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INTERNATIONAL
ECONOMICS
THEORY & POLICY



Chapter 14

Exchange Rates and the Foreign Exchange Market

TENTH EDITION



Preview

- The basics of exchange rates
- Exchange rates and the prices of goods
- The foreign exchange markets
- The demand of currency and other assets
- A model of foreign exchange markets
- What explains carry trade?



Definitions of Exchange Rates

- Exchange rates are quoted as foreign currency per unit of domestic currency or domestic currency per unit of foreign currency.
 - How much can be exchanged for one dollar? ¥97.385/\$
 - How much can be exchanged for one yen? \$0.01027/¥
- Exchange rates allow us to denominate the cost or price of a good or service in a common currency.
 - How much does a Nissan cost? ¥2,500,000
 - Or, $42,500,000 \times \$0.01027/Y = \$25,672.50$



Table 14-1: Exchange Rate Quotations

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		19.3473	-0.1597	25.5780	-0.1605	30.0627	-0.2200	Thailand	(Bt)	30.6300	0.0300	40.4944	0.1192	47.5944	0.090
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Source: Data from Financial Times, June 8, 2013, p. 17.



Depreciation and Appreciation

- Depreciation is a decrease in the value of a currency relative to another currency.
 - \$1/€ → \$1.20/€ means that the dollar has depreciated relative to the euro.
 - It now takes \$1.20 to buy one euro, so that the dollar is less valuable.
- Appreciation is an increase in the value of a currency relative to another currency.
 - $$1/€ \rightarrow $0.90/€$ means that the dollar has appreciated relative to the euro.
 - It now takes only \$0.90 to buy one euro, so that the dollar is more valuable.



Depreciation and Appreciation

- A depreciated currency means that imports are more expensive and exports are less expensive.
 - A depreciated currency lowers the price of exports relative to the price of imports.
- An appreciated currency means that imports are less expensive and exports are more expensive.
 - An appreciated currency raises the price of exports relative to the price of imports.
- Appreciation of the euro against the dollar means depreciation of the dollar against the euro.



Exchange Rates, Auto Prices, and Currency Wars

- Auto production a significant share of international trade, fierce competition
 - Ford (USA), Volvo (Sweden), BMW, Mercedes, Audi (Germany), Honda (Japan), Land Rover (GB), Hyundai, Kia (South Korea)
 - Exchange rates are crucial for auto producers
- Appreciation of the won hurts Korean producers in two ways
 - It lowers the prices of imported cars and thus lowers the domestic purchases of Korean cars
 - It rises the prices of Korean exported cars and thus lowers the purchases of Korean cars in the rest of the world.
- Strong depreciation of the Japanese yen in 2013
 - Nissan was able to lower the dollar prices of some car models sold in USA and still obtain higher yen profits. Altima became cheaper by \$580 and Armada SUV by \$4400.



Foreign Exchange Markets

- The set of markets where foreign currencies and other assets are exchanged for domestic ones
 - The main centers of foreign exchange trade are: London, New York, Tokyo, Frankfurt, and Singapore.
- April 2010: The daily volume of foreign exchange transactions was \$4.0 trillion
 - In 1989 it was only \$600 billion.



Foreign Exchange Markets – The Participants

- 1. Commercial banks and other depository institutions: transactions involve buying/selling of deposits in different currencies for investment purposes.
- 2. Non-bank financial institutions (mutual funds, hedge funds, securities firms, insurance companies, pension funds) may buy/sell foreign assets for investment.
- **3. Multinational corporations** conduct foreign currency transactions to buy/sell goods, services and assets.
- **4. Central banks**: conduct official international reserves transactions.



Foreign Exchange Markets

- Most transactions (85% in April 2010) exchange foreign currencies for U.S. dollars.
 - Because of its pivotal role in so many foreign exchange deals, the U.S. dollar is called **vehicle currency**, as it is frequently used by parties from other coutries than USA.
- Buying and selling in the foreign exchange market are dominated by commercial and investment banks.
 - Inter-bank transactions of deposits in foreign currencies occur in amounts \$1 million or more per transaction.
 - Central banks sometimes intervene, but the direct effects of their transactions are small and transitory in many countries.
 The goal of CBs transactions is rather to signal their intentions and expectations to market participants.



Foreign Exchange Markets

- Computer and telecommunications technology transmit information rapidly and have integrated markets.
- The integration of financial markets implies that there can be no significant differences in exchange rates across locations.
 - The reason is arbitrage (buy cheap and sell it dear) which eliminates price differentials among different places. Why?
 - Buing where it's cheap increases demand there and pushes the price upwards. Selling where it's dear increases supply there and drives the price down.

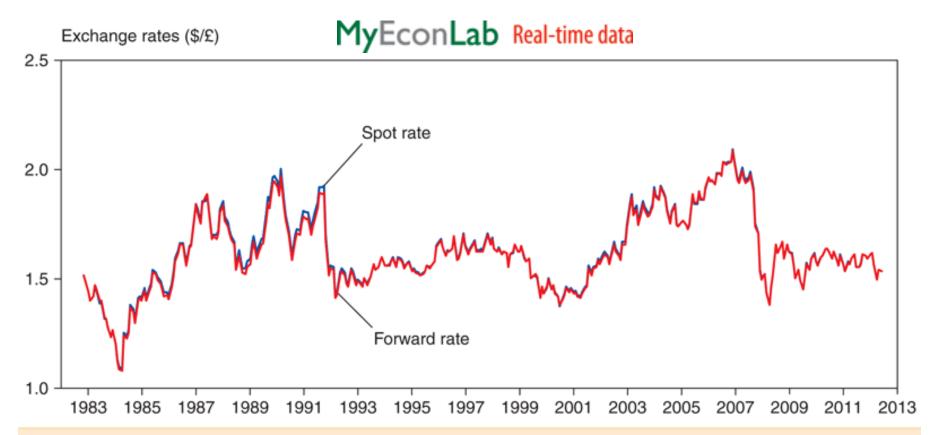


Spot Rates and Forward Rates

- Spot rates are exchange rates for currency exchanges "on the spot," or when trading is executed in the present.
- **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 the present, but the exchange occurs in the future.



Fig. 14-1: Dollar/Pound Spot and Forward Exchange Rates, 1983-2013



Source: Datastream. Rates shown are 90-day forward exchange rates and spot exchange rates, at end of month.



Other Methods of Currency Exchange

- Foreign exchange swaps: a combination of a spot sale with a forward repurchase.
- Swaps often cost less in fees than separate transactions.
- For example, suppose Toyota receives \$1 million from American sales, plans to use it to pay its California suppliers in three months, but wants to invest the money in euro bonds in the meantime.



Other Methods of Currency Exchange

- Futures contract: a standardized forward contract.
 - Contracts can be bought and sold in markets, and only the current owner is obliged to fulfill the contract.
- Options contract: You are buing an option to buy (call option) or sell (put option) a specified amount of foreign currency on or before a specified date.
 - Standardized contracts that can be bought and sold in markets.
 - A contract gives the owner an option, but not obligation, of buying or selling currency if the need arises.



The Demand of Currency Deposits

- What influences the demand of currency deposits?
- Rate of return: the percentage change in value that an asset offers during a time period.
- Real rate of return: inflation-adjusted rate of return,
 - The real rate of return when the nominal rate of return is 2% and inflation is 1.5%: 2% 1.5% = 0.5%.
 - If prices are fixed, the inflation rate is 0% and (nominal) rates of return = real rates of return.
- Because trading of deposits in different currencies occurs on a daily basis, we often assume that prices do not change from day to day.
 - A good assumption to make for the short run.



The Demand of Currency Deposits

- Risk of holding assets also influences decisions about whether to buy them.
- **Liquidity** of an asset, or ease of using the asset to buy goods and services, also influences the willingness to buy assets.
- We will assume that risk and liquidity of currency deposits in foreign exchange markets are essentially the same, regardless of their currency denomination.
 - Risk and liquidity are only of secondary importance when deciding to buy or sell currency deposits.
 - Importers and exporters may be concerned about risk and liquidity, but they make up a small fraction of the market.



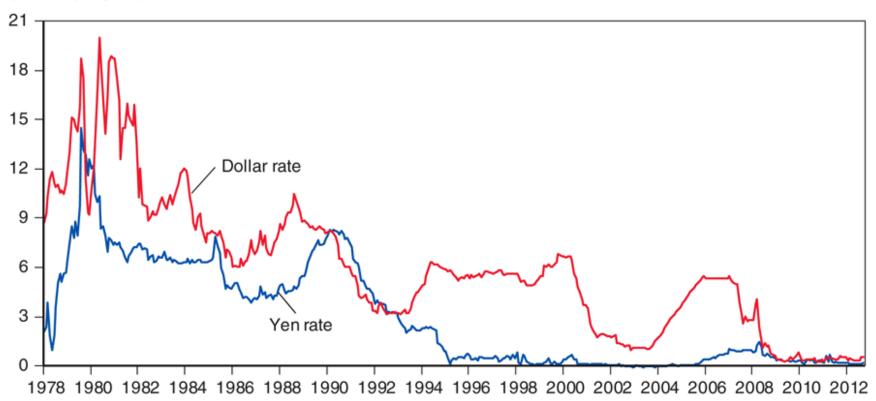
The Demand of Currency Deposits

- Investors are primarily concerned about the rates of return on currency deposits.
- To compare the rate of return on a deposit in domestic currency with one in foreign currency, consider
 - the interest rate for the domestic and foreign currency deposits
 - the expected rate of appreciation or depreciation of the foreign currency relative to the domestic currency.



Fig. 14-2: Interest Rates on Dollar and Yen Deposits, 1978-2013

Interest Rates (percent per year)



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



The Demand of Currency Deposits - Numerical Example

- Suppose that the interest rate on a dollar deposit is 2% and the interest rate on a euro deposit is 4%.
- Does an euro deposit yield a higher expected rate of return?
 - Suppose today the exchange rate is \$1/€1, and the expected rate one year in the future is \$0.97/€1.
 - \$100 can be exchanged today for €100. These €100 will yield €104 after one year. These €104 are expected to be worth \$0.97/€1 x €104 = \$100.88 in one year.
- The rate of return in terms of dollars from investing in euro deposits is (\$100.88 - \$100)/\$100 = 0.88%.



The Demand of Currency Deposits - Numerical Example

- The euro deposit has a lower expected rate of return: thus, all investors should be willing to dollar deposits and none should be willing to hold euro deposits.
- Note that the expected rate of appreciation of the eurowas (\$0.97 \$1)/\$1 = -0.03 = -3%.
- We simplify the analysis by saying that the dollar rate of return on euro deposits approximately equals
 - the interest rate on euro deposits plus the expected rate of appreciation of euro deposits
 - $-4\% + (-3\%) = 1\% \approx 0.88\%$
 - $-R_{\epsilon}+(E^{e}_{\$/\epsilon}-E_{\$/\epsilon})/E_{\$/\epsilon}$



Model of Foreign Exchange Markets

- We use the
 - rate of return on dollar denominated deposits
 - and the rate of return on foreign currency denominated deposits

to construct a model of foreign exchange markets.

- This model is in equilibrium when deposits of all currencies offer the same expected rate of return: interest parity.
 - Interest parity implies that deposits in all currencies are equally desirable assets.
 - Interest parity implies that arbitrage in the foreign exchange market is not possible.



Model of Foreign Exchange Markets

• Interest parity says:

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

- Why should this condition hold? Suppose it didn't.
 - Suppose $R_{\$} > R_{\ell} + (E^{e}_{\$/\ell} E_{\$/\ell})/E_{\$/\ell}$
 - Then no investor would want to hold euro deposits, driving down the demand and price of euros.
 - Then all investors would want to hold dollar deposits, driving up the demand and price of dollars.
 - The dollar would appreciate and the euro would depreciate, increasing the right side until equality was achieved.



Model of Foreign Exchange Markets

- How do changes in the current exchange rate affect the expected rate of return of foreign currency deposits?
- Depreciation of the domestic currency today lowers the expected rate of return on foreign currency deposits.
 - When the domestic currency depreciates, the initial cost of investing in foreign currency deposits increases, thereby lowering the expected rate of return of foreign currency deposits.
- Appreciation of the domestic currency today raises the expected return of deposits on foreign currency deposits.
 - When the domestic currency appreciates, the initial cost of investing in foreign currency deposits decreases, thereby increasing the expected rate of return of foreign currency deposits.



Table 14-4: Today's Dollar/Euro Exchange Rate and the Expected Dollar Return on Euro Deposits When $E^e_{\$/\$} = \$1.05$ 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 _{S/€}	$R_{m{\epsilon}}$	$\frac{1.05 - E_{\mathbb{S}/\mathfrak{S}}}{E_{\mathbb{S}/\mathfrak{S}}}$	$R_{\epsilon} + \frac{1.05 - E_{S/\epsilon}}{E_{S/\epsilon}}$		
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		

Fig. 14-3: The Relation between the Current Dollar/Euro Exchange Rate and the Expected Dollar Return on Euro Deposits

Given that $E^{e}_{$/$}$ = \$1.05 per euro and $R_{$\in$}$ = 0.05, an appreciation of the dollar against euro raises the expected return on euro deposits, measured in terms of dollars.

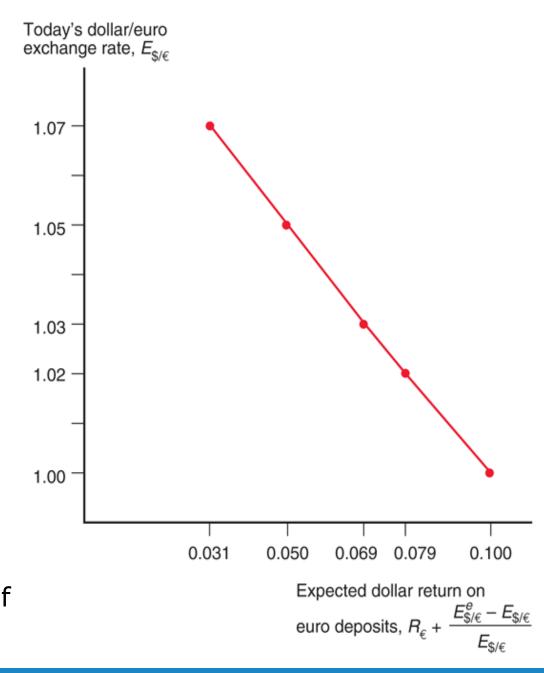
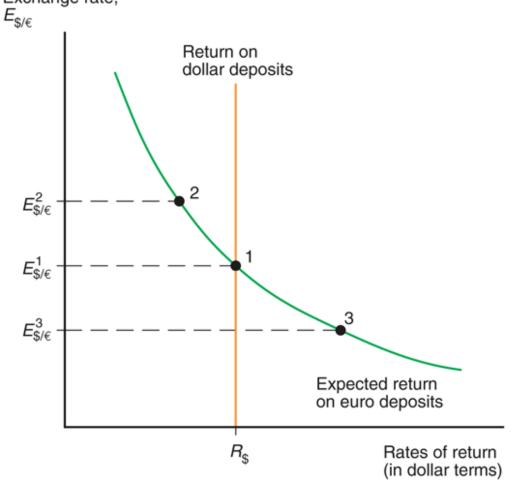




Fig. 14-4: Determination of the **Equilibrium Dollar/Euro Exchange Rate**

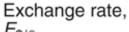


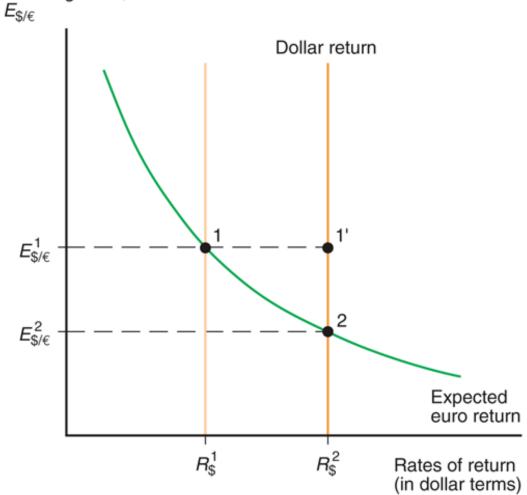


Equilibrium in the foreign exchange market is at point 1, where the expected dollar returns on dollar and euro deposits are equal.



Fig. 14-5: Effect of a Rise in the Dollar Interest Rate



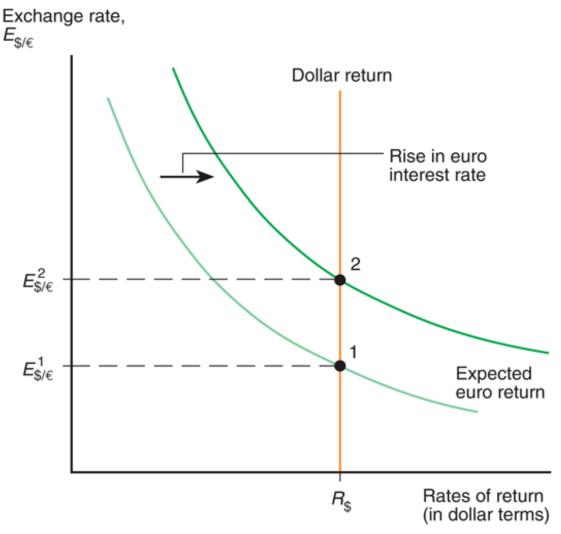


An increase in the interest rate paid by dollar deposits from R^1 to R^2 will increase the rate of return on those deposits.

This leads to an appreciation of the dollar from E^1 (point 1) to E^2 (point 2).



Fig. 14-6: Effect of a Rise in the Euro Interest Rate

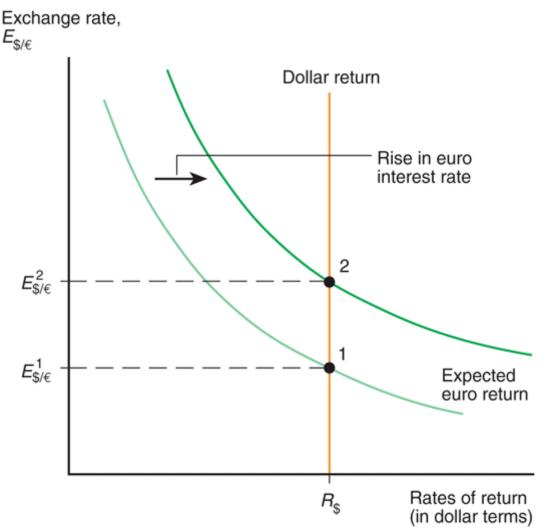


A rise in the interest rate paid by euro deposits will increase the expected return on those deposits. The corresponding schedule shifts outwards.

It causes the dollar to depreciate from E^1 to E^2 .



The Effect of an Expected Appreciation of the Euro (Depreciation of the Dollar)

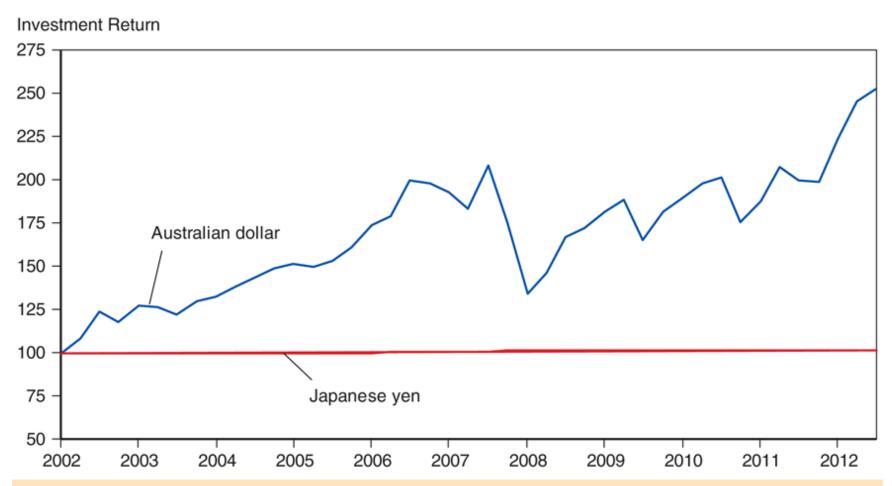


The same figure as on the previous slide also shows the effects of a rise in the expected future exchange rate of the dollar (expected depreciation of the dollar).

It is a kind of a **self- fullfiling prophecy** – the
expected depreciation of
the dollar against euro
leads to the current
depreciation of the dollar.



Fig. 14-7: Cumulative Total Investment Return in Australian Dollar Compared to Japanese Yen, 2003-2013



Source: Exchange rates and three-month treasury yields from Global Financial Data.



- 2002-2012: Japanese interest rates were close to zero while Australian interest rates were positive (7% in 2008).
 - An incentive to borrow yens and invest them in Australian dollar bonds
 - The interest parity condition implies that this strategy should not be systematically profitable.
 - The higher interest return on Australian dollars should be compensated by an expected relative appreciation of the yen.
- However, a lot of investors pursue this kind of strategy
 - To borrow low-interest currency (funding currency) and buy high-interest currency (investment currency).
 - It is called the carry trade.



- Does it mean that the interest parity is a useless concept?
 - Although interest parity does not hold exactly in the practice in part because of the liquidity and risk factors mentioned previously – it can get us some insight on the problem of carry trade.
- The risk of investment currencies is that their exchange rates can experience abrupt depreciation
 - Funding currencies can experience abrupt appreciation
 - In 2002 yen investment offered negligible return contrary to the Australian dollars which yielded handsome pay off.
 - In 2008 came the abrupt depreciation of the Australian dollar.
 This depreciation did not wipe out all the gains to the carry trade strategy from 2002.
 - However, if someone invested in Australian dollar deposits in 2007, then in 2008 he experienced a significant loss.



- Carry trade is obviously a very risky business.
 - You can earn a lot, but you can also lose a lot.
- If there is 90% probability of 1% appreciation and 10% probability of 40% depreciation, then
 - expected change = 0.9*1 + 0.1*(-40) = -3.1% per year which means expected depreciation.
 - Although you see a slow appreciation for a long time, a small probability of a sudden and large depreciation may lead to expected depreciation which is in line with the interest parity condition.



- Often, abrupt exchange rate changes occur during financial crises when liquid cash is particularly valuable.
 - In such circumstances, large losses on carry trade positions are extra painful and may force traders to sell other assets they own at loss.
- From the perspective of an economic policy, carry trade is a problem.
 - It leads to a gradual appreciation followed by an abrupt depreciation.
 - An abrupt depreciation leads to a panic run away of investors.
 - A greater volatility of exchange rates and a possibility of large losses negatively influences the functioning of a financial market



Covered Interest Parity

 Covered interest parity relates interest rates across countries and the rate of change between forward exchange rates and the spot exchange rate:

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

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

- It says that rates of return on dollar deposits and "covered" foreign currency deposits are the same.
- Covered and uncovered interest parity will hold simultaneously only if $F_{\$/\$} = E^e_{\$/\$}$, i.e. when the forward rate is the same as the spot rate expected in the future.



Summary

- 1. An exchange rate is the price of one country's currency in terms of another country's currency.
 - It enables us to translate different countries' prices into comparable terms.
- 2. Depreciation of a currency means that it becomes less valuable and goods denominated in it are less expensive: exports are cheaper and imports more expensive.
- Appreciation of a currency means that it becomes more valuable and goods denominated in it are more expensive: exports are more expensive and imports cheaper.



Summary

- Commercial and investment banks that invest in deposits of different currencies dominate the foreign exchange market.
 - Expected rates of return are most important in determining the willingness to hold these deposits.
- 5. Rates of return on currency deposits in the foreign exchange market are influenced by interest rates and expected exchange rates.
- Equilibrium in the foreign exchange market occurs when rates of returns on deposits in domestic currency and in foreign currency are equal: interest rate parity.



Summary

- 7. An increase in the interest rate on a currency's deposit leads to an increase in its expected rate of return and to an appreciation of the currency.
- 8. An expected appreciation of a currency leads to an increase in the expected rate of return for that currency, and leads to an actual appreciation.
- Covered interest parity says that rates of return on dollar deposits and "covered" foreign currency deposits should be the same.