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# Open Economy Macroeconomics

## Exchange Rates, Interest Rates and Macroeconomic Policy

# Outline

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1. Exchange Rates
  2. Theories: Purchasing Power Parity and Uncovered Interest Parity
  3. Monetary and Fiscal Policy in Open Economies
- Textbook Readings: Ch. 18 & Ch. 19 pp. 676-681

# How Economies Are Connected?

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- **Goods** flow between nations

- USA sends corn to China
  - China sends flat screen TVs to USA

- **Services** flow between nations

- USA processes European transactions via Mastercard
  - India fields questions on iPad usage via call centers

- **Financial assets** flow between nations

- China's central bank (PBoC) has bought billions of U.S. Treasuries
  - U.S. companies invest billions of dollars building factories in China



# Balance of Payments

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- Records all transactions with foreign economic agents over a period of time (a flow)
- 3 main types of transactions:
  - Exports and imports of **G&S** → CA: Current Account
  - Sale and purchase of **financial assets** → FA: Financial Account
  - Certain **transfers of wealth** (small) → KA: Capital Account
- Balance of payments (BoP) has to balance:

$$\text{BoP} = \text{CA} + \text{FA} + \text{KA} = 0$$

# Why Does the BoP Has to Balance?

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- CA captures transactions of G&S → Think EX – IM
  - Related to NX (or the trade balance), but is not exactly the same
  - Recall how do we go from GDP to GNP?
  - NFIA (Net Factor Income from Abroad) = FP from ROW – FP to ROW
  - To obtain GNP, we add NFIA to GDP
  - $CA = NX + NFIA$
- FA captures how that is financed → Think Inflows – Outflows
  - A measure of international lending and borrowing
  - International financial flows

# Why Does the BoP Has to Balance? Example

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- US people buy \$475b worth of Chinese goods every year
- Chinese people buy \$115b worth of US goods every year
- What does China do with the rest \$360b?
- China receives \$360b of US assets
  - PBoC buys T-bonds,
  - Chinese elites buy US stocks and Seattle real state

# CA Deficit/Surplus → FA Surplus/Deficit

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- A **CA deficit** must be offset by an **FA surplus** (e.g. US)
  - In September 2017, US bought \$43b more G&S than sold to ROW
  - Therefore, ROW purchases of US assets must have been \$43b higher than US purchases of ROW assets
    - ❖ US invests in factories in China and buys European stocks
    - ❖ ROW buys US Treasuries, shares of US companies, houses in Florida
- A **CA surplus** must be offset by an **FA deficit** (e.g. China)

# Saving and Investment in an Open Economy

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- In a closed economy, we saw that:

$$S = I$$

- In an open economy we have (CA identity):

$$CA = S - I \quad \text{or} \quad I = S - CA$$

- What does the CA identity say?

# Net Foreign Asset Position

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- BoP records a **flow** (not a stock)
- Net foreign asset (NFA) position is a **stock**
  - Value of **US-owned** foreign assets - Value of **foreign-owned** US assets
  - Also called Net International Investment (NII) position or External Wealth
  - A CA deficit reduces NFA position and vice versa
  - $NFA < 0 \rightarrow$  Debtor country
- US is a **net debtor** to the world, China is a **net lender** to the world

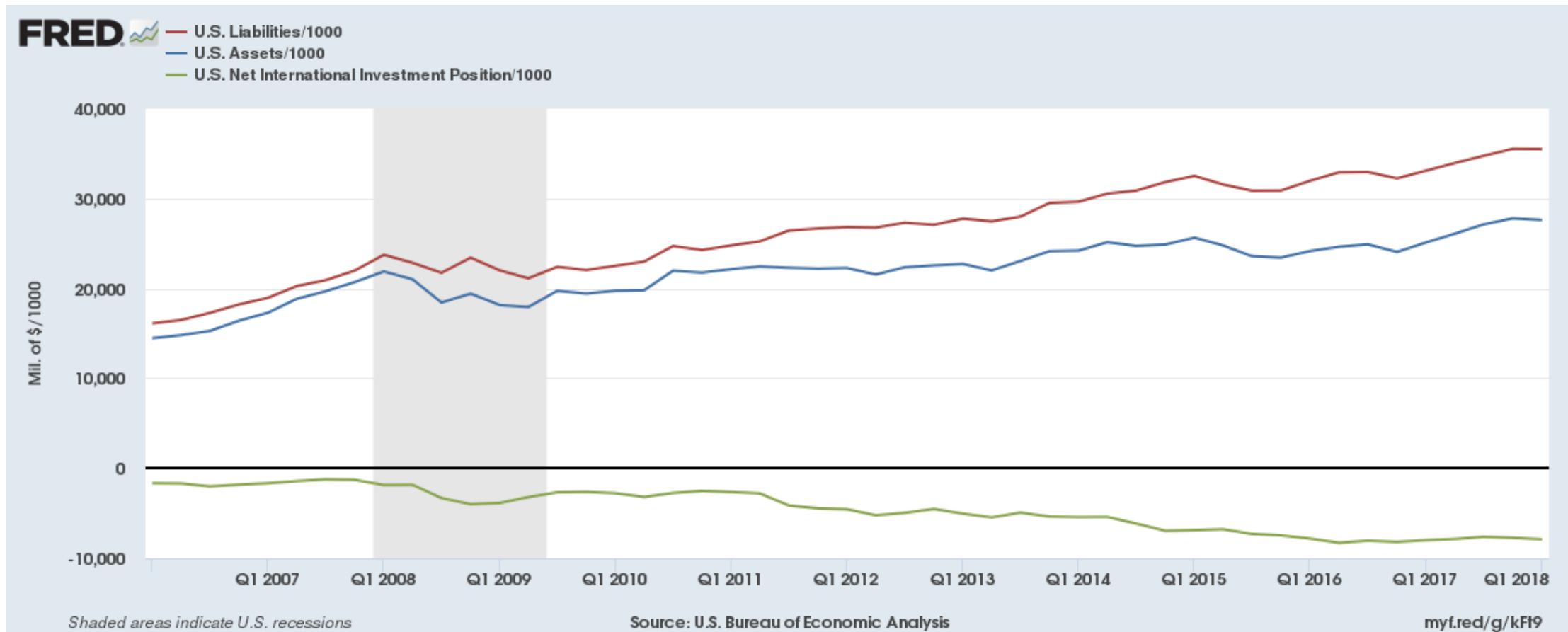
# The World is Much More “Inter-Owned”

- US consistently has CA deficits → Net debtor position has grown
- However, US also owns a large sum of ROW assets
- **Net** debtor position is small relative to **gross** assets and liabilities

■ Surge in gross flows

	2000	2017
U.S. net debtor status (\$ trillions)	-1.3	-8.1
U.S. net debtor status (share of GDP)	-0.10	-0.43
U.S. owned foreign assets (\$ trillions)	6.2	26.1
U.S. owned foreign assets (share of GDP)	0.49	1.36
Foreign owned U.S. assets (\$ trillions)	-7.6	-34.4
Foreign owned U.S. assets (share of GDP)	-0.61	-1.80

# U.S. As A Net Debtor



# NFA Position: Return on Assets

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- Despite the US **net debtor** status, it collects more on its assets than what it pays on its liabilities
  - **Income received** in US investments abroad:  
\$783bn in 2015 on \$25tr → US Return of Assets: 3.1%
  - **Income paid** to foreign-owned US assets:  
\$600.5b in 2015 on \$33tr → ROW Return of Assets: 1.8%
- Why does the US have a much better ROA?
  - US owns factories around the world
  - Foreigners own US Treasury securities

# Exchange Rates

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- When selling a good, a service or a financial asset, foreigners will often want to be paid in their own currency
- **Nominal exchange rate:** Value of one currency in terms of another
- Important because they affect **relative prices** in different markets:
  - Labor → Employment
  - Goods → International trade
  - Financial assets → International finance

# Notation

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- Exchange rates can be **expressed in two ways**
  - **Example:** If one US dollar can purchase 100 Japanese yen, then the exchange rate is  $\text{¥}100 = \$1$ ; or alternatively  $\text{¥}1 = \$0.01$
- Our **notation**:
$$E_{\text{¥}/\$} = 100 \quad \text{or} \quad E_{\$/\text{¥}} = 0.01$$
- **Warning:** Convention in the market uses the opposite notation
  - **Example:** Our  $E_{\text{¥}/\$}$  is quoted as  $E_{\text{USDJPY}}$  in the market

# Exchange Rate Quotations

August 14, 2015

Currency (XYZ)	Units of Foreign Currency per USD (How many XYZ can be purchased with \$1 or how many XYZ are needed to buy \$1)	USD per Unit of Foreign Currency (How many dollars can be purchased with 1 XYZ or how many dollars are needed to buy 1 XYZ)
Japanese yen	<b>124.32</b>	0.008
Chinese renminbi (or yuan)	<b>6.39</b>	0.156
British pound	<b>0.64</b>	<b>1.56</b>
Euro (used by 19 countries)	<b>0.90</b>	<b>1.11</b>

# Using Exchange Rates

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- Assume the value of euros **in terms of dollars** is  $E_{\$/\epsilon} = 1.25$

- A foreigner has €40, how many dollars can she buy?

$$\epsilon 40 \times E_{\$/\epsilon} = \epsilon 40 \times 1.25 = \$50$$

- If you have \$65, how many euros can you buy?

$$\$65 \times \frac{1}{E_{\$/\epsilon}} = \$65 \times E_{\epsilon/\$} = \$65 \times 0.8 = \epsilon 52$$

- If you want to buy €100, how many dollars do you need?

$$\$?? \times 0.8 = \epsilon 100 \rightarrow \$125$$

# Exchange Rates: Volatile Relative Prices of Currencies

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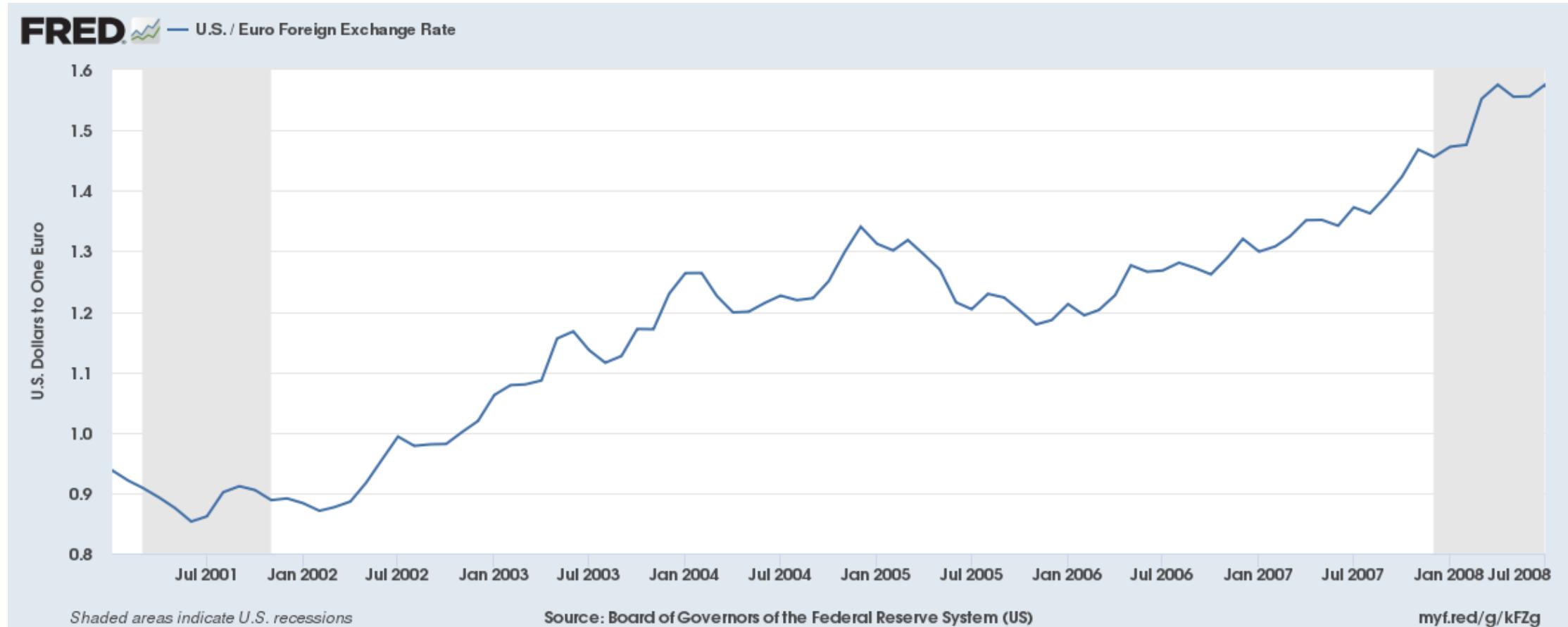
	Euro (Euro area)	Yen (Japan)	Renminbi (China)	Ruble (Russia)
Q4:2006	1.32\$/€	120Y/\$	7.8R/\$	26.3RB/\$
Q4:2012	1.32\$/€	85Y/\$	6.3R/\$	30.3RB/\$
Q4:2016	1.07\$/€	109Y/\$	6.9R/\$	64.8RB/\$

# Appreciation and Depreciation

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- Currency **appreciates** when it **increases** in value relative to another
  - Currency **depreciates** when it **decreases** in value relative to another
  - Sometimes ‘stronger’ and ‘weaker’ is used but may be misleading
- 
- **Example:**
    - If the exchange rate changes from ¥ 100 = \$1 to ¥ 120 = \$1, which currency **appreciated**?
    - If the exchange rate changes from ¥ 1 = \$ 0.010 to ¥ 1 = \$ 0.015, which currency **depreciated**?

# What Happen to the US Dollar 2001-2008?



# Is a Strong Dollar Better than a Weak Dollar?

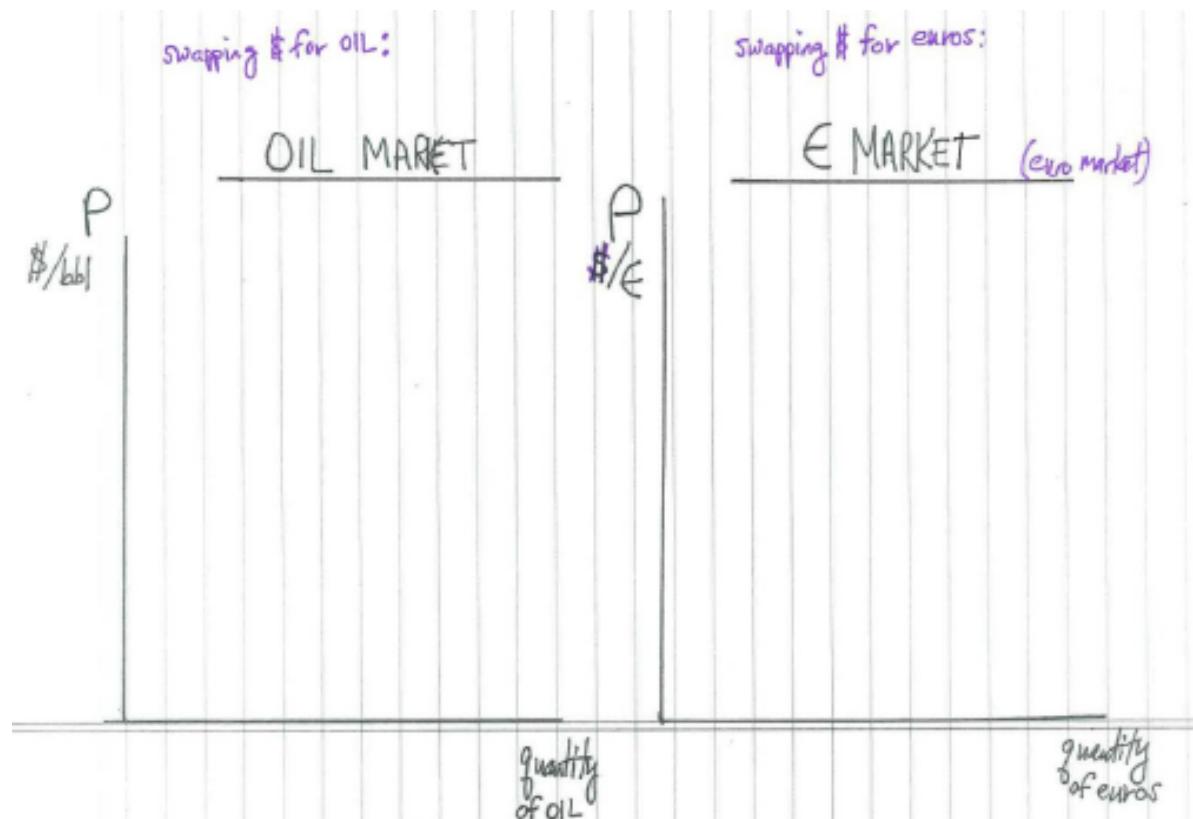
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- The words “strong” and “weak” can **mislead** people to believe that an appreciating currency is always better for the economy
- There is no simple connection between the strength of a country’s currency and the strength of its economy
- **Swings in exchange rates** create **both** winners and losers

With a depreciation of the dollar	EX are cheaper IM are expensive	$NX \uparrow$
With an appreciation of the dollar	EX are expensive IM are cheaper	$NX \downarrow$

# The Market for Euros

- We can think about exchange rates using supply/demand curves
- The market for euros is just like any other market



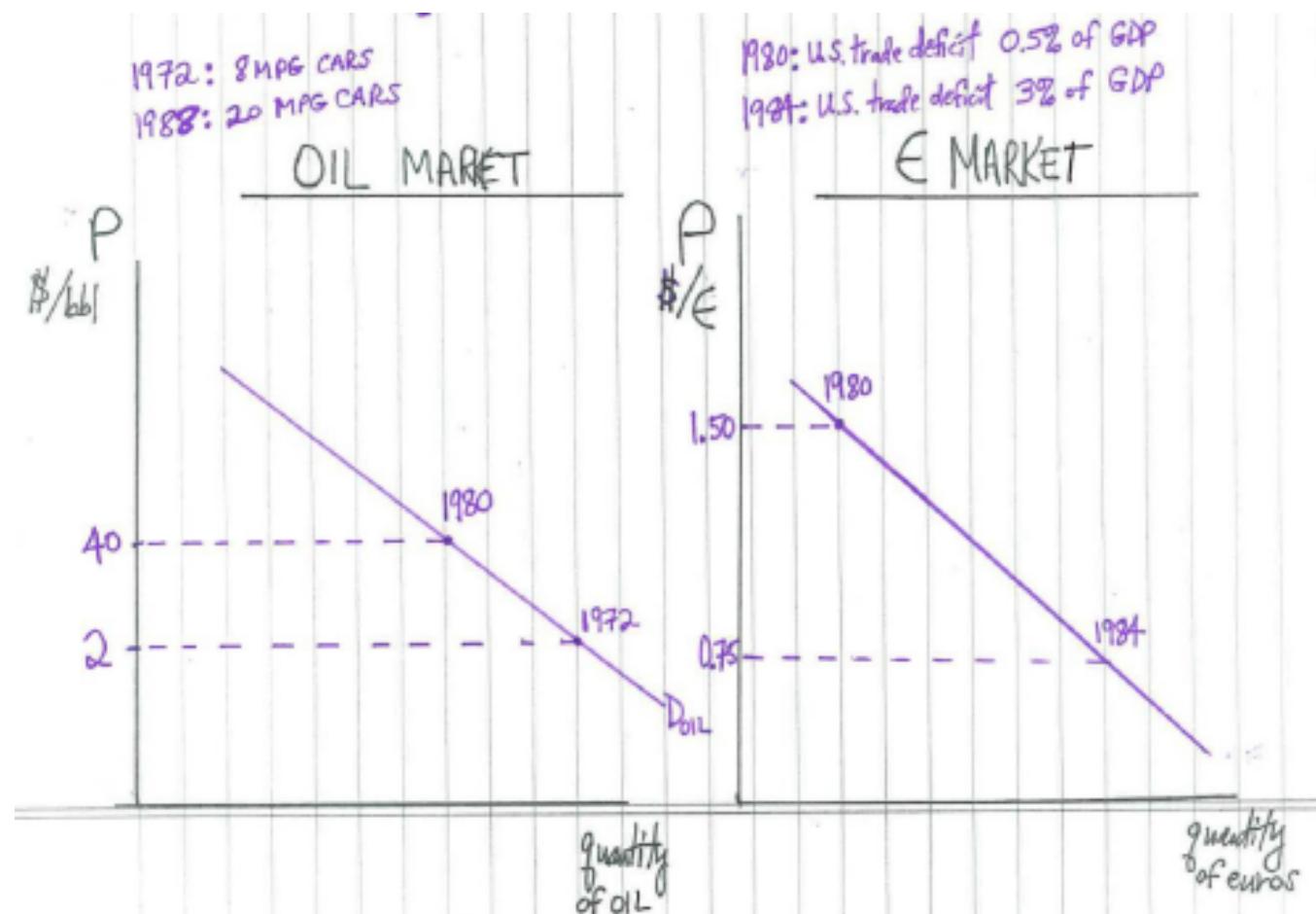
# Downward Sloping Demand for Currency

- 1972-1980 surge in oil prices

- Sharp reduction in demand

- 1980-1984 price of European currencies plunged

- Surge in buying of those currencies
  - Facilitated buying of European goods by US citizens



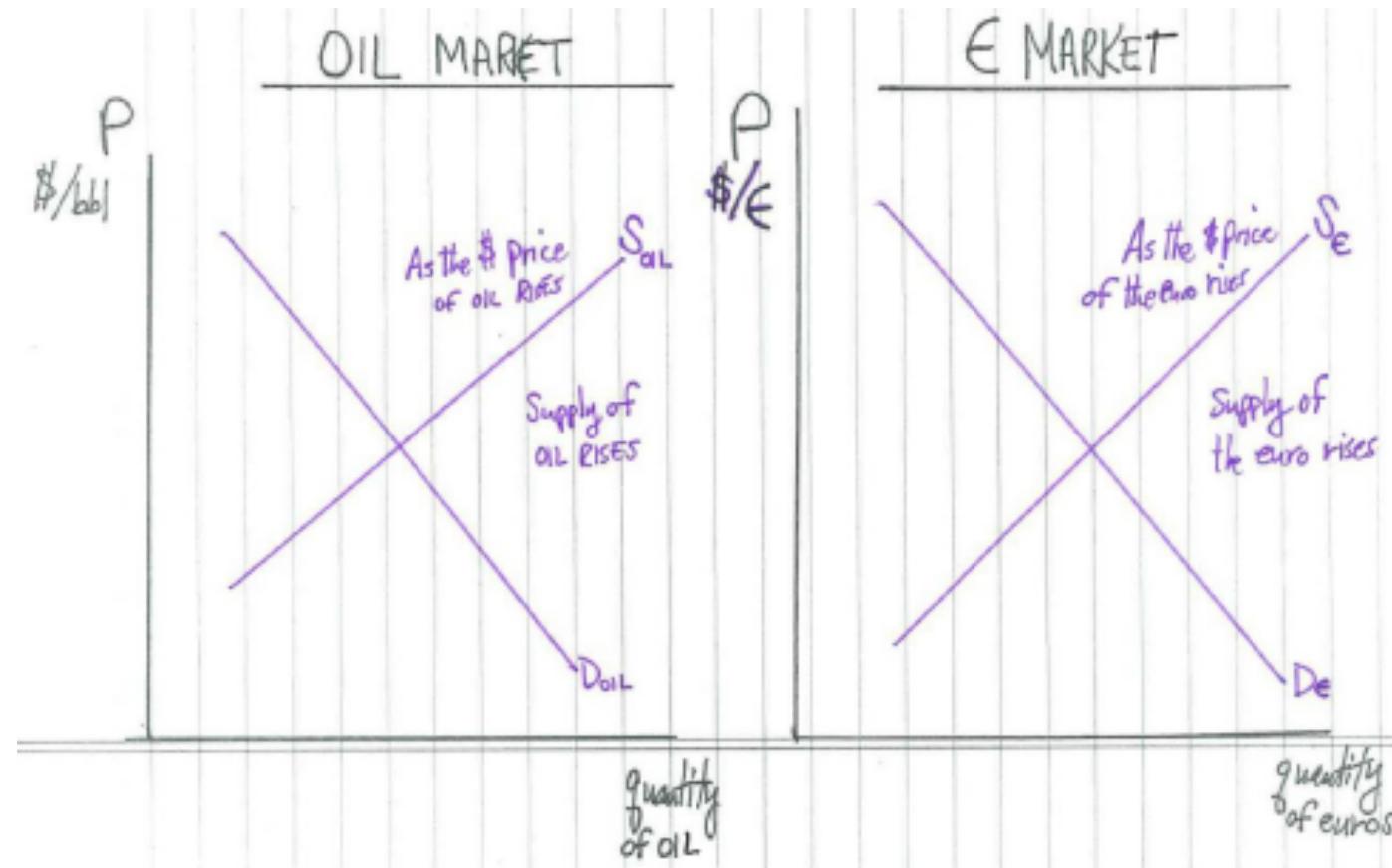
# Upward Sloping Supply for Currency

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- If oil price leaps (e.g. \$100), output soars
- If the price of the euro soars, it means that you get more dollars per euro
  - The **purchasing power** of the € **jumps**
  - You swap your euros for dollars to buy **cheap US goods**

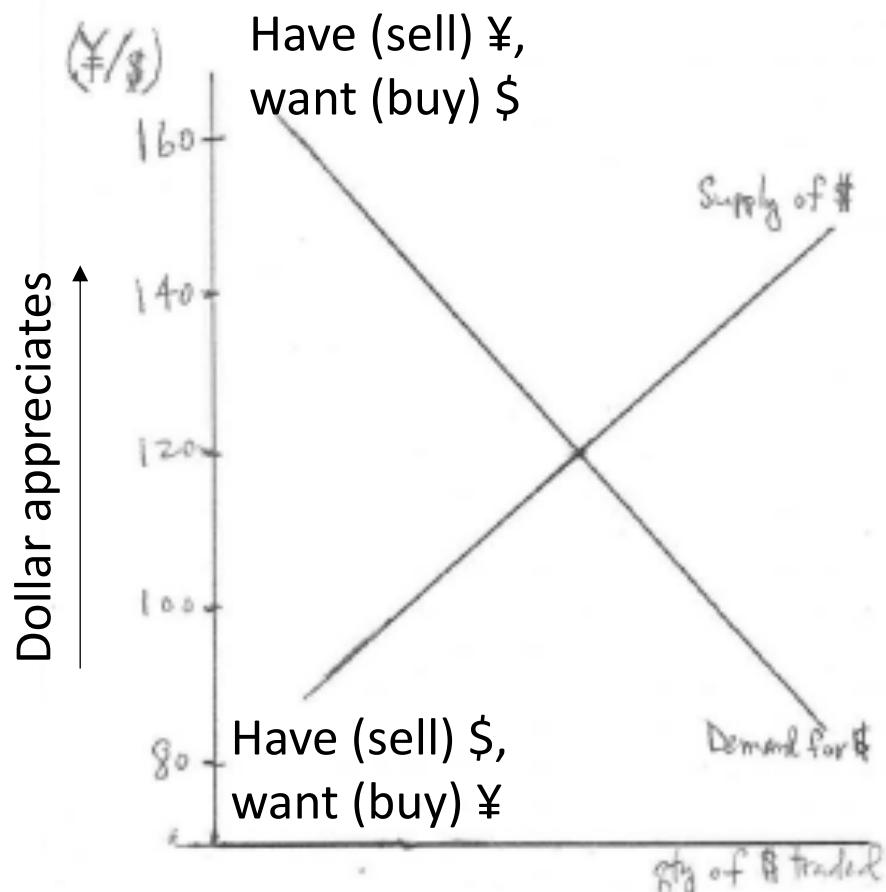
# Equilibrium in the Market for Euros

- Market exchange rate is determined by the interaction of demand and supply

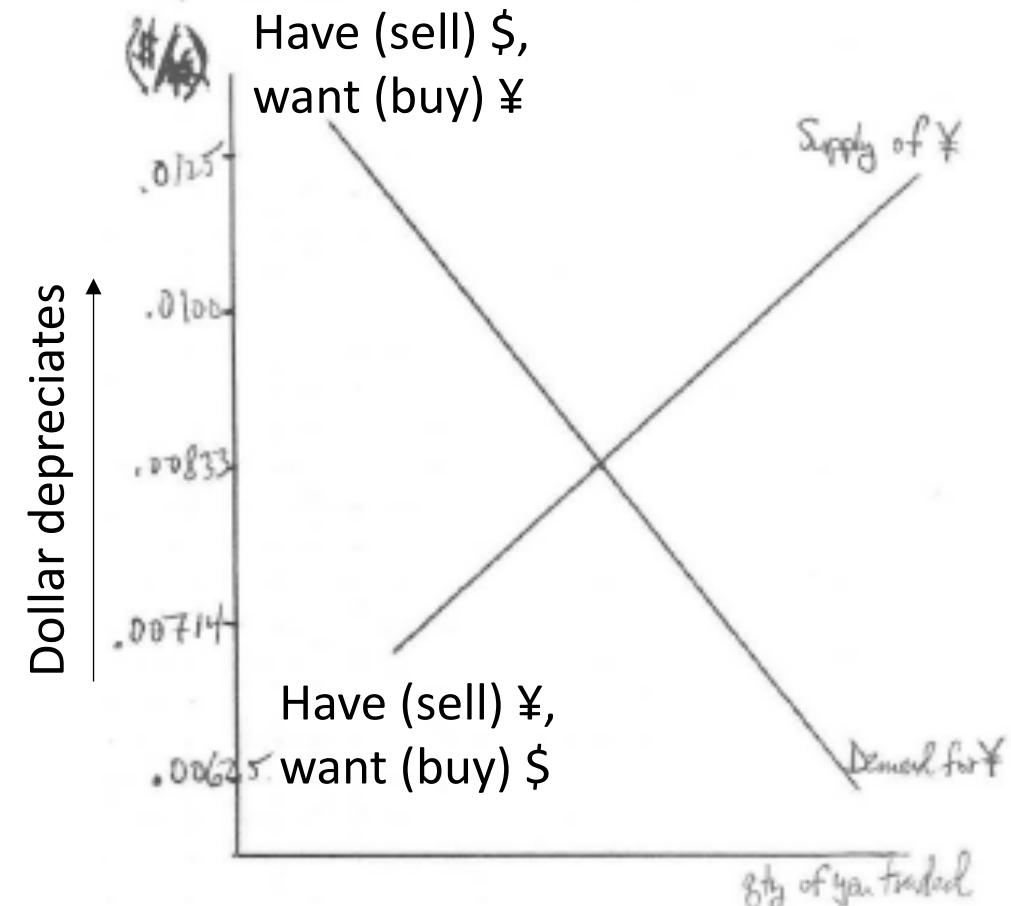


# Forex Markets

## Market for Dollars



## Market for Yen



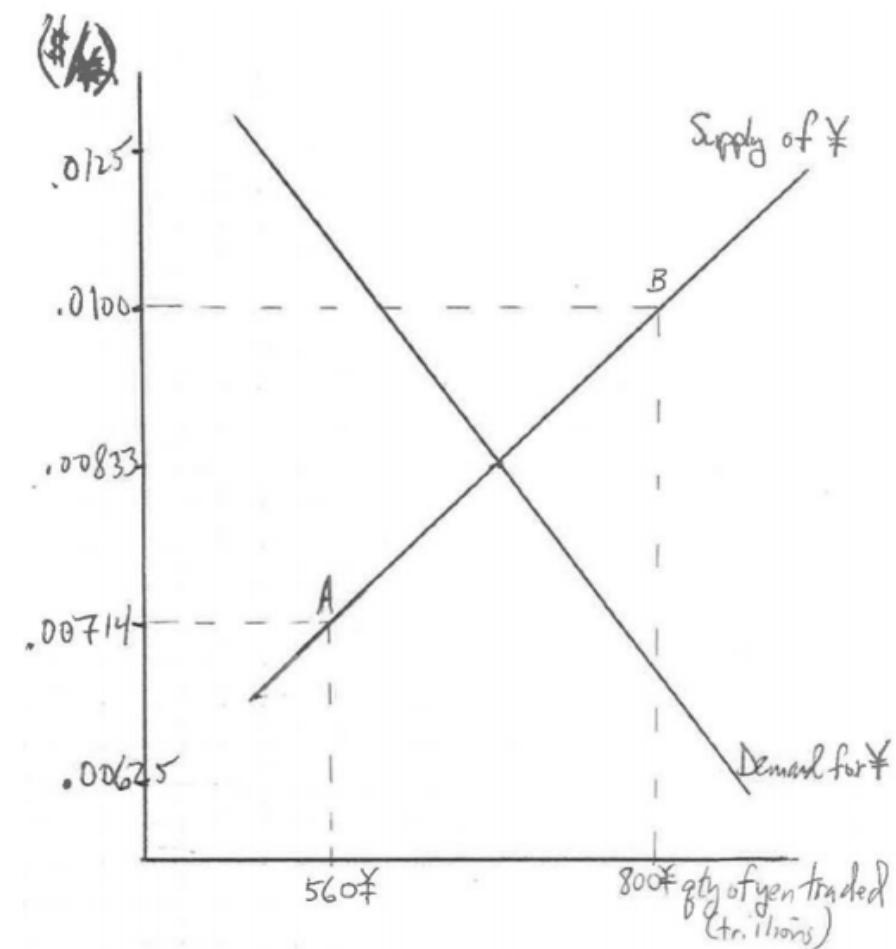
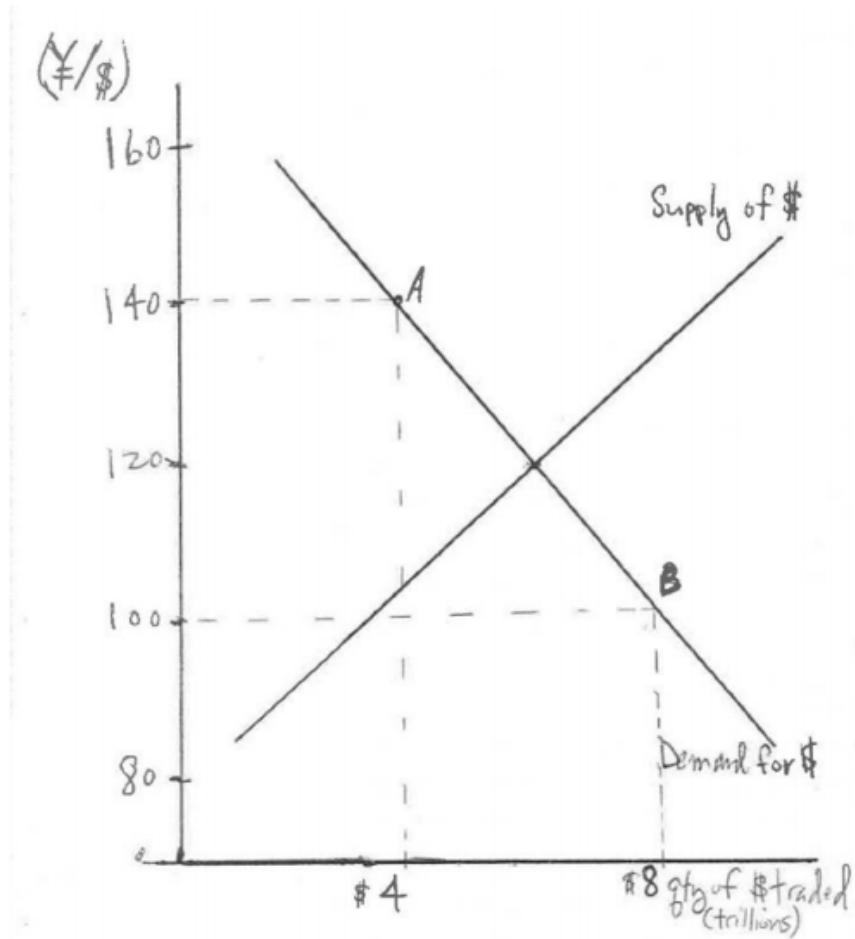
# Supply and Demand in Forex: Two Sides of Same Coin

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yen per dollar	dollar per yen	dollars traded (dollar demand)	yen traded (yen supply)
160	0.0063	2	320
140	0.0071	4	560
120	0.0083	6	720
100	0.0100	8	800
80	0.0125	10	800

# Forex Markets

- Demand curve in USD market **equals** supply curve in Yen market



# Who Demands a Currency?

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- Demand for dollars (= Supply of yen) composed by:
  - Foreign firms and HH that want to buy **G&S** produced in the US
  - Foreign firms and HH that want to buy **financial assets** issued in the US
  - Currency traders: If they **believe** that the value of the \$ in the future (¥140) will be greater than its value today (¥120), they will buy dollars  
Example: Sell ¥120M in t → Buy \$1M in t → Buy ¥140M in t+1
- Similar for the demand for yen (= Supply of dollar)

# Shifts of Curves in Forex Market

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- Shifts in demand and supply curves cause the equilibrium exchange rate to change
- 3 main factors cause the curves in the forex market to change:
  - Changes in demand for **US-produced G&S** vs **foreign-produced G&S**
  - Changes in desire to buy **US financial assets** vs **foreign financial assets**
  - Changes in **expectations** of currency traders about the likely future value of currencies

# Example: Shifts in Demand for \$ (= Supply of ¥)

- Demand for \$ (= Supply of ¥) shift to the

## Right when:

- Expansion in **Japan**,
- Interest rates in the **US** rise, or
- Speculators expect the future value of the dollar to be **higher** than its current value

## Left when:

- Recession in **Japan**,
- Interest rates in the **US** fall, or
- Speculators expect the future value of the dollar to be **lower** than its current value

- Similar for shifts in the demand for ¥ (= supply of \$)

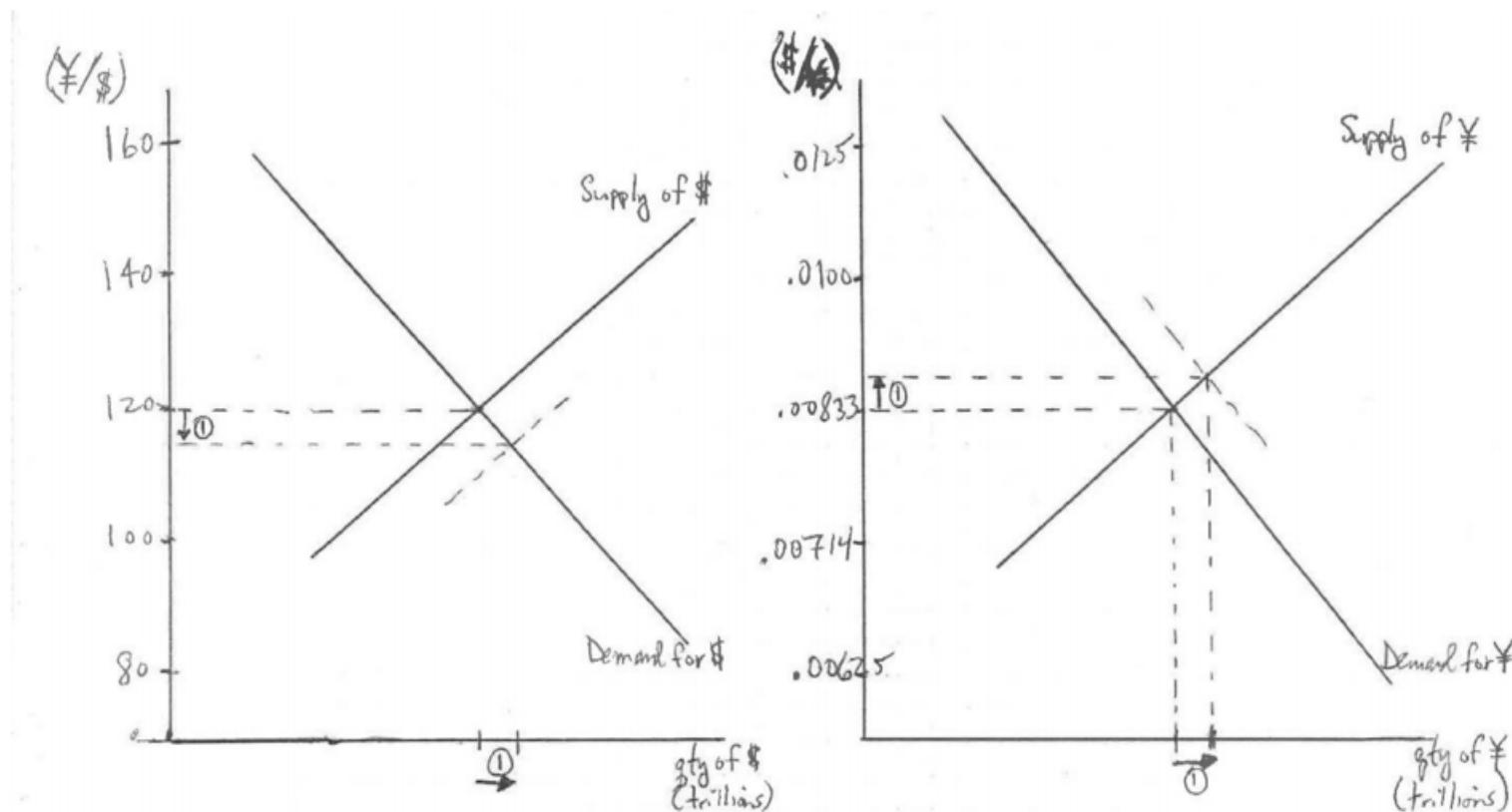
# Shifts in Demand and Supply in Forex Market

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- There can be shifts in **both** the demand and supply curves for one currency
- Whether the exchange rate increases or decreases depends on the **direction** and **size** of the shifts in both curves

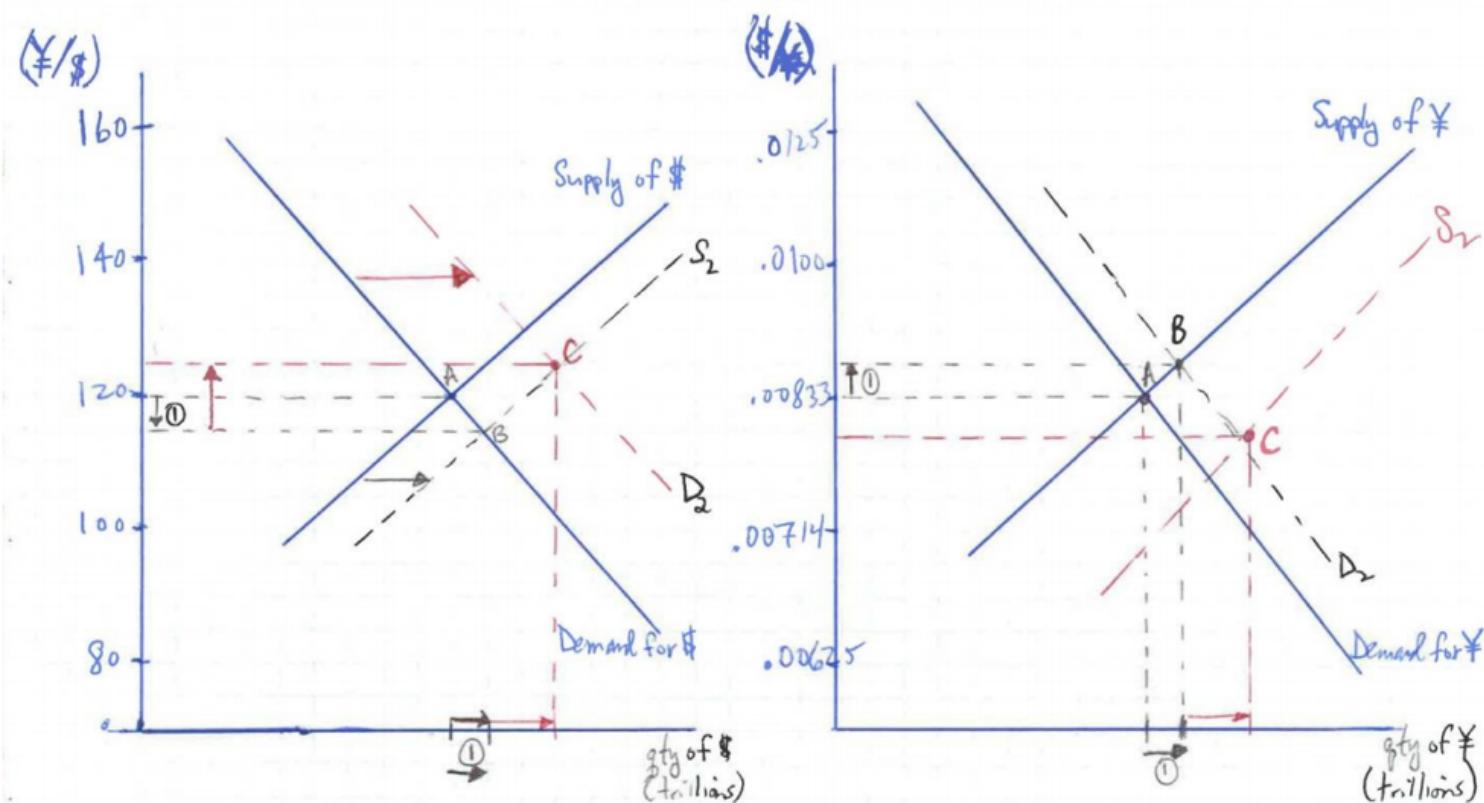
# Example: Boom in the US

- **Effect 1:** US demand goes up for all goods, including Japanese goods → Increased demand for ¥



# Example: Boom in the US

- **Effect 2:** With strong US economy, US interest rates will rise and so Japanese demand for US assets → Increased demand for \$



# Exchange Rate Regimes

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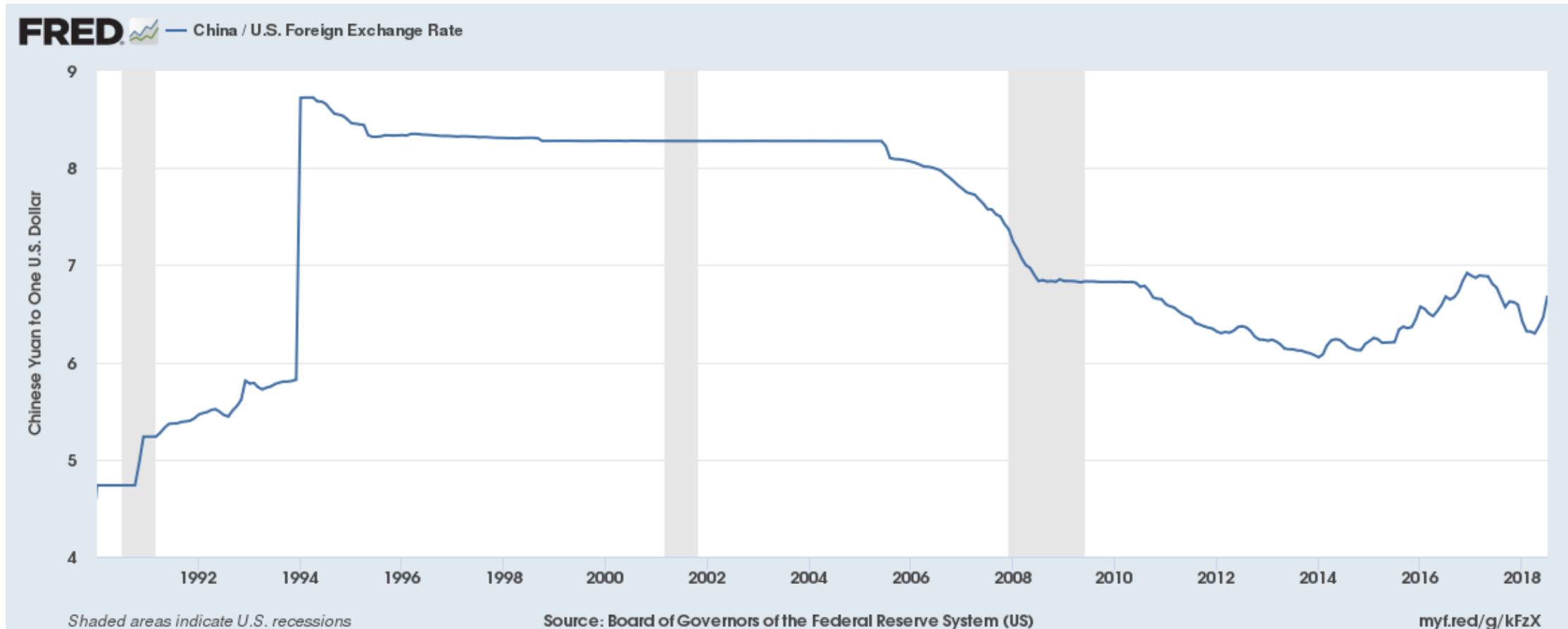
- **Exchange rate regimes:** How countries **manage** their exchange rates
- Two general categories:
  - **Fixed** exchange-rate regimes
  - **Floating** exchange-rate regimes
- Some countries fix their exchange rates

# Central Bank's Role in the Forex Market

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- With a **closed economy** perspective, we said central banks focus on one of two targets
  - Target the money supply and use the quantity equation
  - Target an interest rate, think in a loanable funds model and use Taylor rule
- In an **open economy**, CBs can use monetary policy to guide their exchange rate
  - **Example:** China kept the renminbi at RM8.3/\$ for 10 years

# RM/\$ Exchange Rate

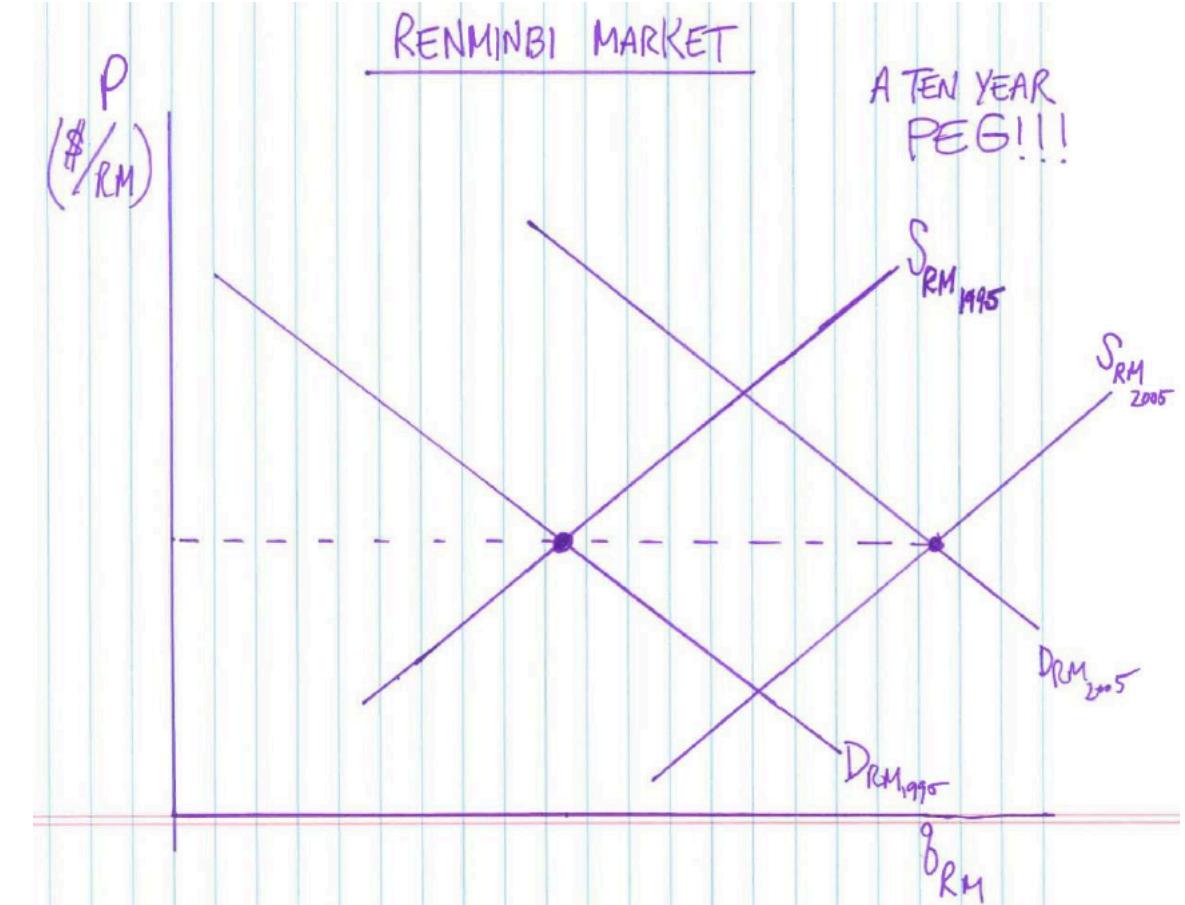
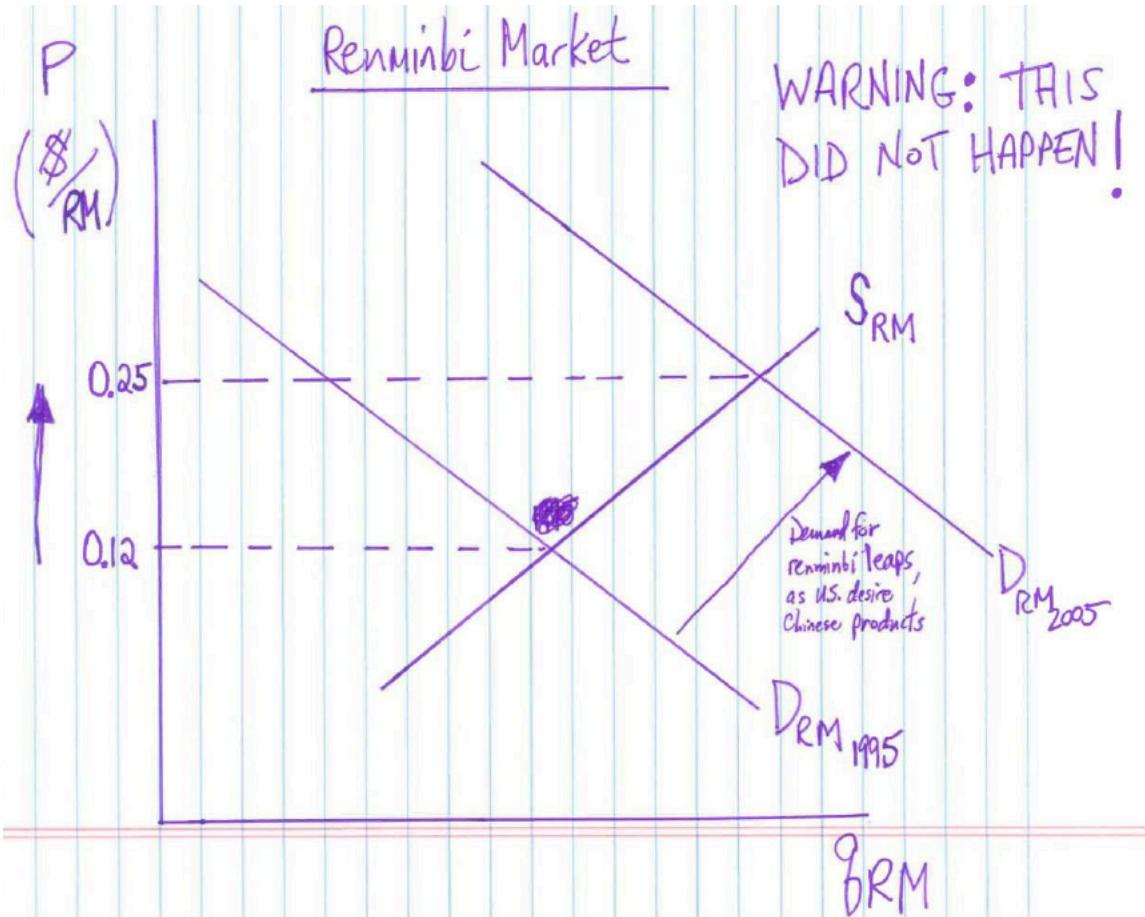


# US-China Trade and Exchange Rate

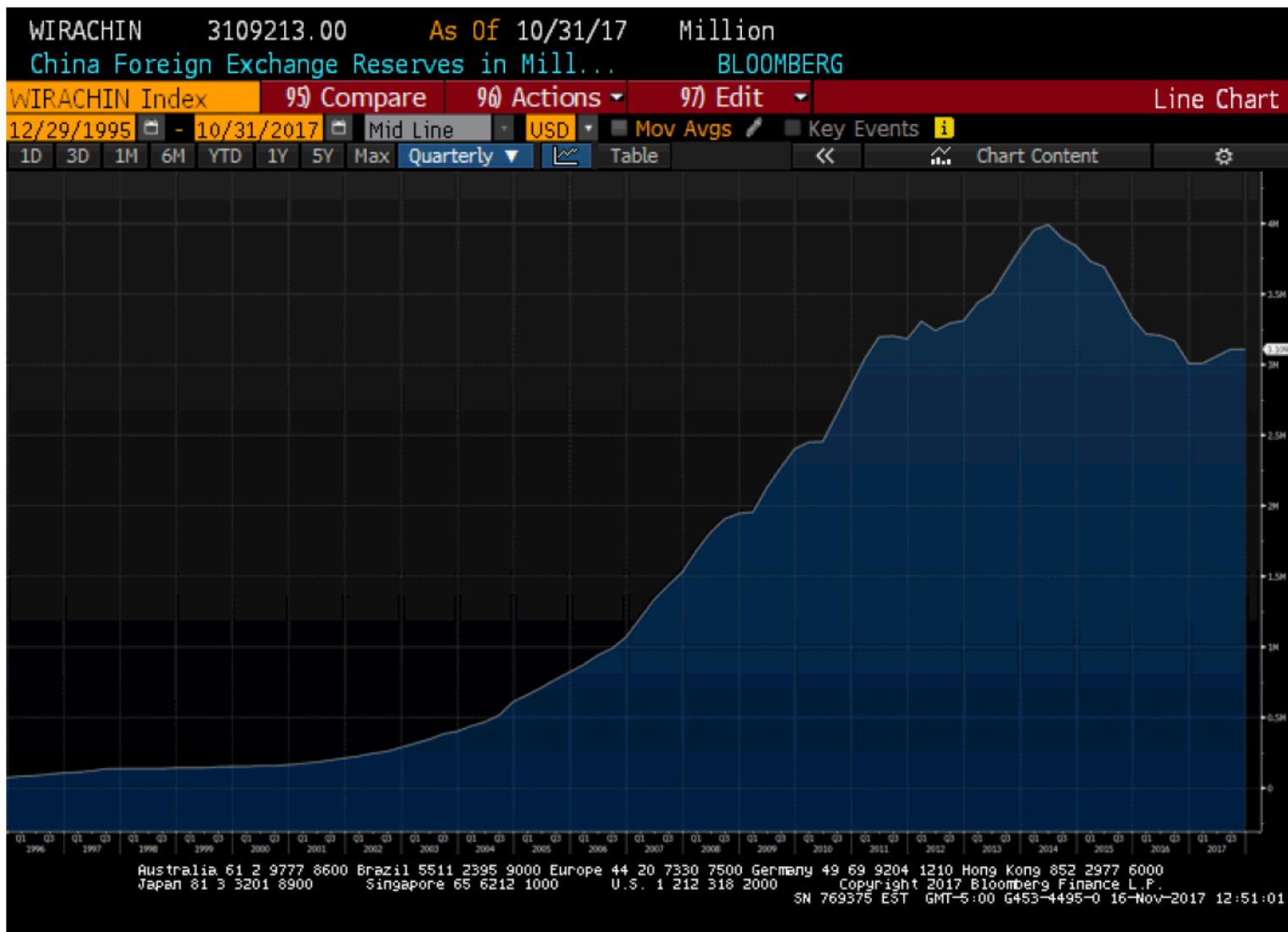
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- US bought zillion TVs and PBoC bought trillions of T-bonds
- US demand for China's goods soared
  - 1995-2005: US trade deficit with China climbed from \$20bn to \$200bn
- US demand for Chinese renminbi soared
  - Value of renminbi vs \$ should have soared
  - A dime for a RM ( $0.12\$/RM = 8.3RM/\$$ ) in 1995 could have been a quarter for a RM in 2005
- How did the RM stay steady vs \$ while the US trade deficit with China soared?

# Monetary Policy and Exchange Rates



# What Did the PBoC Do with All Those Dollars?



# Real Exchange Rate

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- Relative prices of two countries' G&S are determined by:
  - **Relative price levels** in the two countries
  - **Nominal exchange rate** between the two countries' currencies
- These two factors are combined to obtain the real exchange rate
- **Real exchange rate** (RER): Price of domestic goods in terms of foreign goods

# Real Exchange Rate: Formula

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- RER **corrects** the **nominal** exchange rate for differences in prices of G&S between countries
  - Useful to evaluate real change in **value of a currency's purchasing power**
- **Definition:**

$$q = E \times (P^{\epsilon}/P^{\$})$$

$q_{US/EU}$  – real exchange rate

$E_{\$/\epsilon}$  – nominal exchange rate

$P^{\epsilon}$  – average price level in the euro area

$P^{\$}$  – average price level in the US

# Real Exchange Rate: Example

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- Assume you need €100 to buy a broad basket of G&S in euro area
- Assume that if you exchange your €100 for \$, you can buy **25% more** of the same basket of G&S in the US
- Then the RER between the US and the Eurozone is
$$q_{US/EU} = 1.25$$
- RER says **how many units** of the basket you can buy in the US per unit of basket in the euro area
  - $q_{US/EU} > 1 \rightarrow$  G&S are **more expensive in the Eurozone** than in the US

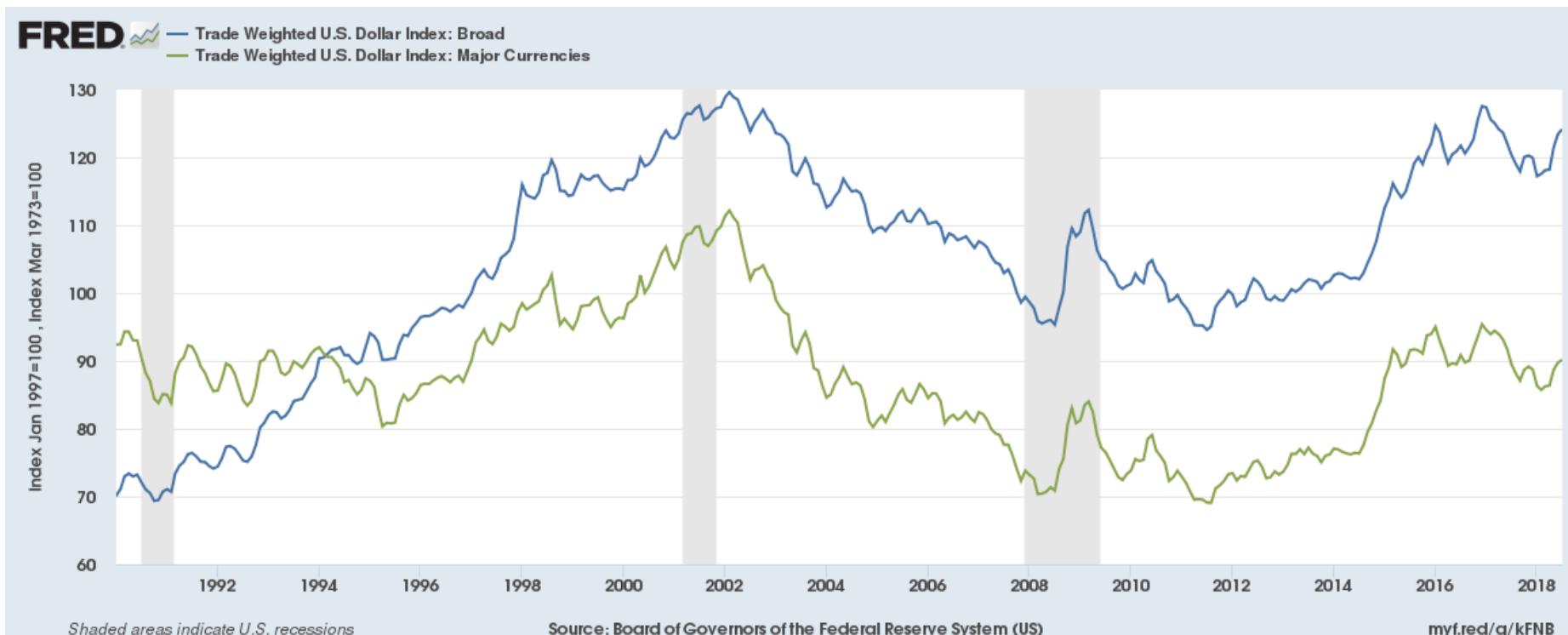
# Nominal vs Real Exchange Rate

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- Difference between nominal and real exchange rate?
- Real exchange rate,  $q$ , is the relative price of (baskets of) **goods**
- Nominal exchange rate,  $E$ , is the relative price of **currencies**

# Effective Exchange Rate

- An exchange rate is between **two** currencies
- We can create an index (weighted by trade) to see whether a currency appreciates or depreciates against **many** currencies



# Purchasing Power Parity Theory

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- Purchasing Power Parity (PPP) : In the long run, goods should have about the **same** price everywhere when expressed **in terms of a given currency**
- Implication for *nominal* exchange rates?
  - What nominal exchange rate allows the two currencies to have the **same purchasing power**

# Purchasing Power Parity Theory

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- Example:
  - In country A, I spend **\$130,000** per year in house, car, food, drinks
  - In country B, I spend **€100,000** per year in house, car, food, drinks
  - What *nominal* exchange rate gives me the same purchasing power?
- PPP implies **q = 1**

$$1 = E \times (P^{\epsilon}/P^{\$})$$

$$E_{\$/\epsilon} = P^{\$}/P^{\epsilon}$$

# The Big Mac Index

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- *The Economist* magazine compares Big Mac prices across countries
- We compare hamburger prices and infer the currency value that makes them equal

	Price of a Big Mac
	Local Currency Price (as of 7/17)
US	\$5.30
China	RM19.30

- What RM/\$ exchange rate equalizes the cost of a burger?

$$E_{RM/\$} = RM19.3/\$5.3 = RM3.64/\$$$

# Undervalued and Overvalued Currencies

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- According to the Big Mac index,  $E_{RM/\$}$  should be RM3.64 = 1\$
- If the current market exchange rate were RM6.6 = \$1, what does the Big Mac index say about the RM?
  - Is it undervalued or overvalued?
- To go from RM6.6 = \$1 to RM3.64 = 1\$, **RM would need to appreciate** → Today's value (RM6.6 = \$1) is **undervalued** relative to RM3.64 = 1\$

# PPP: Application

- IMF provides a summary table of economic performances

	Real GDP	Real GDP	annualized
	2001	2016	growth
	(trillions of \$)		rate
United States	12.7	16.7	1.9%
Germany	2.7	3.6	2.0%
China	7.2	19.0	6.7%
India	2.8	7.8	7.1%
Russia	1.5	3.4	5.4%

# Application

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- From table: China **\$19 tr** vs US \$16.7 tr
- China's economy uses yuan or renminbi, how did we get Chinese GDP in US dollars?
- What is the 2016 value for Chinese real GDP in renminbi?
  - RM66.5 tr
- What if we use the **nominal** (forex market) exchange rate **RM/\$** to convert China's real GDP from RM into \$?

$$RM66.5 \text{ tr} \times \left( \frac{\$1}{RM6.6} \right) = \$10 \text{ tr}$$

# Application

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- Why does the IMF don't use market exchange rates?
  - Not be the best guide to equate countries' real GDP levels
  - IMF evaluates purchasing power of currencies
  - IMF looks at the prices of thousands of G&S to calculate PPP
- Instead of using market exchange rates, we can use the implied PPP exchange rate obtained using the Big Mac index

$$RM66.5 \text{ tr} \times \left( \frac{\$1}{RM3.4} \right) = \$18.3 \text{ tr}$$

- The PPP-adjusted exchange rate gets us close to the **\$19 tr**

# Is PPP Supported in the Data?

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- In practice, PPP **does not hold exactly**
  - Not all products can be traded internationally
  - Products and consumer preferences are different across countries
  - There are barriers to trade
- PPP applies **in the long run on average** between countries that have a *similar* levels of development
  - **Example:** US and UK
  - However, deviations are relatively persistent

# Exchange Rates and Interest Rates

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- What is the relationship between interest rates and the exchange rate?
- Bonds **denominated in different currencies** yield different interest rates
- **Arbitrage**: All bonds should have the **same expected dollar return**
  - Interest rate differential between bonds in two countries should equal the expected change in the exchange rate

# International Bond Investment

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- $E_{\$/\epsilon}$  - Current dollar per foreign currency (say euro) exchange rate
  - $E'$  - Exchange rate ( $\$/\epsilon$ ) in one year
  - $i_\epsilon$  - Foreign interest rate for one year
  - $i_\$$  - Dollar interest rate for one year
- 
- Let's start with \$1. You have two options to invest it:
    1. You can invest your \$1 at the dollar interest rate  $i_\$$
    2. You can invest it at the foreign interest rate  $i_\epsilon$  after you exchange your dollar for foreign currency using  $E \rightarrow$  After receiving your interests, you exchange your money back into \$ using  $E'$

1 dollar  
today



$1/E$  euro  
today

$(1+i_{\epsilon})E'/E$  dollar  
in one year



$(1+i_{\epsilon})/E$  euro  
in one year

- If you invest in the foreign bond:

1 dollar  
today



$(1 + i_{\epsilon}) \frac{E'}{E}$  dollars  
in one year

- If you invest in the US bond:

1 dollar  
today



$(1 + i_{\$})$  dollars in  
one year

# Uncovered Interest Parity

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- Global investors should expect foreign currency bonds to have approximately the same dollar return as dollar bonds
  - What would happen otherwise?
- UIP says all bonds should have the same **expected** dollar return

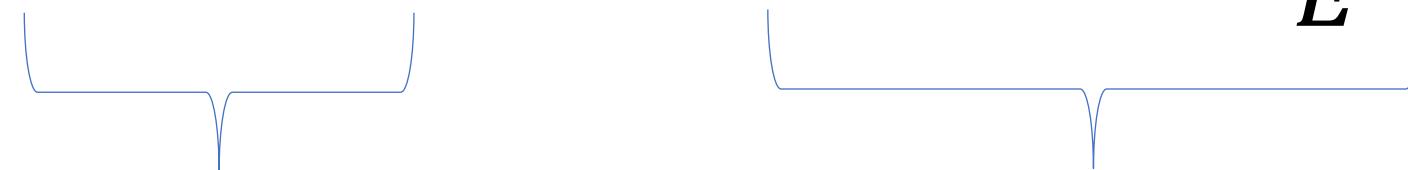
$$1 + i_{\$} = (1 + i_{\epsilon}) \frac{E^e}{E}$$

$E^e$  – Exchange rate **expected in one year**

- **Uncovered** because the exchange rate risk ( $E' \neq E^e$ ) is not hedged

# What Does UIP Say?

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$$1 + i_{\$} = (1 + i_{\epsilon}) \frac{E^e}{E}$$


Gross US deposit  
**dollar return**

Gross euro deposit  
(expected) **dollar return**

# UIP: Approximate Formula

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$$1 + i_{\$} = (1 + i_{\epsilon}) \frac{E^e}{E}$$

$$i_{\$} \approx i_{\epsilon} + \frac{\Delta E^e}{E}$$

$$i_{\epsilon} - i_{\$} = - \frac{\Delta E^e}{E}$$

# What Does the Approximate Formula Say?

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$$i_{\epsilon} - i_{\$} = - \frac{\Delta E^e}{E}$$

- **Note:** Since  $E = E_{\$/\epsilon}$ ,  $E^e \downarrow$  means that  $\epsilon$  is expected to depreciate
- A foreign currency that is expected to depreciate must yield a higher interest rate than the dollar
- A foreign currency that yields a high interest rate is likely to depreciate
  - The opposite would be too good to be true

# What Does the Data Say About UIP?

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$$i_{\epsilon} - i_{\$} = - \frac{\Delta E^e}{E}$$

- **Implication:** The interest rate differential should be a good predictor of currency depreciation against the dollar
- Approximately true for survey data on **market expectations**
- Not so good when use **realized** exchange rates

# Comparing PPP and UIP

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- Exchange rates are complicated because they determine the *relative* prices of objects traded **in different markets**
- **PPP** links exchange rates to the equilibrium in the market for **G&S**
- **UIP** links exchange rates to the equilibrium in the market for **financial assets**, especially bonds

# UIP and Monetary Policy

- “Dollar surges as March Fed rate hike comes into view” FT, 02/07/2017



# Monetary Policy, Interest Rates and Exchange Rates

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- Market commentary about exchange rates mostly about central bank actions
  - Interest rates
- A higher interest rate leads to an appreciation of the currency
- What is the nexus between exchange rates, interest rates and news?

# Comparative Statics

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- Looking for the impact of one variable on another, ***other things equal***
  - What does this mean?
  - Take all the other variables of the model **as given**

UIP:

$$1 + i_{\$} = (1 + i_{\epsilon}) \frac{E^e}{E}$$

- What is the impact of an increase in euro interest rate  $i_{\epsilon}$  on the exchange rate  $E_{\$/\epsilon}$  taking  $i_{\$}$  and  $E^e$  **as given** (unchanged)?

# Effect of $i_{\epsilon}$ on the US Dollar (Other things equal)

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- Assume  $i_{\epsilon}$  increases by 1% (other things equal)
- By how much does the dollar appreciate or depreciate against the euro?
- Increasing the euro interest rate depreciates the dollar (other things equal)
- Intuition?
  - Lower demand for US bonds relative to euro bonds (other things equal)
  - US dollar depreciates by 1%

# Effect of $i_{\epsilon}$ on the US Dollar: Subtle Points

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$$1 + i_{\$} = (1 + i_{\epsilon}) \frac{E^e}{E}$$

- Today's euro appreciation generates an **expected depreciation** of the euro over time which offsets the higher euro interest rate
- The “other things equal” assumption is not always appropriate
  - For example, what if expected US inflation and  $i_{\$}$  increase at the same time?

# Exchange Rates and Expectations

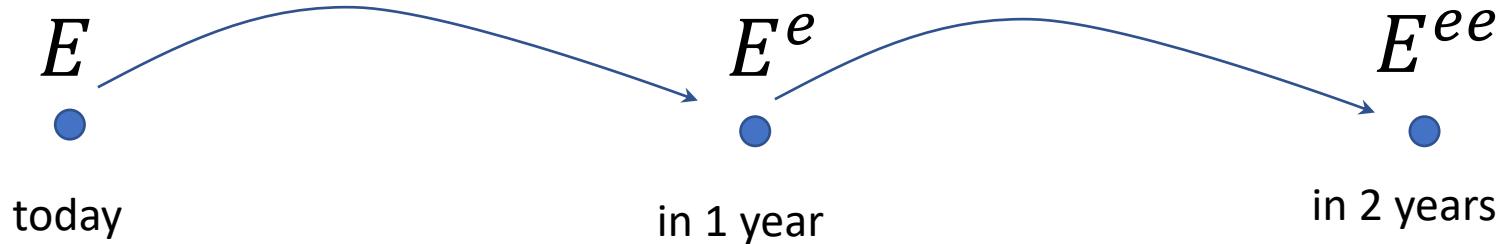
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- Like any asset price, exchange rates are **forward looking** and **influenced by expectations**
- UIP can help us to understand why
- Assume that we suddenly learn that the ECB is going to raise its interest rate  $i_{\epsilon}$  by 1% in **one year**: What is the impact on the exchange rate  $E_{\$/\epsilon}$  **today**?

# Iterated Expectations

- Assume rational and forward-looking investors

$$E = \frac{1 + i_{\epsilon}}{1 + i_{\$}} E^e \longrightarrow E^e = \frac{1 + i_{\epsilon}^e}{1 + i_{\$}^e} E^{ee}$$



# Effects of News on Exchange Rates

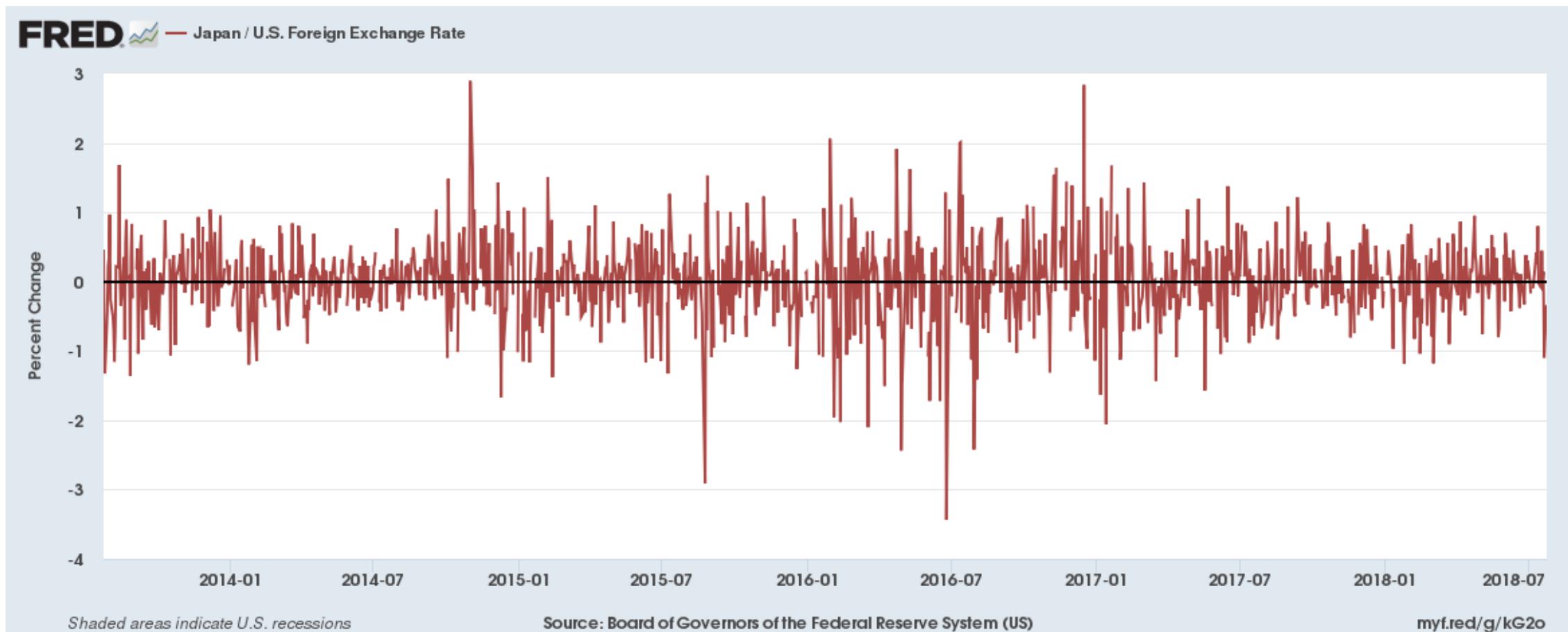
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- Importance of “news”
  - Exchange rate is **moved by changes in expectations** (“news”) about future monetary policy
  - Same as for any price in financial asset markets
- **Implication 1:** Changes in exchange rates are not necessarily correlated with **observed** changes in economic fundamentals
- **Implication 2:** Exchange rates are volatile

# Implication 1: FFR vs Exchange Rate



# Implication 2: Exchange Rate Volatility



# News Announcements

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- One way of identifying **impact of change in expectations** on exchange rates is to **measure “news” at high frequency** (intra-day data)
  - Policy announcements
  - Data release
  - Etc.
- **Example: Brexit**
  - Vote June 23, 2016
  - If  $E_{\$/\text{£}} \rightarrow$  what does  $E \downarrow$  mean?

# Effect of Brexit on \$/£ Exchange Rate

USD per 1 GBP

20 Jun 2016 18:15 UTC - 27 Jun 2016 18:15 UTC  
GBP/USD close: 1.31784 low: 1.31468 high: 1.50056



# Exchange Rate Trading

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- Currency forecasters spend a lot of time **speculating** about what central banks will do in the future
  - “Fed watching”
- Changes in market views about future monetary policy is a **primary driver** of short-run fluctuations in exchange rates
- Two key factors:
  - News about the state of the economy, and
  - How central banks will respond to these developments
- Importance of central bank **communication**

# June 16, 2017

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## Dollar Falls on Weak Data, Political Uncertainty



Investors take profits on housing figures, concerns about economy

WSJ Dollar Index

June 16, 2017 | 12:00 AM ET | Last updated June 16, 2017 | 12:00 AM ET

# Macroeconomic Policy in an Open Economy

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- **Aggregate Expenditure** model can be extended to an open economy
- In a **closed economy**, we had a consumption function and investment was a function of the real interest rate
- In an **open economy**, in addition we will have factors affecting NX

# Key Drivers of Net Exports

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- $P^{US}$  Relative to  $P^{ROW}$ 
  - If  $\pi^{US} < \pi^{ROW}$ , prices of U.S. products increase more slowly than prices of products of other countries → NX will rise
- Growth Rate of  $GDP^{US}$  Relative to the Growth Rates of  $GDP^{ROW}$ 
  - When incomes in the US rise **more slowly** than incomes in other countries → NX will rise
- Exchange Rate Between the Dollar and Other Currencies
  - As the value of the **U.S. dollar rises**, the foreign currency price of U.S. products sold in other countries rises, and the dollar price of foreign products sold in the United States falls → NX will fall

# Monetary and Fiscal Policy in an Open Economy

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- By affecting domestic GDP, **fiscal policy** will also affect NX
  - If your income increases, you will demand both more domestic and foreign goods
- **Monetary policy** will influence the economy through two channels
  - Investment and spending
  - Effect on the exchange rate
- Both policies will not only affect GDP but also NX
  - Manage internal and external **imbalances**