchange rate is offset by change in relative prices and the real exchange remain constant (If PPP holds then q = 1).

Prices Levels and FX in the Long Run

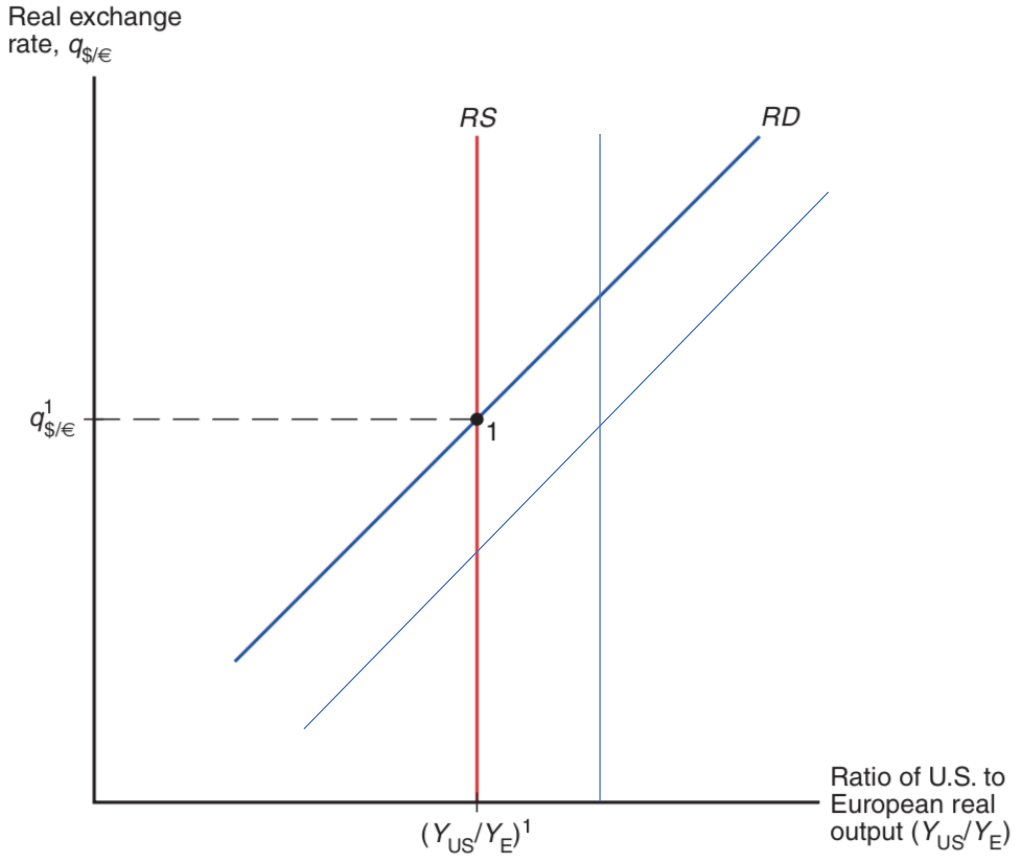
Demand, Supply and the Long-Run Real Exchange Rate

- The real exchange rates that reflects the changes in relative prices between two countries' expenditure baskets, are influenced by changes in supply and demand conditions.

    1. *A change in relative demand for American products*. Any demand change in favor of American products with respect to European products causes a real appreciation of the dollar against the euro (a fall in $q_{\$/€}$). (**RD shifts to the right**)

    2. *A change in relative supply*. An increase in total factor productivity in the US relative to Europe cause an excess supply of American products which, in turn, causes a long-run real depreciation of the dollar against the euro (an increase in $q_{\$/€}$). **(RS shifts to the right)**

- In the long run the supply curve is determined by productivity and factor supplies. An increase in productivity in US would shift the RS curve to the right with a real depreciation of the US dollar against the euro.
- An increase in demand for American products would shift the RD curve to the right causing a real appreciation of dollar against the euro.



Prices Levels and FX in the Long Run

Nominal and Real Exchange Rates in the Long-Run

- *Change in National money supplies cause proportional long run movements in nominal exchange rate and price level as predicted by PPP leaving real exchange unaffected, but shift in relative demand between countries or productivity changes (non monetary factors) affect nominal exchange through changes in the long run real exchange rate. This do not conform to PPP theory . Indeed, for the PPP theory, $q_{\$/€}$ oscillates around 1 in the long run.*

$$q_{\$/€} = (E_{\$/€} \times P_E)/P_{US}. \quad (1)$$

$$E_{\$/€} = q_{\$/€} \times (P_{US}/P_E). \quad (2)$$

Formally speaking, the only difference between (1) and equation (2), on which we based our exposition of the monetary approach to the exchange rate, is that (2) accounts for possible deviations from PPP by adding the *real* exchange rate as an additional determinant of the nominal exchange rate. Thus, the real exchange rate can change independently and autonomously.

The equation implies that for a given real dollar/euro exchange rate, changes in money demand or supply in Europe or the United States affect the long-run nominal dollar/euro exchange rate as in the monetary approach. Changes in the long-run real exchange rate, however, also affect the long-run nominal exchange rate. The long-run theory of exchange rate determination implied by equation (2) thus includes the valid elements of the **monetary approach**, but in addition it corrects the monetary approach by allowing for **nonmonetary factors** that can cause sustained deviations from purchasing power parity.

Prices Levels and FX in the Long Run

Nominal and Real Exchange Rates in the Long-Run

- *A shift in relative money supply.* A permanent increase in the US money supply will cause in the long run an increase the US price level, interest rate remains unchanged, the exchange rate will depreciate. Real exchange rate does not change. PPP holds.

- *A shift in relative money supply growth rates*. A permanent increase in the money growth rate will raise the inflation rate and the interest rate (Fisher effect). As a result of higher interest rate the demand for money , L(Y, r), declines and the price level increase. The exchange rate will depreciate steadily as for the interest rate differential between countries. Real exchange does not change. PPP holds.

- *A change in relative output demand*. An increase in relative output demand does not affect the price level since according to the Monetary Approach to the exchange rate depends only on money demand and money supply. Given that long run national prices are unchanged, a long run appreciation of the dollar must occur ($E_{\$/€}$). Thus, an increase in world relative demand for the US output will cause a real appreciation of the dollar.

- *A change in relative output supply.* An increase in total factor productivity causes an increase of US output (Y) with respect Europe. Goods are cheaper in US. A relative expansion of US output with respect to Europe causes a long-run real depreciation. The effects on nominal exchange rate however are ambiguous. See equation (2)

$$E_{\$/€} = q_{\$/€} \times (P_{US}/P_E).$$

- If the real exchange rate depreciates also the nominal exchange rate depreciates (if q goes up, then E goes up). But the increase of Y increases the demand for money, L(Y, r), and thus, pushes the US price level down and therefore the nominal exchange rate through this channel will appreciate (E goes down). This works in opposite direction, thus making the net effect on the nominal exchange rate ambiguous

Prices Levels and FX in the Long Run

Nominal and Real Exchange Rates in the Long-Run

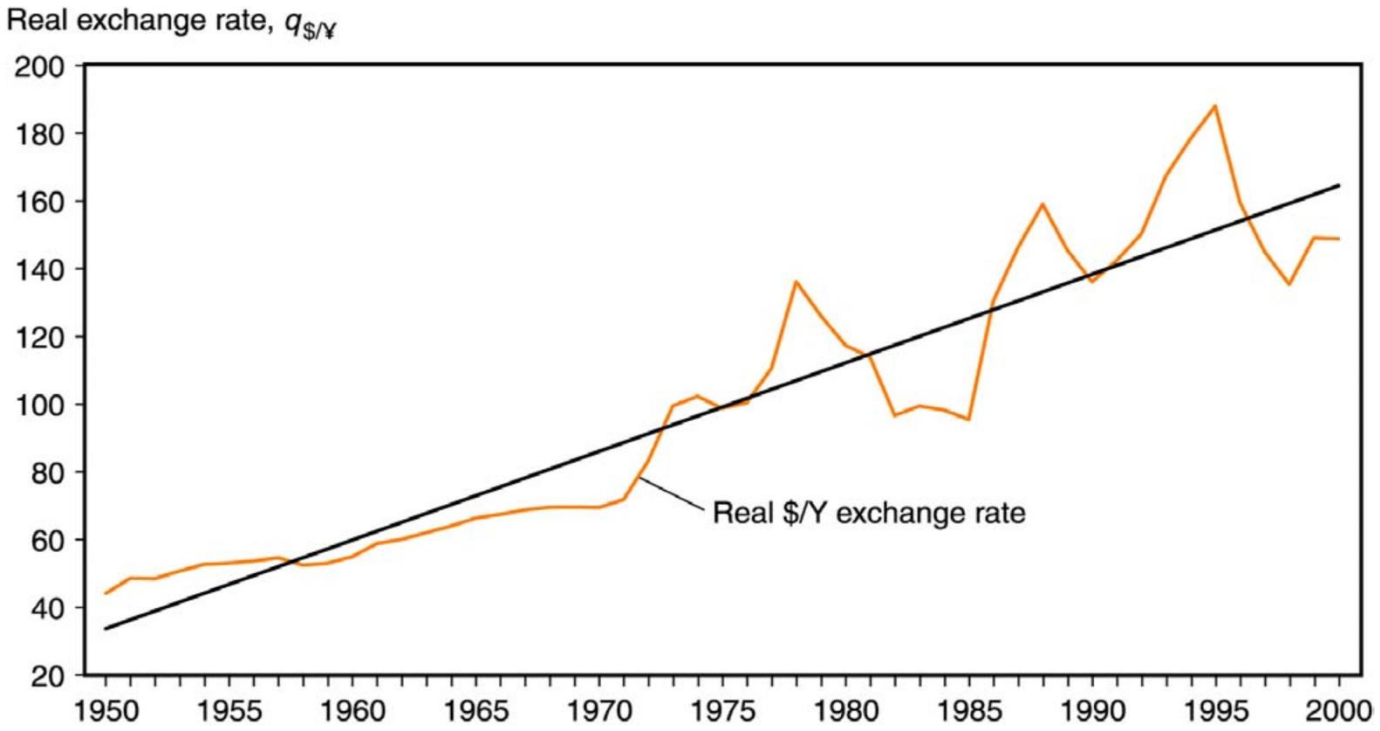
	Type of shocks	Nominal Exchange Rate	Real Exchange Rate
Monetary Shocks	Increase in money Supply	Nominal depreciation $	No change
	Increase money supply growth	Nominal depreciation $	No change
Real Shocks	Increase in demand for US output	Nominal appreciation $	Real appreciation
	Increase in US output (incr. prod.)	Ambiguous	Real depreciation

When the disturbances are monetary in nature, exchange rates obey relative PPP in the long run. When disturbances affect output markets, the exchange rate does not obey the PPP both in the long run than in the short run

Prices Levels and FX in the Long Run

Nominal and Real Exchange Rates in the Long-Run

The Real Dollar/Yen Exchange rate

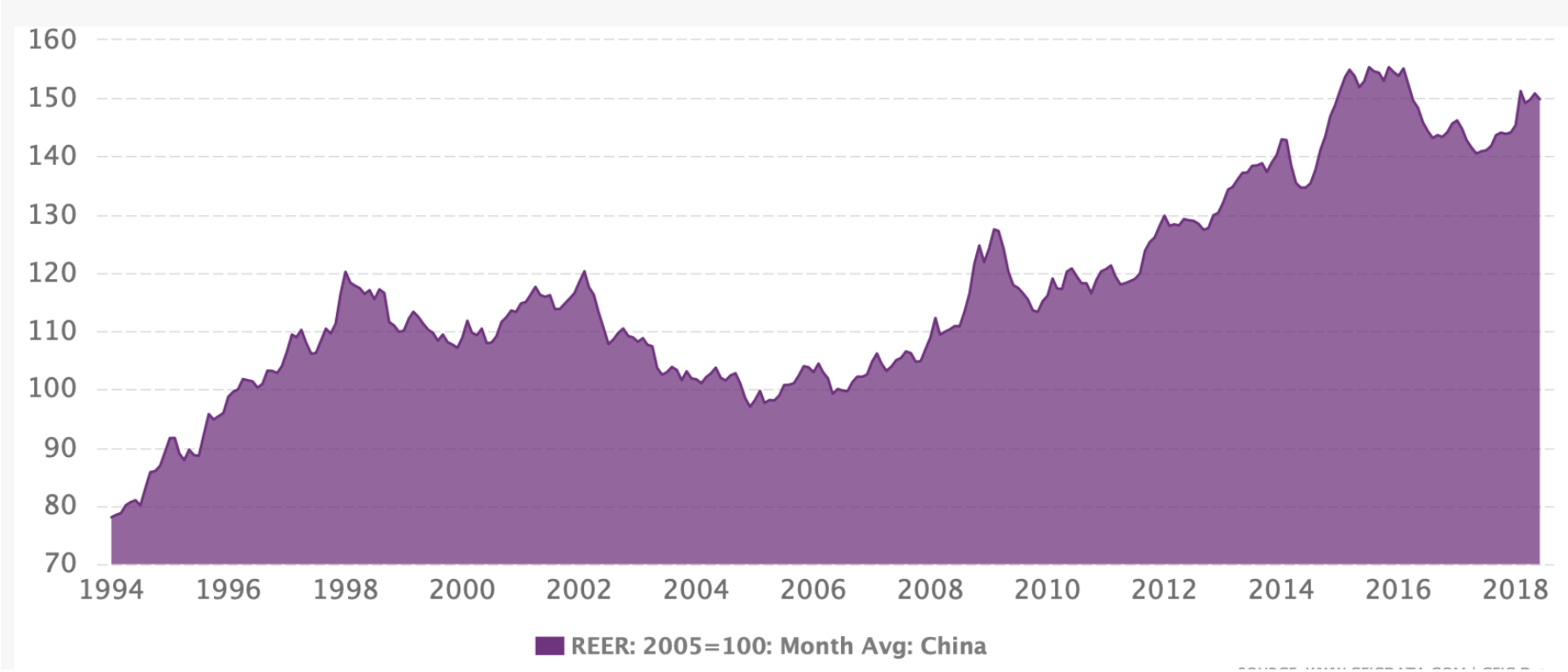


The U.S. dollar has steadily depreciated in real terms against Japan's yen. (The straight line indicates the average trend over time in the real exchange rate.)

Prices Levels and FX in the Long Run

Nominal and Real Exchange Rates in the Long-Run

View China's Real Effective Exchange Rate from Jan 1994 to Jun 2018 in the chart:



An increase in REER here indicates a reduction of competitiveness (an appreciation of real exchange rate)

Prices Levels and FX in the Long Run

Nominal and Real Exchange Rates in the Long-Run

Real Effective Exchange Rate behavior in developing countries

Technological progress leading to productivity increases in goods commonly traded, called tradables, is an important factor in dertemining fluctuations in REER . Higher productivity lowers production costs, thus lowering prices of such tradable goods in the higher-productivity country, which then translates into lower tradable goods prices elsewhere through international competition. But not all goods are tradables. Nontradable sectors, such as housing and many personal services, face minimal international price competition. So the prices of tradable goods will tend to fall relative to those of nontradable goods. To the extent that nontradable goods have a large weight in the country's consumption basket, the country's consumer price index will rise relative to the international consumer basket; hence, its REER will tend to appreciate. This mechanism is often referred to as the "Balassa-Samuelson effect." Both theory and data support that much of the REER variations across countries are accounted for by fluctuations in the prices of nontradables relative to those of tradables, and particularly so among developing countries.

Prices Levels and FX in the Long Run

Interest rate difference and Real Exchange rate

$$(q^e_{\$/€} - q_{\$/€})/q_{\$/€} = [(E^e_{\$/€} - E_{\$/€})/E_{\$/€}] - (\pi^e_{US} - \pi^e_{E}),$$

$$R_{\$} - R_{€} = (E^e_{\$/€} - E_{\$/€})/E_{\$/€}.$$

$$R_{\$} - R_{€} = [(q^e_{\$/€} - q_{\$/€})/q_{\$/€}] + (\pi^e_{US} - \pi^e_{E}).$$

Note that if PPP holds ($q^e - q$) / q will drop to zero. In general, however, the dollar/euro interest difference is equal to the sum of two components: 1) the expected rate of change of real exchange rate and 2) the expected inflation rate differential. For example, if U.S. inflation will be 5 percent per year forever and European inflation will be zero forever, the long-run interest difference between dollar and euro deposits need not be the 5 percent that PPP (when combined with interest parity) would suggest. If, in addition, everyone knows that output demand and supply trends will make the dollar depreciate against the euro in real terms at a rate of 1 percent per year, the international interest spread will actually be 6 percent.

Prices Levels and FX in the Long Run

Real Interest Parity

$$R_{\$} - R_{€} = [(q^{e}_{\$/€} - q_{\$/€})/q_{\$/€}] + (\pi^{e}_{US} - \pi^{e}_{E}).$$

$$r^{e} = R - \pi^{e}.$$

$$r^{e}_{US} - r^{e}_{E} = (q^{e}_{\$/€} - q_{\$/€})/q_{\$/€}.$$

Expected real interest rate are the same when relative PPP holds. However, if there factors that permanently change the expected real exchange rate need not to be equal even in the long run.
For example, let suppose that in South Korea we expected a continuous growth in productivity in the tradable sector in the next 10 years while the productivity stagnates in the non tradable sector. This means that, if Balassa–Samuelson* effect is in place, the Korean goods will become relatively speaking more and more expensive and therefore the US dollar will depreciate in real terms against the Won. The expected real interest rate as a consequence should be higher in the US.

* Price levels among countries when measures in one currency tend to be lower as a country is poorer. According to **Balassa-Samuelson** this is because in poor countries prices in the non tradable sector are lower. This is because the wages are lower, while prices in the tradable sector are close to those of the rich countries. In the rich countries prices in the non tradable wages are higher because wages are higher in the tradable sectors. This reason is because the productivity is higher in the rich countries than in poor countries. As a country becomes richer wages in the non tradable sector become more aligned to those of tradable sector and price levels tend to rise.

Prices Levels and FX in the Long Run

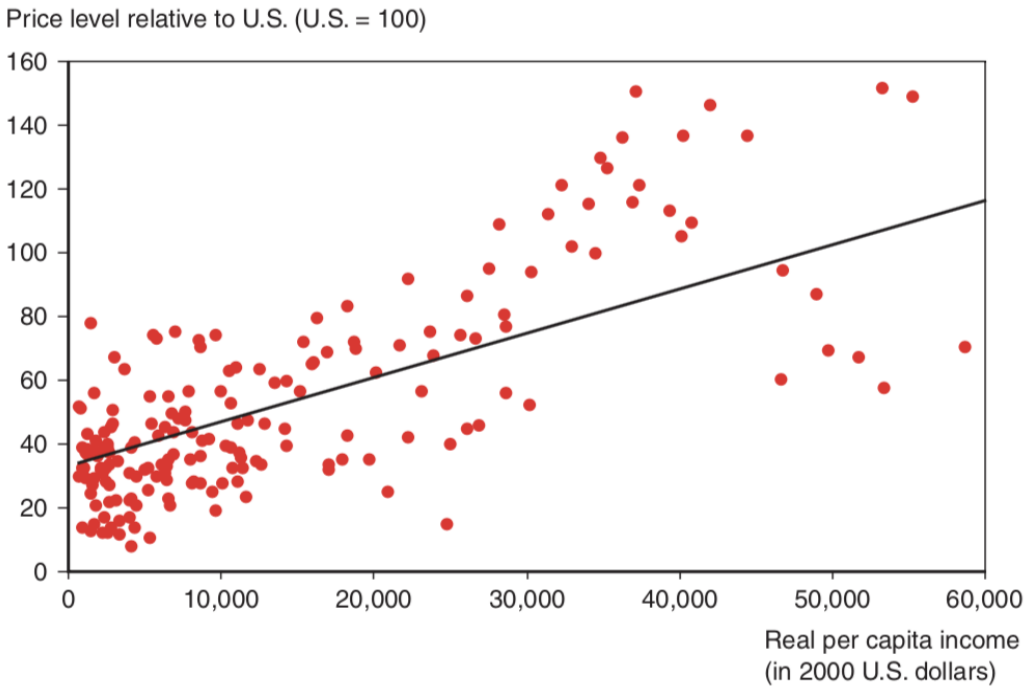
Why Price levels are lower in Poorer Countries

- When expressed in terms of a single currency we see strong correlation between price level and real income per capita. International variations in the prices of the non tradable goods explain this variation.

- The Balassa-Samuelson explanation is based on the fact that richer countries are more productive in the tradable sector than the poorer countries, while in the non tradable sector the differences are negligible.

- According to the Balassa-Samuelson effect, this is due to productivity growth differentials between the tradable and non-tradable sectors in different countries. High-income countries are more technologically advanced, and thus more productive, than low-income countries, and the advantage of high-income countries is greater for the tradable goods than for the non-tradable goods. According the law of one price, the prices of tradable goods should be equal across countries, but not for non-tradable goods. Higher productivity in tradable goods will mean higher real wages for workers in that sector, which will lead to higher relative price (and wages) in local non-tradable goods that those workers purchase. Therefore, the long-run productivity difference between high- and low-income countries leads to trend deviations between exchange rates and PPP. This also means that countries with lower per capita income will have lower domestic prices for services and lower price levels.

- High growth countries will experience a higher inflation due to a stronger price dynamics in the non tradable sector with an appreciation of the real exchange rate.



Prices Levels and FX in the Long Run

Balassa – Samuelson Effect

The Balassa-Samuelson effect, also known as the Balassa-Samuelson hypothesis or the Penn effect, is an economic theory that explains the relationship between productivity growth, real exchange rates, and the relative price levels in different countries. It is named after economists Bela Balassa and Paul Samuelson, who independently formulated the hypothesis in the 1960s.

The Balassa-Samuelson effect starts with the observation that differences in productivity levels between countries can lead to differences in the real income and wage levels in those countries. Specifically, the theory suggests that countries with higher productivity growth in their tradable sectors (industries that can export and import goods and services) will experience higher wage growth in those sectors, as workers' wages tend to rise in line with productivity gains. This results in higher prices for tradable goods and services in those countries.

However, in non-tradable sectors (industries that do not easily participate in international trade, such as haircuts or housing services), wages tend to be determined by the overall level of economic development and productivity in the country. Therefore, in countries with high productivity growth, wages in the non-tradable sectors also tend to rise.

The key implication of the Balassa-Samuelson effect is that countries with fast-growing productivity in their tradable sectors will experience higher inflation in these sectors compared to countries with slower productivity growth. This will lead to a higher relative price level in the fast-growing productivity country, making its currency appreciate in real terms compared to other countries with slower productivity growth.

In essence, the Balassa-Samuelson effect explains how differences in productivity growth can lead to differences in relative price levels and real exchange rates between countries. This effect has important implications for international trade, as it can impact the competitiveness of countries in the global marketplace and have consequences for trade balances, currency exchange rates, and inflation rates.

Output and the Exchange rate

The Aggregate Demand

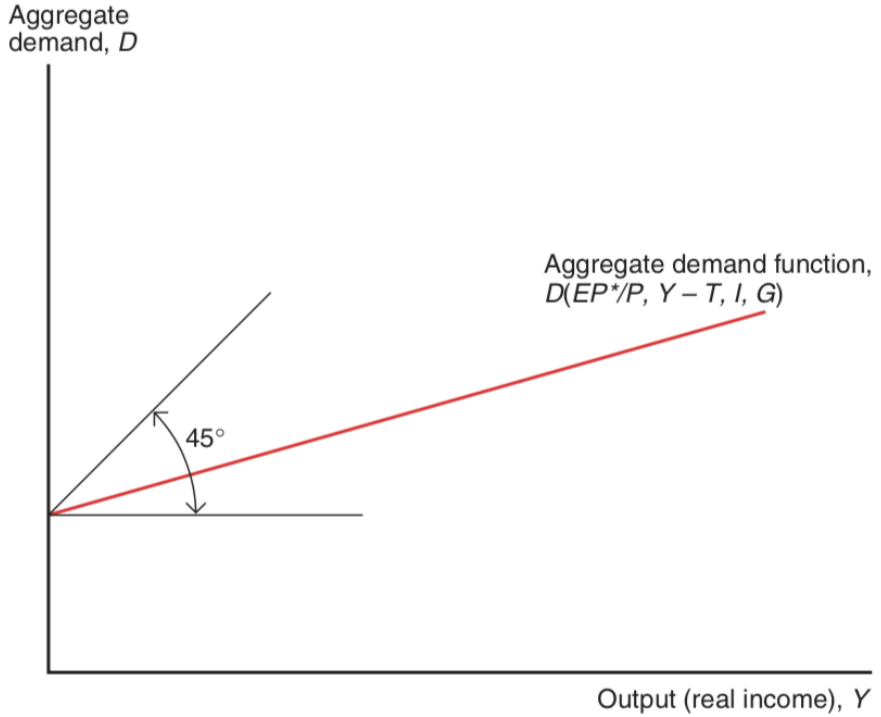
$$D = C(Y - T) + I + G + CA(EP^*/P, Y - T),$$

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

- *Consumption demand*. It increases as disposable income increases.

- *Current Account (EX-IM)*. When the real exchange rate depreciate export goods become cheaper to foreign consumers, therefore EX increases. The effects on IM are more complicated. Now the same basket of goods have a higher values. Even though the IM will decline in real terms because are more expensive, the IM in domestic value terms might be higher than before the depreciation. However, we **will assume** that a depreciation of real exchange rate will cause always an increase of the CA. The second factor that influences the CA is the disposable income (Y – T). An increase in Y^d will cause an increase in all component of the income included the imports.

- The Aggregate demand is therefore a function of the real exchange, disposable income, investment demand and government spending. The increase in aggregate demand is less that an increase in income the slope of the curve is less than one. This is due to the fact that a portion of the spending is devoted to foreign goods.



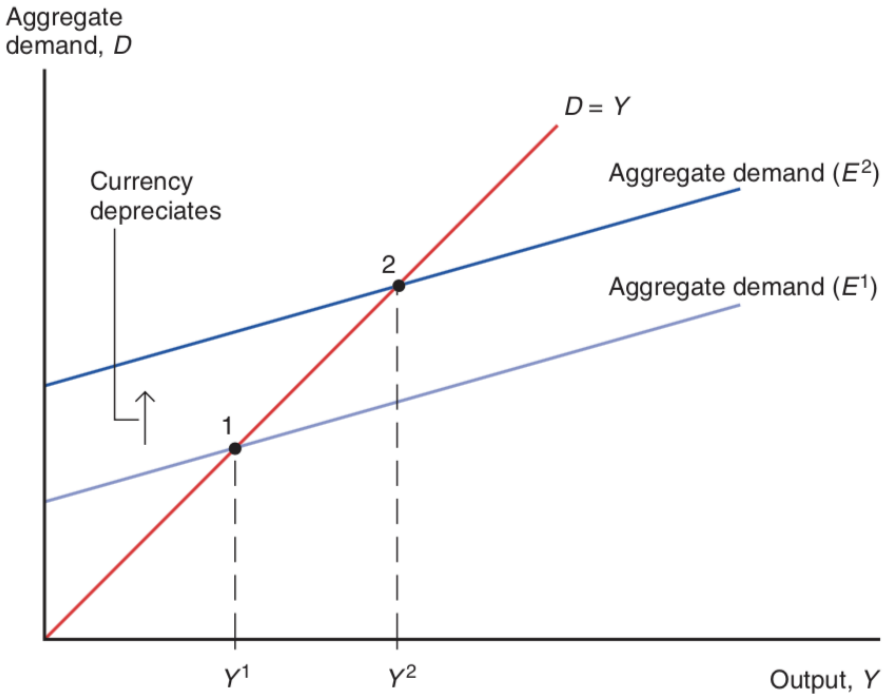
Output and the Exchange rate

The Short Term Equilibrium

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

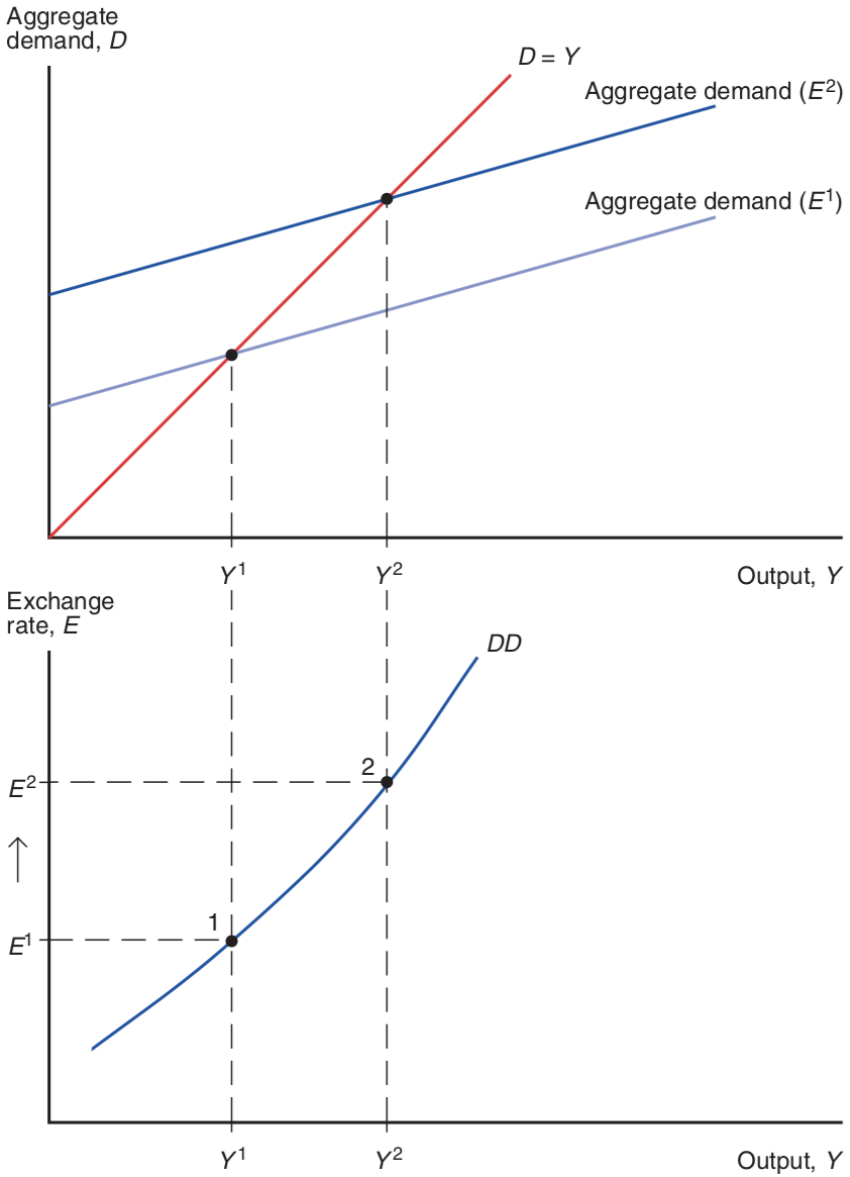
$$Y = D(EP^*/P,\ Y - T,\ I,\ G).$$

- The equality of aggregate demand and aggregate supply determines the short run equilibrium.
- With fixed price at home and abroad, a devaluation of the currency will shift the aggregate demand upward. Any rise of real exchange rate, EP^*/P, *depreciation,* due to a rise in *E, P* or declines *in P** will cause un upward shift of the aggregate demand curve and vice-versa.
- The effect of domestic real income on aggregate demand is more complex. An increase in disposable income increases C, but lower CA by increasing demand for foreign products. However, the fist effect dominates the second effect. *Therefore, a rise in domestic real output raises demand for home output, and a fall in domestic real output lowers aggregate demand for home output.*



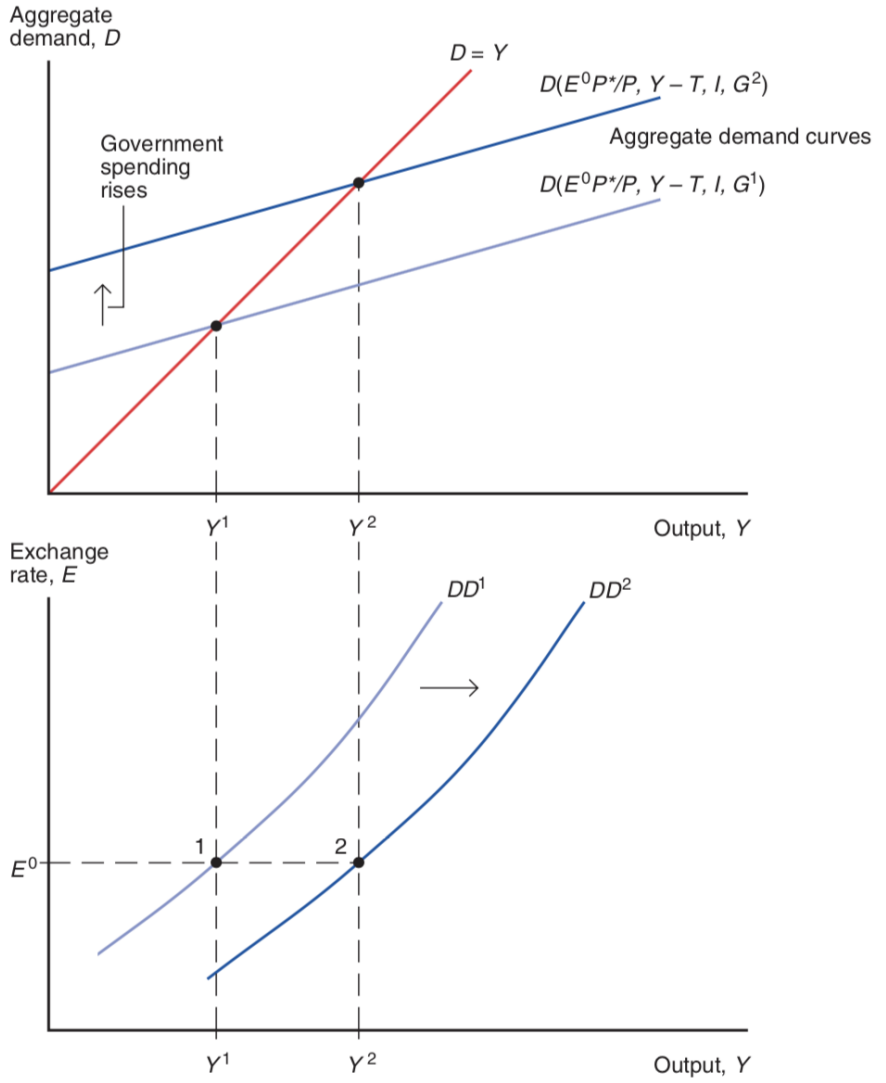
Output and the Exchange rate
The DD Schedule

- We assume the P and P* are fixed in the short term. The DD schedule show all the combination of E and output for which aggregate demand is equal to aggregate supply in the short term.
- A depreciation of E (higher E) is associated with higher level of Output and vice-versa.



Output and the Exchange rate
Factors that Shift the DD schedule

- A change in G, I and T affect aggregate demand. An increase causes a DD shift to the right and vice-versa.
- A change in P*. A rise in P* make foreign good more expensive. This increase causes an increase in the domestic demand. DD shifts to the right.
- A change in P. An increase in P, given E and P*, makes domestic good more expensive. DD shift to the left.
- A change in the consumption function. Residents want to consume more and save less. DD shifs t to the right.
- A demand shift between foreign and domestic good. If resident and/or non-resident dedicate more spending in the domestic goods DD shifts to the right



Output and the Exchange rate

Asset Markets Equilibrium in the Short Term: AA Schedule

- The AA schedule shows the combination of output and exchange rate that are consistent with the asset market equilibrium.
- It is easy to derive this relationship looking at the money market and the FX market (asset markets).
- An increase in the output, shifts the money demand curve to the right pushing up the domestic interest rate.
- From the interest parity condition, given E^e, R^*, an increase in R causes an fall in *E* (appreciation).
- *For asset markets to remain in equilibrium, a rise in domestic in domestic output must be accompanied by an appreciation of the domestic currency and vice-versa.*

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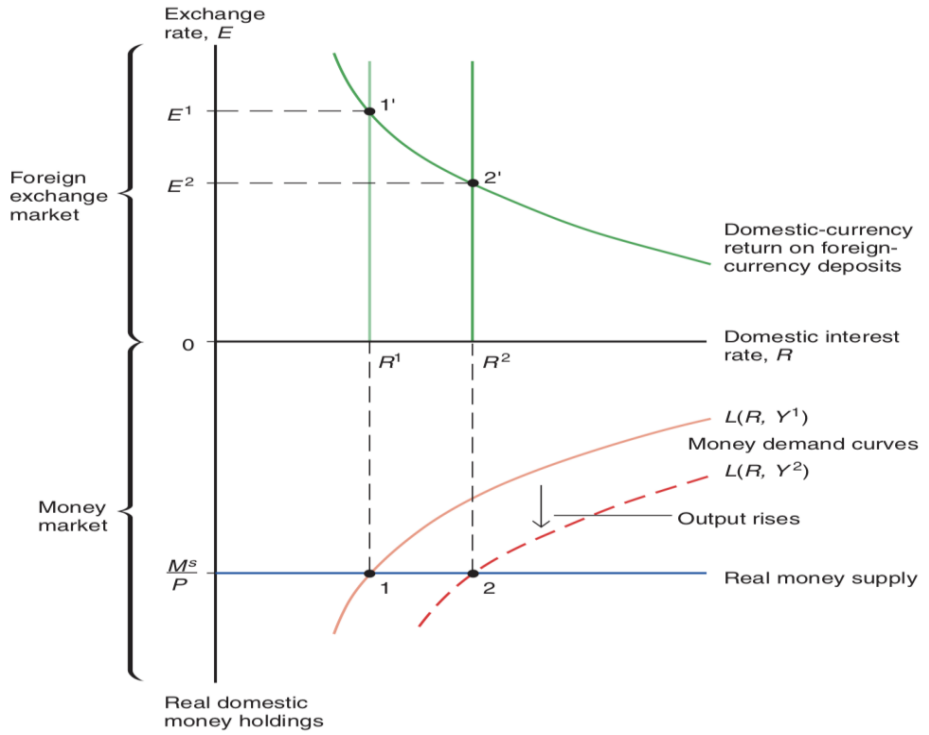
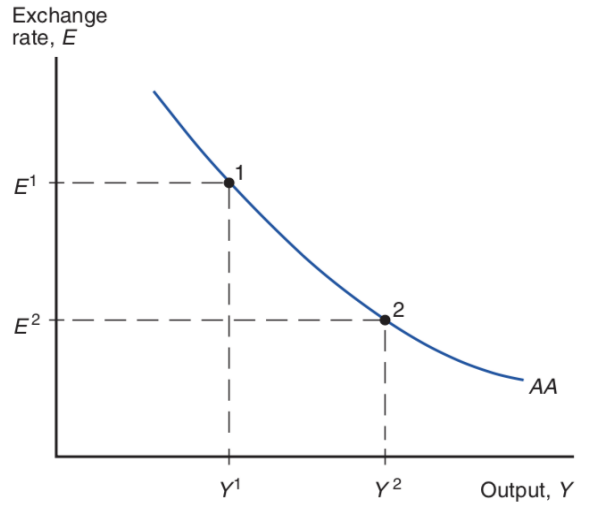
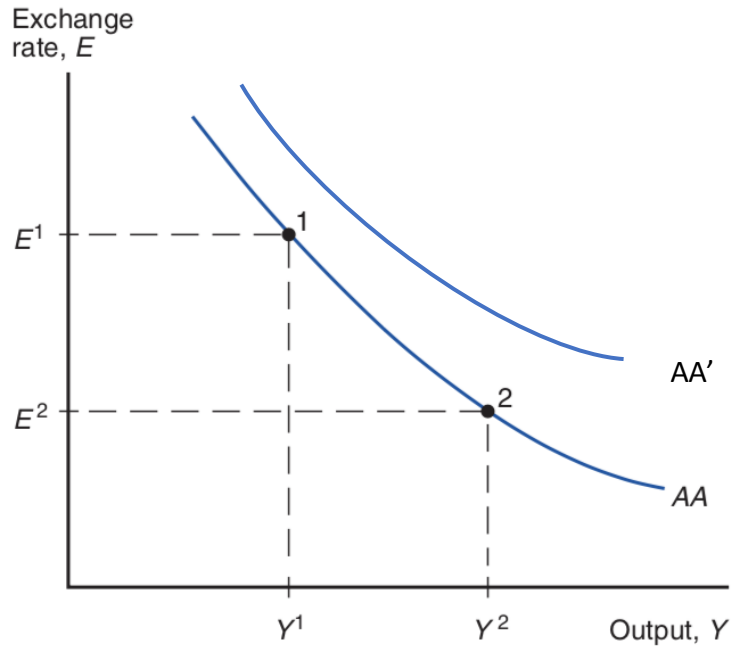




Output and the Exchange rate
Asset Factors that Shift the AA schedule

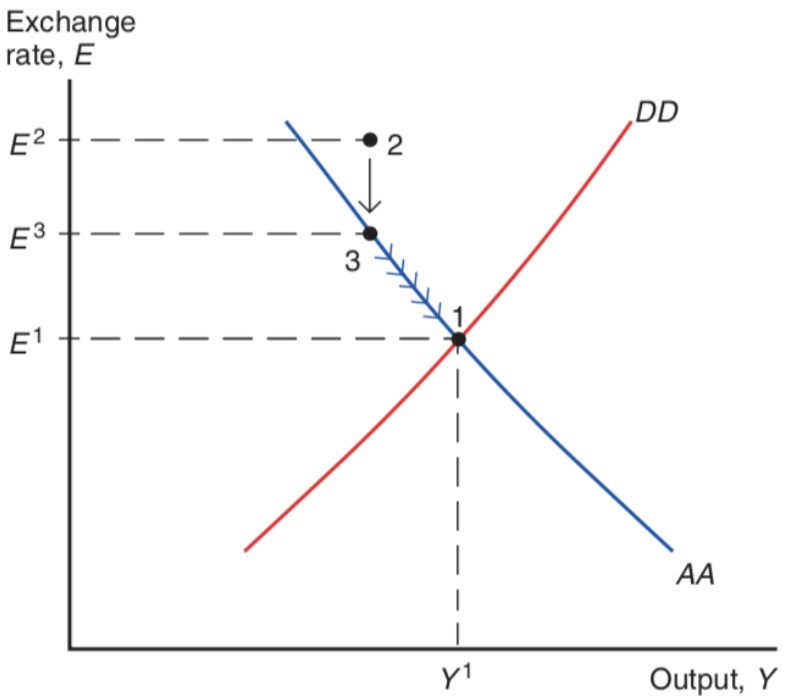
- *A change in M*. An increase in *M* cause *E* to depreciate. For each level of Output *E* is higher. AA shifts to the right.
- *A change in P.* An increase in *P* reduce the real money supply. Higher interest rate, *E* (appreciate) falls. AA shifts to the left.
- *A change in* E^e. An increase in the expected exchange rate, other things equal, to keep the parity condition causes an increase in *E*. AA shifts to the right.
- *A change in R** . A rise in R* causes a depreciation (E increases) to restore the parity condition. The AA shift to the right.
- *A change in real money demand*. An increase in real money demand will causes an increase in the interest rate (money market). E will appreciate (E will fall) for each level of output. AA shifts to the left.



Output and the Exchange rate

Short-Run equilibrium

- The short run equilibrium occurs at point 1 where the asset markets and output (goods) markets are in equilibrium.
- Suppose that the economy is at point 2. In the asset markets at the current level of E^2 there will be an excess demand of domestic currency because it is “too much” depreciated to be consistent with the interest rate differential. The exchange rate will fall to E^3. But at this level there will be an excess demand in the good markets (goods are cheap for foreign buyer). *E* will appreciate (fall) to achieve E^1



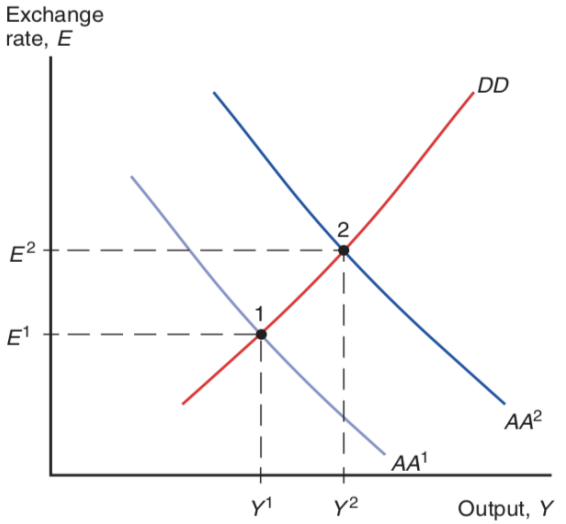
Output and the Exchange rate

Monetary Policy and Fiscal policy

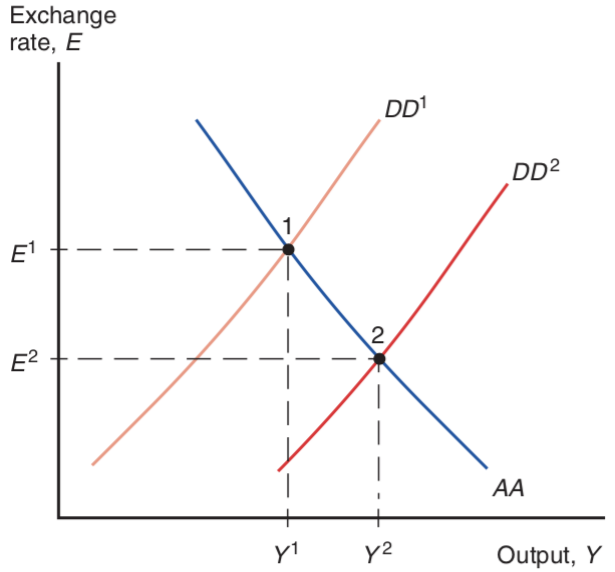
- **Monetary Policy**. The increase in the money supply reduce the interest rate which will cause a depreciation of *E*. This will stimulate the demand. The excess demand in the good market will push output from Y^1 to Y^2 .

- **Fiscal policy**. An expansionary fiscal policy which can take the form of an increase in *G* and/or a reduction in *T*. The increase in the demand push Y^1 to Y^2. This will increase the demand for real balances pushing up interest rate, and thus, appreciating (a fall) the exchange rate, *E*.

Increase in Money Supply



Temporary Fiscal expansion

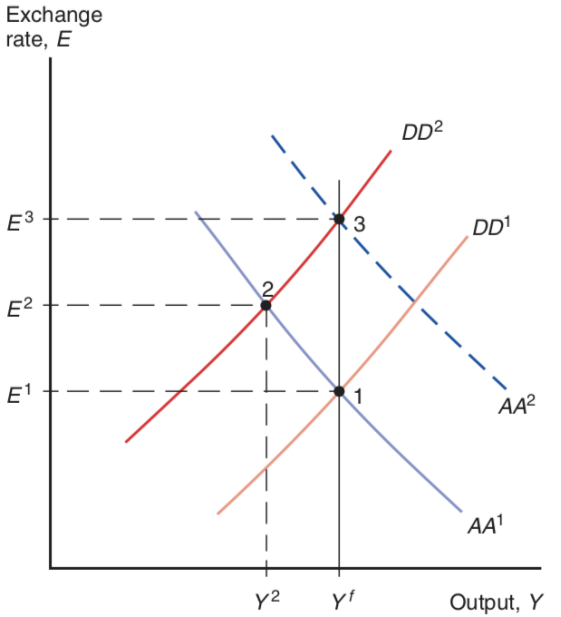


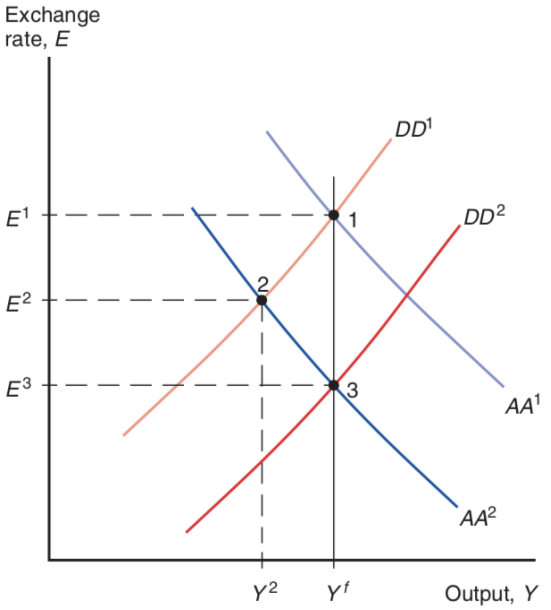
Output and the Exchange rate

Temporary Changes in Monetary and Fiscal policy

- **Temporary Fall in World Demand.** DD shifts to the left. A temporary fiscal expansion can restore full employment output by shifting back the DD curve. A temporary expansionary monetary policy can shift the AA curve to achieve full employment (Y^f). The fiscal policy restore the exchange rate at the original level, while the monetary policy causes E to depreciate.

- **Temporary Increase in Real Money Balances**. AA shifts to the left. A temporary increase in money supply and or a an expansionary fiscal policy can restore the full equilibrium condition (Y^f).





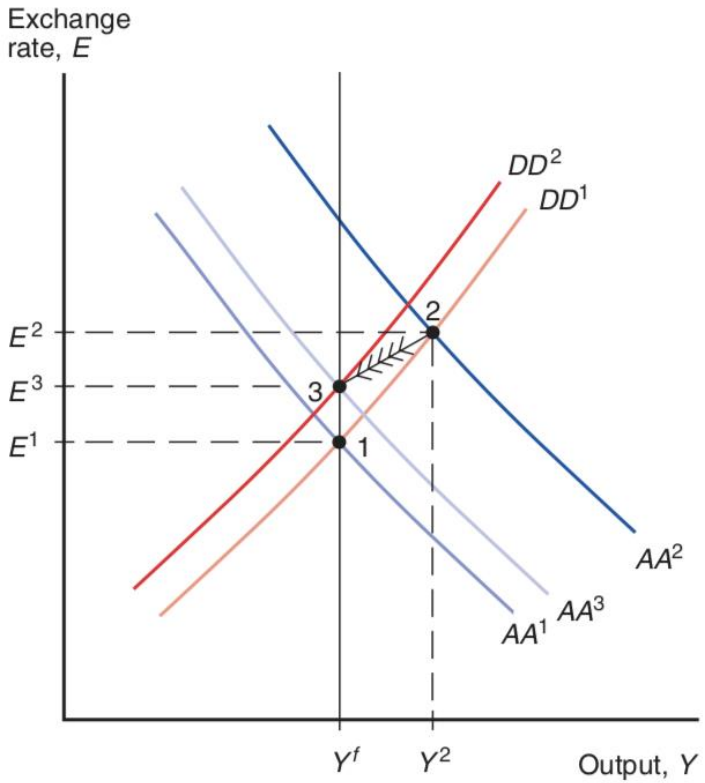
Output and the Exchange rate
A permanent increase in the money supply

- A permanent shift affects not only the government policy's instrument but also the future exchange rate

- The AA shift to the right is higher with respect to a temporary increase because E in order to keep the parity condition in the asset markets is overshooting.

- If the economy is above full employment prices will start to rise. As domestic prices increase the foreign demand of domestic will decrease (CA fall) and DD will shift to the left.

- The AA and DD will eventually set back at point 3 which corresponds to the full employment equilibrium with a higher level price, an exchange rate devaluated and the same interest rate.



Output and the Exchange rate
A permanent Fiscal Expansion

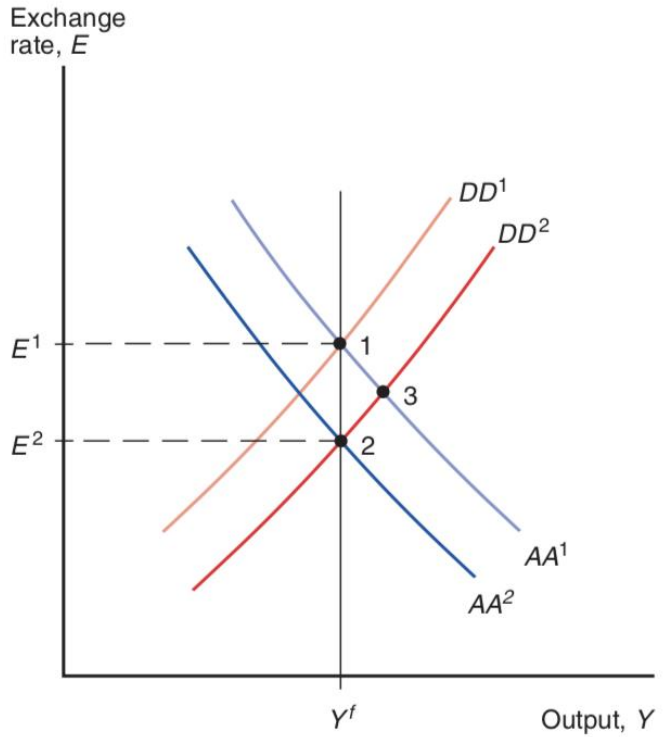
- A permanent fiscal expansion affects not only the output market but also the asset markets through its impact on future exchange rate expectations.

- A permanent increase in government spending for **domestic goods** causes a shift to the right di DD and an appreciation of the long term exchange rate E^e.

- The fall in E^e pushes the AA schedule to the left until the new equilibrium is achieved at point 2

- Notice that the output does not change because the increase *G* is crowded out by a decline of foreign demand (reduction in *CA*) due to the appreciation of *E* (a fall in *E*).

- Notice that the change in nominal *E* is a real appreciation because the permanent increase of the government causes a change in relative output demand with respect to foreign products (change in relative prices).



Output and the Exchange rate
Macroeconomic Policies and the Current Account

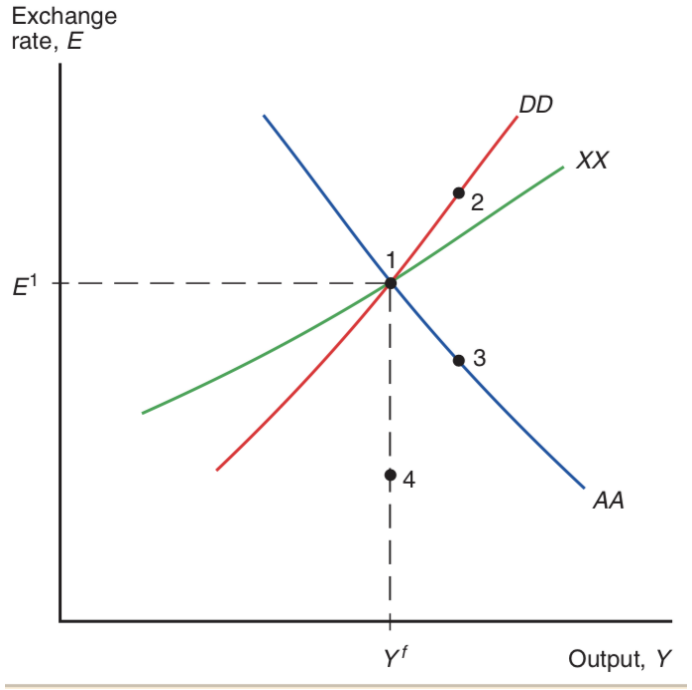
- Excessive *CA* imbalances are a main concern for policy makers and politicians. Monetary and fiscal policies are used to affect *CA*.

- The XX curve indicates the combination of output and *E* that keep the *CA(EP*/P, Y - T) = X* at a desired level. It slops positively because an increase in Y worsens the CA if it is not compensated by a depreciation of *E*. In fact, keeping E constant as E goes up (goes down) the CA increase (decreases).

- Notice that in point 2 CA > X because E is more depreciated than in XX where E is depreciated to maintain in equilibrium the CA. This is because part of the income is saved, and part is spent to acquire foreign goods. In order to have equilibrium in the good markets, E must depreciate to sustain higher foreign demand to fill the gap. Foreign demand must be stimulated to cover for the slack left by domestic saving and the part of the income dedicate to purchase foreign goods. Along the XX curve E is depreciated to keep constant the CA but not enough to have equilibrium in the whole good market. Therefore, XX is less steep than DD. If in 1 CA=X, it follows that in 2 CA > X.

- *An increase in monetary policy shifts AA to 2. Since 2 is above XX a monetary expansion causes the CA to increase.*

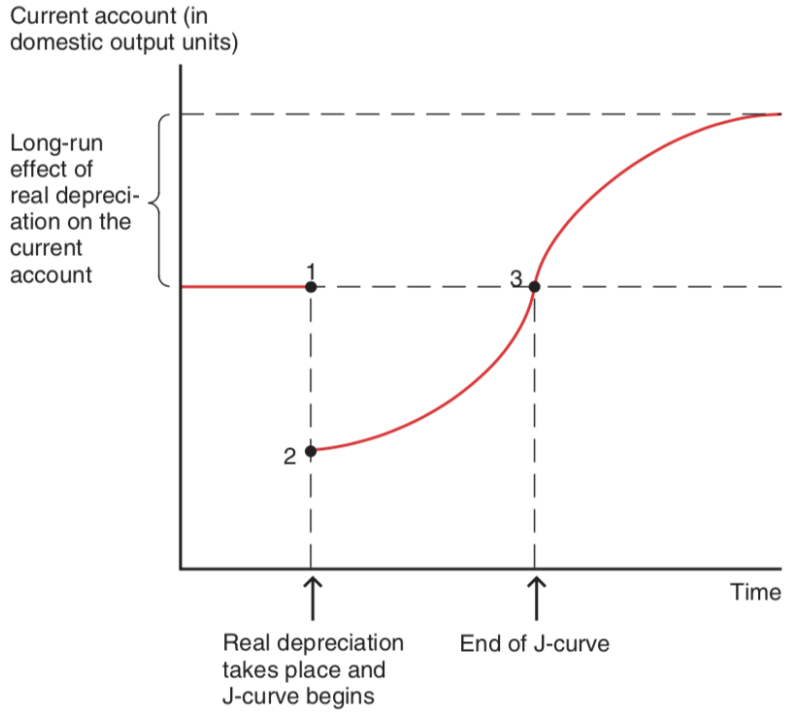
- *An increase in fiscal policy shifts DD to 3. Since 3 is below XX a a fiscal expansion causes the CA to decrease.*



Output and the Exchange rate

The J curve

- CA can actually deteriorate right after a real currency depreciation because most import and export orders are placed several months in advance.
- The first effect of a depreciation is to increase the value of imported goods. If export initially do not change the final effect is a deterioration of CA.
- To expand new export takes some time. To observe the full effect of on the CA of a depreciation of E it takes almost one year.
- An expansionary monetary policy contrary to what we have seen so far could contract output in the very short term.



Output and the Exchange rate

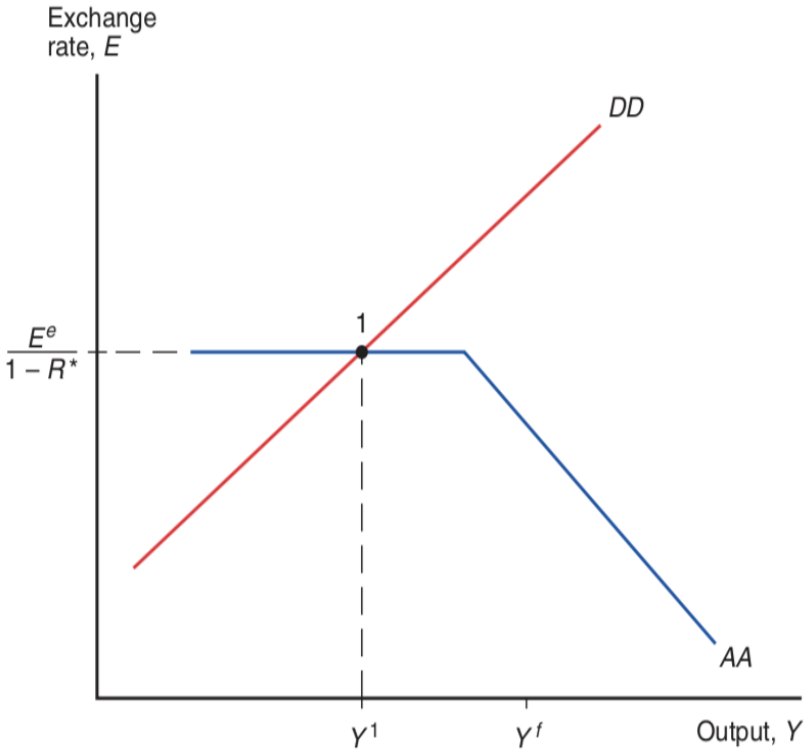
The Liquidity Trap

- In Japan in the late 90s and in the last Great Recession we have seen the return of the liquidity trap. As interest rate approach to zero monetary policy becomes ineffective. Interest rate has a “natural” floor equal to zero. People can avoid negative interest rates just holding currency.

- Suppose that $R=0= R^* + (E^e - E)/E$. If you want to depreciate E you need a negative interest rate, but for the reason mentioned above that is not possible. E cannot depreciate beyond the level $E = E^e/1 - R^*$.

- This fact is captured by the flat part of the AA curve. Expansionary monetary policy will have no effect as people will hold the extra money. One way to escape from this trap is convince people that the monetary is permanent so that E^{e} rises in accordance with money supply. This will shift up the AA curve and E will depreciate stimulating the demand (increase of Y up to Y^f).

- During the recent crises Central Banks resorted to unconventional monetary policies (buying long term bonds) to convince the public that their policy was permanent and inflationary.



Fixed Exchange Rate
Fixed exchange Predominancy

- **Fixed exchanges are predominant**. In the XIX century until WWI exchange rate were fixed as well as from 1920 to 1931 and again between 1945 and 1971.

- **Managed floating**. Systems of completely flexible exchange rate are rare. Central banks have concerns about exchange rates. Between the end of World War II and 1973 (Bretton Woods) we were operating under a system of fixed dollar exchange rate. Today we are in a *manage floating* system.

- **Regional Currency Arrangements**. China pegs its currency to the dollar and finance the US CA deficit. Some economists say that we are in a "New Bretton Woods". Some countries belong to exchange rate unions whose members agrees to fix their mutual rates. Since 1999 the European countries have joined the EMU.

- **Developing countries**. Many developing countries peg their currencies to the dollar or some other currencies or "baskets" of currencies

Fixed Exchange Rate
Central Bank intervention

- The assets of the central banks are foreign assets (official reserves in the form of bonds) and domestic assets (government bonds).
- Money supply shrinks or increase when the CB sell or buy assets.
- **Sterilization**. If the Central bank sells foreign Assets this transaction will reduce the money supply. The Central Bank can offset (sterilized) these effects buying domestic assets such as government bonds and so increasing the money supply.

Central Bank Balance Sheet

Assets		Liabilities	
Foreign assets	$1,000	Deposits held by private banks	$500
Domestic assets	$1,500	Currency in circulation	$2,000

Central Bank Balance Sheet After $100 Foreign Asset Sale (Buyer Pays with Currency)

Assets		Liabilities	
Foreign assets	$900	Deposits held by private banks	$500
Domestic assets	$1,500	Currency in circulation	$1,900

Central Bank Balance Sheet Before Sterilized $100 Foreign Asset Sale

Assets		Liabilities	
Foreign assets	$1,000	Deposits held by private banks	$500
Domestic assets	$1,500	Currency in circulation	$2,000

Central Bank Balance Sheet After Sterilized $100 Foreign Asset Sale

Assets		Liabilities	
Foreign assets	$900	Deposits held by private banks	$500
Domestic assets	$1,600	Currency in circulation	$2,000

Fixed Exchange Rate

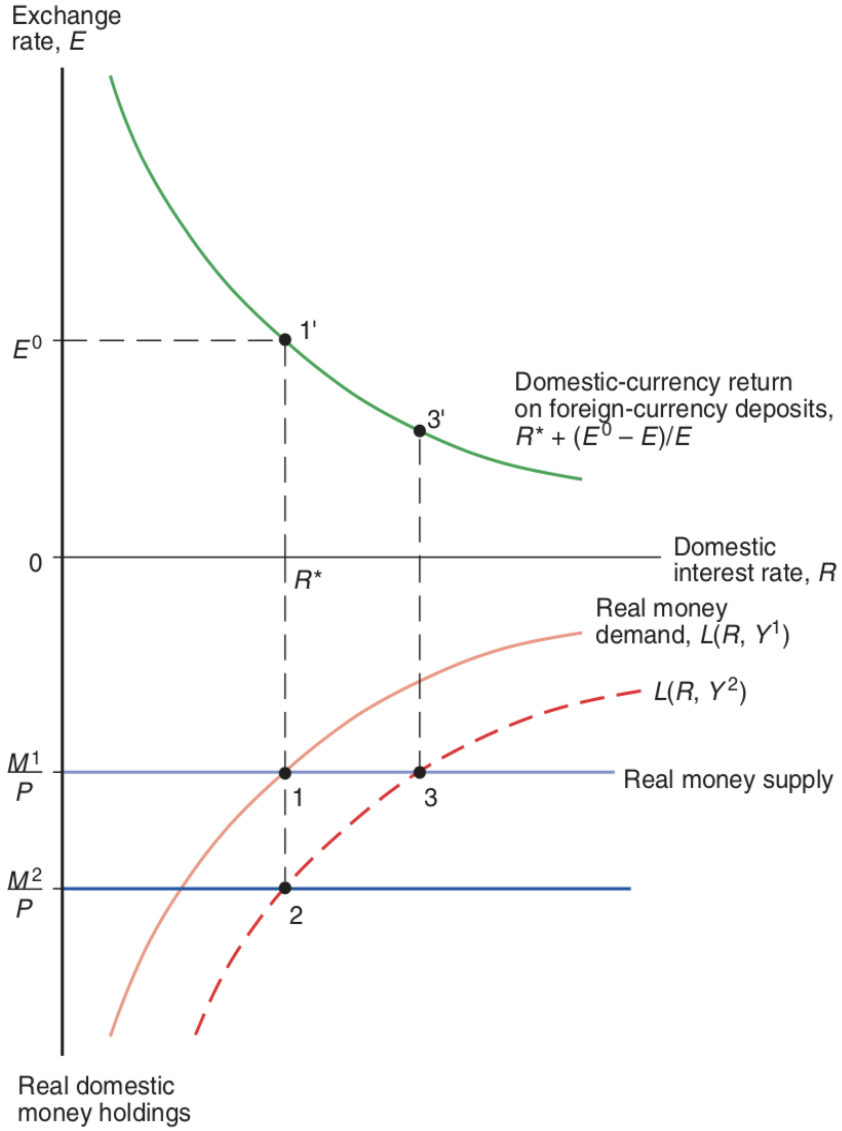
Balance of payment and the money supply

- **Balance of payment = Current Account + Capital Account – Non reserve component component of the Financial account = net purchases of foreign asset by the CB less net purchases of domestic assets by foreign central banks.**
- A deficit balance of payment denotes that the gap of financing the current and capital accounts is covered by the sales of foreign asset by the CB and purchase of domestic assets by foreign CB.
- *If central banks are not sterilizing and the CB has a balance of payments surplus that will cause an increase in the money supply and vice-versa.*

Fixed Exchange Rate

Foreign Exchange market equilibrium under fixed Exchange Rate

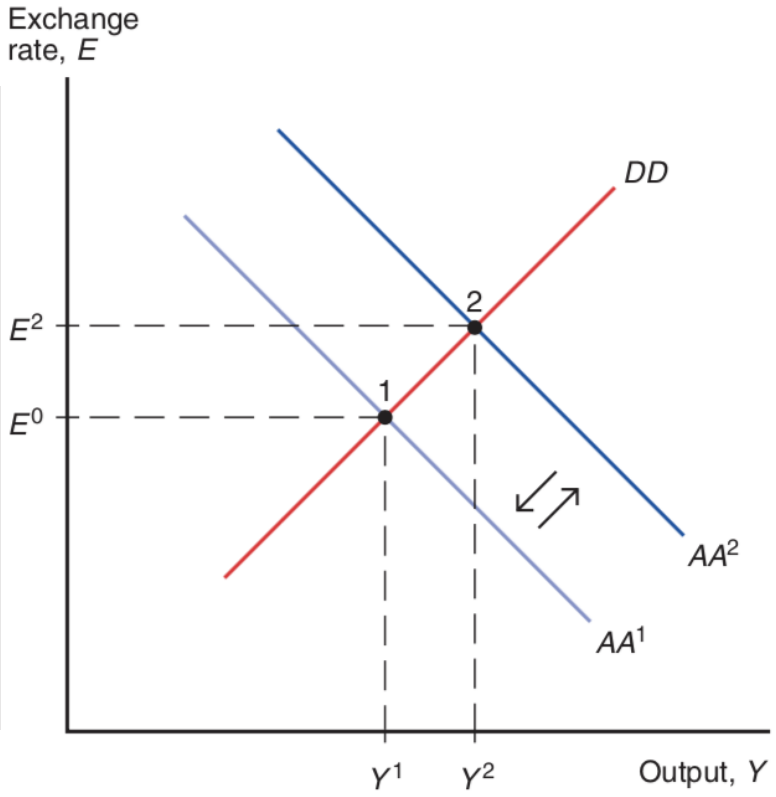
- Let suppose that economy is initially at point 1, where R=R*, domestic interest rate is equal to foreign interest rate, exchange rate is equal to E^0 .
- An increase in Y will shift the real money demand to the right pushing up domestic interest rate. As a result the exchange rate, *E*, will appreciate.
- The central Bank to hold the exchange rate to the E^0 level must intervene in the foreign exchange markets purchasing foreign exchange assets until the real money supply increase to the point re-establish the interest parity condition R*=R.



Fixed Exchange Rate

Stabilization Policy with A Fixed Exchange Rate: Monetary Policy

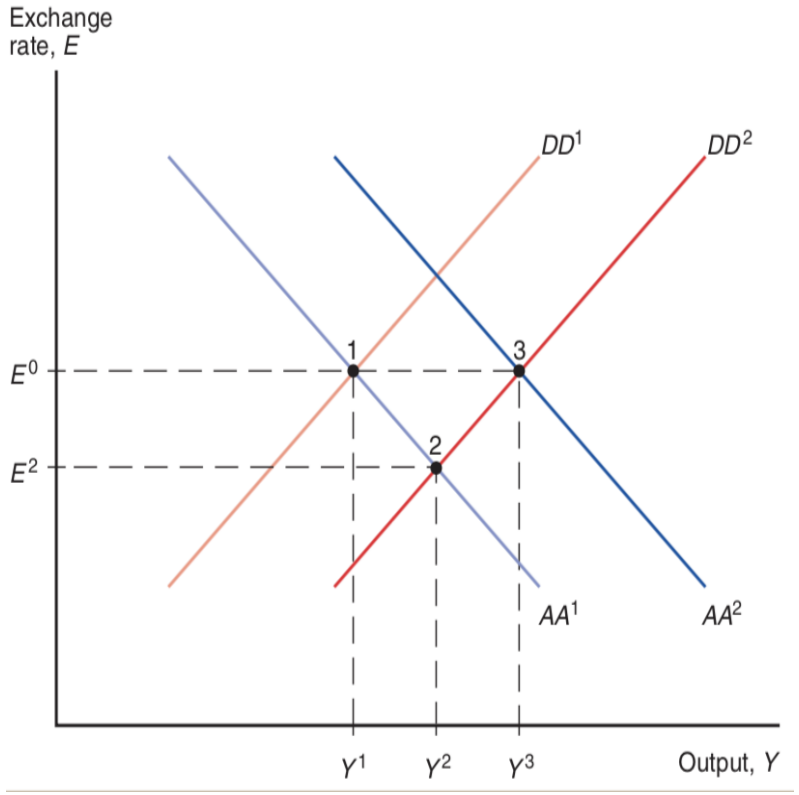
- Initial equilibrium is at pint 1. With fixed exchange rate R=R*. If the CB wishes to increase output using monetary policy through open market operation must buy domestic assets and increase the money supply. AA shift to the right.
- That will depreciate the currency. However, under a regime of fixed exchange rate the CB will try to prevent the depreciation selling foreign assets for domestic money. The result will be a contraction of the money supply pushing back AA to the original position.
- **Under a fixed exchange CB are powerless to affect the economy's money supply.**



Fixed Exchange Rate

Stabilization Policy with A Fixed Exchange Rate: Fiscal Policy

- An expansionary fiscal policy (tax reduction or a government expenditure) will shift the DD curve to right. If the CB refrains to intervene exchange rate would appreciate (2) through the increased in the interest rate due to the expansion of Y.
- However, under fixed exchange rate the CB will buy foreign assets expanding the money supply to keep the exchange rate in the target level (3).
- Unlike the monetary case the fiscal policy can affect output under a fixed exchange rate. Notice under fixed exchange rate fiscal policy can be even more effective than under floating exchange rate. In a floating exchange rate regime, the output will increase to Y^2, while in a fixe exchange rate regime the output will increase up to Y^3.



Fixed Exchange Rate

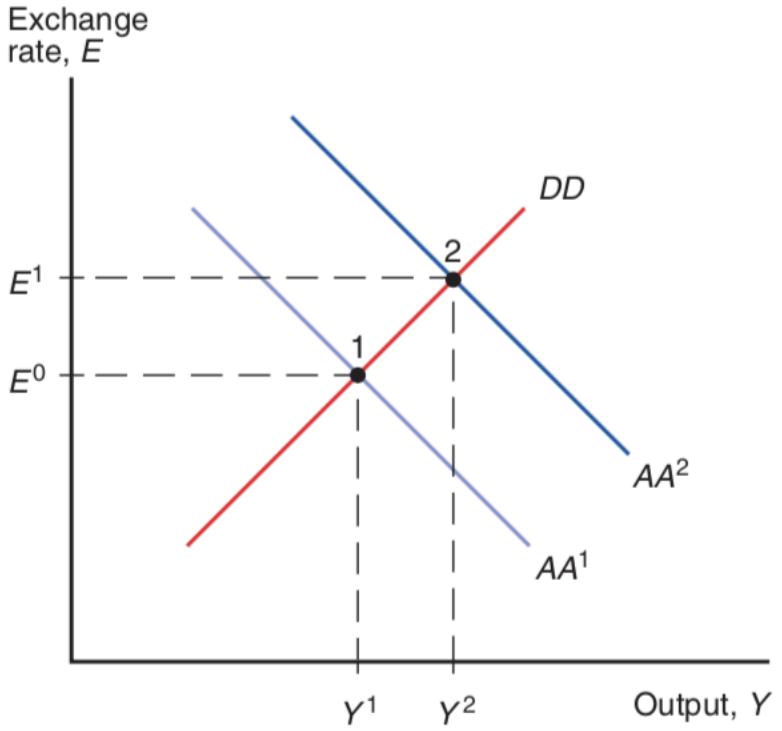
Stabilization Policy with A Fixed Exchange Rate: Change in exchange rate

- Governments that is fixing the FX sometime decides to change the exchange rate parity. For example, if a country is losing foreign reserves might opt for sudden devaluation. One a new exchange rate is fixed the CB must be ready to buy and sell the currency against foreign reserves at the new fixing.

- The Fig. on the right shows how a devaluation affects the output. As E is devaluated the CA increases stimulating output and pushing up the demand for money and the interest rate. E will tend to appreciate. To maintain level of E^1 the CB must increase the money supply shifting AA1 to AA2.

- A devaluation therefore causes a rise in output, a rise in the official reserves, and an expansion of money supply.

- A government can resort to a devaluation for several reasons: a) devaluation can improve the current account; b) a devaluation can help to stop a run on foreign reserves.



Fixed Exchange Rate

Adjustment to Fiscal Policy and Exchange Rate Changes

- If fiscal and exchange rate changes occur when there is full employment and the policy change are maintained for ever, they will cause the domestic price to change in such way that full employment is restored.
- If the economy is at full employment a fiscal expansion will increases output which will causes an increase in P. That will result in a real exchange appreciation (EP*/P, P increases) that will cause a reduction in foreign demand and output will move back to the original position.
- At full employment the increase in government spending has been crowded out by a decline of foreign demand. The long term real exchange rate (EP/P*) has *permanently* appreciated. Remember: Y^f = D(EP/P*, Y^f - T, I, G).
- To sustain the new price level the CB will have to increase the money supply.

Fixed Exchange Rate
Balance of Payment Crisis

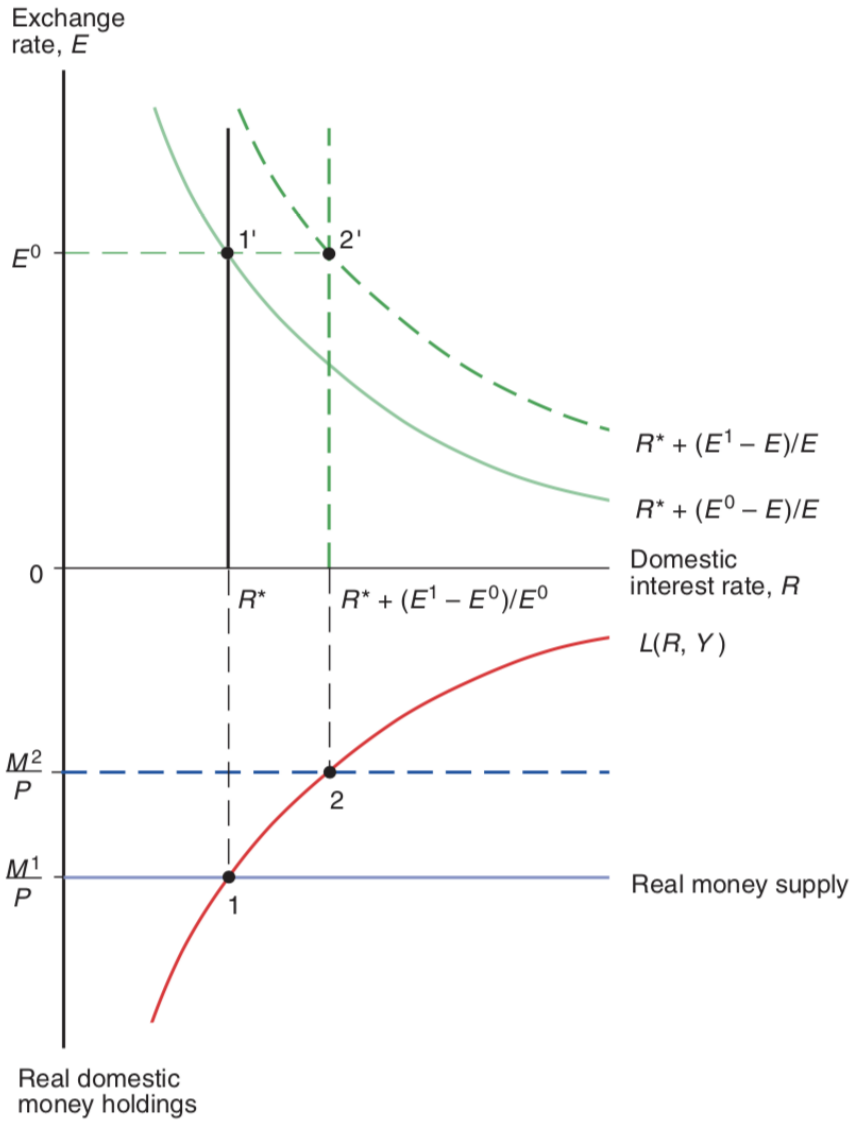
- Under specific circumstances (running short of reserves, high unemployment, et.) , it become very difficult for a CB maintaining and defend a fixed exchange rate. As this happen market's belief in a sudden change in the exchange rate rise to a *balance of payment crisis*.

- The economy start at point 1 with expected exchange rate equal to E^0 and R=R*. A sudden deterioration, for example, of the CA leads to a change in the expectation of the exchange rate to E^1. At the current domestic interest rate level, R*, is more profitable to hold foreign deposits. The CB to peg the exchange rate to E^0 the central bank will sell foreign reserves, and thus, contracting the money supply until the money market is at equilibrium at R* + (E^1 - E^0)/ E^0. As the CB loses reserves and consequently the balance of payment worsens, market participants will expect a further devaluation of the currency. The attempt of the CB to defend the exchange rate will bring about a further loss of reserves. And so on.

- *The expectation of a future devaluation causes a balance of payment crisis marked by a fall in reserves and a rise in the domestic interest rate.*

- The reserve loss with currency devaluation is labeled capita flight.

- When does a balance of payment occur? Any time a government is pursing policies that are not consistent with fixed exchange rate.



Fixed Exchange Rate
Managed Floating and Sterilized Intervention

- Under managed floating monetary policy is driven by exchange rate change without being completely committed to the requirements of a fixed exchange.
- Suppose that CB wants to fight unemployment increasing the money supply. This will lower interest rate and depreciate the exchange rate. However, the CB does not want depreciate the currency. To contrast this CB must intervene in FX market selling foreign assets.
- If we assume perfect asset substitutability as we have done so far with our AA model sterilization is fruitless.
- The key assumption is that the exchange rate is in equilibrium when the expected return in foreign and domestic deposits are the same (interest parity condition holds).
- In contrast we can assume **imperfect asset substitutability**, i.e., when it is possible for the assets' expected return to differ in equilibrium. One factor that makes asset' returns to differ is risk.
- Under imperfect asset substitutability the CB can affect the riskiness of domestic asset without altering the money supply.

Fixed Exchange Rate
Managed Floating and Sterilized Intervention

- Suppose that Government does an expansionary fiscal policy. To avoid an appreciation the CB must expand the money supply. This will eventually causes inflation. The CB could for example intervene in the fx markets selling domestic currency and buy foreign reserves. To avoid an expansion of money supply can do open market operations selling government bonds and withdrawing reserves.

- When domestic and foreign assets are imperfect substitutes the interest parity condition is

$$R = R^* + (E^e - E)/E + \rho$$

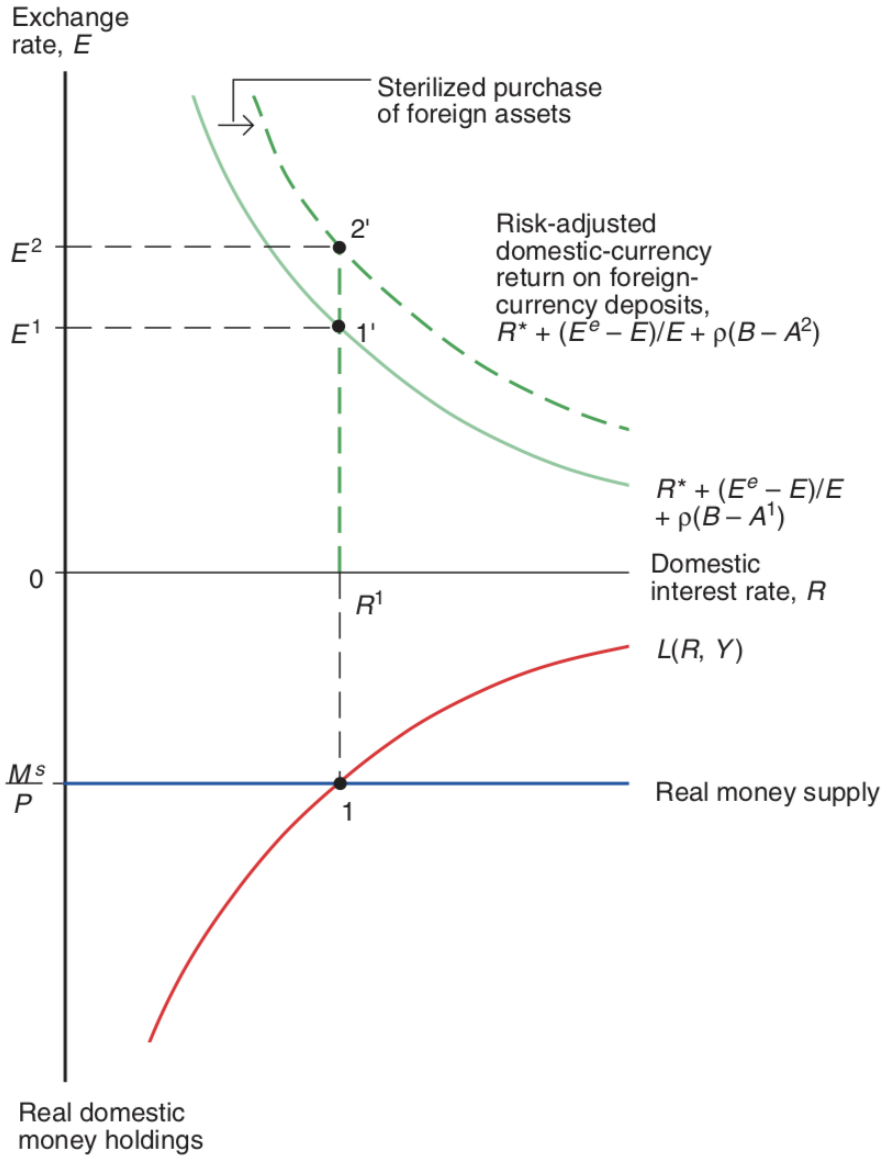
where ρ reflects the difference between the riskiness between domestic and foreign assets. As the CB sell domestic asset and withdraw money the risk premium in domestic asset rises. The stock of the government debt in circulation increases. Investors will be willing to hold more domestic assets (government bonds) if are compensated by a higher return. If B is the stock of government bond and A is the stock held by the CB, then

$$\rho = \rho(B - A)$$

Selling bonds (decreasing the money supply) A declines and ρ increases. Buying bonds (increasing the money supply) and ρ decreases. Now the Central Bank gains a **degree of freedom** and can affect both E and R.

Fixed Exchange Rate
Managed Floating and Sterilized Intervention

- At point 1 the fx market is in equilibrium. The domestic interest rate is equal to the risk-adjusted foreign interest rate.
- Suppose that the Central Bank wants to devalue the currency but keep constant the money supply. First the CB will acquire foreign assets selling domestic currency. That will depreciate the currency. A sterilized intervention leaves the money supply unchanged and so the domestic interest which will remain unchanged. By matching its purchasing of foreign asset with a sale of domestic asset , the central bank holds the money supply constant (pushing up ρ). However, now there are more government bond in circulation (A declines) which causes an increase of ρ (the spread between domestic and foreign bonds). Investors will be willing to hold the new stock of bonds only with a devaluated currency.
- In other words, the increase in the risk premium in domestic asset to keep the parity condition, other things equal, causes a depreciation of E. (E= E^e /(1+R-R*- ρ) (if ρ goes up, E goes down)
- With imperfect asset substitutability sterilized purchases of foreign exchange cause the home currency to depreciate



Fixed Exchange Rate
A Reserve Currency Standard

- The workings of a reserve currency standard are similar to those based on the US dollar set up put in place after World War II until 1973.
- Under the system each CB that participate at the system fixed its currency against the dollar trading domestic currency against dollar asset in the foreign exchange market.
- Since all the currencies of the system are fixed against the dollar all the other cross-currency exchange rate are fixed.
- The country that its currency is held as reserve, i.e. the US, has a special and privileged position. First, he does not need to intervene in FX market and does not have the burden of financing its balance of payment.
- The reserve-issuing country has the clear advantage that he can use monetary policy for internal stabilization purposes and at the same time enjoys fixed exchange rate. The other countries cannot have the privilege to use the monetary policy apart from the strict limits set by sterilization operations.
- If the reserve-issuing country expand the money supply will lower its domestic interest rate and appreciate the other currencies against the dollar. The other currencies will be forced to buy dollar and sell their domestic currencies with the effect of increasing their money supply thus “importing” the monetary policy of the reserve-issuing country. The reserve-issuing country decides the world monetary conditions. (this is known in the literature as **the Nth currency problem**)

Fixed Exchange Rate
The Gold Standard

- The Gold Standard avoids the asymmetry problem of the reserve standard. Under this system each country fixes the prices of its currency against the gold by standing ready to trade domestic currency against the gold metal.
- Under this system all the cross-currency rate are determined. Thus, it is a fixed currency system but here no country has a privileged position.
- Suppose that BoE decides to increase the money supply. This will cause a decrease the interest rate and make foreign asset more attractive. But there will not cause a devaluation of the currency because CB are obliged to trade for gold at fixed rate. Unhappy investor can sell sterling against gold at the CB and sell the gold to foreign CB against foreign currency and get higher interest rate in foreign deposits. The decline in the pound money supply will push back the interest rate to the original position.
- Under Gold Standard there is full symmetry. No country can impose on the others the monetary conditions.

Fixed Exchange Rate

The Gold Standard: Benefits and Drawbacks

Benefits

- Simmetry. No country can play a dominant role.
- CB are constrained to fix the the money price of the gold. No discretionary growth of money
- The real value of money is potentially more stable and predictable and does not depend by the political cycle.

Drawbacks

- CB cannot use monetary policy for stabilization purposes, i. e., fight unemployment, recession , etc.
- The price level is however subject to variations of of supply of gold, New discoveries that change the relative price of gold in terms of the other good are inflationary. If the supply gold on the other hand does not growth in line with economy, the gold standard is deflationary.
- International reserves may become scarce.
- Countries with potentially large gold production (Russia, South Africa) can influence the stability of the international monetary system

International Monetary System
Macroeconomic Goals in an Open Economy

Internal Balance

- **Price stability**
- **Full employment**

External Balance

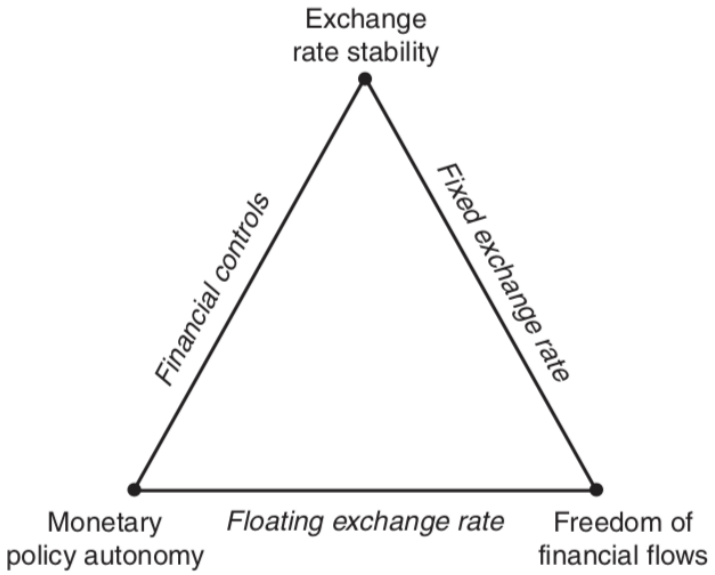
- **Sustainable Current Account**

- **Excessive CA deficit.** No particular problem if the financing is to support productive investments. However, prolonged CA deficits increases the country's foreign debt. With a large foreign debt a country is subject to the risk of a **sudden stop** in foreign lending.

- **Excessive CA surpluses.** An excess of CA surpluses can denote a lack of national investment ($S > I$) : Too much national saving is devoted to foreign investment. However, excessive CA deficits represent a bigger concern for policy makers than excess CA deficits.

International Monetary System

The Open-Economy Trilemma



- An open economy face an inescapable **Trilemma.** Of the three features of the internal monetary system only two can coexists.
- However, intermediate regime are possible. For example, a country can sacrifice , i.e, exchange stability to contrast unemployment.

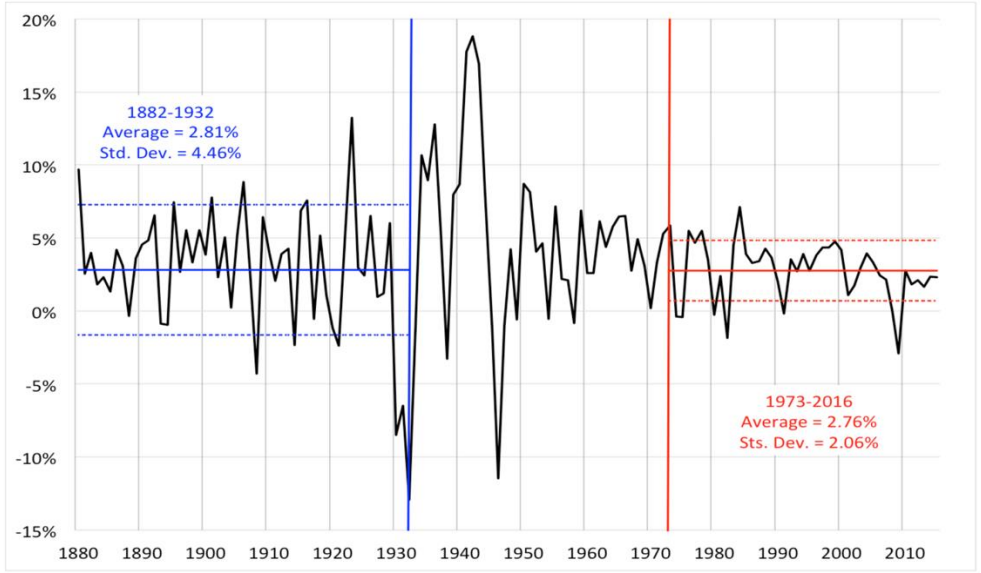
International Monetary System
The Gold Standard, 1870 – 1914.

- The Gold Standard was officially adopted by UK in 1819. Later US, Germany and Japan and others joined the system.
- **Balance of payment**. Because the international reserves took the form of gold, surplus or deficits of the balance of payments had to be financed by shipping of golds between CBs. (a BoP is an equilibrium when current account + capital account —non reserve financial account = 0, i.e., when it is not necessary to use reserves to finance the unbalances)
- **The flows of gold**. If a country was running a surplus greater than the financial account, gold will flow to the surplus country from the deficit countries. As a result prices in the surplus countries will go up and prices in the deficit countries will go down, and the equilibrium will be restored (**price-specie-flow-mechanism**).
- **Rules of games**. When a country was losing gold the Central Banks sold domestic bonds pushing up interest rate. In this way they are attracting capital. On the other hand, countries that had inflow of gold bought domestic bonds pushing down interest rate and so facilitating capital outflow. These measures were reinforcing the price-specie-flow-mechanism.
- **Exceptions to the rules**. However, these rules were followed mainly by the deficit countries which bore than burden of the adjustment. Deficit countries competing for scarce gold reserves were imposing contractionary monetary policies to their citizens.

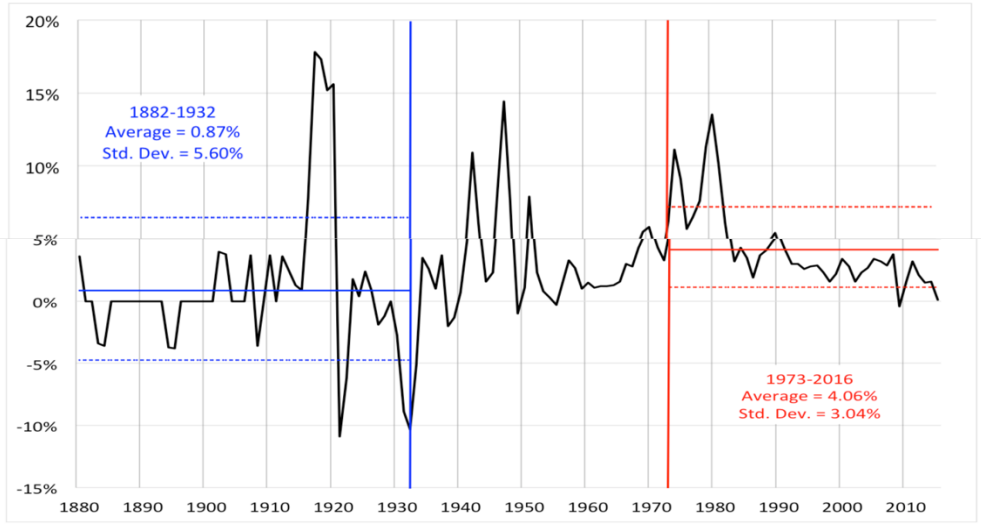
International Monetary System
The Gold Standard, 1870 – 1914.

- The Gold Standard aimed to limit monetary growth. While the price level did not rise much, inflation showed a high volatility.
- Also economic growth was very volatile. Subordination of monetary policy to maintain external balance imposed a a cost in terms of stability in employment.
- From 1880 to 1933 in the US there were at least 5 banking panics. US never went out of Gold Standard until 1932.
- On every score the gold standard was less stable. Prices, Growth and the financial system were more unstable compare to the post World War II period.
- It presents all the short-falls of a fixed exchange rate system and it subject to speculative attacks (Bank of England, 1931; Bank of England, 1992 (with foreign reserves rather than gold)

Annual GNP Growth, 1880-2016



Annual Consumer Price Inflation, 1880 to 2016



International Monetary System
The Inter-wars Years, 1918-1939

- During World War I the gold standard was suspended to finance the military spending through printing money. The result was inflation.
- The Genoa Conference restored the Gold Standard (a partial gold exchange as small countries could detain gold and foreign currencies as reserves)
- In 1925 Britain returned to the old parity. This imposed a deflationary policy that caused a large increase in unemployment. Britain will leave the gold standard in 1931.
- The Great Depression and the high unemployment forced many countries to leave the gold standard as the priority became the internal balance. The tariff imposed by the US in 1930 had damaging effect abroad. Autarkic policies became the norm. Deflation led repudiation of debt particularly by Latin American countries.
- In the late 20s and early 30s the situation was aggravated by the policies of US and France that sterilized their balance of payment surplus instead of following an expansionary policies. The burden was put on the deficit countries: German and Central European countries. The consequences were disastrous.

International Monetary System
The Bretton Woods System, 1944-1973

- In July 1944 countries met in Bretton woods to design the new monetary system to avoid the mistakes of the past.
- Bretton Woods called for a fixed exchange rate against the dollar and a fixed dollar price of gold - $35 for an ounce.
- Members countries held their reserves in gold or dollar assets and they could convert dollar against gold to the Federal reserve.
- The IMF articles of Agreement provided for a mixture of discipline and flexibility.
- The reserve country in order to mantain the convertibility was limited in pursuing autonomous monetary policy.
- Member countries at the same time in order to maintain the fixed exchange rate were limited in pursuing monetary policy at their discretion.
- However the the IMF agreements wanted to introduce some flexibility to allow countries to pursue internal objectives (full employment).
- First, the IMF could help through a lending facility countries in difficult financial situation.

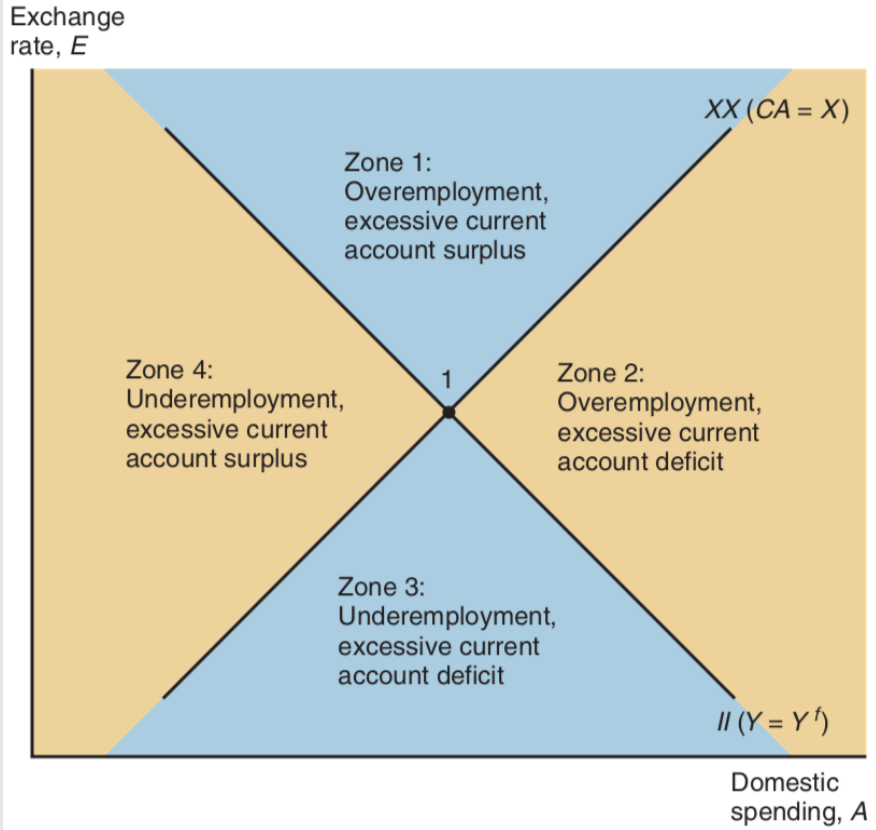
International Monetary System
The Bretton Woods System, 1944-1973 (2)

- Second, in case a country suffered a prolonged adverse situation the foreign exchange parity could be revised.
- The Bretton System resolved the Trilemma allowing the possibility to introduce forms of capital movement restrictions. In this way the member countries had some flexibility allowing some degree of independence for monetary policies.
- This limits on capital movement could allow the possibility to avoid speculative attacks and eventually to have orderly exchange rate changes.
- Full currency convertibility is restored in 1958, however most countries maintained at the beginning restrictions on financial account transactions.
- As trading activities were growing those restrictions started to be released. The Bretton Woods resolution of the Trilemma was gradually coming undone.
- As a country began to run CA surplus investors expected a possible “revision” of the exchange parity. The CB to avoid the currency appreciation would start to sell the domestic currency and get swamped of foreign reserves. The excessive growth the money supply would eventually upset the internal balances.
- On the other hand, as a country began to run CA deficits investors would expect a sudden change in the parity. The CB would start to loose their reserve to defend the exchange parity.
- These crises became so massive by the early 70s that eventually brought down the system.

International Monetary System
Options for Reaching internal and external Balance

- The *II* schedule shows combinations of E and domestic spending A (absorption) that hold output Y^f constant and thus maintain internal balance. It is downward sloping because higher domestic spending tend to rise output which must be compensated by exchange rate appreciation (lower E). To the right of II we have overemployment and to the left we have underemployment.

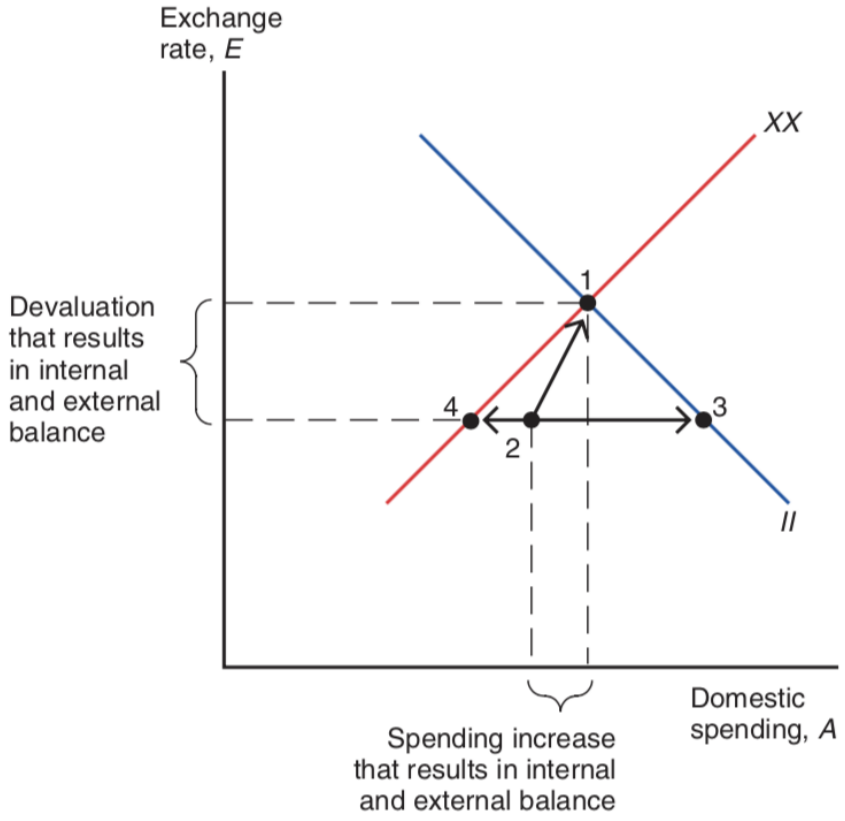
- The XX curve shows the combination of E and A that holds constant the CA at X level. It is upward sloping because higher level of domestic spending which causes a Ca deficit must be compensated by a higher E (devaluation) which causes a CA surplus. To the left of the XX curve we have a CA surplus and to the left we have CA deficit.



$$Y^f = C + I + G + CA(EP^*/P, A) = A + CA(EP^*/P, A).$$

International Monetary System
Options for Reaching internal and external Balance (2)

- If an economy is away from point 1 a change in fiscal policy (expenditure-change policy) and/or a change in the exchange rate (expenditure-switching policy) can bring back the economy at the point of external and internal equilibrium.
- Under the Bretton Woods change in the exchange rate are infrequent. If the economy is at point 2 an expansionary fiscal policy can push the economy at point 3 (internal balance) or a contractionary fiscal policy can take the economy at point 4 (external balance).
- Unless the currency is devalued and the level of domestic expenditure rises the internal and the external balance cannot be reached.



$$Y^f = C + I + G + CA(EP^*/P, A) = A + CA(EP^*/P, A).$$

International Monetary System

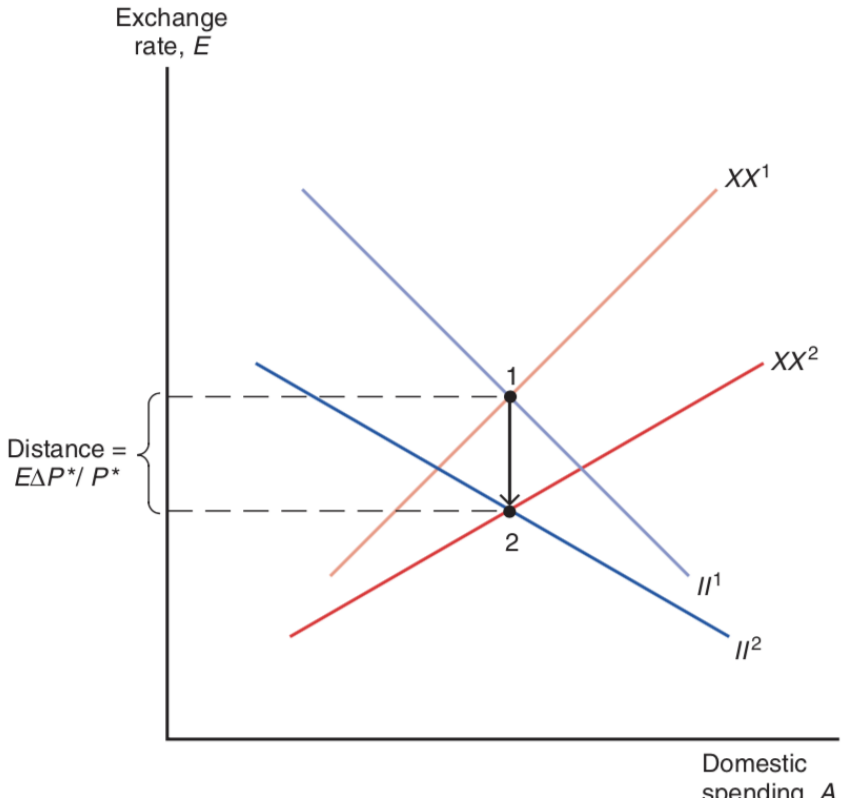
The mechanics of imported inflation without changing E

- Let suppose that in foreign country *P** increases. The economy will have overemployment and CA surplus (Zone 1). XX shift to the right and II to the left
- A first reaction is to let E to revaluate to maintain the real exchange rate unchanged (*EP*/P*). E goes down of the same percentage of the increase in P*.

- If nothing is done by government the economy will end up in the area with overemployment and a surplus of CA. This will put a pressure on P and the two curve will gradually shift back to the original position. The CB to avoid an appreciation of the currency caused by an increase in real money balances and thus interest rate will increase the money supply. <u>At the end of the process the domestic country will have an increased money supply, an increased P level (imported inflation), an unchanged interest rate and an unchanged real exchange rate</u>.

- A <u>*way to avoid the imported inflation*</u> is to revaluate the currency (a lower E) as P* increases. A revaluation restore internal and external balance immediately maintaining unchanged the real exchange rate.

- The collapse of the Bretton Woods was due at the end by the asymmetric position of the US on one hand, and the difficulty for the countries to balance the necessity to maintain the stability of the exchange rate with domestic goals.



Inflation rates, 1966-72

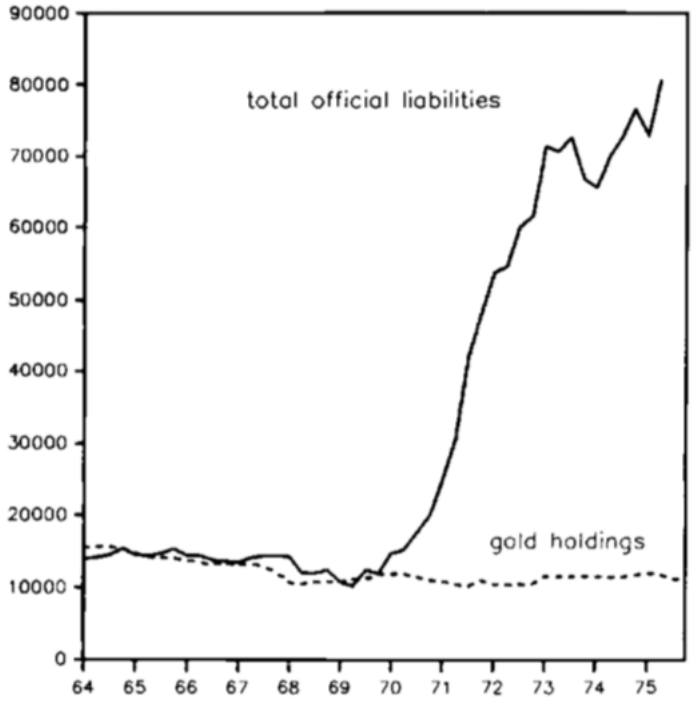
Country	1966	1967	1968	1969	1970	1971	1972
Britain	3.6	2.6	4.6	5.2	6.5	9.7	6.9
France	2.8	2.8	4.4	6.5	5.3	5.5	6.2
Germany	3.4	1.4	2.9	1.9	3.4	5.3	5.5
Italy	2.1	2.1	1.2	2.8	5.1	5.2	5.3
United States	2.9	3.1	4.2	5.5	5.7	4.4	3.2

International Monetary System

The collapse of the Bretton Wood System – Countries were forced to import the US inflation

- The US as the reserve issuer country has the responsibility to hold the dollar price of gold at $35 per ounce (28 grams) maintaining convertibility.
- Because gold supply was not keeping up with economic growth central banks were holding their reserves in dollar assets.
- The US took advantage of his privilege of being the reserve-issuing country with an excess of money growth.
- This would have caused the so called **confidence problem**: the sustainability of the conversion of the gold against the official liabilities.
- In the 70 the US entered a recession. To restore an internal and external balance the US had to bring about a real exchange rate depreciation through a fall of the price level or through a depreciation of the dollar revising the the parity against the dollar. The markets guessed that a change in the dollar's value was inevitable. In 1971 the US ended the link of dollar to the gold.

US gold holding vs. liquid dollar liabilities (ml)



International Monetary System
The case for floating Exchange Rate

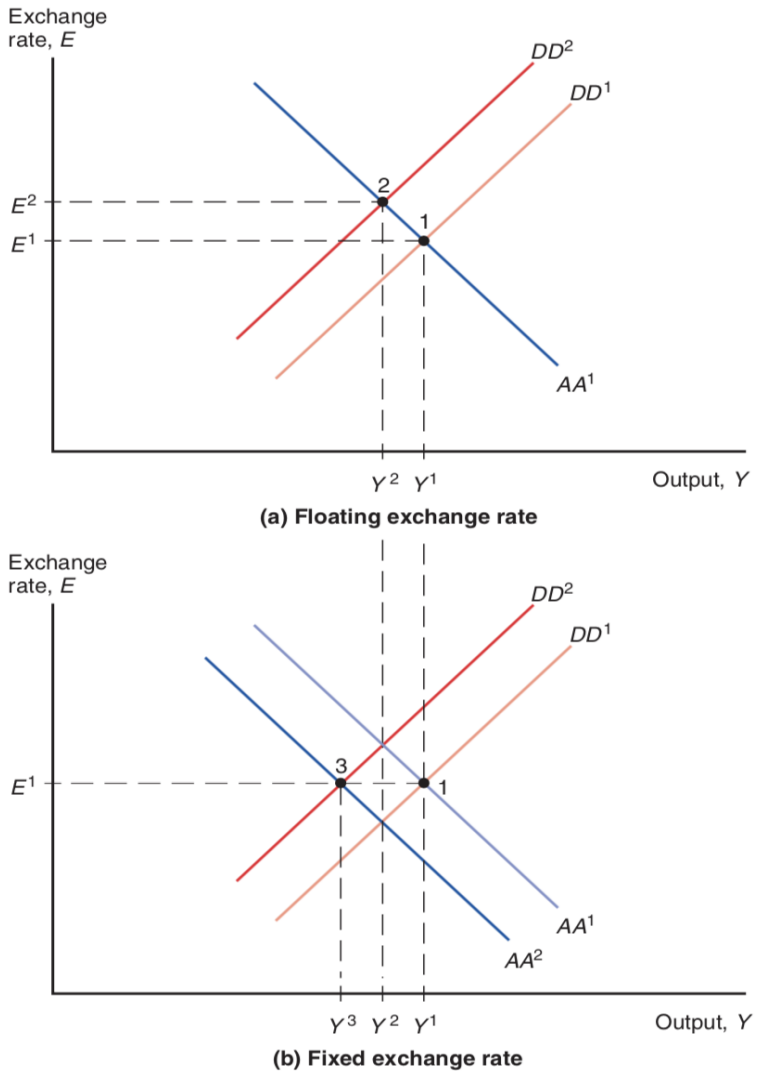
- ✓ ***Monetary policy autonomy***. Removal of pegging exchange rate allows country to purse monetary policy for stabilization purposes and have free capital movements. To choose long term inflation target. No importing inflation. Insulating economies from foreign inflation. Under Bretton Woods a country must chose to follow the US inflation or revaluate their currency.

- ✓ ***Simmetry.*** The Bretton Wood had two asymmetries. The US played the leading role in in determining the world money supply. Foreign countries could de-valued in condition of fundamental disequilibrium , but the system's rules did not give the US the option to devalues against foreign countries. Floating rate would do away with these asymmetries.

- ✓ ***Exchange rate as Automatic Stabilizers***. Floating rate promote relatively less painful adjustments for the economy. A fall in export demand, for example, cushions domestic output more in a floating rate regime than in a fixed exchange regime. (see Graphs) In the fixed exchange rate case a negative export demand shock is contrasted by a monetary contraction to defend the exchange rate which induces a larger negative effect on output.

- ✓ ***Exchange Rates and External Balance***. A final benefit is that floating rate prevent persistently large account deficit or surpluses. As a country run a large deficit markets expect that the country will require to re-equilibrate and therefore would drive the currency down. Speculators play a stabilization role and therefore currencies under floating role will not be too volatile.

A Fall in Export Demand



International Monetary System

What we have learnt from the Floating Rate Experience.

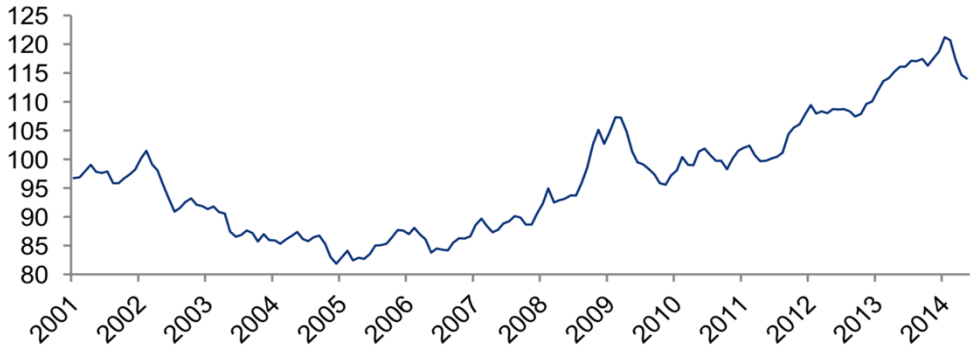
- ***Monetary Policy Autonomy.*** It is true that with floating rate CBs control monetary policy. In the long term that can give the possibility of choose different inflation rate. In the short term, however, monetary policy affects real exchange rate transmitting the effects to other countries. Countries, for example, can be involved in a number of competitive devaluations that defeats the purpose of those actions in a regime of floating rates.

- **Simmetry.** After the demise of the Bretton Woods countries continued to hold dollar as reserves and the US has continued to run CA deficits. China on a unilateral basis has linked the Yuan to the dollar accumulating large amount of dollar reserves. Some economists talk about of "Revived Bretton Woods". Symmetry has not disappeared in the actual floating rate regime. China may play a different role in the future (abandon of the export-driven growth model and financial repression). The real exchange rate has steadily appreciated of about 30% since 2004.

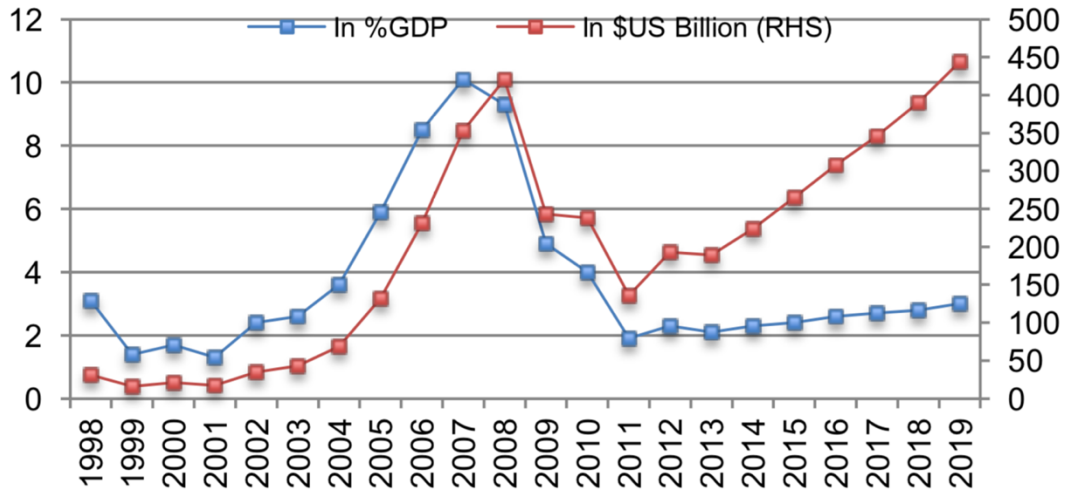
- **Exchange rate as automatic stabilizer**. In the 80s the contractionary US monetary policy with fiscal expansion which led to an real appreciation of the US dollar shows that floating rate might cushion price level and output. However, change in the real exchange rate can impose painful adjustments between domestic and export sectors

- **External Balance**. As the Fig. shows the floating exchange rate system did not prevent the existence of external imbalances. True, that is because the China has linked the Yuan to the dollar and cannot be imputed per se to floating rate. If china had allow a free float the Yuan would have appreciated. US and China would have registered a less severe CA imbalances. However, the fact that countries are preventing a true free float denotes the potential problems with this regime.

China real effective exchange rate



China Current Account



International Monetary System

What we have learnt from the Floating Rate Experience.

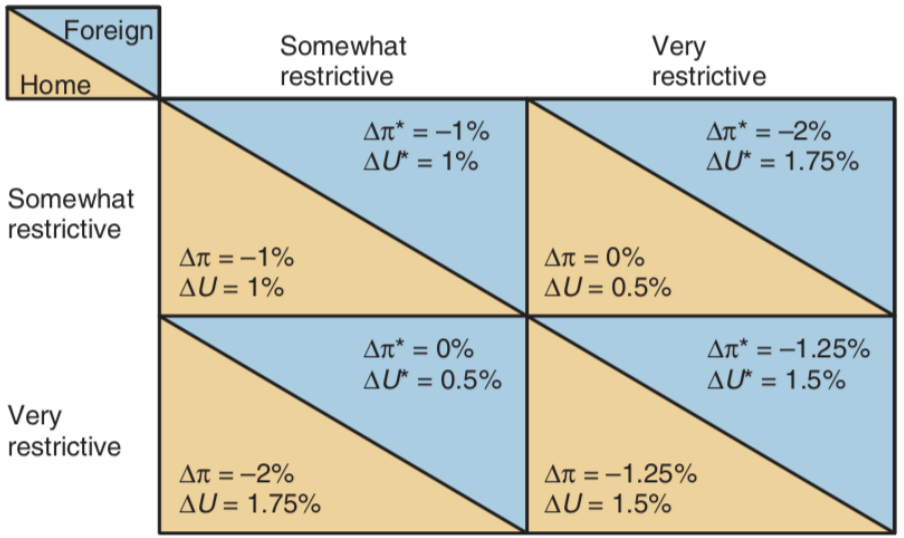
- ***The problem of policy coordination.*** This problem has not disappeared under floating exchange rates. The problem resolving global imbalances is a good example. See China-US example. Another example is deflationary policy at the beginning of the 80s where countries could have done a better job if they had followed a coordinated policy or in the 2007-9 crisis where they could have coordinated a fiscal expansionary policy.

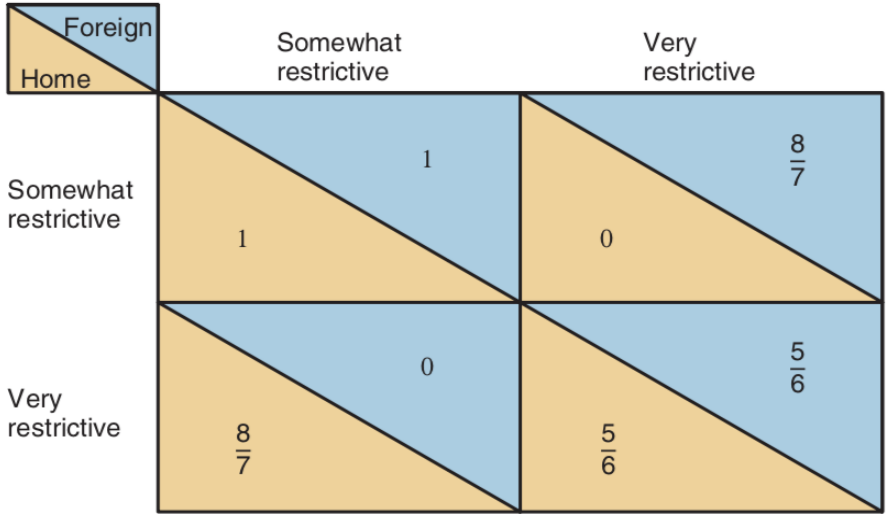
- In the example Foreign country can choose a weak or a strong restrictive monetary policy. Each government wishes to max $-\Delta\pi/\Delta U$, that is to obtain max reduction of inflation with the lowest increase in unemployment.

- If Foreign chooses "some what restrictive" and Home "very restrictive" the foreign exchange of the home county depreciate and the the effect of deflationary policy will be less effective (higher interest rate will still have deflationary effects).

- We assume that <u>each player "goes it alone" and picks the policy that maximizes its own payoff given the other's player policy choice</u>. For example, if Foreigner choose "some what restrictive", Home will pick "very restrictive" and if Foreigner chooses "very restrictive", Home will pick "very restrictive". No matter what Foreign does, Home will **always** go for "very restrictive". (Nash equilibrium)

- A better solution would be for both player to choose "somewhat restrictive" (cooperative solution)





Optimal Currency Area and the EMU

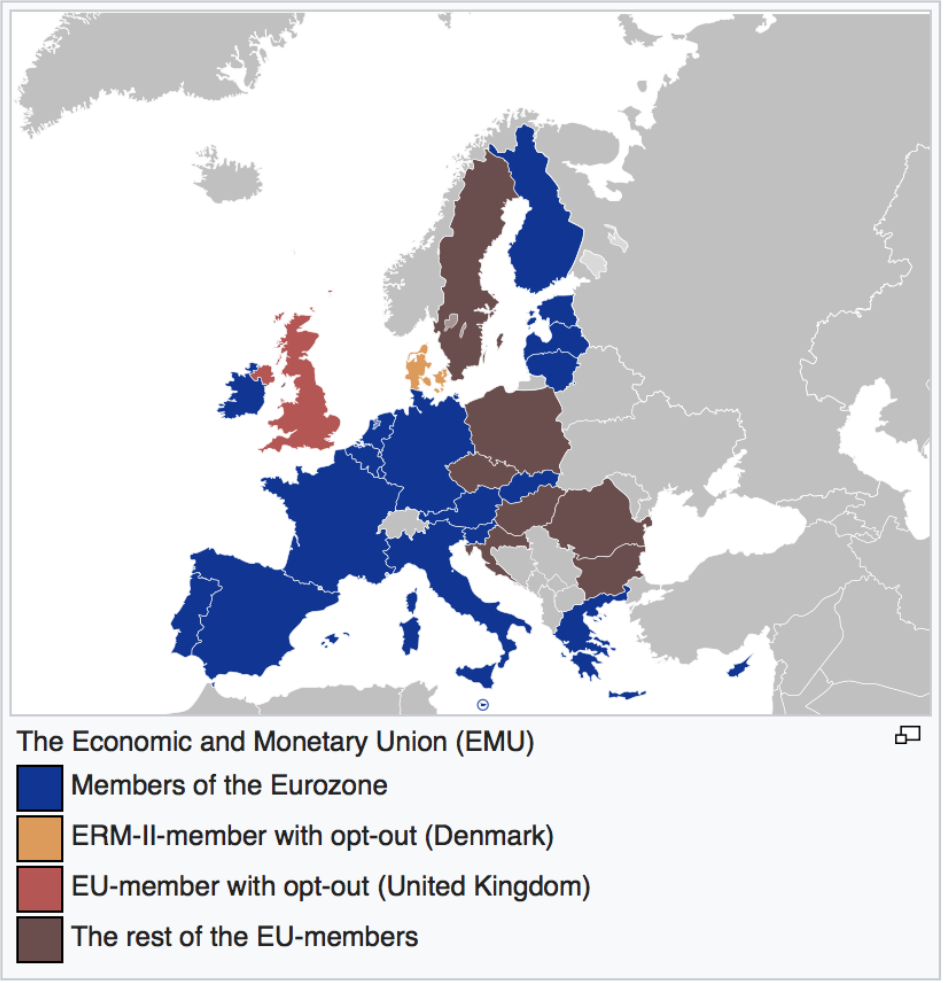
What has driven the EMU creation?

There are economic and political reasons that have prompted the EU countries to set up the Economic and Monetary Union.

1. **To enhance the Europe's role in the world monetary system**. After the collapse of the Bretton Wood system European countries become aware that they must cooperate to defend better their interests. The first step will be the creation of European Monetary system in 1979.

2. **To turn the European Union in a truly unified market**. Exchange rate uncertainty is a limiting factor for a truly common trading area.

3. **To limit the Germany's hegemony after the re-unification with East Germany**. France after re-unification of Germany push for the creation of a European Monetary Union. Germany at the beginning resists the idea.



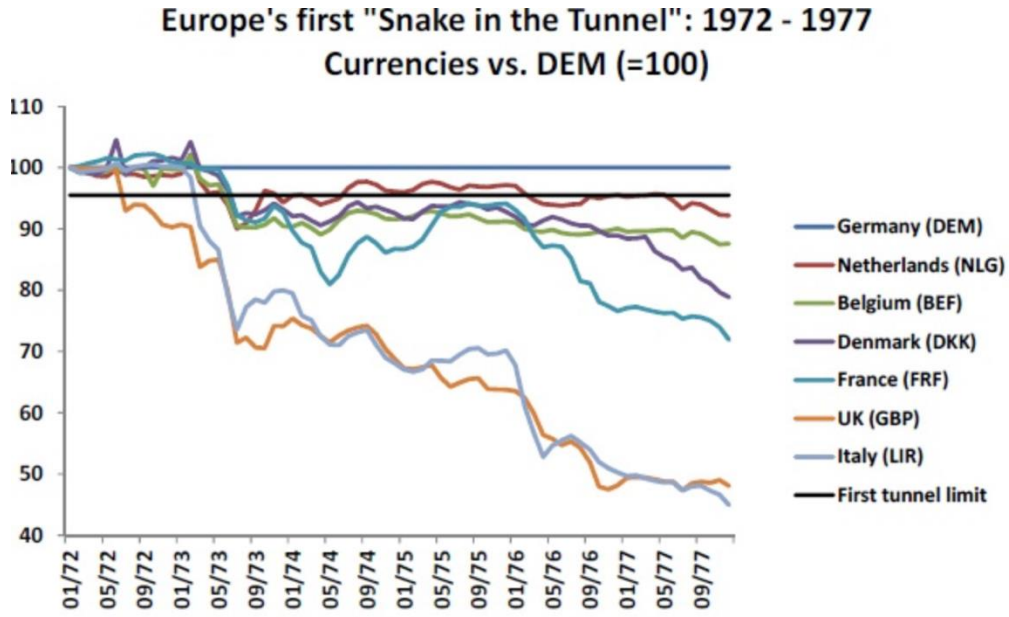
Optimal Currency Area and the EMU

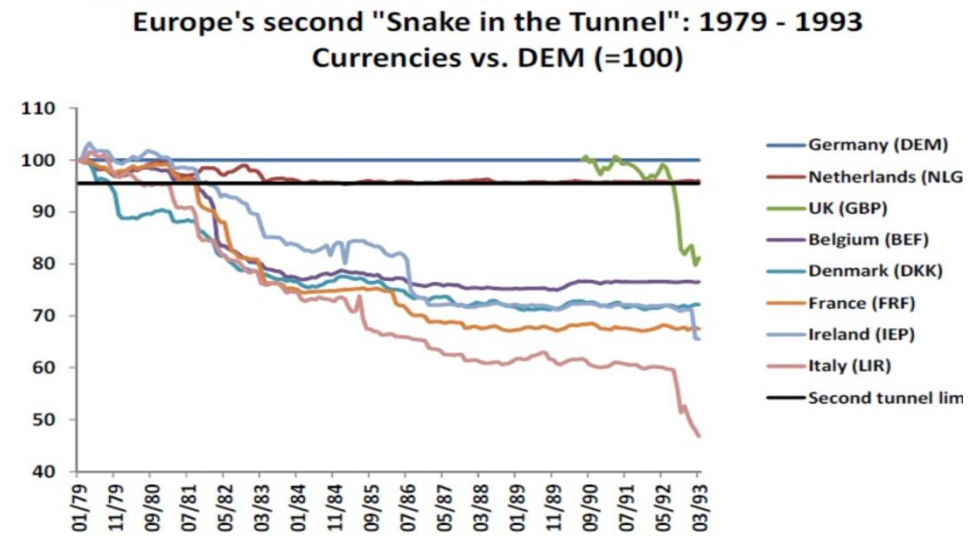
The Snake in the Tunnel and The European Monetary System

- After the collapse of the Bretton Woods the “snake in the tunnel” was the mechanism to limit the currency volatility. The tunnel consisted of bands of 2.25% up and down in which were allowed to trade. The system started in April 1972. UK left the same year, Italy the year after and France in 1974. By 1977 only Benelux and Denmark with Germany were left.

- In 1979 the system was resurrected under the name “EMS”. Some safety valves were: larger bands (+/- 6%) for some countries, lending facility from strong to weak countries to defend parity.. From 1979 to 1987 there were 11 realignments. Capital control reduced the possibility of speculative attacks. Removing of capital controls reduced countries’ monetary independence.

- With the reunification of Germany and the perils of inflation the Bundesbank increased the interest rates. France, Italy and UK were no willing to increase the interest rates and induce a recession. The UK left and in September 1992 several currencies were under attacks. By August 1993 the EMS were force to retreat to very wide bands (+/- 15%).



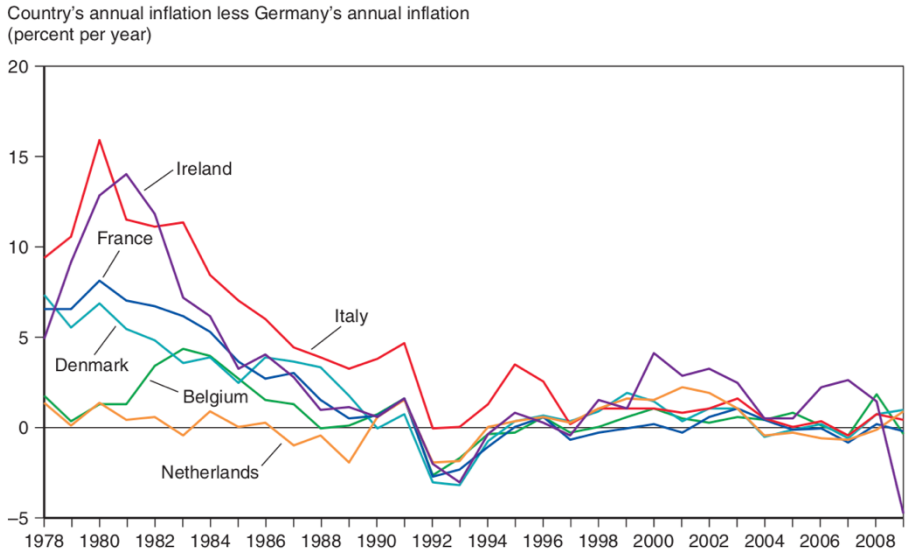


Optimal Currency Area and the EMU

Towards the EMU

- One of the economic reasons to fix the exchange rate to the DM was to build up a reputation to be committed to low inflation, to gain credibility. During this year there is a convergence to the Germany's inflation.

- In 1991 the leader of the EU countries met at Maastricht to start a more ambitious project: the creation of **economic and monetary union.**
  I. An EMU would produce a greater degree of integration.
  II. The EMS was centered around Germany, an EMU would be more balanced.
  III. With free capital movement any fixed exchange system will be subject to failure
  IV. Beside the economic reasons, the EMU is seen as the prelude for a political Union and strong antidote against the war.



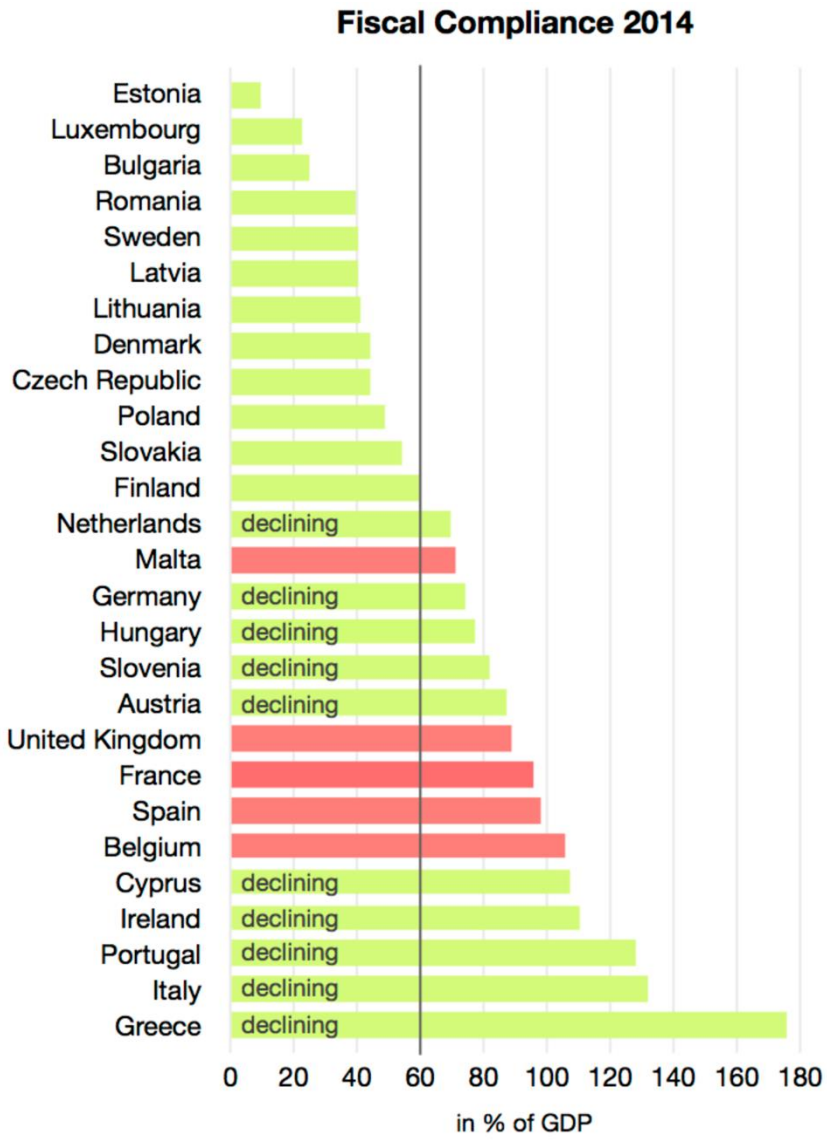
Optimal Currency Area and the EMU

Towards the EMU

- The Maastricht Treaty satisfy several macroeconomic convergence criteria:
    1. The inflation rate before joining the union must be non more than 1.5%
    2. The country must have maintained a stable exchange rate within the ERM
    3. The public deficit must be no higher than 3% of GDP
    4. The public debt must be below 60% of GDP or approaching that level.
- The criteria 3 and 4 are monitored by the European Commission which can impose penalties on countries that violates these rules.

- A supplementary **Stability and Growth Pact** was negotiated in 1997. A set of rules designed to ensure that countries pursue sound public finances

- The SGP was proposed by German finance minister Theo Waigel. Germany feared that loose fiscal policy would have undermined the low-inflation policy which have characterized the German policy World War II. German did not want to adopt the Euro. The SGP was the final compromise.
- The SGP was the additional constrain (along with the sacrifice of the monetary autonomy) on national economic policy which explain why it was never literally adopted.



Optimal Currency Area and the EMU

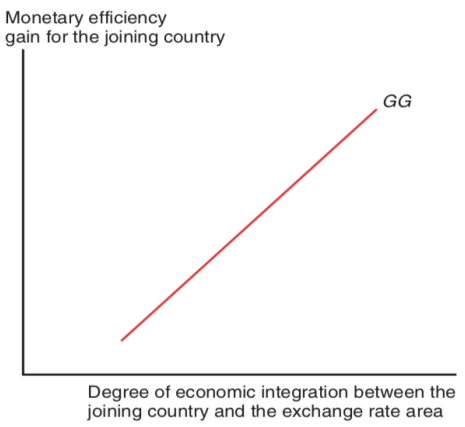
The Theory of Optimum Currency Area

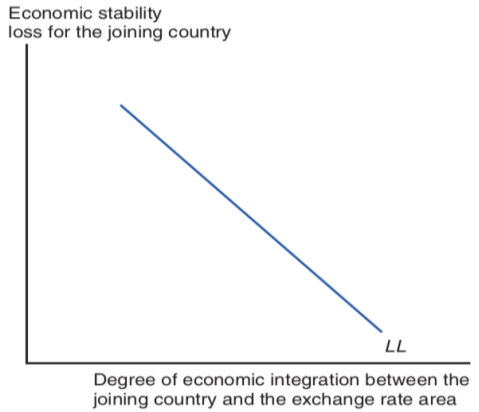
- A country's costs and benefits of joining a Currency or fixed exchange Area depend on how integrated its economy is with those of its potential partners.

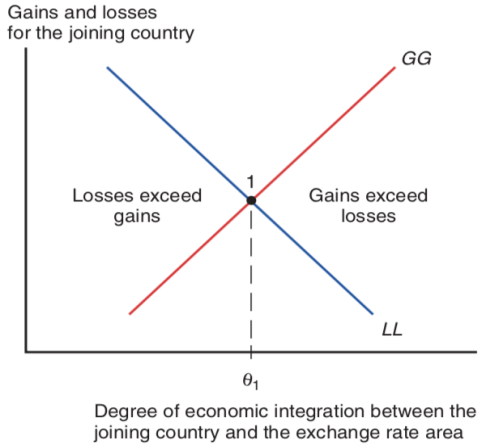
- **Benefits of a currency area**. A major benefit is the simplification in the economic calculation, avoidance of exchange risk, better planning, less transaction costs. This **monetary efficiency gains** will be higher if the country has a large **trading** activity with its potential partner, if factor of productions (labor and capital) can migrate freely within the area. (See GG curve)

- **Costs of a currency area**. The costs arise because joining the currency area a country must give up its ability to use the monetary policy and the exchange rate to stabilization purposes. The **economic stability loss** is greater the less a country is integrated with the other partners. The more a country is subject to be hit by idiosyncratic shocks, the less is integrated. On the contrary, if the country is well integrated in the area he can benefit by the the reaction of monetary policy (ECB) and by the adjustment of the exchange rate of the area (euro). (See LL curve)

- **Optimum currency area** are groups of regions with economies closely linked by trade in good and services and by factors mobility. (see graph: θ must be greater than θ_1 where gains exceed losses)





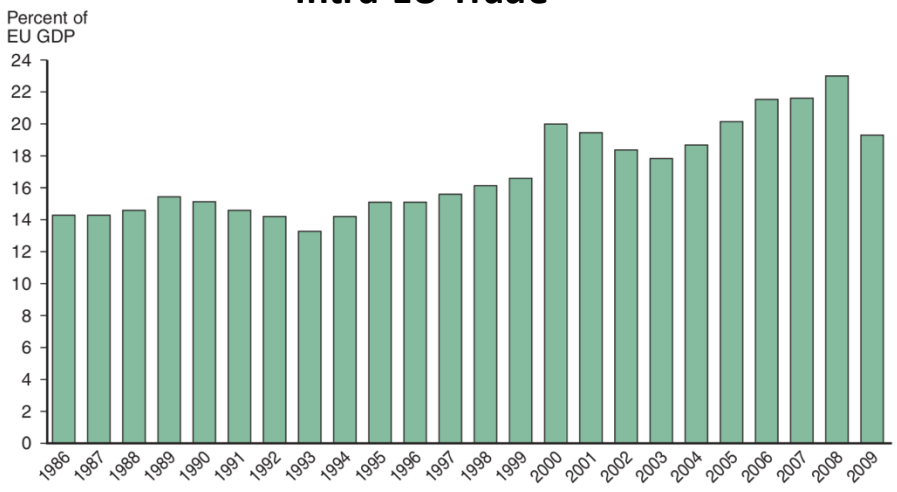


Optimal Currency Area and the EMU

Is Europe an Optimum Currency Area?

- The integration of the product markets is given by the extent of the countries trade with each other, by the factors mobility.
- **Intra-European Trade.** Although the trade was larger than the trade between EU-US is it was much lower than the trade between the American States when the Euro was introduced.
- After the introduction the intra EU trade increased abut about 9%. On the contrary evidence show that price differentials of goods among countries have not been tightening during the years.
- **Labor mobility**. Language and cultural barriers discourage labor mobility. Unemployment figures are more persistent in the Euro Area compared to the US as result of the fact that labor mobility is limited

Intra-EU Trade



People changing Region of Residence

Britain	Germany	Italy	United States
1.7	1.1	0.5	3.1

Sources: Peter Huber, "Inter-regional Mobility in Europe: A Note on the Cross-Country Evidence," *Applied Economics Letters* 11 (August 2004), pp. 619–624; and "Geographical Mobility, 2003–2004," U.S. Department of Commerce, March 2004. Table data are for Britain in 1996, Germany in 1990, Italy in 1999, and the United States in 1999.

Optimal Currency Area and the EMU

Is Europe an Optimum Currency Area?

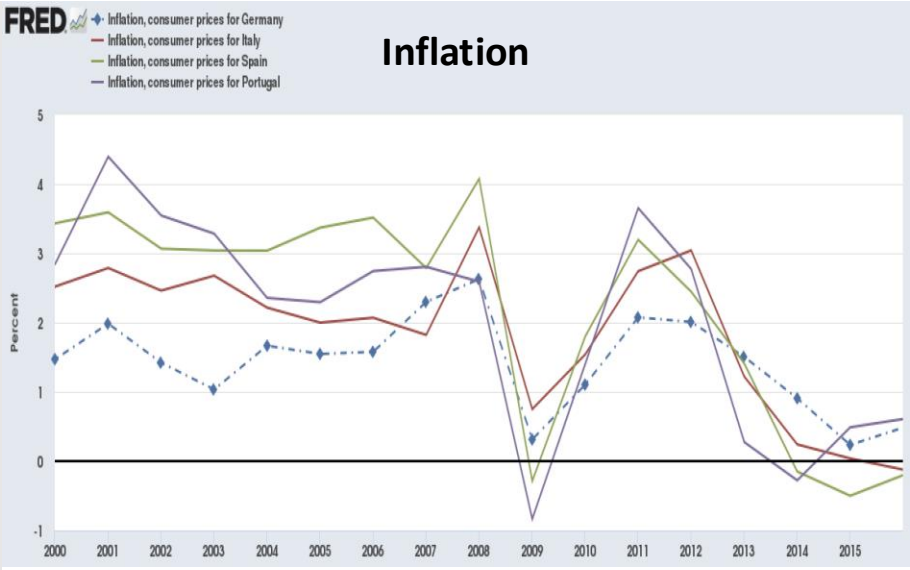
- **Asymmetric Macroeconomic Shocks.** The first decade of the EMU was characterized by quite different economic performance among the currency union's members. The ECB monetary policy stance was not appropriate for all countries.

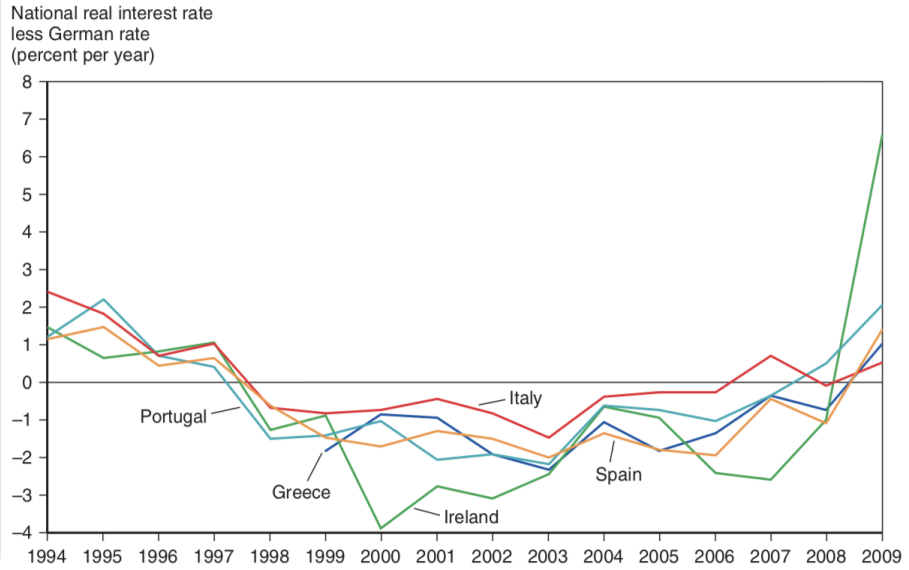
- Long tern interest rate converged, but inflation rate was quite different. The result was (1) the real interest rate they were quite different and (2) real exchange rate appreciated for the South countries.

- A further consequence was that the current account deficit expanded for Greece, Ireland, Italy, Portugal and Spain and the current account surplus expanded for Germany and other Northern countries.

- The South countries experienced a higher inflation because (1) of the Balassa-Samuelson Effect (poor countries experience higher increase in prices in the non-tradable sector compared to rich countries) and (2) because the low real interest rates stimulated a boom in the real estate sector (Spain, Portugal, Greece) which was financed by the banks of the Northern countries which, in turn, increased the real estate prices.

- It is difficult to see how a uniform monetary policy could be appropriate for countries in such diverse situations.





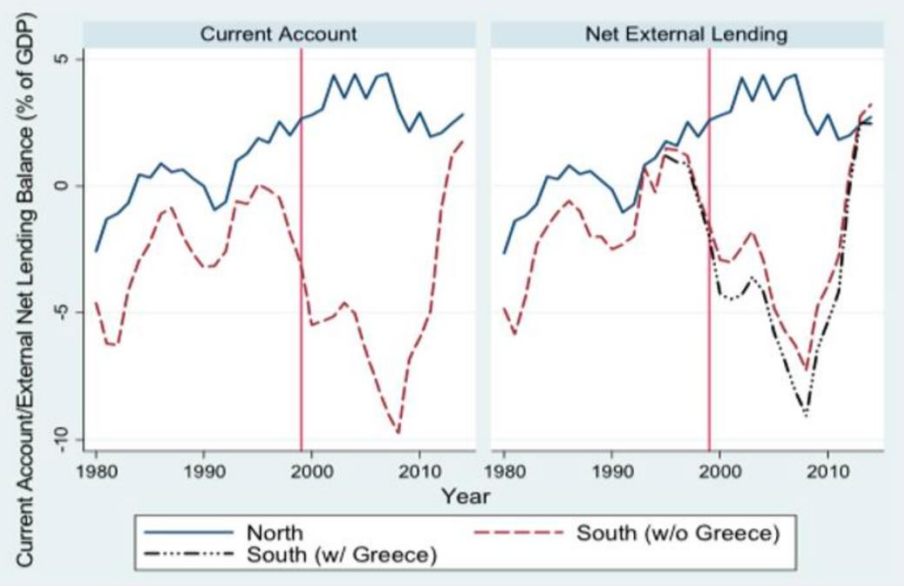
Optimal Currency Area and the EMU

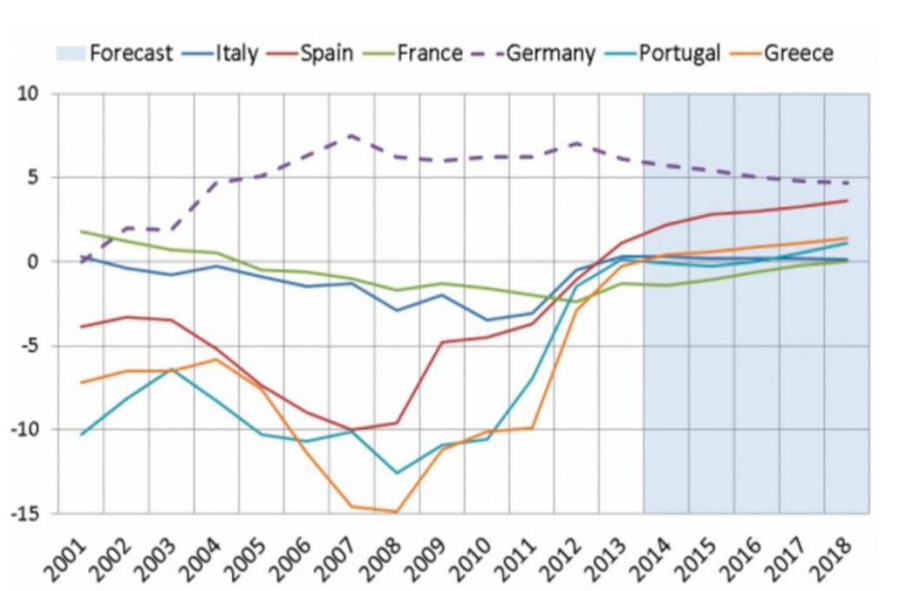
The Current Account Imbalances and the Eurocrisis

- With the introduction of the Euro, we observe a huge increase in the current account. Northern countries (Au, Be, Fr, Fi, Fr, Ge, Ne) recorded a surplus, Southern countries (Gr, Ir, It, Po, Sp) recorded a deficit

- With the Eurocrisis we observe a dramatic adjustment in the Eurozone Trade imbalances (2013).

- The introduction of the single currencies removed two decisive adjustment instrument:
    1. Monetary policy – limited capacity of ECB to deliver inflation convergence. The result: accumulation of inflation differentials; persistent divergence in the real exchange rate
    2. Currency devaluations

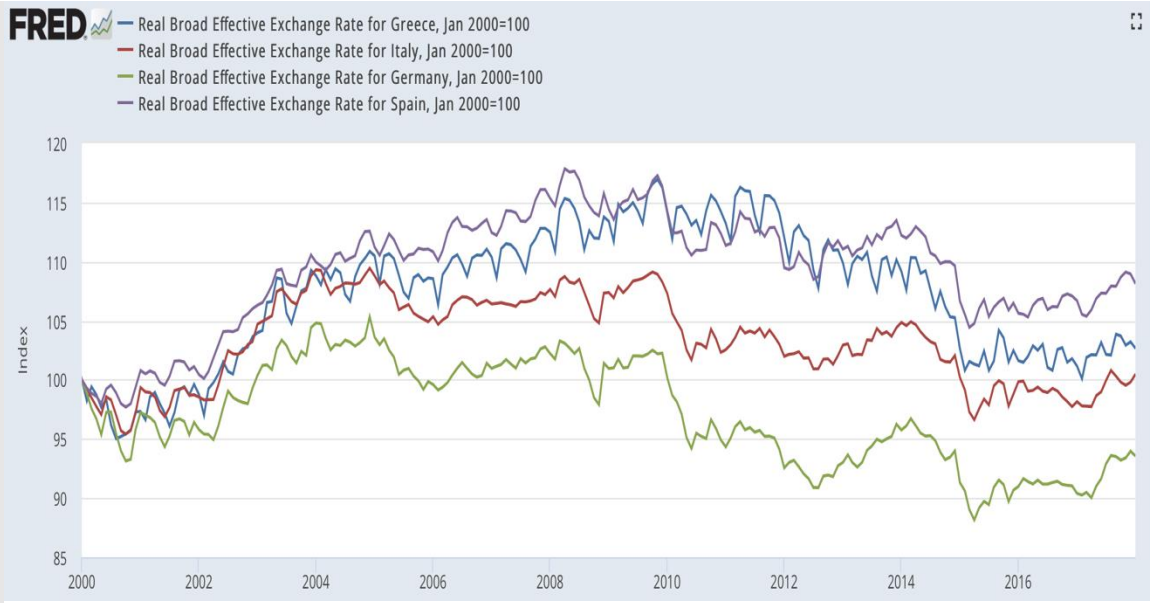


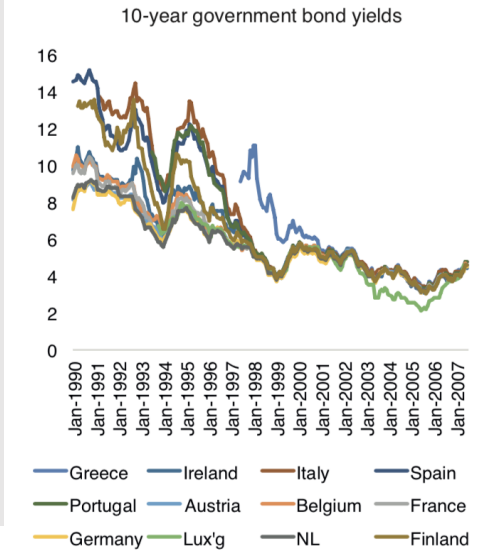


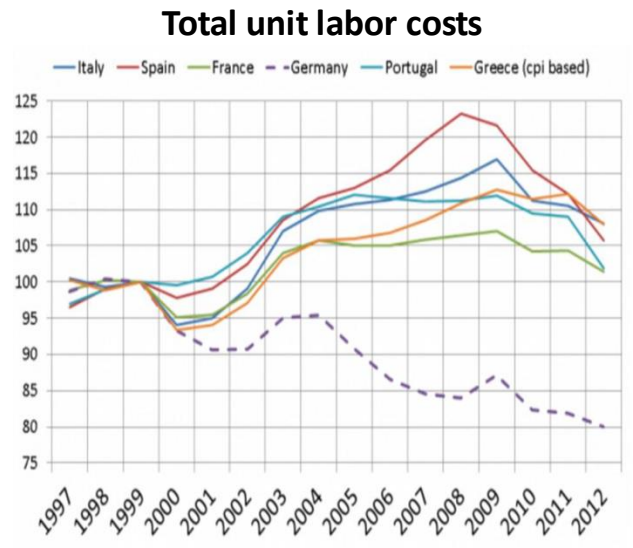
Optimal Currency Area and the EMU

The Current Account Imbalances and the Eurocrisis (2)

- In the currency Union relative inflation become the only variable in the real exchange identity
- In the currency Union the Northern countries are low-inflation prone and the Southern countries are high-inflation prone which are subject to the Balassa-Samuelson effect
- Structural competitiveness differential between North and South
- Interest rates fell and risk premiums disappeared pre-Crisis



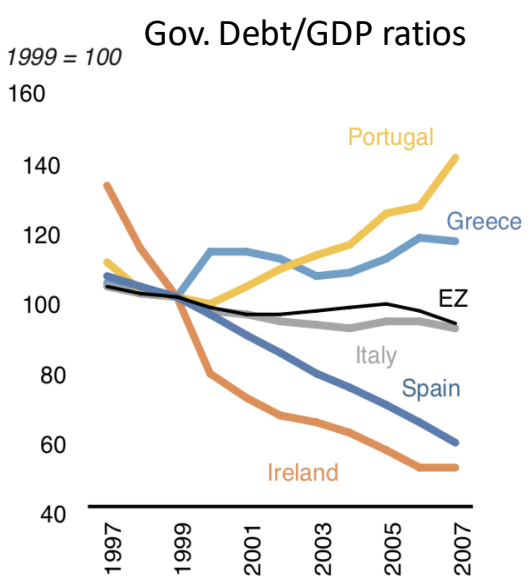


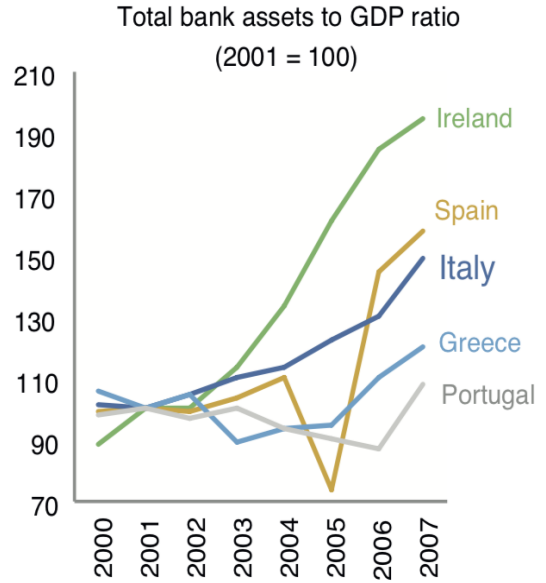


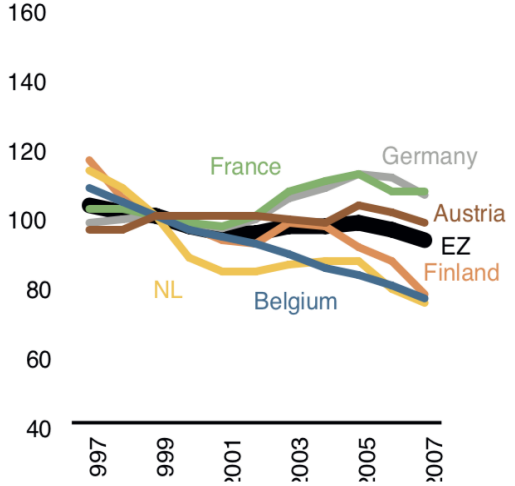
Optimal Currency Area and the EMU

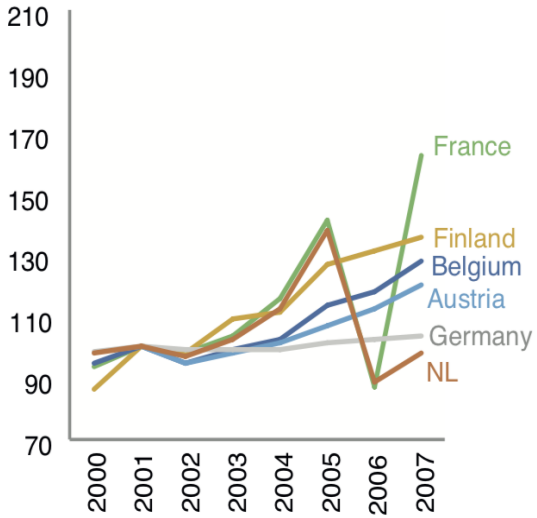
The Current Account Imbalances and the Eurocrisis (3)

- For Ireland and Spain the public debt was not an issue before the crisis. Government debt ratios improved for most EZ nations.
- Bank loans soared in all countries. Large capital flows were channeled to Southern member by Northern banks into non-tradable sectors in the south.
- Confidence generated by the formation of the EMU was one of the causes of cheap credit (low real interest rate in the Southern countries).
- Low interest rates and access to cheap credit fueled consumption and real-estate booms.







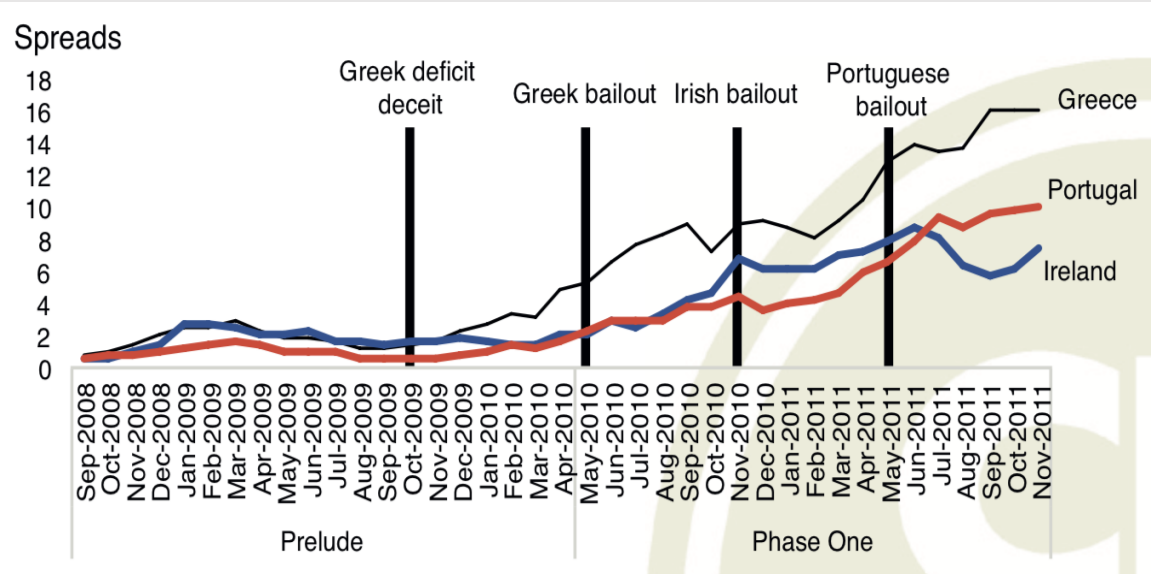


Optimal Currency Area and the EMU

The Current Account Imbalances and the Eurocrisis (4)

Phase one: Failed Bailout and contagion

- The EZ crisis was closely linked to the Global crisis which started as Subprime Crisis in 2007.
- In Europe the trigger was the Greek "deficit deceit". They masked the true deficit.
- The "self-rescue" failed and the country entered a public-debt vortex – a self-fueling cycle. People start to believe that the debt is not anymore sustainable. This pushed up the interest rates, etc. But as you try to close budget deficit through austerity measures things get worse.
- The Troika put in place a rescue package but soon market participants realize that the Greek debt remained unsustainable. The spread continued to rise.
- Markets started to wonder if this problem could affect other countries.
- Ireland and Portugal would be the next countries to suffer a debt vortex.
- In 2010 it was signed the Irish bailout. The Irish government rescued banks, but this turned a banking problem in a public-debt problem.
- Portugal was rescued in may 2011.

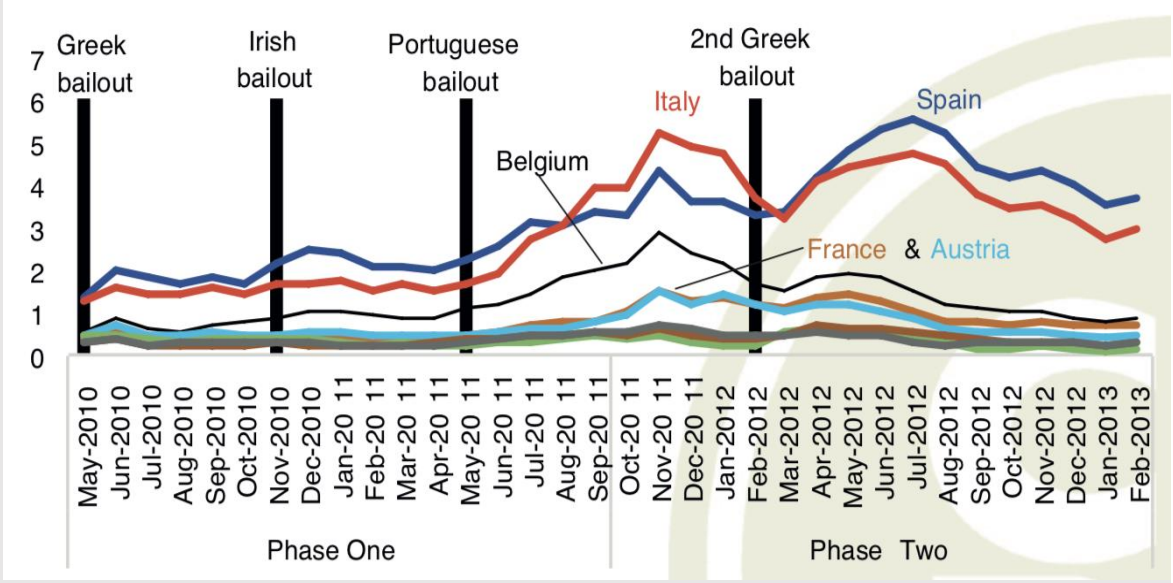


Optimal Currency Area and the EMU

The Current Account Imbalances and the Eurocrisis (5)

Phase two: Contagion spreads to the core

- In August 2011 the EZ Crisis was infecting Italy with the spread up to 500 b.p. and subsequently hit Belgium, France and Austria.
- Borrowing costs went up to validate that fears. Nations that had been considered safe investments were now seen as possibly s liding into debt vortex.
- The massive pre-2008 lending across EZ borders had exposed banks in the core to government in the periphery. Dexia, a Belgian bank, was pushed into a bank's vortex worries over its exposure to Greek government bonds.
- Spain which was initially hit by a banking crisis saw its public debt's spread soaring.
- Italy did not have yet banking problems, but due to his high debt/GDP ratio market participants started to question its debt sustainability.
- All these country became vulnerable to a sudden stop since its implicit reliance on foreign investors rose along its current account deficit.
- No current account surplus countries were exposed to a sovereign debt crisis, while the Southern economies (except) required a bail-out program.

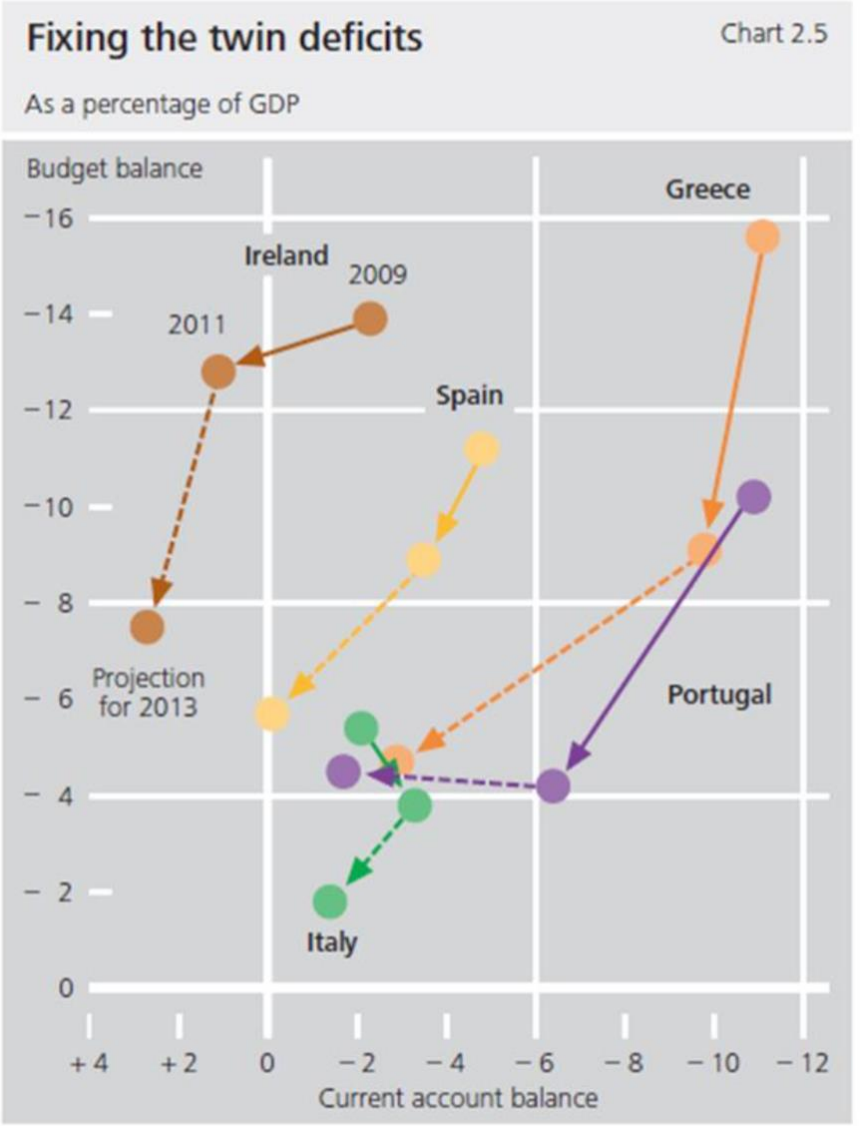


Optimal Currency Area and the EMU

The Current Account Imbalances and the Eurocrisis (6)

Pro-cyclical fiscal tightening

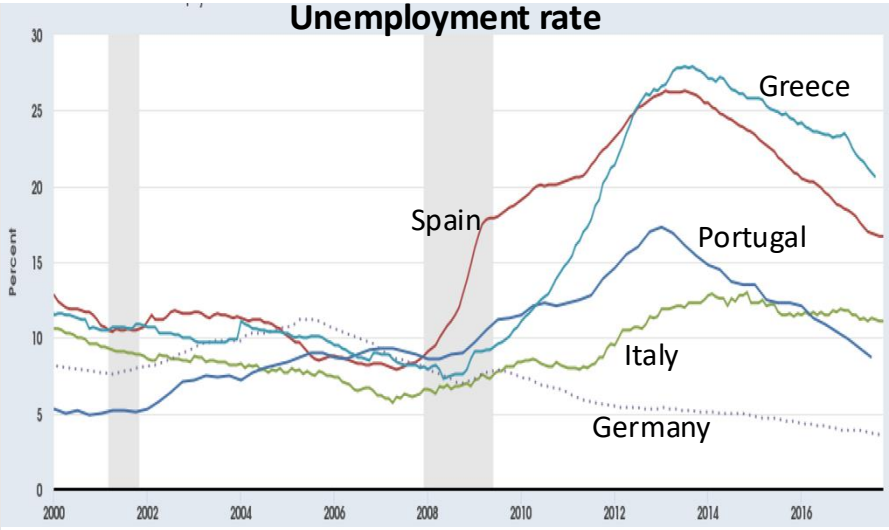
- Sharp action by national government calmed waters. However, as the second Greek bail-out failed, market expectations turned negative again. In particular, the 50% hair-cut imposed on private holders of Greek debt disproved the lingering belief that public default was unthinkable in the EZ.
- The Great Recession produced some countercyclical fiscal policy via the automatic stabilizers – rising social spending etc.
- However, from 2010 the fiscal stance turned from stimulus to contraction. The EZ as whole saw its primary deficit move from minus €350 bl to positive €10 bl.
- The Southern countries accounted for about 48% of the fiscal swing even though they accounted for 1/3 of the the EZ GDP.
- The effects were amplified by the fact that the tightening was done increasing taxes. Cutting spending could have had less recessionary effects.
- *To avoid a pervasive recession, we should have had an active aggregate demand management at the level of Eurozone. EZ core nations, Northern countries, instead of having an expansionary fiscal policy opted for austerity measures for themselves.*

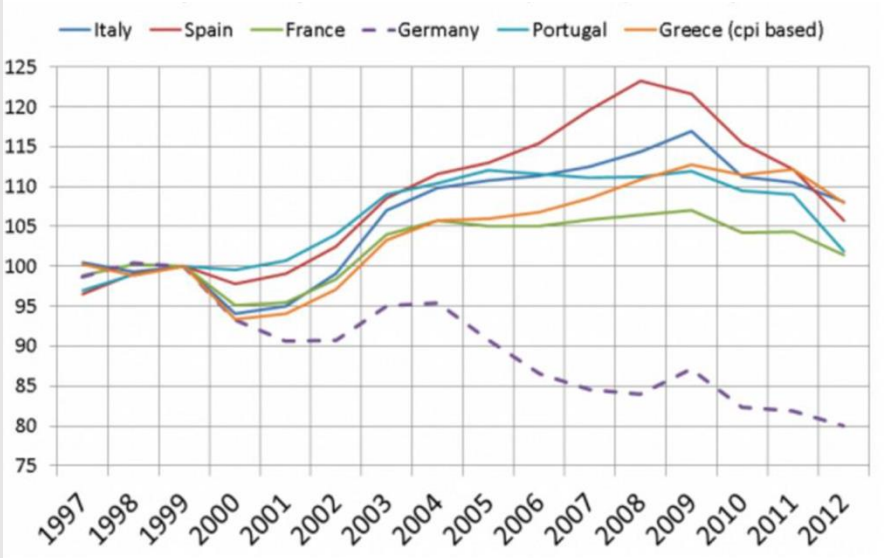


Optimal Currency Area and the EMU

Adjustment through Budget Balance

- The return to confidence was caused by the forceful intervention by ECB President Draghi in his famous July 2012 speech. “ECB would do what ever it takes”. It stopped the debt vortex. Quantitative Easing (QE) followed.
- Imbalances (current account deficits) within the Eurozone have gone down because of the recession in Southern countries caused by fiscal tightening.
- Since 2010 unemployment rates soared in all Southern countries and declined in the Northern countries.
- All the costs of the adjustment were borne by the Southern countries.
- Labor costs have decreased since the crisis in Southern countries, but the Gap with Germany has not.
- The reason for lower imbalances is not wage disinflation but the impact of the austerity program
- Germany’s real exchange rate is now about 20% lower than it was in 1999.
- We should expect that as Southern countries grow again, the imbalances will show again.





Optimal Currency Area and the EMU

What have we learnt from the EZ crisis?

- A country which joins a currency area gives up monetary policy as instrument to achieve internal or external balance. However, countries can use the **fiscal policy** to achieve internal or, alternatively, external balance. Northern countries were afraid that Southern countries would not be able to discipline their public finances. In the end they feared that they have to pay the bill for the non fiscal rectitude of the Southern countries. Setting a Fiscal Union was and still is not a feasible objective in a reasonable time framework. A political Union require, as in any political community, some form of solidarity among their citizens. Northern countries are fiercely opposed to a "Transfer Union".

- The main safeguard adopted to avoid a "Transfer Union" was the **Stability and Growth Pact**. This left each country with no policy instrument to mitigate adverse shocks.

- It is quite instructive that in the pre-crisis years there were 34 breaches of the 3% threshold (deficit/GDP) including countries such as Germany and France. It is also notable that the two countries that had national debt far below 60% of GDP, Ireland and Spain, they were both caught in the debt vortex. The Monetary Union could not, evidently, work in the pre-crisis period without relaxing the tight jacket imposed by the SGP.

- It also instructive that at the pick of crises the fiscal stance turned from stimulus to contraction. Just the opposite of what was required. The Union was unable to set up a coordinate demand management action. The Northern countries, in particular, should have reacted with expansionary fiscal policy non contractionary policies as they did. The **Stability and Growth Pact** failed even when it succeeded.

Optimal Currency Area and the EMU

What have we learnt from the EZ crisis?

- From our narrative it emerges that the Currency Area is subject to structural imbalances and a lack of crisis management mechanism. The only stabilization that really worked was the QE, but it could have been activated earlier.

- Although the EZ crisis was closely interlinked to the Great Recession, from our narrative it emerges clearly that a crisis would have happened in any case due to the existing strong imbalances and the poor design of the EZ. We can identify two main underlying problems that must be fixed:

Policy Failures that allowed the imbalances get so large	→	Creditor countries should adopt expansionary fiscal policies to contrast large CA surplus. Rules of the Game.
Lack of institutions to absorb shocks at the EZ level	→	The creation of European Stability Mechanism (ESM) went in the right direction. See recent proposal to transform the ESM into a Europen Monetary Fund (EMF) under EU law. It should intervene to contrast liquidity crisis - **no bail-out**

The **Stability and Growth Pact** failed even when it succeeded. An alternative to this approach is to give **fiscal autonomy** to the EZ countries. That will allow them to contrast adverse shocks and re-establish the external or the internal balances when they occur. It should also be clear that each country should be responsible of their public finances. The principle of **no-bail out** which was originally adopted by the Emu should be re-established. This imply that a country should be ready to default or restructure its national debt in case of insolvency. The party of the No Transfer Union should be reassured.

1. (interest parity condition). The interest rate in 1Y dollar denominated deposit is 4%. The Interest rate in 1Y euro denominated deposit is 2%. 1Y a-head expected exchange rate is 1.2 (units of dollar per 1 euro). What is the spot rate between the dollar and euro?
   a. 0.9
   b. 1
   c. 1.18
   d. 1.19

1. (DD-AA model) In the context of the DD-AA model a rise in the foreign price makes foreign goods more expensive. What will be the effect on output and exchange rate?
   a. DD shifts to the left causing an increase in output and a depreciation of the exchange rate.
   b. DD shifts to right causing an increase in output and an appreciation of the exchange rate
   c. DD shifts to right causing an increase in output and depreciation of the exchange rate.
   d. DD shifts to the left causing a decrease in output and an appreciation of the exchange rate,

1. The Standard Model) – Which one of the following statements is true in the context of the Standard Model:
   a. Opening up the Trade will change a country's terms of trade (price of export in terms of import). That will always improve its welfare level with respect to a situation without trade (autarchy) proving that trade is always potentially beneficial.
   b. A decline in the terms of trade increase a country's welfare.
   c. In an open economy a change in the terms of trade is always beneficial.
   d. Autarchy can sometimes be a good solution.