



# International Economics

## Lecture 10

### Exchange Rate Regimes

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## A Drill on Real Exchange Rate

- Real exchange rate is defined as
$$q_{\$/\epsilon} = E_{\$/\epsilon} P_{EU}/P_{US}$$
or  $q = EP^*/P$  in more general form
- Now what will happen to the real exchange rate, if
  - the price in the US increases  
→ A decline of  $q$ , and a real appreciation of US dollar
  - the price in EU increases  
→ A rise of  $q$ , and a real appreciation of Euro
  - nominal exchange rate  $E_{\$/\epsilon}$  increases  
→ A rise of  $q$ , and a real depreciation of US dollar
- As a general rule, when price in one country increases, its currency appreciates in real term; when price in one country decreases, its currency depreciates in real term.

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# Preview

- Fixed exchange rate
  - How it works
  - How monetary and fiscal policies work differently under fixed exchange rate regime
- Compare exchange rate regimes: flexible vs. fixed
- The Impossible Trinity
- Chinese currency controversy

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# Central Banks and FX Market

- Many countries try to fix or “peg” their exchange rate to a currency by intervening in the foreign exchange markets. Examples include,
  - Chinese Yuan pegs to US dollar
  - HK dollar pegs to US dollar
  - Danish Krone pegs to euro
- Many with a flexible or “floating” exchange rate in fact practice a **managed floating exchange rate**.
  - The central bank “manages” the exchange rate from time to time by buying and selling currency and assets, especially when exchange rate moves sharply in one direction.
- So the first question to ask is: How do central banks intervene in the foreign exchange markets?

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## Introduction to Central Bank's Balance Sheet

- Assets, including
  - Foreign government bonds (official international reserves)
  - Gold (official international reserves)
  - Domestic government bonds
  - Loans to domestic banks (called discount loans in the US)
- Liabilities, including
  - Deposits of domestic banks
  - Currency in circulation

For example:

**Central Bank Balance Sheet**

Assets		Liabilities	
Foreign assets	\$500 billion	Deposits held by other domestic banks	\$1.5 trillion
Domestic assets	\$2 trillion	Currency in circulation	\$ 1 trillion

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## Central Bank Intervention and Money Supply

- A purchase of any asset by the central bank will be paid for with currency or a check written from the central bank,
  - both of which are denominated in domestic currency, so
  - both of which increase the supply of money in circulation
  - The transaction leads to equal increases of assets and liabilities on central bank's balance sheet
- Thus, as a rule, when the central bank buys domestic assets or foreign assets, the domestic money supply increases.

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## Central Bank Intervention and Money Supply

- A sale of any asset by the central bank will be paid for with currency or a check written to the central bank,
  - both of which are denominated in domestic currency
  - The central bank puts the currency into its vault or reduces the amount of deposits of banks
  - causing the supply of money in circulation to shrink.
  - The transaction leads to equal decreases of assets and liabilities.
- So as a rule, when the central bank sells domestic assets or foreign assets, the domestic money supply decreases.

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## An Example of the Fed's Balance Sheet

- Fed's balance sheet in September 2007

The Fed's Balance Sheet (09/27/2007)			
Assets		Liabilities	
gold	\$10 billion	money in circulation	\$775 billion
securities holding	\$835 billion	bank deposits	\$40 billion
other assets	\$45 billion	other liabilities	\$75 billion
<i>total assets</i>	<i>\$890 billion</i>	<i>total liabilities</i>	<i>\$890 billion</i>

Source: <http://www.federalreserve.gov/releases/h41/20070927/h41.pdf>

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## An Example of the Fed's Balance Sheet

- Fed's balance sheet in September 2010

The Fed's Balance Sheet (09/29/2010)			
<b>Assets</b>		<b>Liabilities</b>	
gold	\$10 billion	money in circulation	\$915 billion
securities holding	\$2,000 billion	bank deposits	\$1,250 billion
dollar swap to other central banks	\$60 billion		
other assets	\$230 billion	other liabilities	\$135 billion
<i>total assets</i>	<i>\$2,300 billion</i>	<i>total liabilities</i>	<i>\$2,300 billion</i>

Source: <http://www.federalreserve.gov/releases/h41/current/h41.pdf>

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## An Example of the Fed's Balance Sheet

- Compared to Sept. 2007, the Fed's balance sheet has increased from \$890 billion to \$2.3 trillion, or a 160% increase. Among those,
  - Currency in circulation has increased from \$775 billion to \$915 billion – a relatively small increase;
  - But bank deposits have increased from \$40 billion to around \$1,250 billion, or 3000% increase! – worse yet, banks hold these excess money on their balance sheets and don't lend to small businesses nor consumers.

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## How Central Bank Fixes Exchange Rates

- To fix the exchange rate, central bank influences the quantities supplied and demanded of currency by trading domestic and foreign assets, so that the exchange rate (the price of foreign currency in terms of domestic currency) stays constant.
- According to the interest parity condition:

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

When the exchange rate is fixed at some level  $E_0$  and if investors or market participants also believe central bank has the *ability* to keep it fixed, then the market expects no change in exchange rate, i.e.,  $E^e = E$ , thus

$$R = R^*$$

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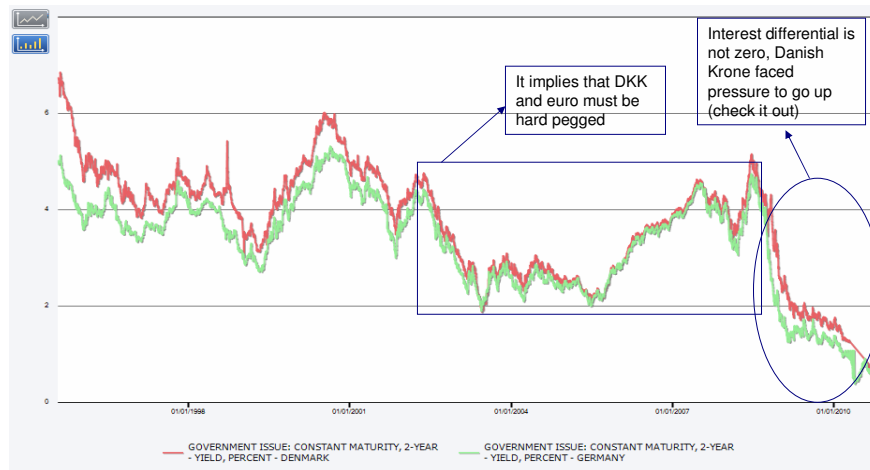
## Fixed Exchange Rates

- So to fix the exchange rate, what the central bank essentially must do is to keep  $R = R^*$ .
- To achieve the goal, central bank adjusts the quantity of monetary assets in the money market until the domestic interest rate equals the foreign interest rate, given the level of average prices and real output:

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

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## Interest rates: Denmark vs. Germany



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## Fixed Exchange Rates (cont.)

- **Suppose** that the central bank has fixed the exchange rate at  $E_0$  but the **level of output rises**, raising the demand of real monetary assets.
- This will put upward pressure on interest rates and the value of the domestic currency. How should the central bank respond if it wants to fix exchange rates?
- In this case, the central bank can *buy* foreign assets in FX market,
  - thereby increasing the domestic money supply,
  - thereby reducing interest rates in the short run,
  - thus, removing the pressure of currency appreciation.

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## Central Bank and Sterilization

- Central bank's buying and selling of foreign bonds in the FX market affects the domestic money supply, a central bank sometimes may want to offset this effect.
- If the central bank sells foreign bonds in the FX market, domestic money supply will decrease. To offset this effect, it can buy domestic government bonds in the bond market.
- Similarly, if the central bank buys foreign bonds in the FX market, domestic money supply will increase. To offset this effect, it can sell domestic government bonds in bond market.
- The buying (or selling) domestic bonds to offset the effect of decreased (or increased) domestic money supply is called **sterilization**.

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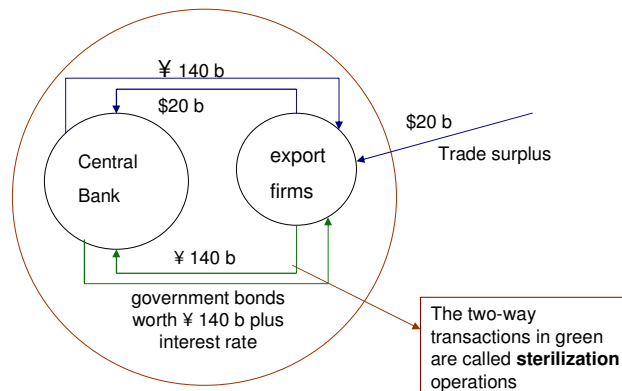
## Example: Central Bank and Sterilization

- Let's say China each month has a trade surplus of \$20 billion. Because its central bank has strict capital control and does not allow firms to hold US dollar, so export firms must exchange their dollar holdings into domestic currency, Yuan.
- Thus central bank will get \$20 billion from firms and record it as foreign assets on its balance sheet. In exchange, it will simultaneously give ¥140 billion Yuan (equals \$20 billion-equivalent of Yuan) to the firms, thus increasing domestic money supply.
- Since China runs a large trade surplus each month, over time, this tends to generate very large increase of domestic money supply, which has the potential to cause high inflation at home. This is not desirable.
- To prevent inflation from rising, China's central bank issues bonds and 'forces' export firms to purchase them. Thus by purchasing central-bank issued bonds, firms surrender their money back into central bank's hands. Through sterilization, central bank drains the extra money supply out of the system.

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## Example: Central Bank and Sterilization



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## Example: Central Bank and Sterilization

### China Central Bank's Balance Sheet, before sterilization (net change)

Assets		Liabilities	
Foreign assets	+\$20 billion	Deposits held by other domestic banks	-
Domestic assets	-	Currency in circulation	+ ¥140 billion



### China Central Bank's Balance Sheet, after sterilization (net change)

Assets		Liabilities	
Foreign assets	+\$20 billion	Deposits held by other domestic banks	-
Domestic assets	- ¥140 billion	Currency in circulation	-

→ Through sterilization, China's central bank drains the increased money supply that resulted from trade surplus out of the system, thus prevent inflation from rising in the long run.

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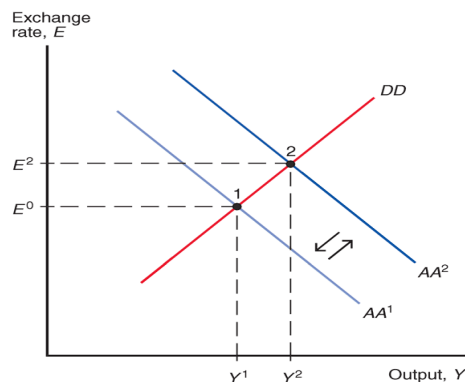
## What will happen without sterilization

- Money supply increases
- Prices increase and inflation rises
- Inflation is bad, but moderate increase of inflation can be acceptable:
  - Higher prices make Chinese goods relatively more expensive, thus export declines
  - Trade surplus becomes smaller, helping China restore external balance
- In this case, the internal and external macro balance are in conflict with each other. Chinese policy makers clearly preferred internal balance (low inflation) over external balance (trade surplus not getting too large).
- This tends to exacerbate the global imbalances – trade surplus getting too big in China; trade deficits too big for the United States. In this sense, China's real 'sin' is not currency undervaluation, but sterilization.

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## Monetary Policy under Fixed Exchange Rates

- When the central bank buys and sells foreign assets to keep the exchange rate fixed and to maintain domestic interest rates equal to foreign interest rates, it is not able to adjust domestic interest rates to attain other goals.
  - In particular, monetary policy is ineffective in changing output and employment.



→ Monetary policy becomes ineffective under fixed exchange rate, as any increase or decrease of money supply will shift AA curve, thus resulting in change in  $E$ , which is not possible under the regime.

→ What's more, since  $R=R^*$ , the monetary policy in foreign country, to which the home currency is pegged, will affect home country's output and employment. In this sense, by fixing home currency to the foreign one, home country lost its autonomy on monetary policy.

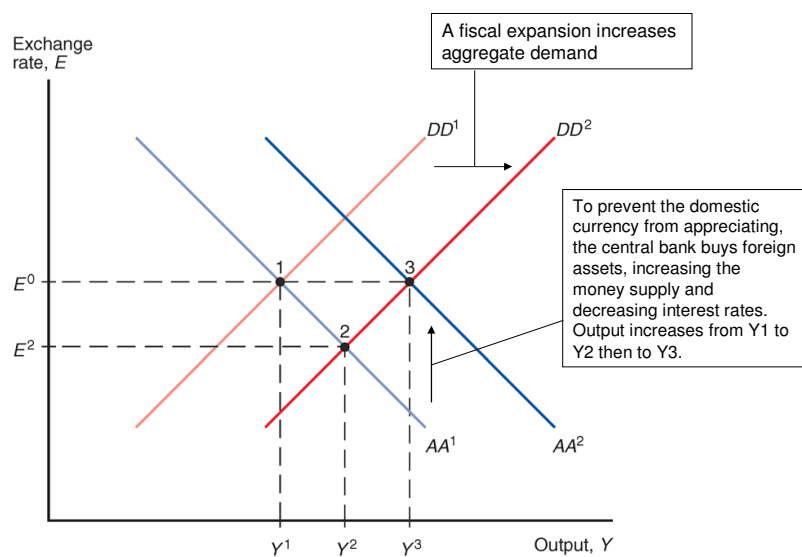
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## Fiscal Policy under Fixed Exchange Rates


- Under fixed change rate, temporary changes in fiscal policy are more effective in influencing output and employment in the short run:
  - The rise in aggregate demand and output due to expansionary fiscal policy raises demand of real monetary assets, putting upward pressure on interest rates and on the value of the domestic currency.
  - To prevent an appreciation of the domestic currency, the central bank must buy foreign assets, thereby increasing the money supply and decreasing interest rates.
  - Central bank's action to keep exchange rate fixed will magnify the effects of fiscal policy. To see why? See the graph that follows...

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## Fiscal Expansion under Fixed Exchange Rate



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## Flexible or Floating Exchange Rates vs. Fixed Exchange Rates

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## Arguments for Flexible Exchange Rates

1. Monetary policy autonomy
  - Floating exchange rate allows monetary policy to be used to pursue macroeconomic goals (stable growth, low inflation)
2. Flexible exchange rates may also prevent speculation in some cases
  - Fixed exchange rates are not sustainable if markets believe that the central bank does not have enough official international reserves.
3. Automatic stabilization
  - In contrast, fixed exchange rate loses the ability to auto-adjust external imbalance of national economy.
  - If the imbalance gets too big, such as the case between Asian exporting countries and the United States, global macro stabilities will be in danger → the problem of global imbalance

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## Example: The Self-adjusting Mechanism under Flexible Exchange Rates

- Let's use US \$ as an example to illustrate how the free movement of ER will help balance an economy.
  - Initially, \$ has a depreciation, then exports increase and output increases, and US current account improves;
  - Then, increase of output drives up money demand, with money supply fixed, US domestic interest rate has to rise;
  - The rise of interest rate helps restore money market equilibrium, but the higher interest rate will also attract foreign investors to invest in US market. Investors' buying \$ or \$-denominated assets increases capital inflow and pushes up the value of dollar. US dollar now starts to appreciate;
  - The appreciation of \$ drives up exports price and lowers the import price, and US current account starts to deteriorate, offsetting the previous CA surplus.
- ➔ This self-adjustment mechanism of free floating exchange rate ensures trade surplus (or deficits) will never get too large.

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## Arguments against Flexible Exchange Rates

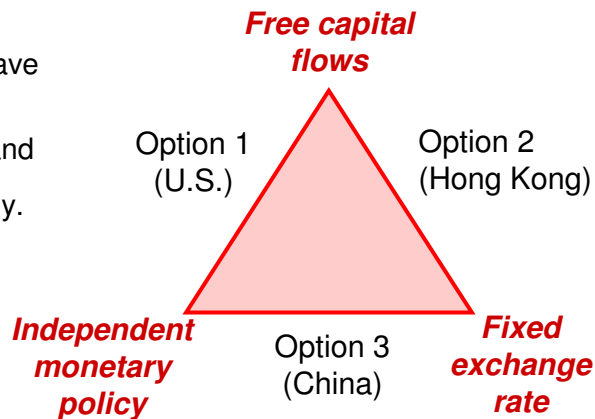
1. Uncoordinated international macroeconomic policies
  - Flexible exchange rate tends to make international macro policies less coordinated across countries. Lack of policy coordination may increase *volatility* across national economies.
2. More speculations and higher volatility in the FX market
  - Also, with higher currency volatility or risk, international transactions, or trade in goods and services, will become more costly and difficult.
3. Fixed change rate may bring more discipline to monetary policy
  - Under flexible exchange rate, central banks lost their ability to control their own monetary policy. This may be a good thing, especially the central banks in developing countries, which are more prone to use inflationary monetary policies (or printing money) to solve their economic problems (such as budget deficits).

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## The Impossible Trinity

A nation cannot have free capital flows, independent monetary policy, and a fixed exchange rate simultaneously.

A nation must choose one side of the triangle and give up the opposite corner.



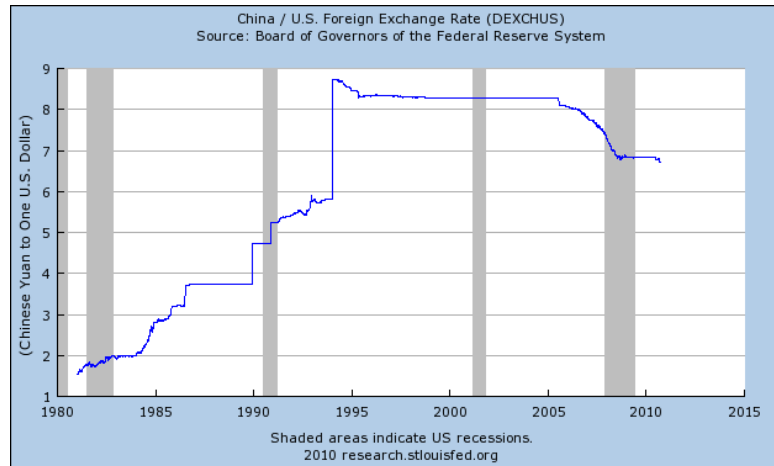
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## CASE STUDY: The Chinese Currency Controversy

- 1995-2005: China fixed its exchange rate at 8.28 Yuan per dollar, and restricted capital flows.
- Many observers believed that the Yuan was significantly undervalued, as China was accumulating large dollar reserves.
- U.S. producers complained that China's cheap Yuan gave Chinese producers an unfair advantage.
- Both President Bush and Obama asked China to let its currency float; Others in the U.S. wanted tariffs on Chinese goods.

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## Yuan/Dollar Exchange Rate: 1980 to 2010



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## CASE STUDY: Chinese Currency Controversy

- First, let's digress a little bit and look at why China wanted to peg its currency to the US dollar in the first place:

- 1) Huge trade volume between China and the US, and most export/import contracts are invoiced or denominated in US dollar – thus pegging Yuan to US dollar removes the currency risk in international trade.
- 2) As discussed before, pegging to the US dollar essentially means that China's central bank surrendered (or *outsourced*, if you put a positive spin on it) its own monetary policy to the Fed.

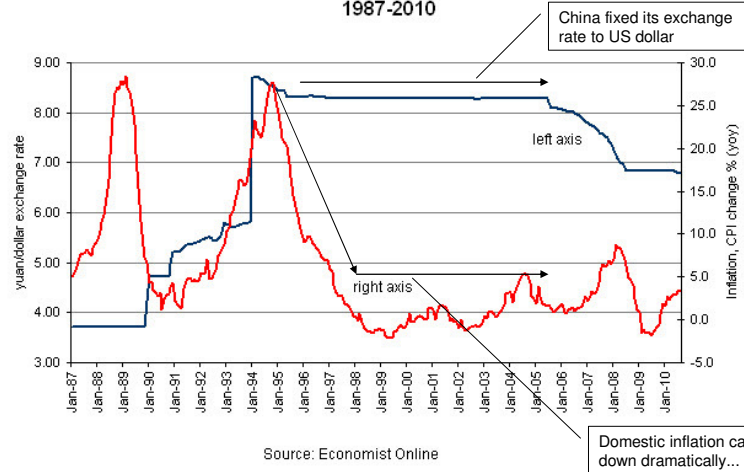
In the context of the Impossible Trinity, although China has capital control, it is not effective in reality – people always find ways to move money in and out of the country. So China's monetary policy is closely connected to the US.

Since the Fed has relatively high credibility and more experience in controlling inflation, China's fixing to the dollar helps itself to achieve macro stability. Does the empirical evidence support the story? →

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## How has China achieved its macro stability?

Exchange Rate and Domestic Inflation in China  
1987-2010



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## CASE STUDY: Chinese Currency Controversy

- Second, we look at what might happen if we allow Yuan to float against the US dollar:
  - It may indeed appreciate;
  - However, if China also relaxes its capital control and allows greater capital mobility, then Chinese citizens may start moving their savings abroad (one reason could be there are far more investment choices in more advanced financial markets);
  - Such capital outflows could cause the Yuan to depreciate rather than appreciate!

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## For the next time...

- History of Int'l Monetary System
- Gold Standard and the Great Depression