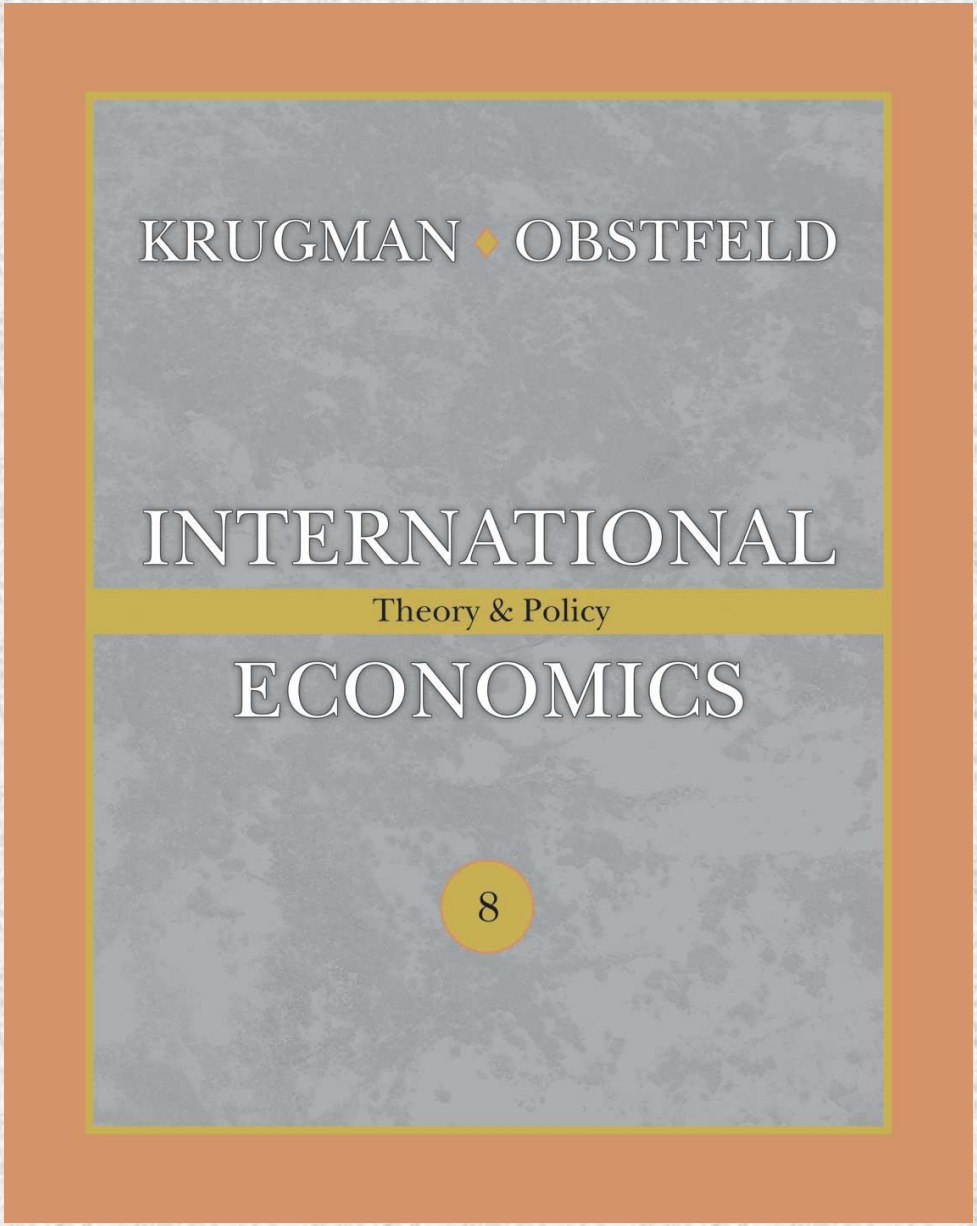


Chapter 13

Exchange Rates and the Foreign Exchange Market: An Asset Approach

Slides prepared by Thomas Bishop

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

PEARSON Addison Wesley

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
  - role of interest rates on currency deposits
  - role of expectations of exchange rates

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

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? ¥102/$1
  - How much can be exchanged for one yen? $0.0098/¥1
- Exchange rates allow us to denominate the cost or price of a good or service in a common currency.
  - How much does a Honda cost? ¥3,000,000
  - Or, ¥3,000,000 x $0.0098/¥1 = $29,400

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Table 13-1: Exchange Rate Quotations

Currencies

July 23, 2007

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

Country/currency	Mon in US$	Mon per US$	US$ vs, YTD chg (%)
Americas			
Argentina peso*	.3199	3.1260	2.2
Brazil real	.5427	1.8426	-13.7
Canada dollar	.9552	1.0469	-10.2
1-mos forward	.9558	1.0462	-10.2
3-mos forward	.9568	1.0452	-10.1
6-mos forward	.9580	1.0438	-10.0
Chile peso	.001943	514.67	-3.3
Colombia peso	.0005224	1914.24	-14.5
Ecuador US dollar	1	1	unch
Mexico peso*	.0930	10.7550	-0.4
Peru new sol	.3168	3.157	-1.2
Uruguay peso†	.04220	23.70	-2.8
Venezuela bolivar	.000466	2145.92	unch
Asia-Pacific			
Australian dollar	.8827	1.1329	-10.6
China yuan	.1322	7.5620	-3.1
Hong Kong dollar	.1279	7.8215	0.6
India rupee	.02492	40.128	-9.0
Indonesia rupiah	.0001102	9074	0.9
Japan yen	.008250	121.21	1.9
1-mos forward	.008286	120.69	1.8
3-mos forward	.008347	119.80	1.9
6-mos forward	.008440	118.48	1.9
Malaysia ringgit§	.2934	3.4083	-3.4
New Zealand dollar	.8057	1.2412	-12.6
Pakistan rupee	.01653	60.496	-0.5
Philippines peso	.0223	44.803	-8.6
Singapore dollar	.6629	1.5085	-1.6
South Korea won	.0010927	915.16	-1.6
Taiwan dollar	.03048	32.808	0.7
Thailand baht	.03350	29.851	-15.8

Country/currency	Mon in US$	Mon per US$	US$ vs, YTD chg (%)
Europe			
Czech Rep. koruna**	.04892	20.442	-1.9
Denmark krone	.1855	5.3908	-4.6
Euro area euro	1.3801	.7246	-4.3
Hungary forint	.005611	178.22	-6.4
Malta lira	3.2147	.3111	-4.3
Norway krone	.1745	5.7307	-8.1
Poland zloty	.3668	2.7263	-6.1
Russia ruble‡	.03935	25.413	-3.5
Slovak Rep koruna	.04176	23.946	-8.3
Sweden krona	.1502	6.6578	-2.7
Switzerland franc	.8285	1.2070	-1.0
1-mos forward	.8306	1.2039	-1.0
3-mos forward	.8340	1.1990	-0.8
6-mos forward	.8391	1.1918	-0.7
Turkey lira**	.8017	1.2473	-11.9
UK pound	2.0578	.4860	-4.8
1-mos forward	2.0568	.4862	-4.8
3-mos forward	2.0547	.4867	-4.7
6-mos forward	2.0505	.4877	-4.5
Middle East/Africa			
Bahrain dinar	2.6526	.3770	unch
Eqypt pound*	.1763	5.6725	-0.7
Israel shekel	.2382	4.1982	-0.4
Jordan dinar	1.4116	.7084	-0.1
Kuwait dinar	3.4854	.2869	-0.8
Lebanon pound	.0006614	1511.94	unch
Saudi Arabia riyal	.2666	3.7509	unch
South Africa rand	.1468	6.8120	-2.6
UAE dirham	.2723	3.6724	unch
SDR††	1.5358	.6511	-2.0

*Floating rate †Financial §Government rate ‡Russian Central Bank rate **Rebased as of Jan 1, 2005
††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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Depreciation and Appreciation

- **Depreciation** is a decrease in the value of a currency relative to another currency.
  - A depreciated currency is *less valuable* (less expensive) and therefore can be exchanged for (can buy) a smaller amount of foreign currency.
  - \$1/€1 → \$1.20/€1 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.
  - The euro has appreciated relative to the dollar: it is now more valuable.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Depreciation and Appreciation (cont.)

- **Appreciation** is an increase in the value of a currency relative to another currency.
  - An appreciated currency is *more valuable* (more expensive) and therefore can be exchanged for (can buy) a larger amount of foreign currency.
  - \$1/€1 → \$0.90/€1 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.
  - The euro has depreciated relative to the dollar: it is now less valuable.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Depreciation and Appreciation (cont.)

- A depreciated currency is less valuable, and therefore it can buy fewer foreign produced goods that are denominated in foreign currency.
  - How much does a Honda cost? ¥3,000,000
  - ¥3,000,000 x $0.0098/¥1 = $29,400
  - ¥3,000,000 x $0.0100/¥1 = $30,000
- A depreciated currency means that imports are more expensive and domestically produced goods and exports are less expensive.
- A depreciated currency lowers the price of exports relative to the price of imports.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Depreciation and Appreciation (cont.)

- An appreciated currency is more valuable, and therefore it can buy more foreign produced goods that are denominated in foreign currency.
  - How much does a Honda cost? ¥3,000,000
  - ¥3,000,000 x $0.0098/¥1 = $29,400
  - ¥3,000,000 x $0.0090/¥1 = $27,000
- An appreciated currency means that imports are less expensive and domestically produced goods and exports are more expensive.
- An appreciated currency raises the price of exports relative to the price of imports.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Foreign Exchange Markets

- The set of markets where foreign currencies and other assets are exchanged for domestic ones
  - Institutions buy and sell deposits of currencies or other assets for investment purposes.
- The *daily* volume of foreign exchange transactions was $1.9 trillion in 2004.
  - About 90% of transactions involved US dollars.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

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. Non-financial businesses conduct foreign currency transactions to buy/sell goods, services and assets.
4. Central banks: conduct official international reserves transactions.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Foreign Exchange Markets (cont.)

- 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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Foreign Exchange Markets (cont.)

- Computer and telecommunications technology transmit information rapidly and have integrated markets.
- The integration of markets implies that there is no significant **arbitrage** between markets.
  - Arbitrage: buying at a low price and selling at a high price for a profit.
    - If dollars are cheaper in New York than in Hong Kong, what do you predict will happen?
    - When other factors are the same, people will buy assets in New York and stop buying them in Hong Kong, so that their price in New York rises and their price in Hong Kong falls, until they are equal in the two markets.

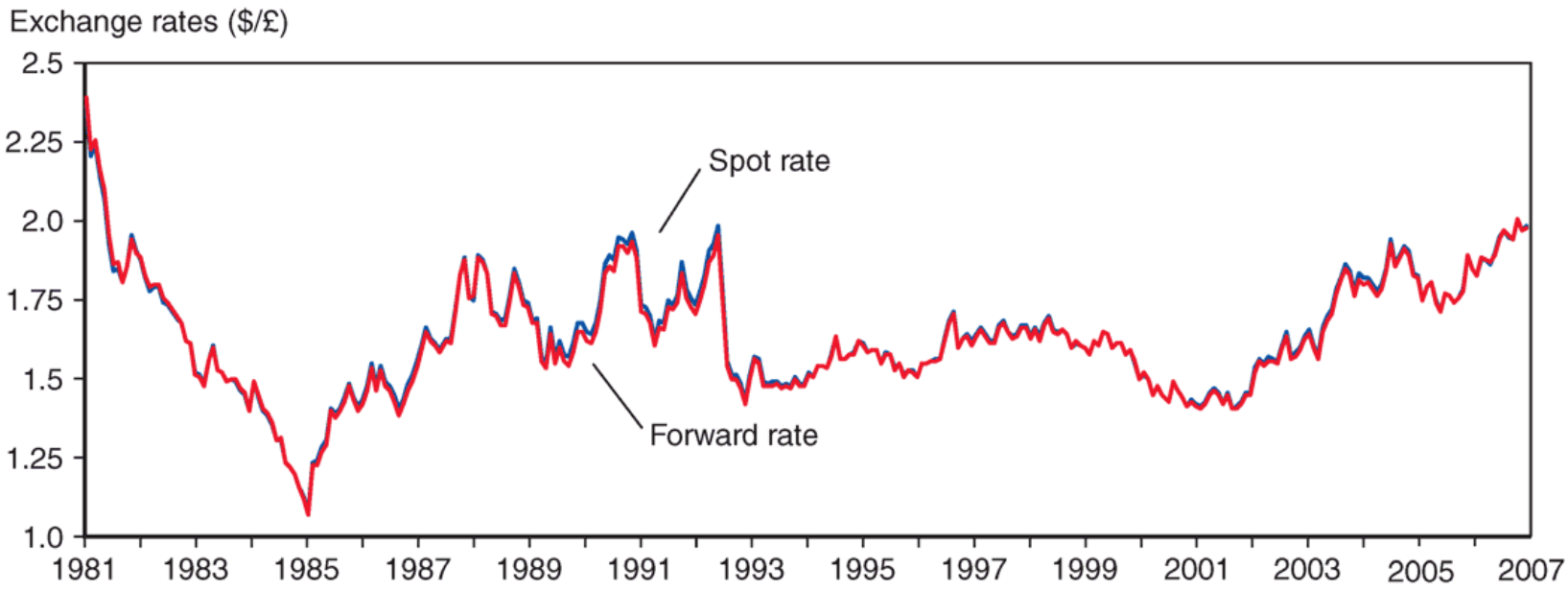
Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Fig. 13-1: Dollar/Pound Spot and Forward Exchange Rates, 1981–2007



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

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Other Methods of Currency Exchange

- **Foreign exchange swaps**: a combination of a spot sale with a forward repurchase.
  - Swaps often result in lower fees or transactions costs because they combine two transactions, and they allow parties to meet each others needs for a temporary amount of time.
- **Futures contracts**: a contract designed by a *third party* for a *standard* amount of foreign currency delivered/received on a *standard* date.
  - Contracts can be bought and sold in markets, and only the current owner is obliged to fulfill the contract.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Other Methods of Currency Exchange

- **Options contracts**: a contract designed by a *third party* for a *standard* amount of foreign currency delivered/received on or before a *standard* date.
  - Contracts can be bought and sold in markets.
  - A contract gives the owner the option, but not obligation, of buying or selling currency if the need arises.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits

- What influences the demand of (willingness to buy) deposits denominated in domestic or foreign currency?
- Factors that influence the return on assets determine the demand of those assets.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits (cont.)

- **Rate of return**: the percentage change in value that an asset offers during a time period.
  - The annual return for $100 savings deposit with an interest rate of 2% is $100 x 1.02 = $102, so that the rate of return = ($102 - $100)/$100 = 2%
- **Real rate of return**: inflation-adjusted rate of return,
  - which represents the additional amount of goods & services that can be purchased with earnings from the asset.
  - The real rate of return for the above savings deposit when inflation is 1.5% is: 2% – 1.5% = 0.5%. After accounting for the rise in the prices of goods and services, the asset can purchase 0.5% more goods and services after 1 year.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits (cont.)

- 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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits (cont.)

- **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.
- But we 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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits (cont.)

- We therefore say that investors are primarily concerned about the rates of return on currency deposits.
- Rates of return that investors expect to earn are determined by
  - interest rates that the assets will earn
  - expectations about appreciation or depreciation

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits (cont.)

- A currency deposit's **interest rate** is the amount of a currency that an individual or institution can earn by lending a unit of the currency for a year.
- The rate of return for a deposit in domestic currency is the interest rate that the deposit earns.
- To compare the rate of return on a deposit in domestic currency with one in foreign currency, consider
  - the interest rate for the foreign currency deposit
  - the expected rate of appreciation or depreciation of the foreign currency relative to the domestic currency.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits (cont.)

- Suppose the interest rate on a dollar deposit is 2%.
- Suppose the interest rate on a euro deposit is 4%.
- Does a 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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits (cont.)

- The rate of return in terms of dollars from investing in euro deposits is ($100.88-$100)/$100 = 0.88%.
- Let's compare this rate of return with the rate of return from a dollar deposit.
  - The rate of return is simply the interest rate.
  - After 1 year the $100 is expected to yield $102: ($102-$100)/$100 = 2%
- 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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits (cont.)

- Note that the expected rate of appreciation of the euro was ($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% ≈ 0.88%
  - $R_{€} + (E^{e}_{\$/€} - E_{\$/€})/E_{\$/€}$

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Demand of Currency Deposits (cont.)

- The difference in the rate of return on dollar deposits and euro deposits is
- $R_{\$} - (R_{€} + (E^{e}_{\$/€} - E_{\$/€})/E_{\$/€}) =$

$R_{\$}$ $- R_{€}$ $- (E^{e}_{\$/€} - E_{\$/€})/E_{\$/€}$

expected rate of return = interest rate on dollar deposits

interest rate on euro deposits

expected exchange rate

current exchange rate

expected rate of appreciation of the euro

expected rate of return on euro deposits

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Table 13-3: Comparing Dollar Rates of Return on Dollar and Euro Deposits

Case	Dollar Interest Rate $R_{\$}$	Euro Interest Rate $R_{€}$	Expected Rate of Dollar Depreciation Against Euro $\frac{E^{e}_{\$/€} - E_{\$/€}}{E_{\$/€}}$	Rate of Return Difference Between Dollar and Euro Deposits $R_{\$} - R_{€} - \frac{(E^{e}_{\$/€} - E_{\$/€})}{E_{\$/€}}$
1	0.10	0.06	0.00	0.04
2	0.10	0.06	0.04	0.00
3	0.10	0.06	0.08	−0.04
4	0.10	0.12	−0.04	0.02

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Model of Foreign Exchange Markets

- We use the
  - demand of (rate of return on) dollar denominated deposits
  - and the demand of (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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

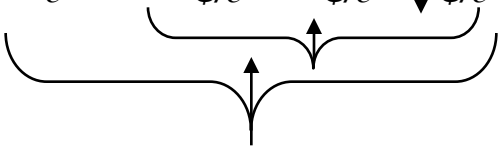
Model of Foreign Exchange Markets (cont.)

- Interest parity says:

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

- Why should this condition hold? Suppose it didn't.
  - Suppose $R_{\$} > R_{€} + (E^{e}_{\$/€} - E_{\$/€})/E_{\$/€}$
  - 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:

$$R_{\$} > R_{€} + (E^{e}_{\$/€} - E_{\$/€})/E_{\$/€}$$



Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Model of Foreign Exchange Markets (cont.)

- How do changes in the current exchange rate affect the expected rate of return of foreign currency deposits?

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Model of Foreign Exchange Markets (cont.)

- Depreciation of the domestic currency today lowers the expected rate of return on foreign currency deposits. Why?
  - 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. Why?
  - When the domestic currency appreciates, the initial cost of investing in foreign currency deposits decreases, thereby lowering the expected rate of return of foreign currency deposits.

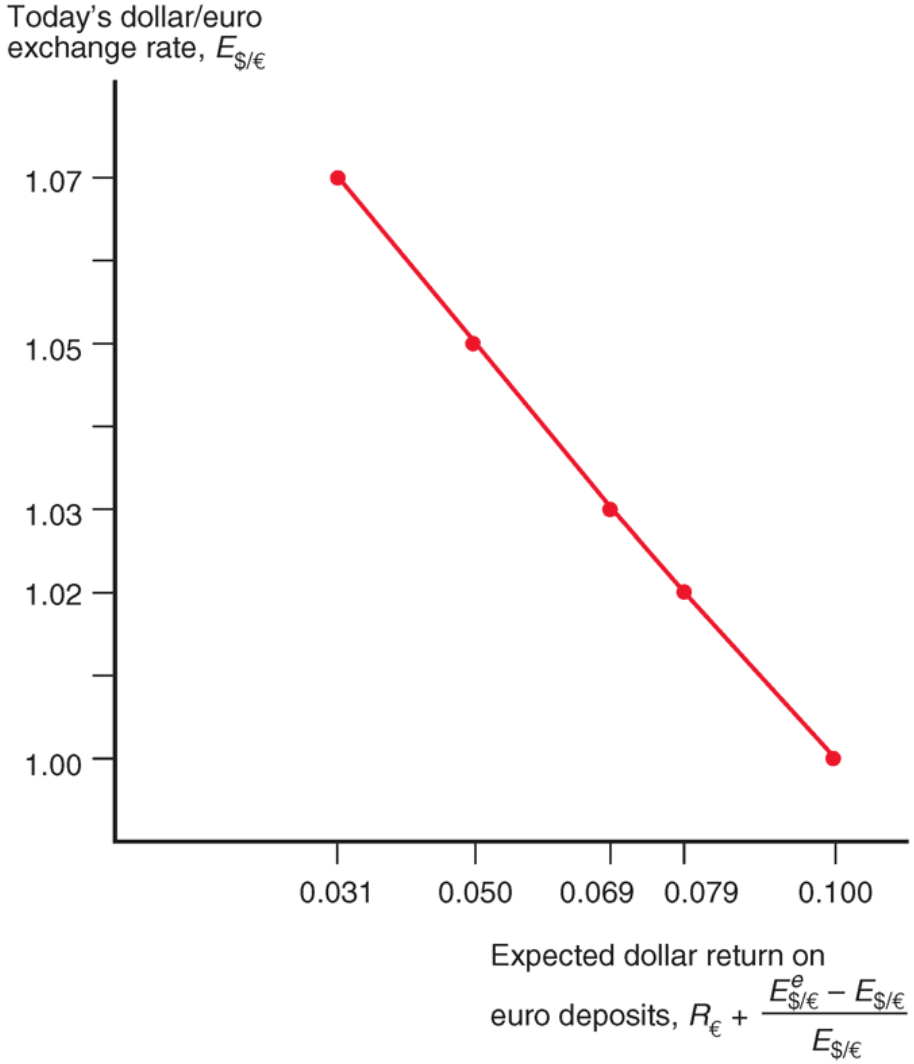
Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Table 13-4: 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
$E_{\$/€}$	$R_€$	$\frac{1.05 - E_{\$/€}}{E_{\$/€}}$	$R_€ + \frac{1.05 - E_{\$/€}}{E_{\$/€}}$
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

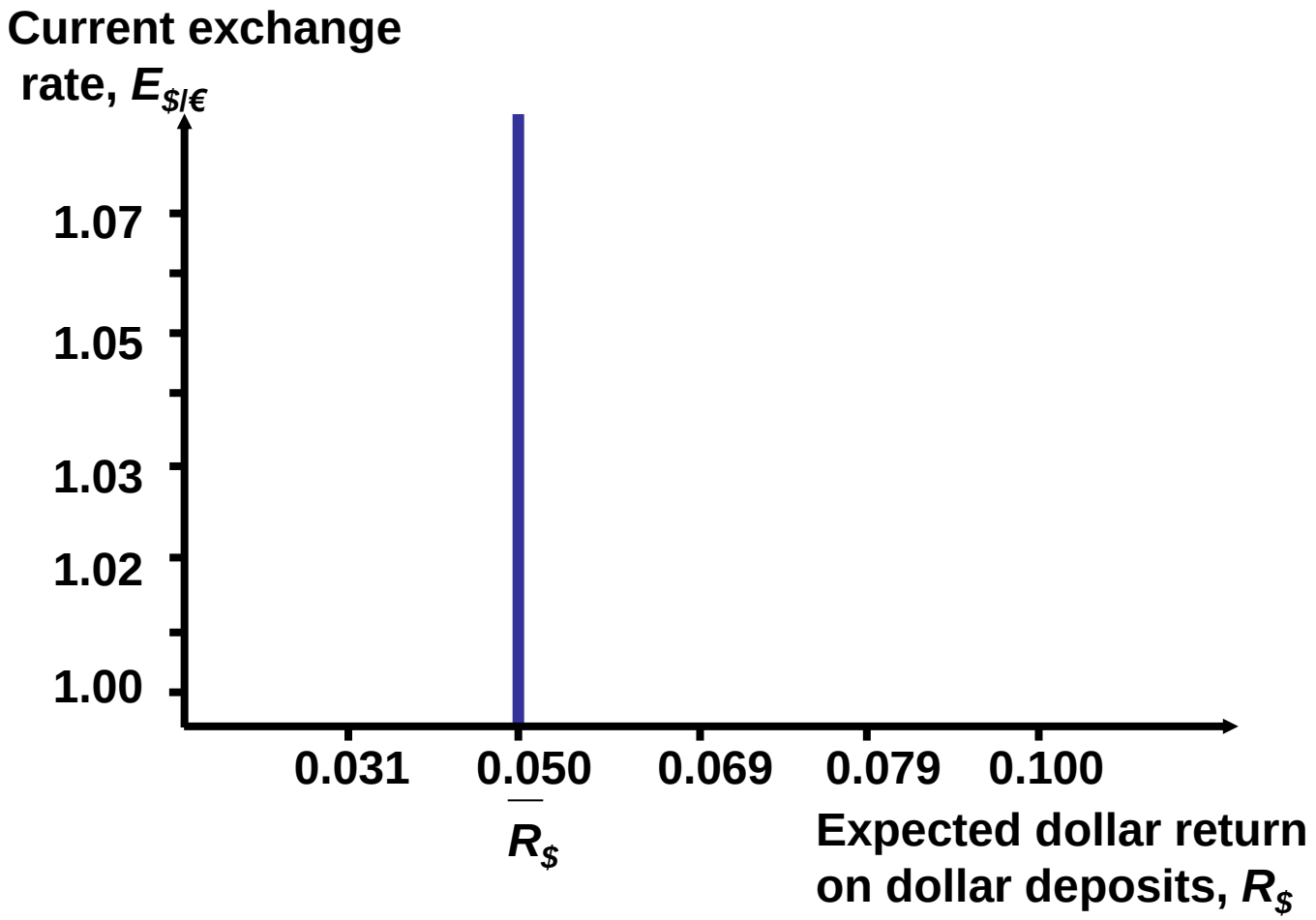
Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Fig. 13-3: The Relation Between the Current Dollar/Euro Exchange Rate and the Expected Dollar Return on Euro Deposits



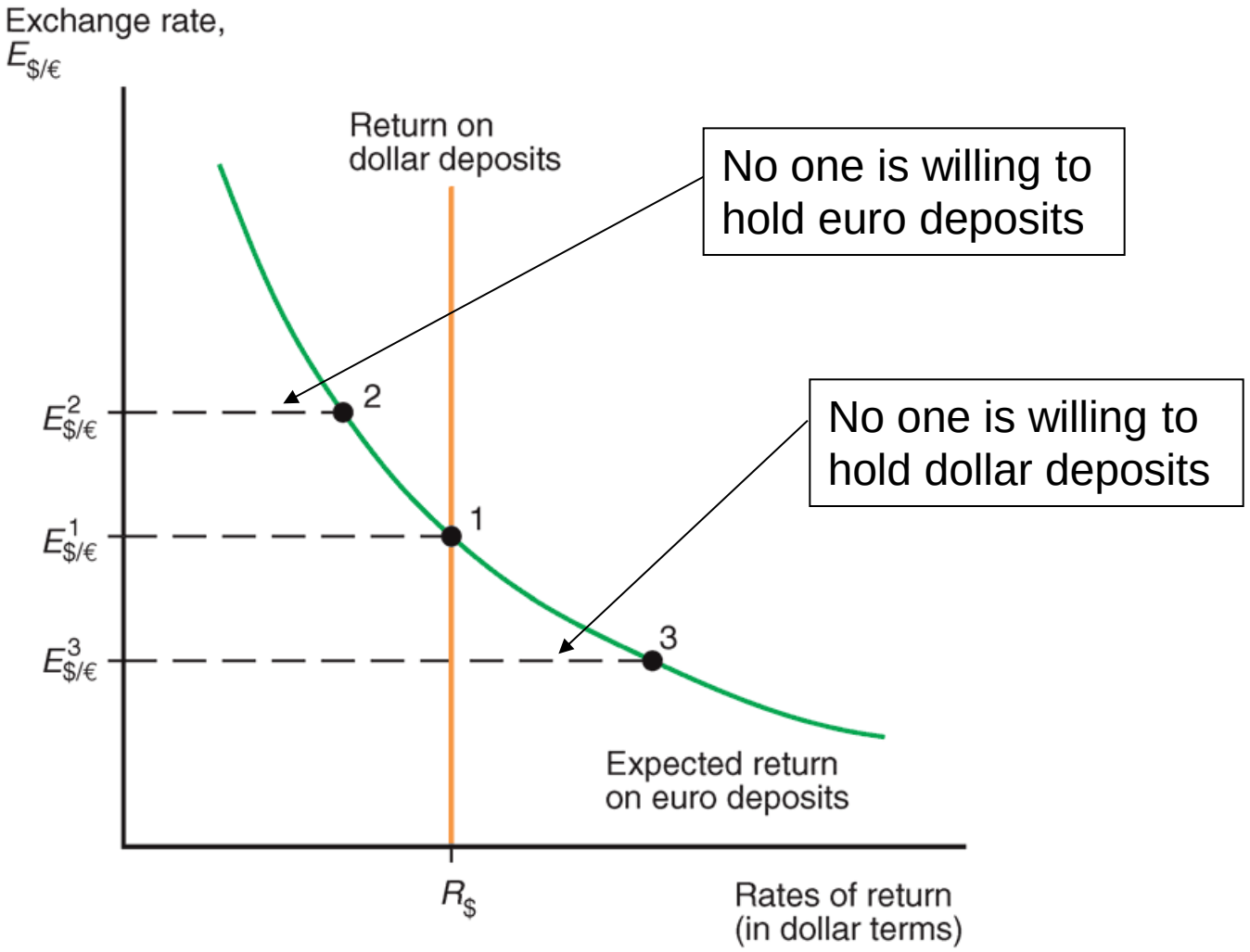
Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Current Exchange Rate and the Expected Rate of Return on Dollar Deposits



Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Fig. 13-4: Determination of the Equilibrium Dollar/Euro Exchange Rate



Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

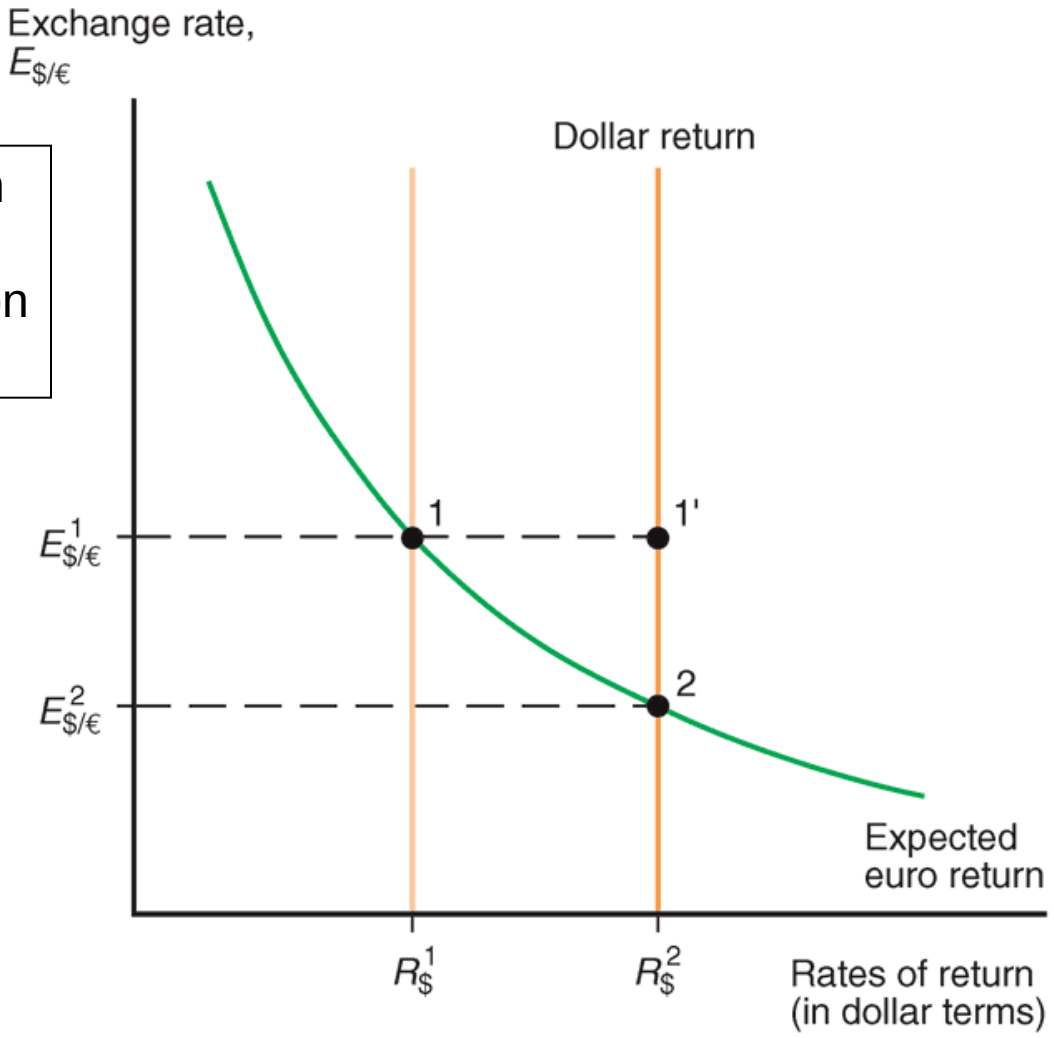
Model of Foreign Exchange Markets

- The effects of changing interest rates:
  - an increase in the interest rate paid on deposits denominated in a particular currency will increase the rate of return on those deposits.
  - This leads to an appreciation of the currency.
  - Higher interest rates on dollar-denominated assets causes the dollar to appreciate.
  - Higher interest rates on euro-denominated assets causes the dollar to depreciate.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

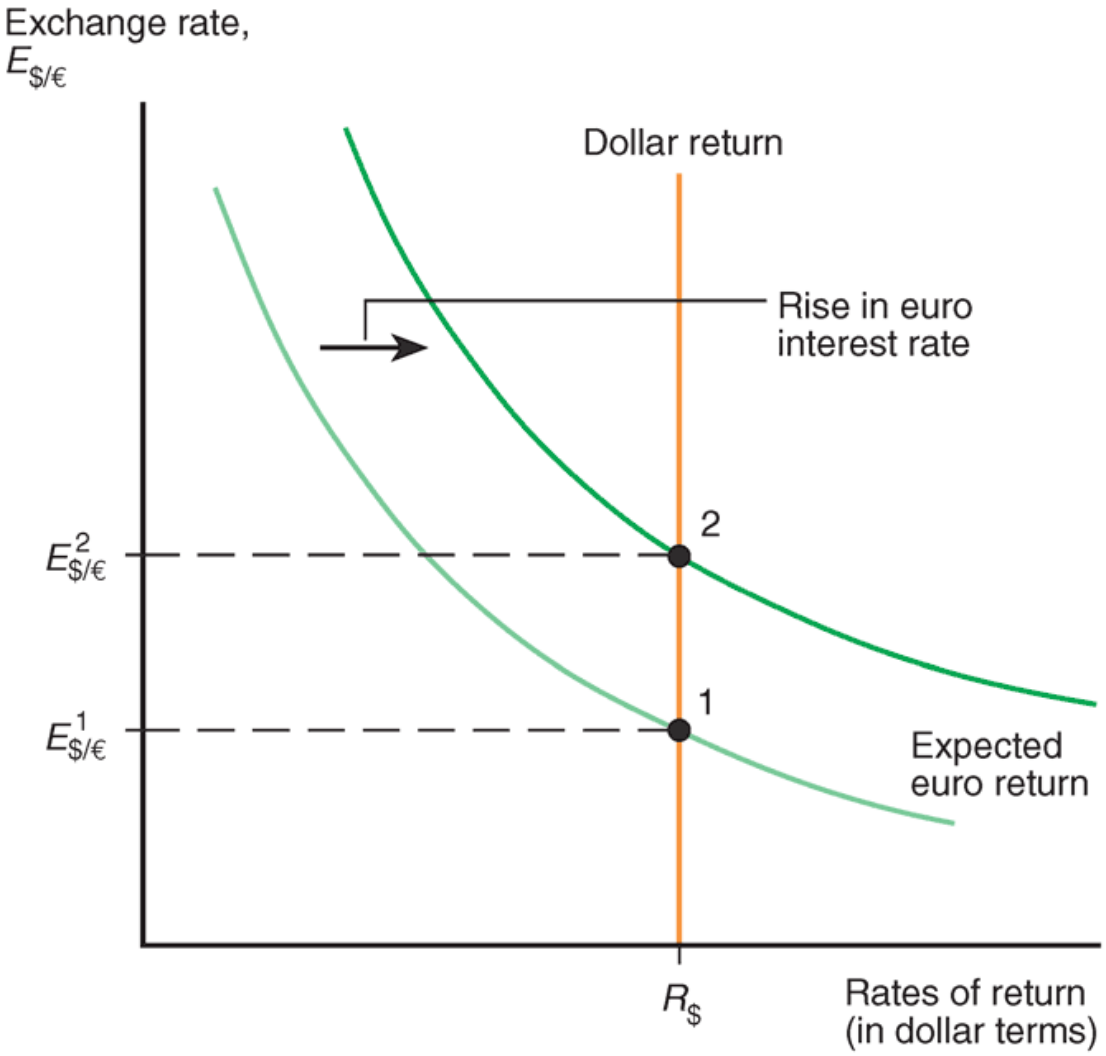
Fig. 13-5: Effect of a Rise in the Dollar Interest Rate

A depreciation of the euro is an appreciation of the dollar.



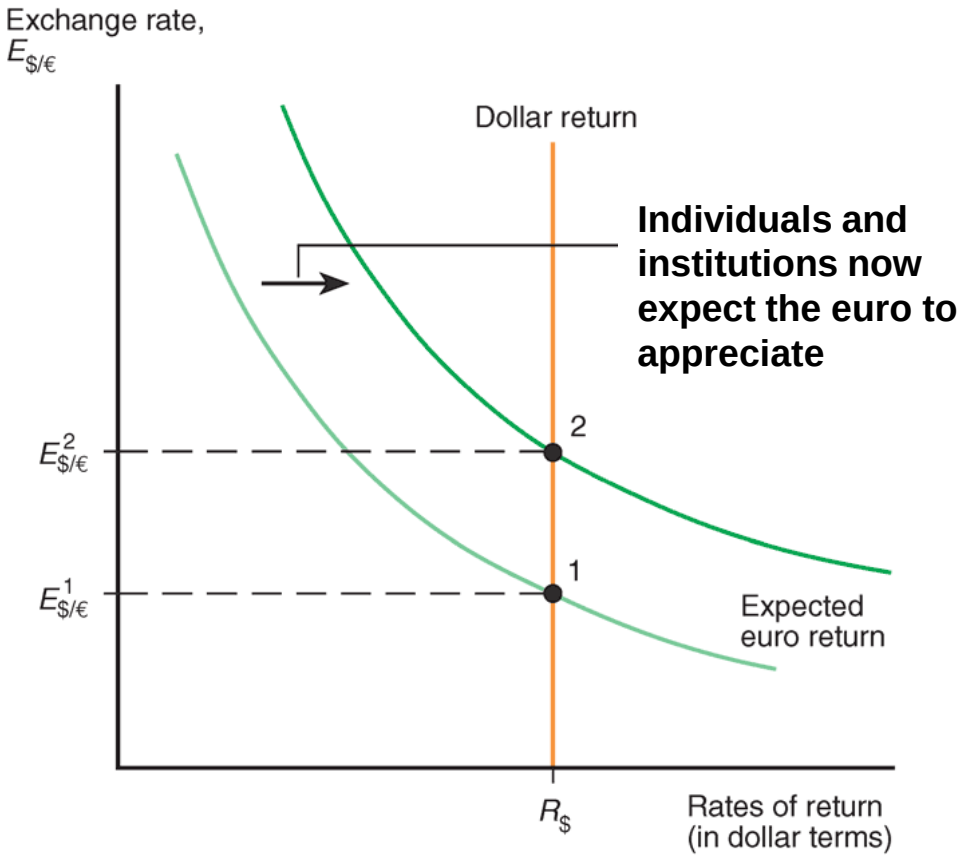
Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Fig. 13-6: Effect of a Rise in the Euro Interest Rate



Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Effect of an Expected Appreciation of the Euro



Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

The Effect of an Expected Appreciation of the Euro

- If people expect the euro to appreciate in the future, then euro-denominated assets will pay in valuable euros, so that these future euros will be able to buy many dollars and many dollar-denominated goods.
  - The expected rate of return on euros therefore increases.
  - An expected appreciation of a currency leads to an actual appreciation (a self-fulfilling prophecy).
  - An expected depreciation of a currency leads to an actual depreciation (a self-fulfilling prophecy).

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

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:

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

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

- It says that rates of return on dollar deposits and "covered" foreign currency deposits are the same.
  - How could you earn a risk-free return in the foreign exchange markets if covered interest parity did not hold?
  - Covered positions using the forward rate involve little risk.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Summary

1. Exchange rates are prices of foreign currencies in terms of domestic currencies, or vice versa.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Summary

2. Depreciation of a country's currency means that it is less expensive (valuable) and goods denominated in it are less expensive: exports are cheaper and imports more expensive.
   - A depreciation will hurt consumers of imports but help producers of exports.
3. Appreciation of a country's currency means that it is more expensive (valuable) and goods denominated in it are more expensive: exports are more expensive and imports cheaper.
   - An appreciation will help consumers of imports but hurt producers of exports.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Summary (cont.)

4. 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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Summary (cont.)

6. 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*.
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.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Summary (cont.)

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.
9. Covered interest parity says that rates of return on domestic currency deposits and "covered" foreign currency deposits using the forward exchange rate are the same.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Additional Chapter Art

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

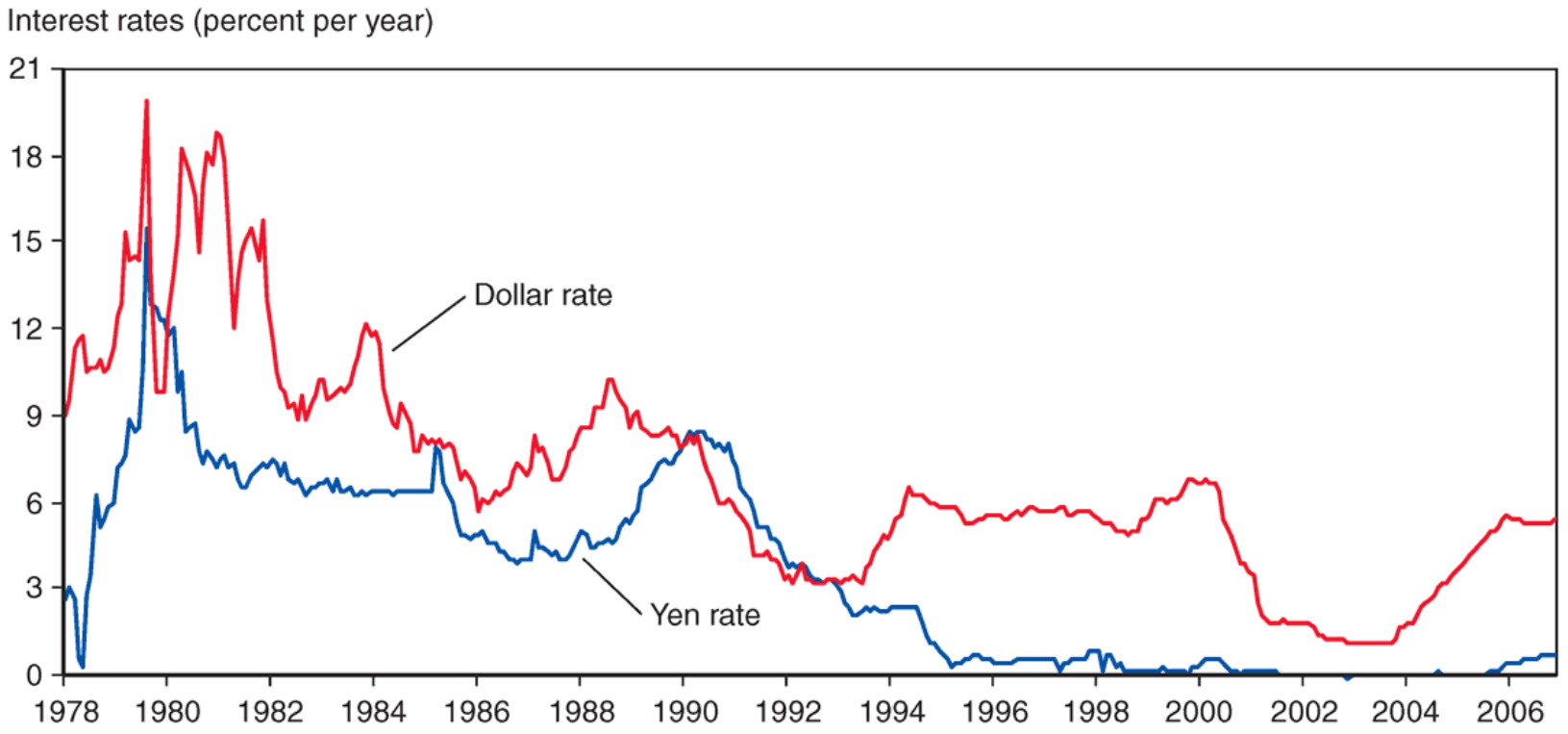
Table 13-2: $/£ Exchange Rates and the Relative Price of American Designer Jeans and British Sweaters

Exchange rate ($/£)	1.25	1.50	1.75
Relative price (pairs of jeans/sweater)	1.39	1.67	1.94

Note: The above calculations assume unchanged money prices of $45 per pair of jeans and £50 per sweater.

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.

Fig. 13-2: Interest Rates on Dollar and Yen Deposits, 1978–2007



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

Copyright © 2009 Pearson Addison-Wesley. All rights reserved.