

# International Economics Fall 2010 Balance of Payments & Introduction to FX Market

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Sept. 23 2010

1



## Today's Plan

- Review of National Income Accounting (NIA)
- Balance of Payments (BoP)
- Introduction to FX market
- Understand interest parity condition

2

# National Income Accounts

- Closed economy:

$$Y = C + I + G$$

*C: private consumption – spending by private households on final goods and services*

*I: investment – spending on **new** capital goods and changes in inventories*

*G: government consumption and investment*

- National product = National income

- The reason for this equality is that every dollar used to purchase goods or services automatically ends up in somebody's pocket as income.
- In reality, due to measurement errors, these two can be different, but still roughly the same.

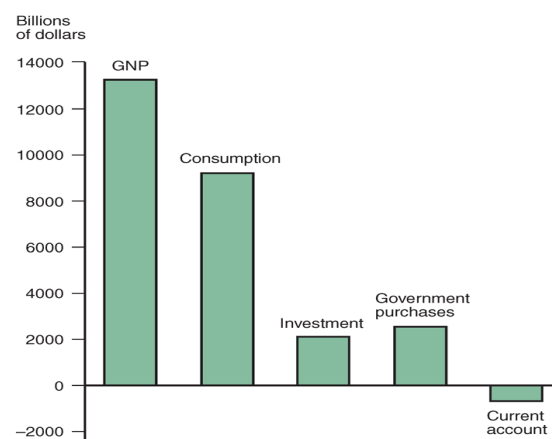
- Open economy

$$Y = C + I + G + (EX - IM) \quad (\text{note: } EX - IM = NX, \text{ or net exports})$$

Current account, CA, and  $NX = CA = EX - IM = Y - (C + I + G)$

3

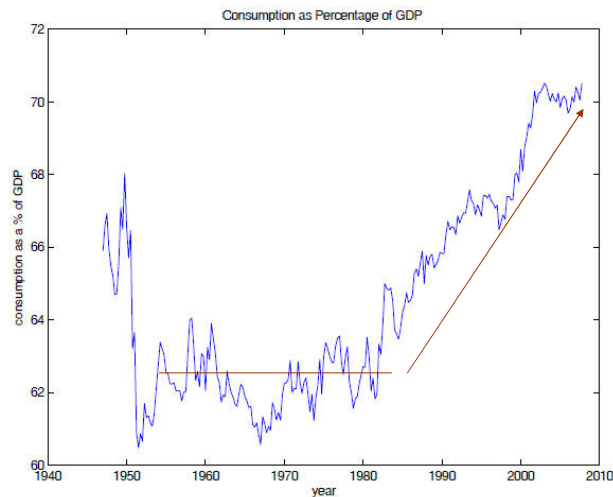
## U.S. GNP and Its Components, 2006



Source: U.S. Department of Commerce, Bureau of Economic Analysis

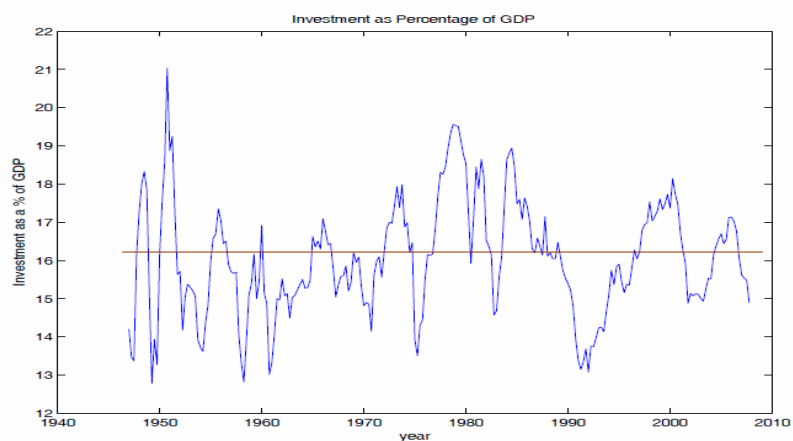
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In recent years, consumption accounts for 70% of US GDP



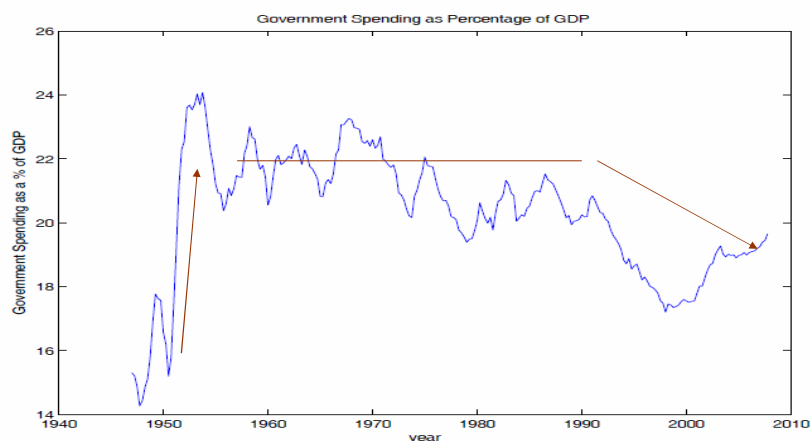
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Investments are much more volatile than consumption



6

## Government spending as percentage of GDP in the US



7

## Expenditure and production in an open economy

$$CA = EX - IM = Y - (C + I + G)$$

### ■ It says:

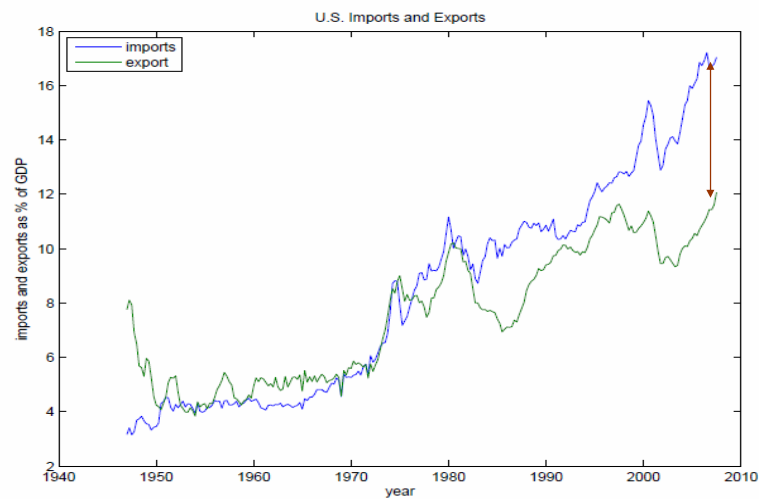
- When production > domestic expenditure, including C, I and G, we have exports > imports, which implies current account > 0
- when a country exports more than it imports, it earns more income from exports than it spends on imports, thus net foreign wealth is increasing

### ■ Conversely,

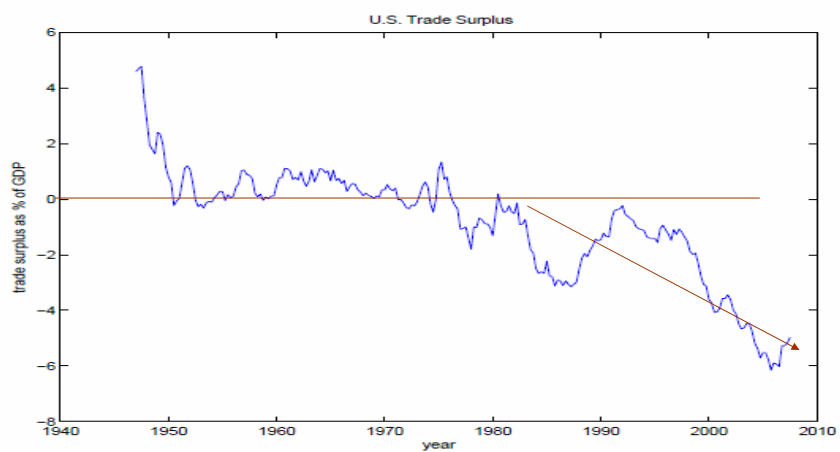
- When production < domestic expenditure, we have exports < imports, which means current account < 0
- when a country exports less than it imports, it earns less income from exports than it spends on imports, thus net foreign wealth is decreasing

8

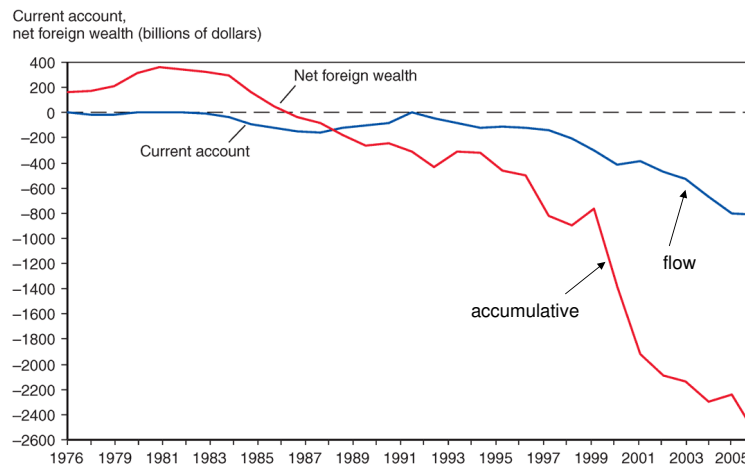
US has run consistent trade deficits since mid 1970s



US Current Account



## U.S. Current Account and Net Foreign Wealth, 1976–2006



Source: U.S. Department of Commerce, Bureau of Economic Analysis, June 2007 release

11

## How saving and current account are connected

- National Saving:  

$$S = Y - C - G$$
- In a closed economy:
  - Since  $Y = C + I + G$ , so  $I = Y - C - G$
  - So  $S = I$ , i.e., mathematically, national saving must equal investment in a closed economy
- In an open economy:
  - $Y = C + I + G + CA$
  - Since  $S = Y - C - G$ , so  $S = I + CA$
  - This means saving roughly equals investment plus revenue from net exports

12

## Balance of Payments (BoP) Accounts

- BoP accounts are separated into 3 broad accounts:

**1. Current Account includes:**

- *net* value of goods trade
- *net* value of services trade
- *net* payments received
  1. net foreign income, incl. interest, dividends & profits from assets owned
  2. unilateral transfers: for example, remittances, charity and foreign aid

**2. Financial Account:** accounts for flows of financial assets (financial capital).

**3. Capital Account:** flows of special categories of assets (capital): typically non-market, non-produced, or intangible assets like debt forgiveness, copyrights and trademarks. Very small.

13

## Examples of BoP Accounting

- You (US consumer) bought a BMW (made by Germany) in San Francisco
- The German producer of BMW deposits the money in its bank account in San Francisco. The bank credits the account by the amount of the deposit.

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BMW purchase	-\$50K
(current account)	

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Credit ("sale") of deposit in account by bank	+\$50K
(financial account)	

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14

## Example of BoP Accounting (cont.)

- You (US citizen) invest in Danish stocks by buying \$500 of Vestas stock through New York Stock Exchange (NYSE)
- Vestas' US subsidiary deposits the money in its California bank account. The bank credits the account by the amount of the deposit.

Purchase of Vestas stock (financial account)	-\$500
Credit ("sale") of deposit in account by bank (financial account)	+\$500

15

## How do the BoP accounts balance?

- To determine whether it should be a debit (-) or credit (+) in BoP account, look at the direction of money flow:
  - If it's money flowing into the country, it is recorded as credit or "+"
  - If it's money flowing out of the country, it's recorded as debit or "-"

16



## U.S. Balance of Payments Accounts for 2006 (billions of dollars)

	Credits	Debits
<b>Current Account</b>		
(1) Exports	+2,096.2	
Of which:		
→ Goods	+1,023.1	
→ Services	+422.6	
→ Income receipts	+650.5	
(2) Imports		-2,818.0
Of which:		
Goods		-1,861.4
Services		-342.8
Income payments		-613.8
(3) Net unilateral current transfers		-89.6
Balance on current account		-811.5
[(1) + (2) + (3)]		
<b>Capital Account</b>		
(4)	very small	-3.9

17

## U.S. Balance of Payments Accounts for 2006 (billions of dollars, cont.)

<b>Financial Account</b>		
(5) U.S. assets held abroad, excluding financial derivatives (increase -)		-1,055.2
Of which:		
Official reserve assets	+2.4	
Other assets		-1,057.6
(6) Foreign assets held in U.S., excluding financial derivatives (increase +)	+1,859.6	
Of which:		
Official reserve assets	+440.3	
Other assets	+1,419.3	
(7) Financial derivatives, net	+28.8	
Balance on financial account	+833.2	
[(5) + (6) + (7)]		= -811.5 - 3.9 + 833.2
Statistical discrepancy		-17.8
[sum of (1) through (7) with sign reversed]		

Source: U.S. Department of Commerce, Bureau of Economic Analysis, June 15, 2007, release. Totals may differ from sums because of rounding.

18

## A very important BoP relationship

- Due to the double entry of each transaction, the balance of payments accounts will balance by the following equation:

$$\text{current account} + \text{financial account} + \text{capital account} = 0$$

Since capital account is often negligible, so roughly we have,

$$\text{current account} = - \text{financial account}$$

### This means:

- Any current account surplus *should* be matched by roughly equal amount of capital outflow
- Any current account deficits *should* be matched by roughly equal amount of capital inflow

19

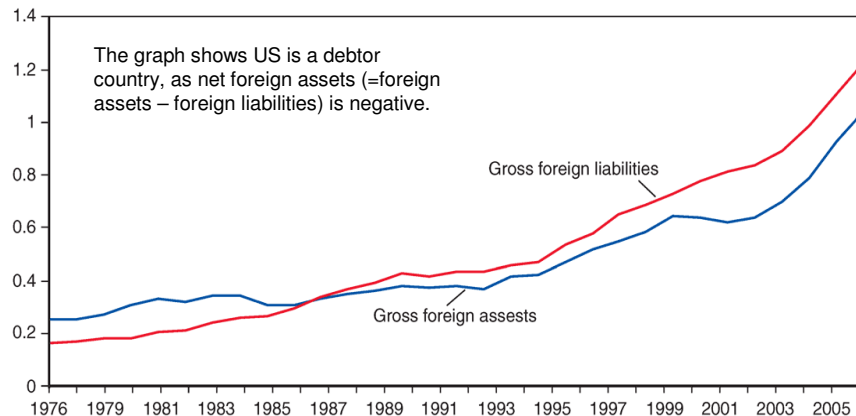
## Balance of Payments (cont.)

- What is BoP in previous US example?
- $\text{BoP} = - \text{official reserve assets} = -(440.3 + 2.4) = - 442.7 \text{ billion}$
- If BoP is bigger than official reserve assets, which means not enough money can be borrowed from foreigners, BoP account is not balanced, or we say this country runs a BoP deficit.
- If BoP deficit is very big, this country will likely to suffer a BoP crisis.
- In the US case, BoP account is balanced, because foreigners are willing to lend money to the US.

20

## U.S. Gross Foreign Assets and Liabilities, 1976-2006

Assets, liabilities  
(ratio to GDP)



Source: U.S. Department of Commerce, Bureau of Economic Analysis, June 2007

21

## Introduction of FX Markets

The major players:

1. **Commercial banks** and other depository institutions: transactions involve buying/selling of deposits in different currencies for investment purposes, e.g., JP Morgan Chase, Deutsche Bank.
2. **Corporations** conduct foreign currency transactions to buy/sell goods, services and assets. The operations of these corporations often involve currency risk, e.g. oil companies.
3. **Non-bank financial institutions** (mutual funds, hedge funds, securities firms, insurance companies, pension funds) may buy/sell foreign assets for investment purpose.
4. **Central banks**: conduct official international reserves transactions. For example, the recent currency market intervention by Japanese central bank.

22

## Characteristics of the FX Market

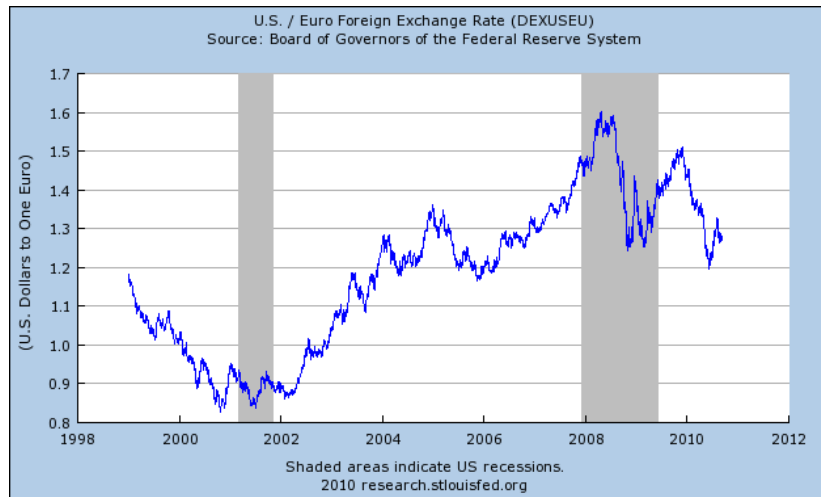
- The size of FX market is huge
  - In 2007, averaged at \$3.2 trillion, **per day!**
  - Compared to international trade, the annual total world export value was \$16 trillion. In other words, one-year of world total exports only equals 5 days of FX trading value.
- Concentrated in five major centers:
  - London (the largest)
  - NYC, Tokyo, Frankfurt and Singapore
- Because these centers cover different time zones, so we have almost 24 hours of continuous trading.

23

Now, get yourself familiar with a few very important currency pairs →

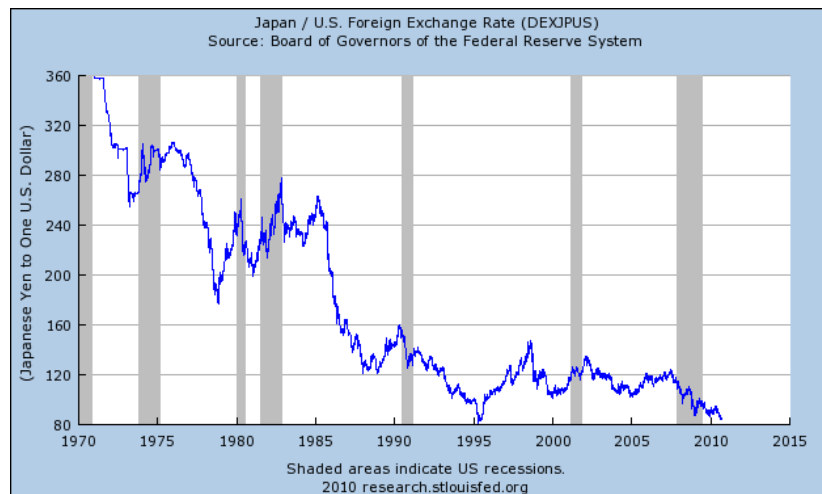
24

## Exchange rate: US \$ per Euro



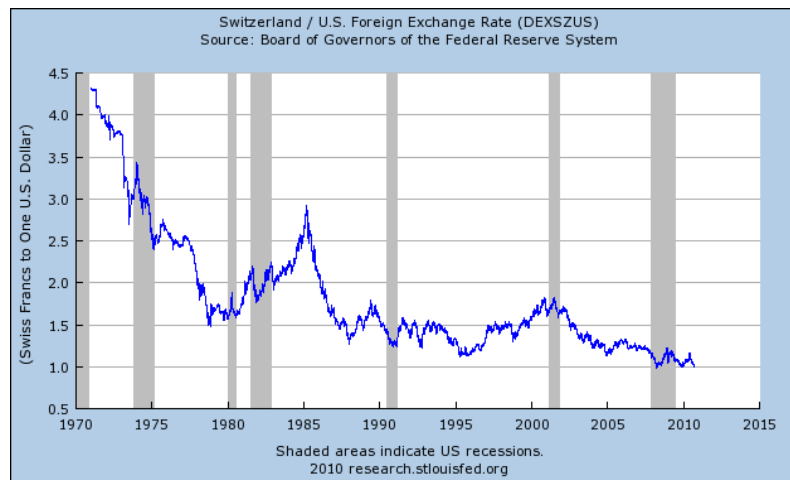
25

## Exchange rate: Japanese Yen per USD



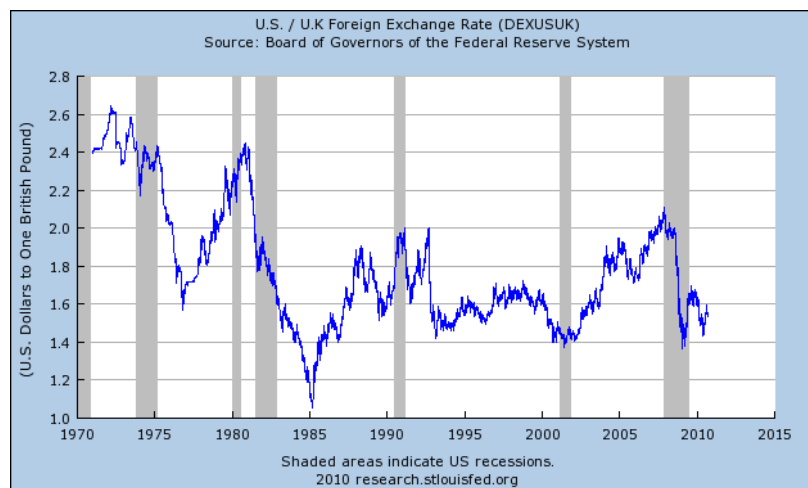
26

## Exchange rate: Swiss Francs per US\$



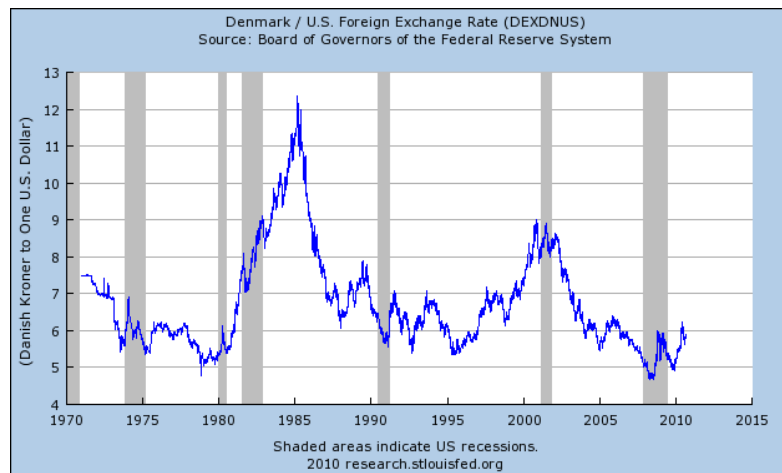
27

## Exchange rate: US \$ per British Pound



28

## Exchange rate: Danish Kroner per US \$



29

## Spot Rates and Forward Rates

- **Spot rates** are exchange rates for currency exchanges “on the spot”, or when trading is executed at the moment.
- **Forward rates** are exchange rates for currency exchanges that will occur at a future (“forward”) date.
  - Forward dates are typically 30, 90, 180, or 360 days in the future.
  - Rates are negotiated between two parties in advance, but the exchange take place on a future specified date.

30

# Exchange Rate Quotations

## Currencies

July 23, 2007

U.S.-dollar foreign-exchange rates in late New York trading

Country/currency	Mon in US\$	per US\$	US\$ vs. YTD chg (%)	Country/currency	Mon in US\$	per US\$	US\$ vs. YTD chg (%)
<b>Americas</b>				<b>Europe</b>			
Argentina peso <sup>o</sup>	.3199	3.1260	2.2	Czech Rep. koruna <sup>o</sup>	.04892	20.442	-1.9
Brazil real	.5427	1.8426	-13.7	Denmark krone	.1855	5.3908	-4.6
Canada dollar	.9552	1.0469	-10.2	Euro area euro	1.3801	.7246	-4.3
1-mos forward	.9558	1.0462	-10.2	Hungary forint	.005611	178.22	-6.4
3-mos forward	.9568	1.0452	-10.1	Malta lira	3.2147	.3111	-4.3
6-mos forward	.9580	1.0438	-10.0	Norway krone	.1745	5.7307	-8.1
Chile peso	.001943	514.67	-3.3	Poland zloty	.3668	2.7263	-6.1
Colombia peso	.0005224	1914.24	-14.5	Russia ruble	.03935	25.413	-3.5
Ecuador US dollar	1	1	unch	Slovak Rep koruna	.04176	23.946	-8.3
Mexico peso <sup>o</sup>	.0930	10.7550	-0.4	Sweden krona	.1502	6.6578	-2.7
Peru new sol	.3168	3.157	-1.2	Switzerland franc	.8285	1.2070	-1.0
Uruguay peso <sup>o</sup>	.04220	23.70	-2.8	1-mos forward	.8306	1.2039	-1.0
Venezuela bolivar	.000466	2145.92	unch	3-mos forward	.8340	1.1990	-0.8
<b>Asia-Pacific</b>				6-mos forward	.8391	1.1918	-0.7
Australian dollar	.8827	1.1329	-10.6	Turkey lira <sup>o</sup>	.8017	1.2473	-11.9
China yuan	.1322	7.5620	-3.1	UK pound	2.0578	.4860	-4.8
Hong Kong dollar	.1279	7.8215	0.6	1-mos forward	2.0568	.4862	-4.8
India rupee	.02492	40.128	-9.0	3-mos forward	2.0547	.4867	-4.7
Indonesia rupiah	.0001102	9074	0.9	6-mos forward	2.0505	.4877	-4.5
Japan yen	.008250	121.21	1.9	<b>Middle East/Africa</b>			
1-mos forward	.008286	120.69	1.8	Bahrain dinar	2.6526	.3770	unch
3-mos forward	.008347	119.80	1.9	Egypt pound <sup>o</sup>	.1763	5.6725	-0.7
6-mos forward	.008440	118.48	1.9	Israel shekel	2.382	4.1982	-0.4
Malaysia ringgit	.2934	3.4083	-3.4	Jordan dinar	1.4116	.7084	-0.1
New Zealand dollar	.8057	1.2412	-12.6	Kuwait dinar	3.4854	.2869	-0.8
Pakistan rupee	.01653	60.496	-0.5	Lebanon pound	.0006614	1511.94	unch
Philippines peso	.0223	44.803	-8.6	Saudi Arabia riyal	.2666	3.7509	unch
Singapore dollar	.6629	1.5085	-1.6	South Africa rand	.1468	6.8120	-2.6
South Korea won	.0010927	915.16	-1.6	UAE dirham	.2723	3.6724	unch
Taiwan dollar	.03048	32.808	0.7	SDR <sup>††</sup>	1.5358	.6511	-2.0
Thailand baht	.03350	29.851	-15.8				

<sup>o</sup>Floating rate <sup>†</sup>Financial <sup>§</sup>Government rate <sup>‡</sup>Russian Central Bank rate <sup>\*\*\*</sup>Rebased as of Jan 1, 2005  
<sup>††</sup>Special Drawing Rights (SDR); from the International Monetary Fund; based on exchange rates for U.S., British and Japanese currencies.  
 Note: Based on trading among banks of \$1 million and more, as quoted at 4 p.m. ET by Reuters.

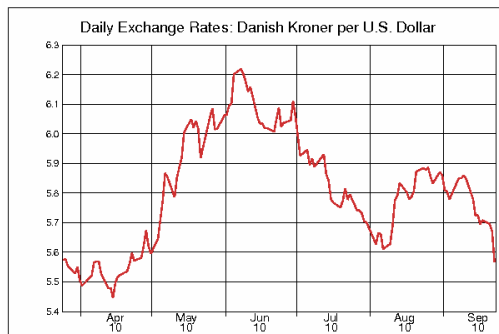
Source: Data from "Currencies," Wall Street Journal, July 24, 2007, p. C5.

31

## An example of using currency forward contract to hedge currency risk

- Fona, the electronics retailer in Denmark, will pay a US supplier in 30 days for a shipment arriving then. The shipment costs 1 million USD. During this period, the exchange rate (ER) between DKK and US dollar will fluctuate. Fona wants to avoid such currency risk.

- Say, for example, the current spot ER is 5.6 DKK per USD; and in 30 days, Danish Kroner depreciates to 6 DKK per USD, and the potential loss for Fona is  $(6 - 5.6) \times 1\text{m} = 0.4\text{m DKK}$  or 400,000 DKK. This is not a small amount.



32



## Example: Hedging currency risk using currency forward contract

- Fona could buy currency forward contract to lock in today's exchange rate:
  - Fona buys forward contract from Danske Bank at 5.625 DKK per US \$, the difference between 5.625 DKK and spot ER rate 5.6 DKK covers bank's expense and expected profit for writing the forward contract.
  - Then 30 days later, Fona converts DKK to US \$ at 5.6 DKK per US\$ as stipulated in the forward contract. The only extra cost to Fona is the cost of buying forward contract, which costs Fona  $0.025 \times 1\text{m} = 25,000$  DKK, but this cost is much smaller than the potential loss from currency depreciation, which is 400,000 DKK.
  - In other words, Fona transferred its current risk exposure to Danske Bank, and the bank will have to hedge its own currency risk too, through other means.

33

## Exchange Rates and Asset Returns

- Transactions in FX market could be currency risk hedging that is related to international trade, such as the Fona example.
- But there are other motives for people to trade currencies:
  - Carry Trade: people move money from one country to another because interest rates charged for bank deposits (or returns on financial assets, such as stocks and bonds) are different in different countries
  - Currency is usually volatile; it goes up and down. As such, people can also engage in short-term speculative trading on currencies based on their expectations on future currency movement (similar to stock market).

34

## Exchange Rates and Asset Returns

- For the carry-traders, i.e., individuals or institutions that move money around to explore the interest rate differentials, the question to ask is: “what is my real rate of return?”:
  - The interest rate in Japan is 1%, while the interest rate in the US is 5%. So the interest rate differential is 4%. But this does not mean your real rate of return is 4%. This is because most people initially borrow Yen to invest in US dollar; they will eventually have to convert US \$ back to Yen to pay back the loan.
  - When you convert \$ to Yen in the future, there is currency risk. You could lose money if the \$ depreciates against Yen more than 4%. However, you will make money if US \$ did not depreciate, or depreciates less than 4%, or even appreciate.

35

## Exchange Rates and Asset Returns

### For example:

The spot ER is 100 yen per USD on 01/01/2005, you borrow 1 million Yen at 1% interest from a bank in Japan and deposit in a US bank, earning 5% interest.

The interest rate differential is:

$$R_{US} - R_{JP} = 5\% - 1\% = 4\%$$

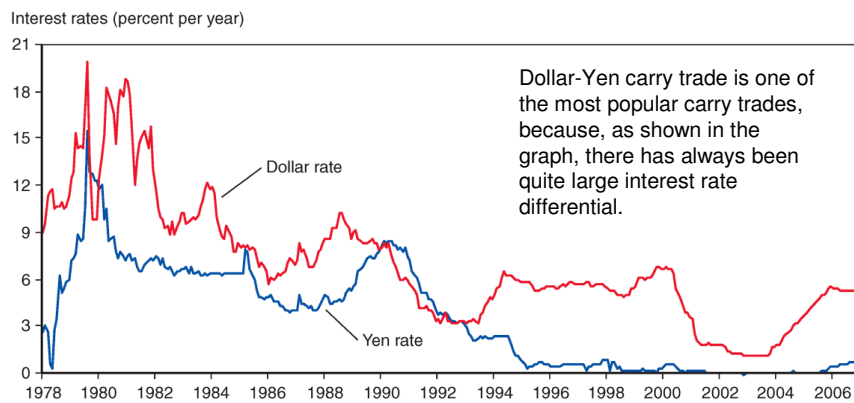
One year later (01/01/2006), you need to convert \$ back to Yen to pay back the loan from the Japanese bank from which you borrowed money. At that day, the spot exchange rate changed to 95 Yen per USD, so the dollar depreciated by 5% =  $(100-95)/100$  in one year.

So your final real return is roughly 4% - 5% = -1%, or -10,000 Yen. You lost money!! ☹

But if the exchange rate changed to 98 Yen per USD on 01/01/2006, i.e., when Japanese Yen only appreciated by 2% =  $(100-98)/100$ , because 4% > 2%, you will still make money. ☺

36

## Interest Rates on Dollar and Yen Deposits, 1978–2007



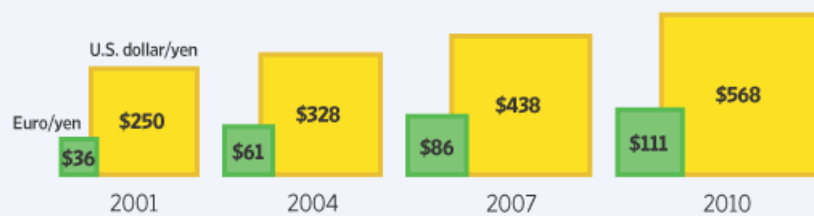
Source: Datastream. Three-month interest rates are shown.

37

## Two popular carry-trades compared

### Growing Money

Daily turnover in foreign-exchange markets by currency pair, in billions of U.S. dollars

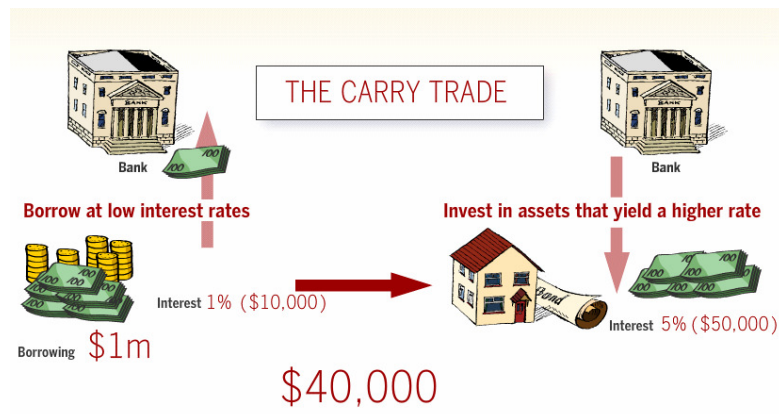


Source: Bank for International Settlements

Note: Daily averages in April for years shown

38

# The Carry Trade Explained...



Watch this fantastic video explaining carry trade (requires free registration):  
<http://www.ft.com/cms/s/0/f3aec6c2-b99e-11de-a747-00144feab49a.html>

39

## Interest Parity Condition

- The foreign exchange market is in equilibrium when deposits of all currencies offer the same expected rate of return.

$$R = R^* + (E_{f*}^e - E_{f*}) / E_{f*}$$

R: interest rate in home country, R\*: interest rate in foreign country  
 $E_{f*}^e$ : expected future exchange rate of foreign currency in terms of home currency  
 $E_{f*}$ : spot exchange rate foreign currency in terms of home currency

- The above equation is called interest parity condition. When it holds, people (e.g. carry traders) have no incentives to move money across borders.
- In other words, if the parity condition does not hold, there are always arbitrage opportunities for people to make money. This is mostly the case in reality.

40

## Derive the Equilibrium Exchange Rate

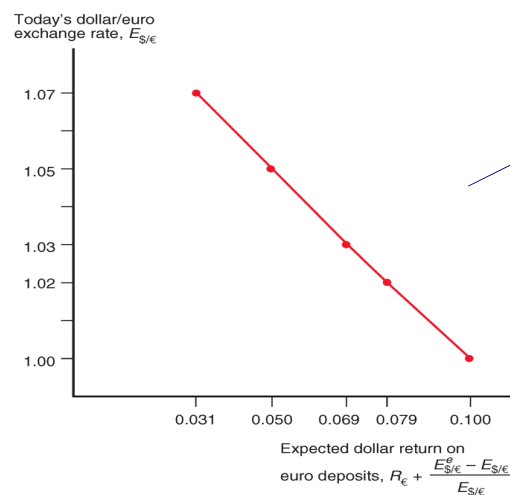
- Now we look at how change in today's exchange rate affect the expected return of a carry trade, with everything else unchanged.

Today's Dollar/Euro Exchange Rate and the Expected Dollar Return on Euro Deposits When  $E_{\$/\epsilon} = \$1.05$  per Euro

Today's Dollar/Euro Exchange Rate	Interest Rate on Euro Deposits	Expected Dollar Depreciation Rate Against Euro	Expected Dollar Return on Euro Deposits
$E_{\$/\epsilon}$	$R_{\epsilon}$	$\frac{1.05 - E_{\$/\epsilon}}{E_{\$/\epsilon}}$	$R_{\epsilon} + \frac{1.05 - E_{\$/\epsilon}}{E_{\$/\epsilon}}$
1.07	0.05	-0.019	0.031
1.05	0.05	0.00	0.05
1.03	0.05	0.019	0.069
1.02	0.05	0.029	0.079
1.00	0.05	0.05	0.10

41

## Derive the Equilibrium Exchange Rate

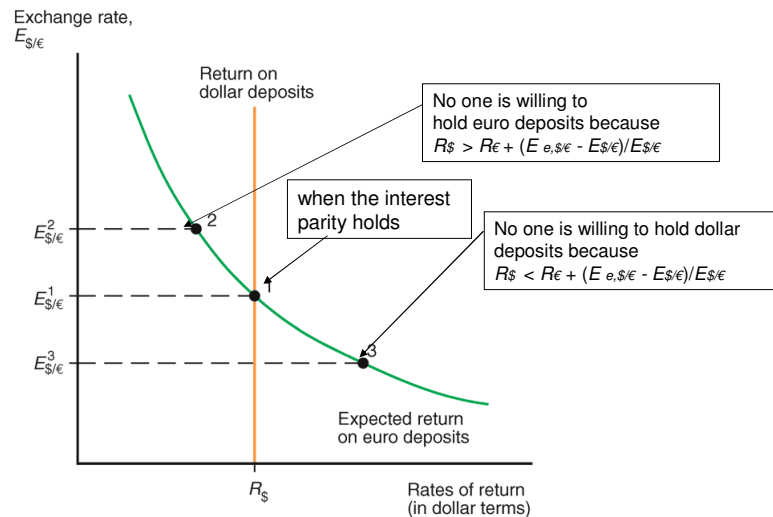


The higher today's exchange rate of US dollar (US \$ per Euro), the lower expected dollar return on Euro deposits in the future.

The intuition behind it is at higher exchange rate, your money in \$ today can exchange for less euros, so your starting level of euro investment is lower.

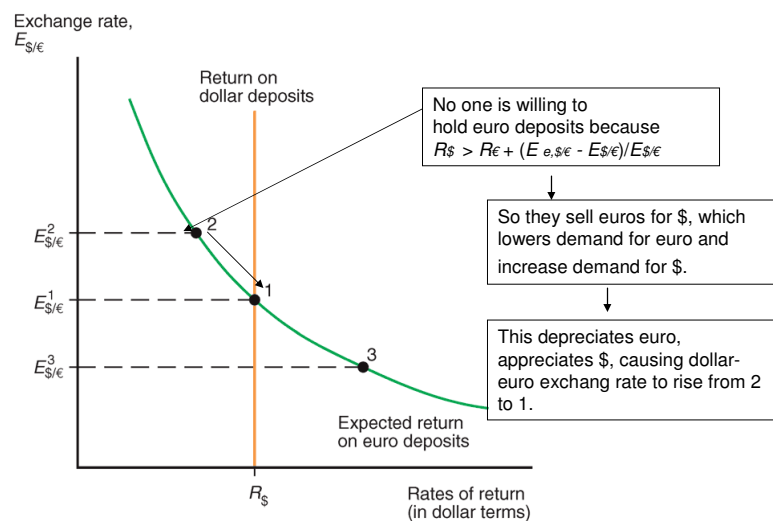
42

# Equilibrium Exchange Rate



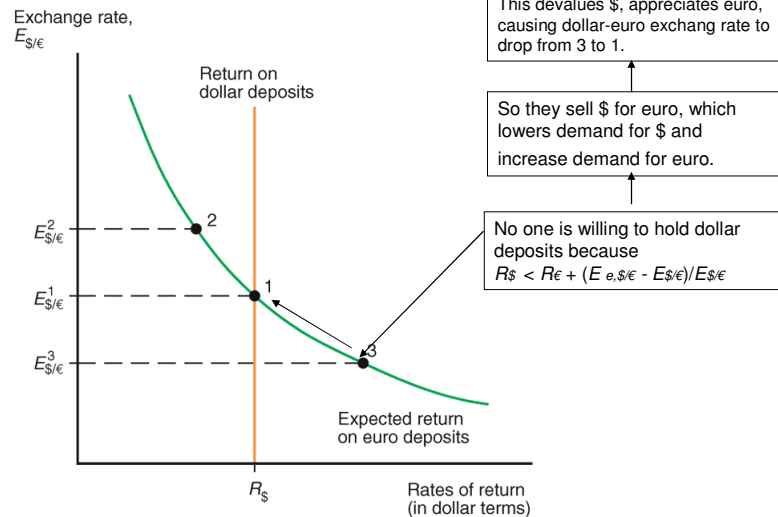
43

# Equilibrium Exchange Rate



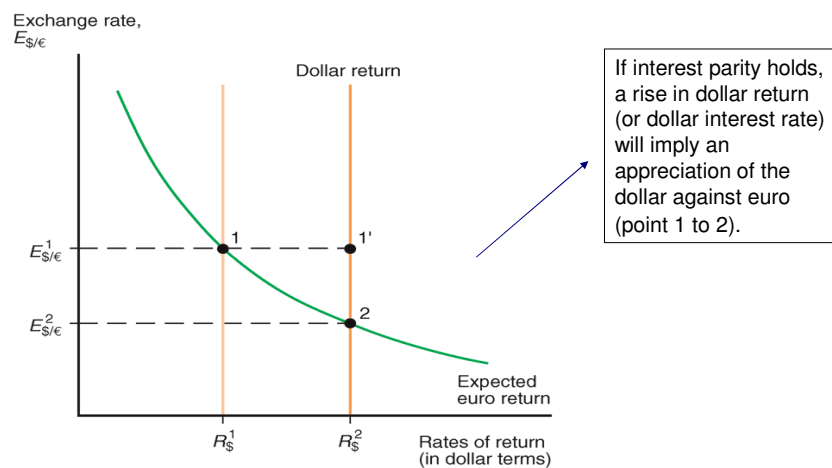
44

## Equilibrium Exchange Rate



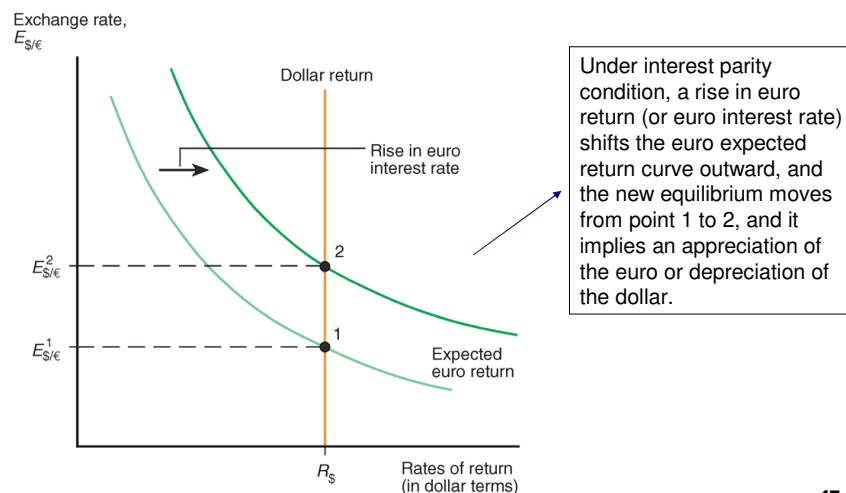
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## How exchange rate is determined under interest parity condition?



46

## How exchange rate is determined under interest parity condition?



47

## How exchange rate is determined under interest parity condition?

- The above analysis sounds logically perfect and quite intuitive
- But...
  - We haven't really talked about how  $E_{\$/€}$  is determined
  - And we assumed as if investors can sell/buy currencies freely all the time, without any restrictions. The reality is far from the case.
  - Just some food for thought...

48



## Covered Interest Parity

- Covered interest parity relates to interest rates, **forward** exchange rates and the spot exchange rate:

$$R_{\$} = R_{\epsilon} + (F_{\$/\epsilon} - E_{\$/\epsilon})/E_{\$/\epsilon},$$

where  $F_{\$/\epsilon}$  is the forward exchange rate.

- To differentiate, the previous equation  $R_{\$} = R_{\epsilon} + (E_{\$/\epsilon}^e - E_{\$/\epsilon})/E_{\$/\epsilon}$  is called “uncovered” interest rate parity.
- The only difference is that covered interest parity replaces **expected** exchange rate in the equation with **forward** exchange rate. Since forward rate hedges currency risk (as in the Fona example), so we say the currency risk is “covered”.

49

## For the next time...

- Readings - pls see course website

50