

# Foreign Exchange Markets

## 266: Financial Markets and Institutions

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### ► Foreign exchange market

- The foreign exchange market is where you trade one currency for another
- The price at which you trade one currency for another is called the exchange rate

### ► 2 reasons to obtain foreign currency

- To buy foreign stuff  
that is, international trade
- To buy foreign financial instruments  
that is, foreign-currency denominated financial instruments

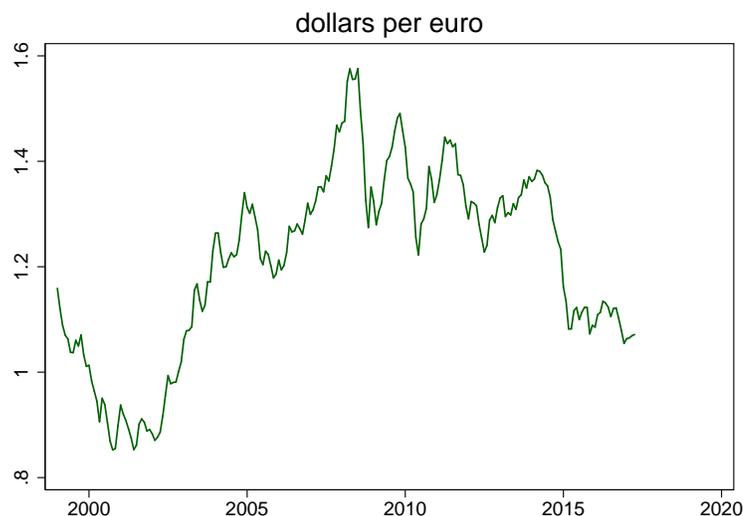
### ► The market

- There are organized markets for trading foreign exchange  
That is, for buying and selling currencies
- They are organized similarly to any other financial market
- Mainly electronic, liquidity providers post a bid and ask, etc.
- And (as you learned on the problem set), foreign exchange markets have the same sorts of price fixing scandals as other markets
- Remember: When we covered the details of the stock market, we said that the lessons generalized to all other markets and that we wouldn't do any other market in detail.
- Thus, we won't say more about how the markets work

### ► Some facts about how exchange rates behave

► **Fact 1: Surprising variability**

- Exchange rates tend to be extremely volatile.



- The U.S. dollar price of euros varies widely and rapidly  
Recently value of the euro vs. the dollar dropped more than 30 percent over a period of several months.
- This variability is very generally a feature of exchange rates

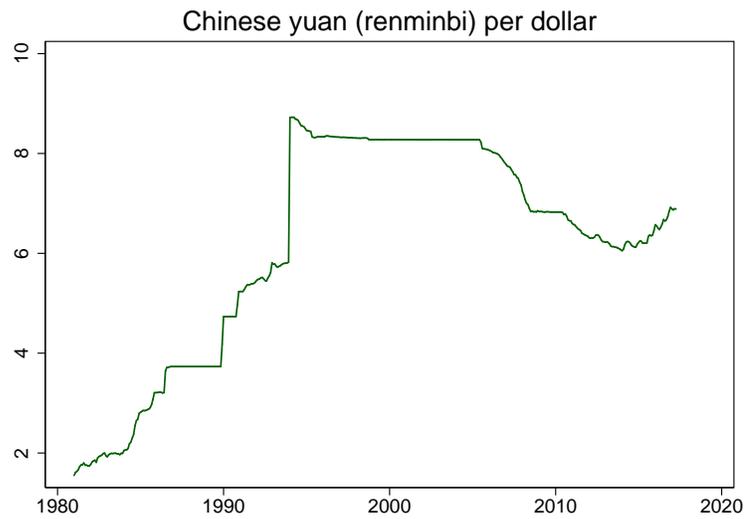
► **What does this mean?**

- When the euro falls in value versus the dollar by 30%, its as if everything in Europe was marked down about 30%.  
Its as if Europe collectively went on sale
- Similarly, U.S. stuff got 30% more expensive for Europeans.
- It's hard to understand why the market delivers outcomes like this
- That is, these prices are changing much more than we can think that macroeconomic fundamentals should allow

► **Fact 2: Central banks can control the exchange rate**

- Central banks can (when it is in their interest to do so) hold the exchange rate at almost any value
- Thus, the variability claim in fact 1 really should be modified
- New version: Except when central banks choose to keep them stable, exchange rates tend to be quite variable.

► ...



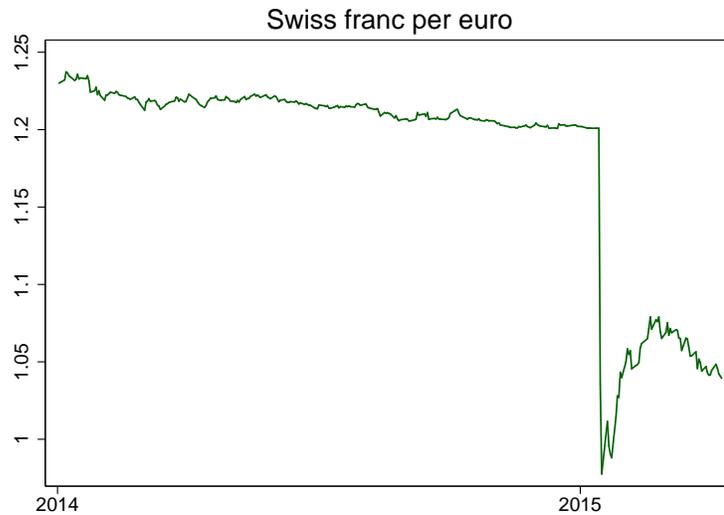
### ► Central banks and exchange rates

- China has pegged the value of the yuan at various times  
(at times causing consternation of trading partners)
- Those flat portions of the graph are where the value is fixed by one or both of the affected central banks.

### ► Fixing to the ‘wrong’ value

- Fact 3: Central banks sometimes ‘fix’ what seems to be the ‘wrong’ theory
- Some values for the currency would be so costly or damaging to the economy that no sensible central bank would attempt to maintain them indefinitely.
- Central banks, nonetheless, sometimes attempt to hold exchange rates at a crazy value
- This predictably ends with some sort of precipitous move in the rate when the central bank comes to its senses.
- And this is regularly associated with an economic crisis in the local economy
- These precipitous moves are often associated with some investors getting fabulously wealthy and others going broke.
- George Soros got fabulously wealthy betting that the Bank of England would not maintain its promise to control the value of the British pound.

### ► The recent Swiss case



► **Losses**

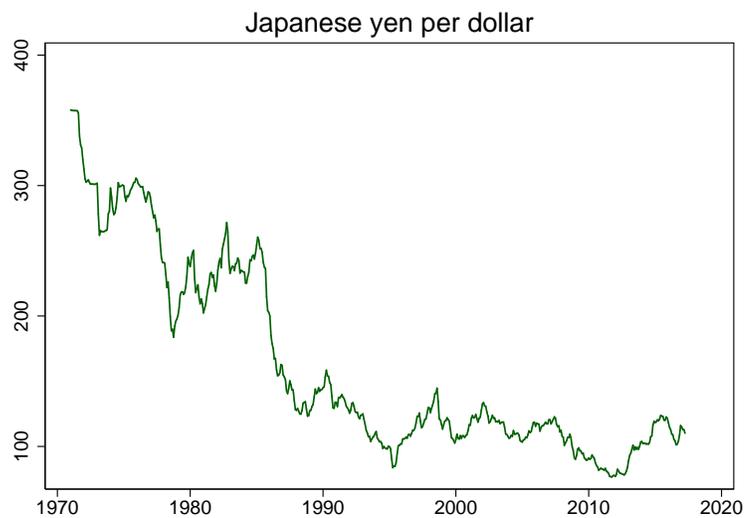
- Surge of Swiss Franc Triggers Hundreds of Millions in Losses

Brokerage FXCM Gets Rescue Package; Deutsche Bank and Citigroup Suffer Big Hits go

<http://www.wsj.com/articles/swiss-franc-move-cripples-currency-brokers-1421371654>

► **Fact 3: long swings**

- I emphasized large movements of exchange rates over long periods above
- Exchange rates also sometimes change gradually for a very long time



- Japanese yen had, for many years, steadily appreciated vs. dollar until recently

(and right now seems to be appreciating again)

► **Thus,**

- Foreign exchange rates are quite variable, unless central banks use policy tools to stabilize them
- Central banks sometimes try to stabilize the exchange rate at a level that leads to economic problems.
- These efforts inevitably end in big moves sometimes associated with crises.

► **Overall**

- Foreign exchange markets blend an immense range of economic fundamentals, political forces among countries, and speculators attempting to profit from the large moves in value that result from breakdowns in unsustainable policies.

► **A deep truth about monetary policy**

► **CBs can ‘set’ at most one value**

- Central banks can pretty much set the value of one, but only one thing.
- Set the value of short term interest rates  
standard U.S. policy before the crisis.
- Set the value of total reserves  
A version of monetarism
- Set the value of the currency vs. gold  
The gold standard
- Set the exchange value of the currency against one other currency (or basket of currencies)  
Fixed exchange rate regime
- If the CB sets one of these, it must let all the others wander wherever the market takes them.
- Thus, for example, under the gold standard, the price of gold was fixed, but the CB lost control of all other prices  
general price inflation wandered widely under the gold standard.
- Under fixed exchange rate, the CB can’t alter policy to promote full employment
- None of these ‘just set ...’ monetary policies has ever had a widespread and sustained period of success.

► **General lesson**

- When somebody says, ‘life would be good if the central bank only do the following simple thing’ ...
- You should think, ‘ok that might be true, but show me the historical example of sustained success.’

When the simple fixes are tried, they tend to perform badly.

► **UIP: an important theory of exchange rate valuation**

► **Uncovered interest rate parity (UIP)**

- We learned the expectations theory of the term structure

Short-hand: Long-term rates are the average of expected future short-term rates

- There is an equivalent across currencies called uncovered interest rate parity

► **Review expectations theory**

- Remember: we started with LOOP plus certainty

LOOP is law of one price

- Under LOOP+certainty, any two ways of investing for, say, 2 years must pay the same

- $(1 + i_{2,t})^2 = (1 + i_{1,t})(1 + i_{1,t+1})$

or  $i_{2,t} \approx \frac{i_{1,t} + i_{1,t+1}}{2}$

- Expectations theory just put an  $e$  on all the future-dated variables

$$(1 + i_{2,t})^2 = (1 + i_{1,t})(1 + i_{1,t+1}^e)$$

- We said that the expectations theory does not hold exactly, so we added an  $\ell$  to the end of the equation:

$$i_{2,t} \approx \frac{i_{1,t} + i_{1,t+1}^e}{2} + \ell_{2,t}$$

- There is an analogous result in foreign exchange

► **UIP under LOOP+certainty**

- Investing for any period, say, 1 year, in any two currencies must pay the same

under LOOP and certainty

- I can invest  $k$  U.S. dollars for 1 year in the U.S. and at the end of the year I’ll have  $\$k(1 + i_{\$,t})$ .

- Alternatively, I could take the  $\$k$  and:
  - buy british pounds today
  - Invest for 1 year at the nominal 1-year pound interest rate
  - convert the proceeds back to dollars in 1 years time
- The results of these two approaches to 1-year investing must pay the same.
- Let's figure out how many dollars I have in a year's time under approach where I invest in pound assets.
- I convert my  $\$k$  to  $\mathcal{L}$  at the exchange rate rate  $E_t$  today to get  $k \times E_t$  pounds

$E_t$  is stated in  $\mathcal{L}/\$$

- I earn the pound interest rate,  $i_{\mathcal{L}}$ , so in year, I'll have this many pounds:

$$k \times E_t \times (1 + i_{\mathcal{L},t}).$$

- I convert back to dollars at the exchangre rate at  $t + 1$ :  $E_{t+1}$  .
- Thus, in a year, I end up with:

$$k(1 + i_{\mathcal{L}})E_t/E_{t+1}$$

► **Aside:: Define RAP**

- Let's define the rate of appreciation (RAP) of the dollar:

$$(1 + RAP_t) = \frac{E_{t+1}}{E_t}$$

- Note 1:  $E$  is stated as  $\mathcal{L}/\$$  so that if  $E$  rises, it takes more pounds to buy a dollar—the dollar has gone up in value.

And remember that as always, 1 plus a rate equals future value over present value.

► **Thus,**

- In a year, if I invest in the pound asset, I end up with this many dollars:

$$k \frac{(1 + i_{\mathcal{L}})}{1 + RAP_t}$$

- If the two ways of investing for 1 year pay the same, then:

$$k(1 + i_{\$}) = k \frac{(1 + i_{\mathcal{L}})}{1 + RAP_t}$$

cancel the  $ks$ , take logs, and apply the standard approximation that  $\ln(1 + z) \approx z$

- $i_{\$} - i_{\pounds} \approx -RAP$

► **UIP, LOOP+certainty, intuition**

- Take the case where the dollar interest rate is higher

the value of my investment will grow faster in the U.S. than in the U.K.

- The exchange rate must even things out.
- I'm earning more in dollars, so the value of the dollar must be falling to even things out.
- In words: The interest differential (home vs. foreign) equals the rate of depreciation of the home currency.

► **Adding uncertainty**

- Just as in the expectations theory of the term structure, when we add uncertainty, we turn all future variables into expectations

That is we put a superscript  $e$  on them

- Uncovered interest rate parity:

$$i_{\$,t} - i_{\pounds,t} \approx -RAP^e_{t+1}$$

- The home minus foreign interest rate differential equals (approximately) the expected rate of *depreciation* in the value of the home currency.
- Intuition again: anything extra you make on the home interest rate you expect to lose on the exchange rate depreciation
- The expected change in the value of the currency is just the right amount to cancel out any difference in the interest rates.

► **Just as with all our valuation theories**

- As with all our valuation theories we think that there is an  $\ell$  (a premium) so that UIP does not hold exactly
- So we write,

$$i_{\$} - i_{\pounds} \approx -RAP^e + \ell_{\pounds/\$}$$

► **The horizon**

- We gave the argument for a 1-year investment
- But the same must hold over 2-years, 3-years, etc.
- Thus, UIP relates the term structure in dollars and term structure in pounds to the time path of expected exchange rate appreciation.

- The expected appreciation over  $h$  years:

$$i_{\$,h,t} - i_{\mathcal{L},h,t} \approx -h \times RAP_{h,t}^e + +\ell_{\mathcal{L}/\$}$$

where  $i_{\$,h,t}$  is the U.S.  $h$  year interest rate,  $i_{\mathcal{L},h,t}$  is  $h$ -year pound rate and  $RAP_{h,t}^e$  is the expected annualized rate of appreciation over the  $h$  years.

### ► UIP and reality

- You should remember that the expectations theory of the term structure gives simple predictions about where short-term interest rates are expected to go.
- If the long rate is above the current short rate, short rates must be expected to increase.

Go review if you don't remember this.

- **And we said** that in reality, this prediction very generally gets it backwards.

If expectations theory says short rates expected to rise they tend to fall instead.

- An analogous fact holds in reality for UIP
- When UIP says the exchange rate is expected to appreciate, it tends to depreciate instead.
- Concretely, the high interest rate currency tends to appreciate instead of depreciating as the theory predicts.
- Thus, you make a little extra on the interest rate and then you make even more extra on the exchange rate change.

### ► Carry trade

- There is a very famous investment strategy to exploit this result
- It is called the carry trade.
- Over many periods, you can make very steady money by executing the carry trade in short term interest rates

invest in the high interest rate currency.

- But this is still risky: currencies sometimes move sharply in the *right* direction according to UIP

Meaning you lose big if you are invested in the carry trade.

### ► Right now

- U.S. rates have been higher than German rates for some time.

so UIP says the dollar should be expected to be depreciating

- In fact, dollar interest rates were higher during that entire recent period when the dollar was appreciating more than 30 percent vs. the euro.

Classic example of high interest rate currencies appreciating

► **Bottom line**

- Exchange rates are surprisingly variable
- This can cause big problems for exporters and importers and lead to big tensions between countries
- Exchange rates (like term structures) don't behave how our best understood parts of our theories suggest they should
- That is, the risk premium components seem to be large and variable.

► **Finally,**

- Politicians almost always talk in a crazy way about exchange rates  
much more than on most topics
- You have to be for a strong dollar  
even to politicians other than Trump, you have to advocate strength.
- But anyone thoughtful knows you want 'the right' value  
too strong hurts exporters, too weak hurts importers
- You have to listen very carefully to make sense of political discussions on the exchange rate.