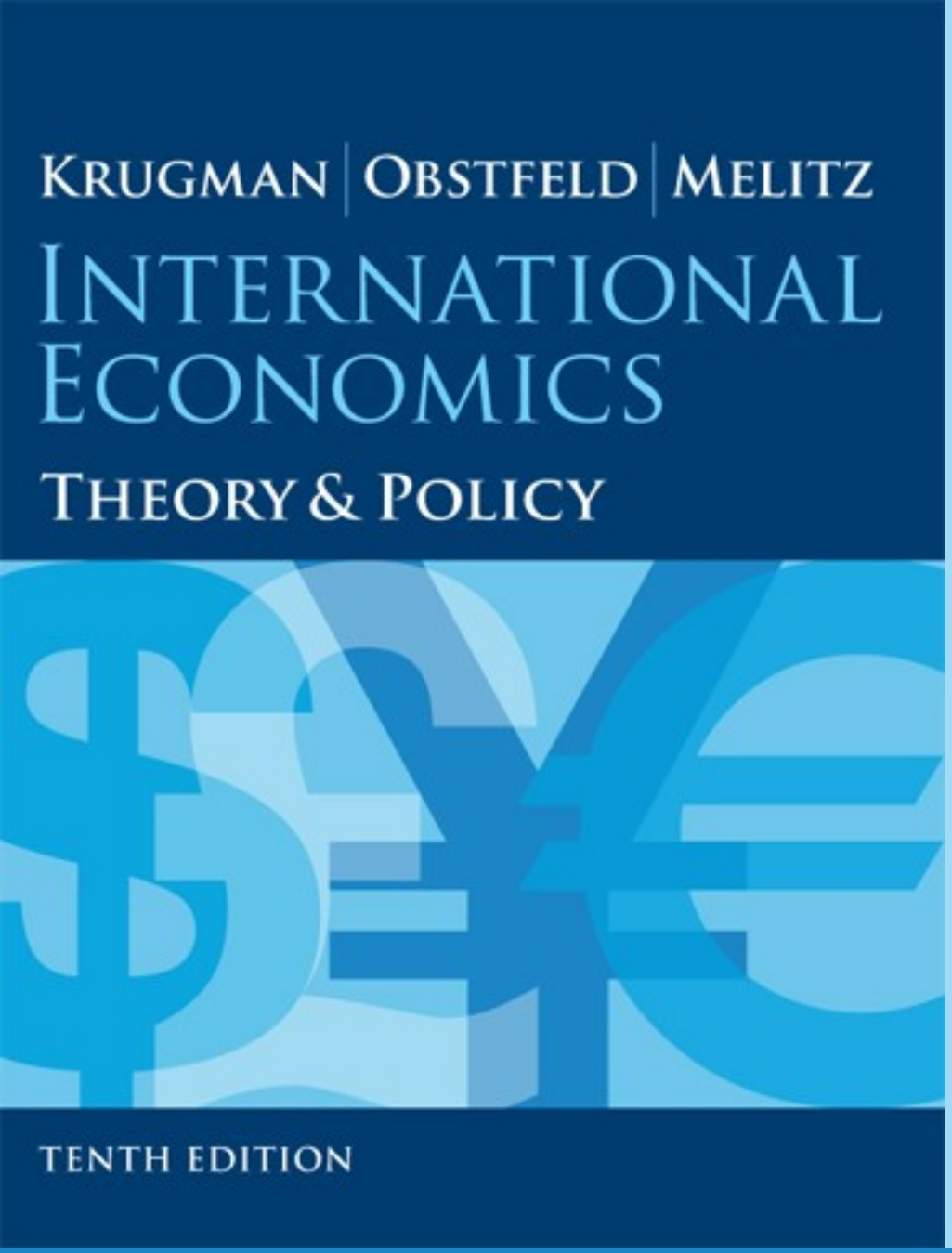


Chapter 14

Exchange Rates and the Foreign Exchange Market: An Asset Approach

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

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, ¥2,500,000 x $0.01027/¥ = $25,672.50

Table 14-1: Exchange Rate Quotations

CURRENCIES www.ft.com/currencies

FX - EFFECTIVE INDICES

	Jun 7	Jun 6	Mth ago		Jun 7	Jun 6	Mth ago
Australia	105.2	106.0	113.0	Sweden	87.1	87.3	88.6
Canada	111.6	110.5	113.6	Switzerland	143.4	143.7	143.7
Denmark	107.3	107.3	106.9	UK	81.1	81.2	80.9
Japan	145.7	144.3	143.4	USA	85.6	86.1	85.9
New Zealand	114.6	115.9	121.8	Euro	95.03	95.04	94.43
Norway	107.5	107.6	106.8				

Source: Bank of England. New Sterling ERI base Jan 2005 = 100. Other indices base average 1990 = 100. Index rebased 1/2/95. for further information about ERIs see www.bankofengland.co.uk

Bank of England Indices

Jun 7	Currency	DOLLAR Closing Mid	DOLLAR Day's Change	EURO Closing Mid	EURO Day's Change	POUND Closing Mid	POUND Day's Change
Argentina	(Peso)	5.3015	0.0077	7.0089	0.0240	8.2378	0.0198
Australia	(A$)	1.0545	0.0050	1.3941	0.0093	1.6385	0.0092
Bahrain	(Dinar)	0.3770	-	0.4985	0.0010	0.5858	0.0006
Bolivia	(Boliviano)	6.9100	-	9.1354	0.0179	10.7371	0.0100
Brazil	(R$)	2.1309	0.0027	2.8172	0.0090	3.3111	0.0072
Canada	(C$)	1.0208	-0.0110	1.3495	-0.0119	1.5861	-0.0156
Chile	(Peso)	500.500	-5.0500	661.686	-5.3619	777.702	-7.1138
China	(Yuan)	6.1335	-0.0027	8.1088	0.0124	9.5306	0.0047
Colombia	(Peso)	1897.17	-13.6300	2508.15	-13.0515	2947.92	-18.4083
Costa Rica	(Colon)	498.980	-0.0300	659.677	1.2578	775.341	0.6772
Czech Rep.	(Koruna)	19.3473	-0.1597	25.5780	-0.1605	30.0627	-0.2200
Denmark	(DKr)	5.6394	-0.0115	7.4555	-0.0006	8.7627	-0.0098
Egypt	(Egypt £)	6.9890	-	9.2398	0.0182	10.8598	0.0102
Hong Kong	(HK$)	7.7626	-	10.2625	0.0202	12.0619	0.0113
Hungary	(Forint)	223.101	-3.1794	294.950	-3.6150	346.665	-4.6122
India	(Rs)	57.0750	0.1850	75.4560	0.3925	88.6860	0.3699
Indonesia	(Rupiah)	9805.00	12.5000	12962.7	41.9865	15235.5	33.6230
Iran	(Rial)	12278.5	-	16232.8	31.9241	19078.9	17.8038
Israel	(Shk)	3.6120	-0.0023	4.7753	0.0064	5.6125	0.0017
Japan	(Y)	97.3850	-0.9900	128.748	-1.0530	151.322	-1.3957
One Month		97.3715	-0.0010	128.750	-0.0008	151.270	-0.0014
Three Month		97.3382	-0.0021	128.751	-0.0037	151.160	-0.0013
One Year		97.0400	-0.0110	128.584	-0.0522	150.509	-0.0441
Kenya	(Shilling)	84.9000	-	112.242	0.2208	131.922	0.1231
Kuwait	(Dinar)	0.2847	-0.0003	0.3764	0.0004	0.4424	-
Malaysia	(M$)	3.0935	0.0105	4.0898	0.0219	4.8068	0.0207
Mexico	(New Peso)	12.7217	-0.1774	16.8187	-0.2009	19.7676	-0.2569
New Zealand	(NZ$)	1.2652	0.0106	1.6726	0.0173	1.9659	0.0183
Nigeria	(Naira)	159.700	0.8000	211.131	1.4708	248.150	1.4735
Norway	(NKr)	5.7702	-0.0076	7.6285	0.0050	8.9660	-0.0035
Pakistan	(Rupee)	98.4750	0.0100	130.189	0.2693	153.015	0.1583
Peru	(New Sol)	2.7280	-0.0060	3.6066	-0.0008	4.2389	-0.0054
Philippines	(Peso)	42.2400	0.1000	55.8434	0.2418	65.6347	0.2165
Poland	(Zloty)	3.2025	-0.0648	4.2338	-0.0771	4.9761	-0.0959
Romania	(New Leu)	3.4133	-0.0294	4.5125	-0.0300	5.3037	-0.0408
Russia	(Rouble)	32.2100	-0.0300	42.5833	0.0442	50.0495	0.0001
Saudi Arabia	(SR)	3.7503	-0.0001	4.9581	0.0097	5.8274	0.0053
Singapore	(S$)	1.2453	-0.0014	1.6464	0.0015	1.9350	-0.0003
South Africa	(R)	9.9518	-0.0399	13.1568	-0.0268	15.4636	-0.0476
South Korea	(Won)	1117.08	1.2250	1476.83	4.5208	1735.77	3.5214
Sweden	(SKr)	6.5789	0.0018	8.6976	0.0195	10.2226	0.0123
Switzerland	(SFr)	0.9351	0.0002	1.2362	0.0027	1.4530	0.0017
Taiwan	(T$)	29.7180	-0.0795	39.2887	-0.0276	46.1773	-0.0803
Thailand	(Bt)	30.6300	0.0300	40.4944	0.1192	47.5944	0.0909
Tunisia	(Dinar)	1.6248	-0.0049	2.1481	-0.0023	2.5247	-0.0052
Turkey	(Lira)	1.8774	-0.0188	2.4820	-0.0199	2.9171	-0.0265
U A E	(Dirham)	3.6729	0.0000	4.8558	0.0095	5.7072	0.0052
UK (0.6436)*	(£)	1.5539	0.0014	0.8509	0.0010	-	-
One Month		1.5535	-	0.8512	-	-	-
Three Month		1.5529	0.0000	0.8518	0.0000	-	-
One Year		1.5510	-0.0003	0.8544	0.0000	-	-
Ukraine	(Hrywnja)	8.1375	-0.0150	10.7582	0.0014	12.6445	-0.0115
Uruguay	(Peso)	20.8250	0.4500	27.5317	0.6479	32.3590	0.7287
USA	($)	-	-	1.3221	0.0026	1.5539	0.0014
One Month		-	-	1.3223	-	1.5535	-
Three Month		-	-	1.3227	-	1.5529	0.0000
One Year		-	-	1.3251	-0.0003	1.5510	-0.0003
Venezuela(Bolivar Fuerte)		6.2921	-	8.3185	0.0164	9.7770	0.0091
Vietnam	(Dong)	21018.0	5.0000	27786.8	61.2433	32658.8	38.2380
Euro (0.7564)*	(Euro)	1.3221	0.0026	-	-	1.1754	-0.0012
One Month		1.3223	-	-	-	1.1749	0.0000
Three Month		1.3227	-	-	-	1.1741	0.0000
One Year		1.3251	-0.0003	-	-	1.1705	0.0001
SDR	-	0.6597	-0.0011	0.8721	0.0002	1.0250	-0.0007

Rates are derived from WM/Reuters at 4pm (London time). * The closing mid-point rates for the Euro and £ against the $ are shown in brackets.The other figures in the dollar column of both the Euro and Sterling rows are in the reciprocal form in line with market convention. Currency redenominated by 1000. Some values are rounded by the F.T. The exchange rates printed in this table are also available on the internet at **http://www.FT.com/marketsdata**

Euro Locking Rates: Austrian Schilling 13.7603, Belgium/Luxembourg Franc 40.3399, Cyprus 0.585274, Finnish Markka 5.94572, French Franc 6.55957, German Mark 1.95583, Greek Drachma 340.75, Irish Punt 0.787564, Italian Lira1936.27, Malta 0.4293, Netherlands Guilder 2.20371, Portuguese Escudo 200.482, Slovenia Tolar 239.64, Spanish Peseta 166.386

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/€ → $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
  - Different institutions buy and sell deposits of currencies or other assets for investment purposes.
  - 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. **Non-financial businesses** (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.

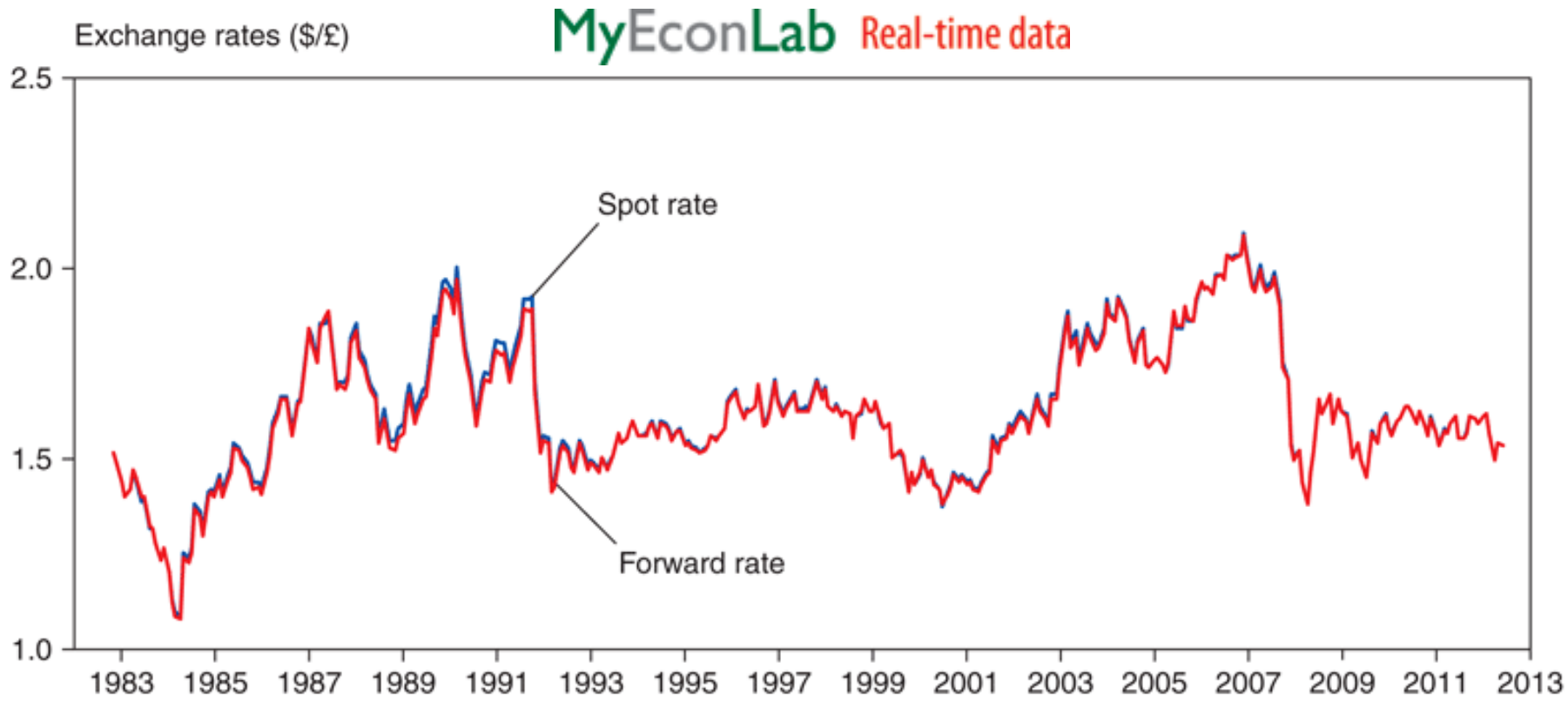
Foreign Exchange Markets

- 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 allow parties to meet each other's needs for a temporary amount of time and 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 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.
- **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.

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.

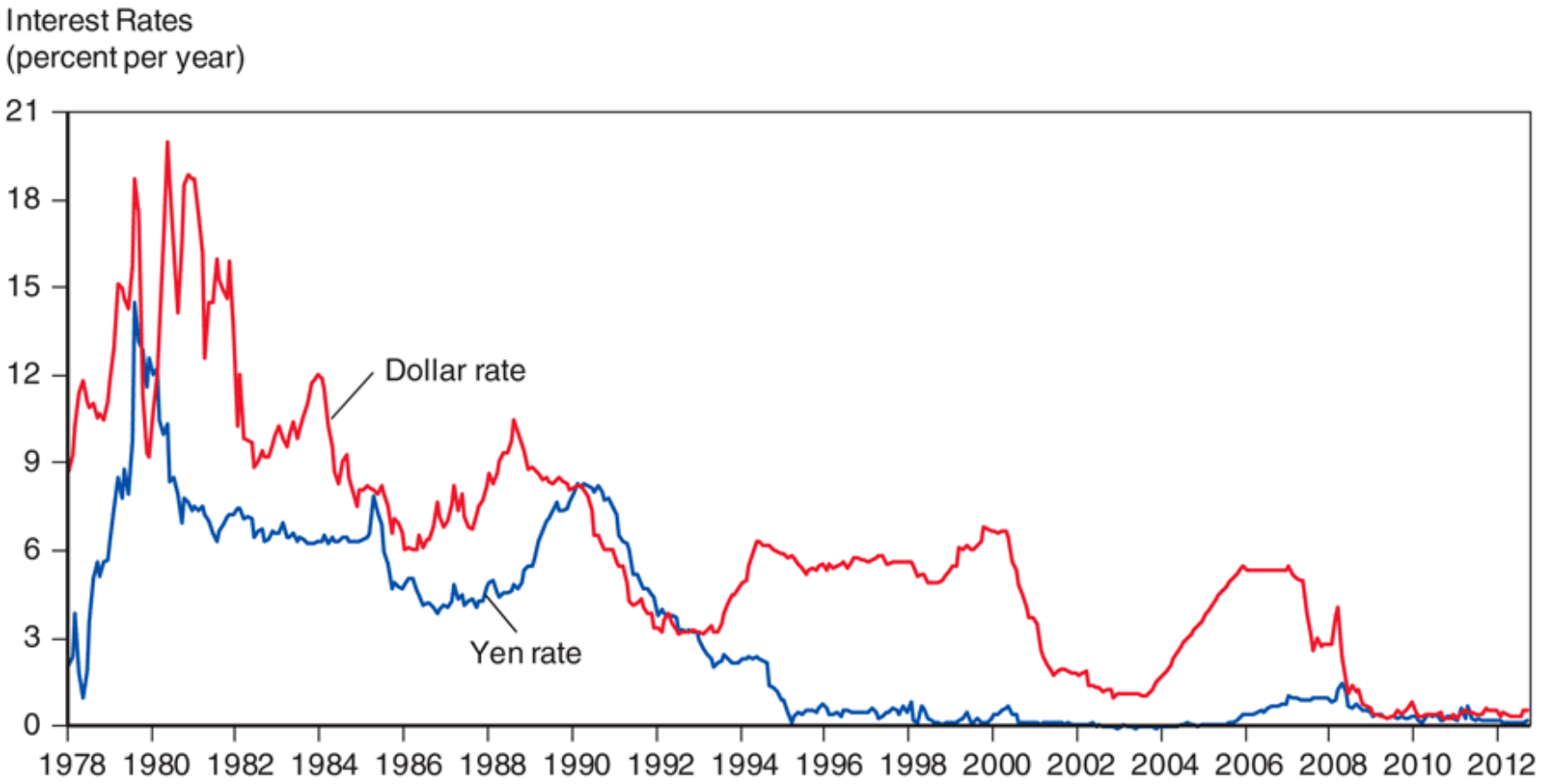
The Demand of Currency Deposits

- **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.
- Rates of return that investors expect to earn are determined by
  - interest rates that the assets will earn
  - expectations about appreciation or depreciation
- 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.

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



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

The Demand of Currency Deposits – Numerical Example

- Suppose the interest rate on a dollar deposit is 2%. Suppose 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 rate of return from a dollar deposit is simply the interest rate: 2%

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

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:

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

- 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.

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
$E_{\$/€}$	$R_{€}$	$\frac{1.05 - E_{\$/€}}{E_{\$/€}}$	$R_{€} + \frac{1.05 - E_{\$/€}}{E_{\$/€}}$
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

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 $R_€$ = 0.05, an appreciation of the dollar against euro raises the expected return on euro deposits, measured in terms of dollars.

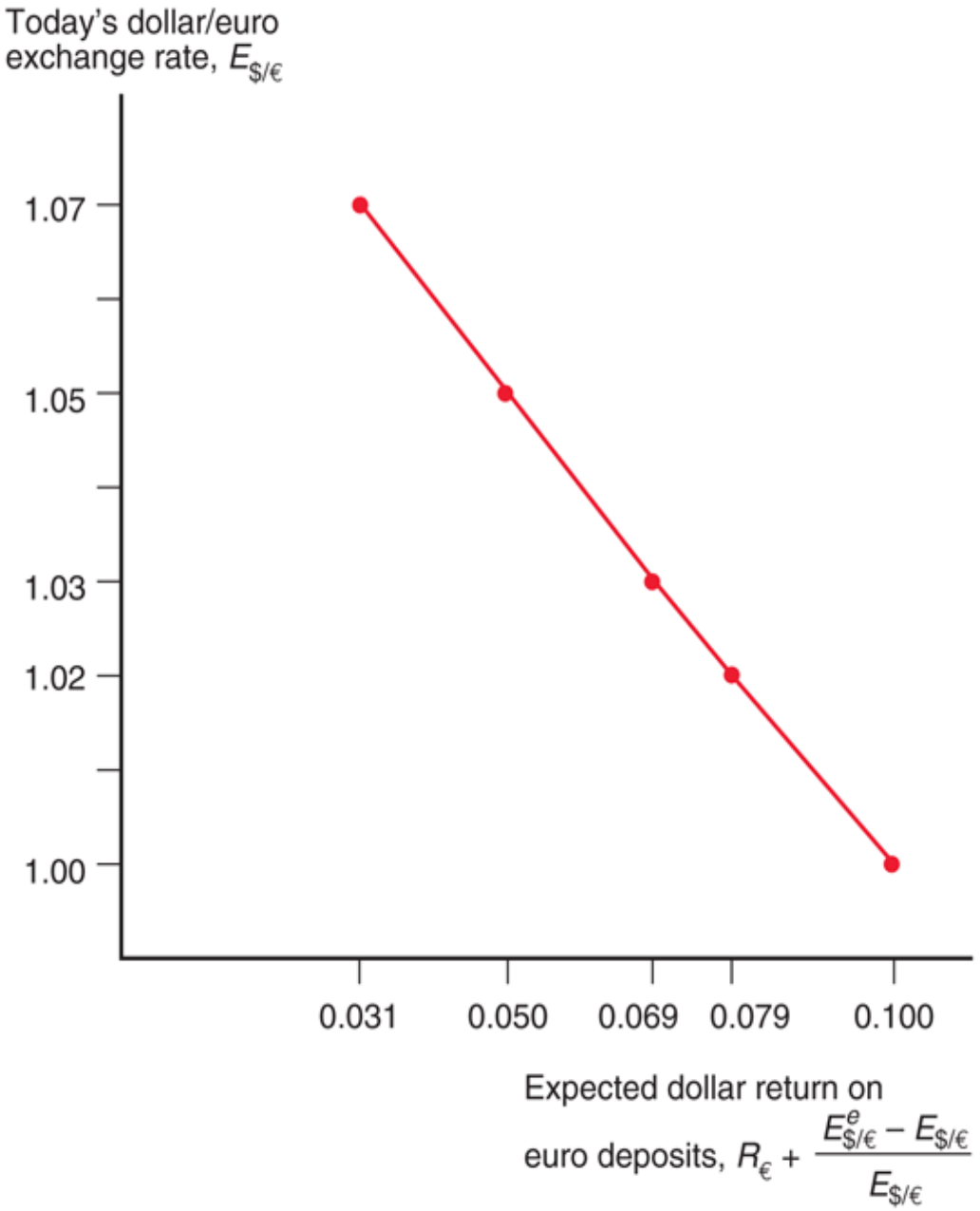
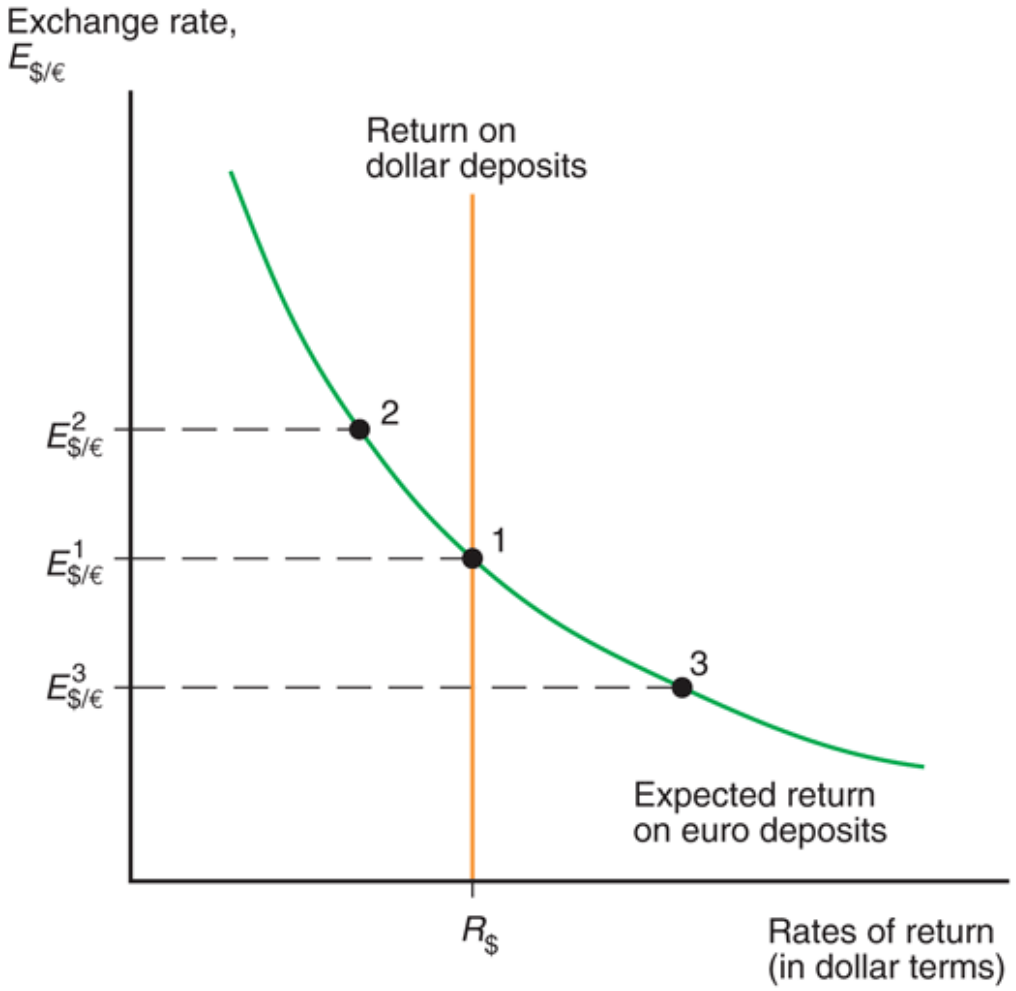
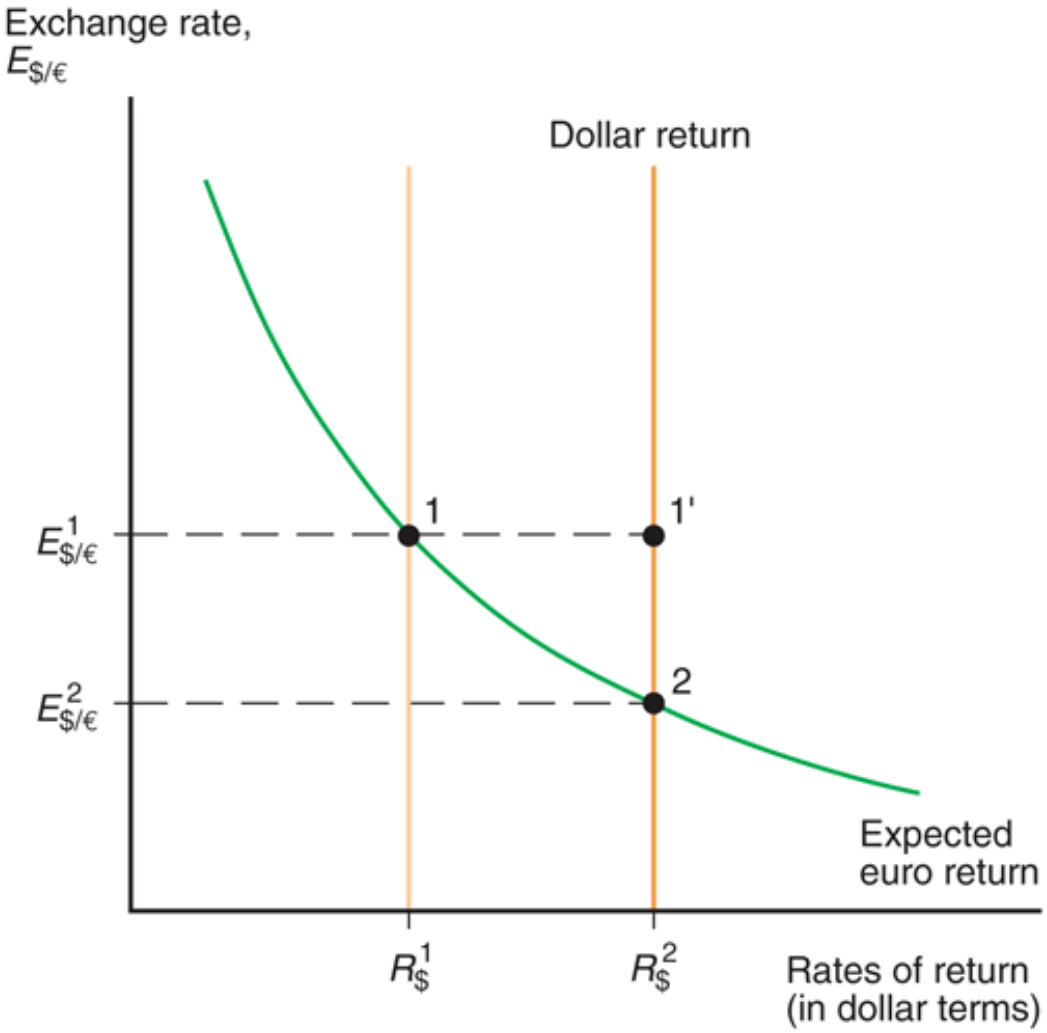


Fig. 14-4: Determination of the Equilibrium Dollar/Euro Exchange Rate



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

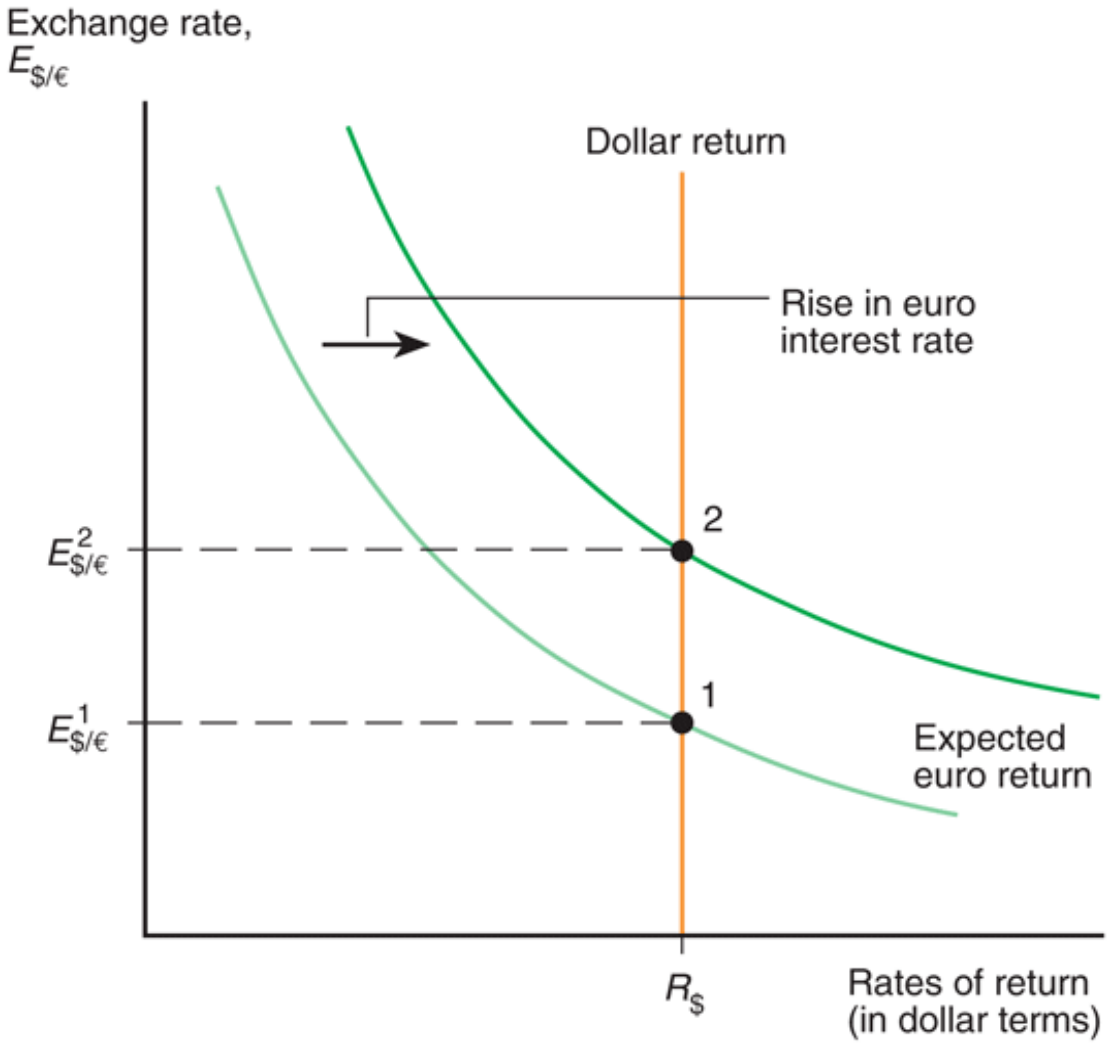
Fig. 14-5: Effect of a Rise in the Dollar Interest Rate



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).

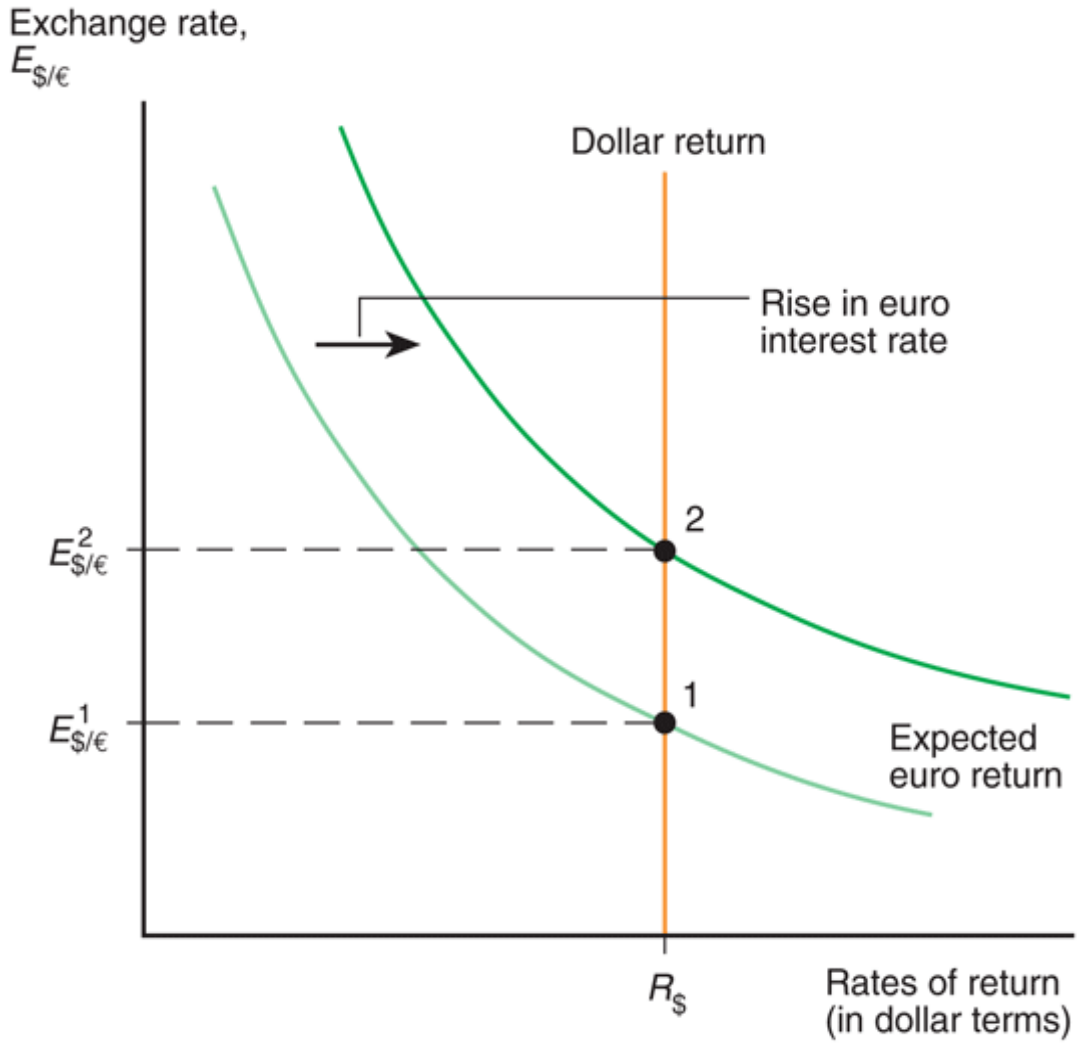
Fig. 14-6: Effect of a Rise in the Euro Interest Rate



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.

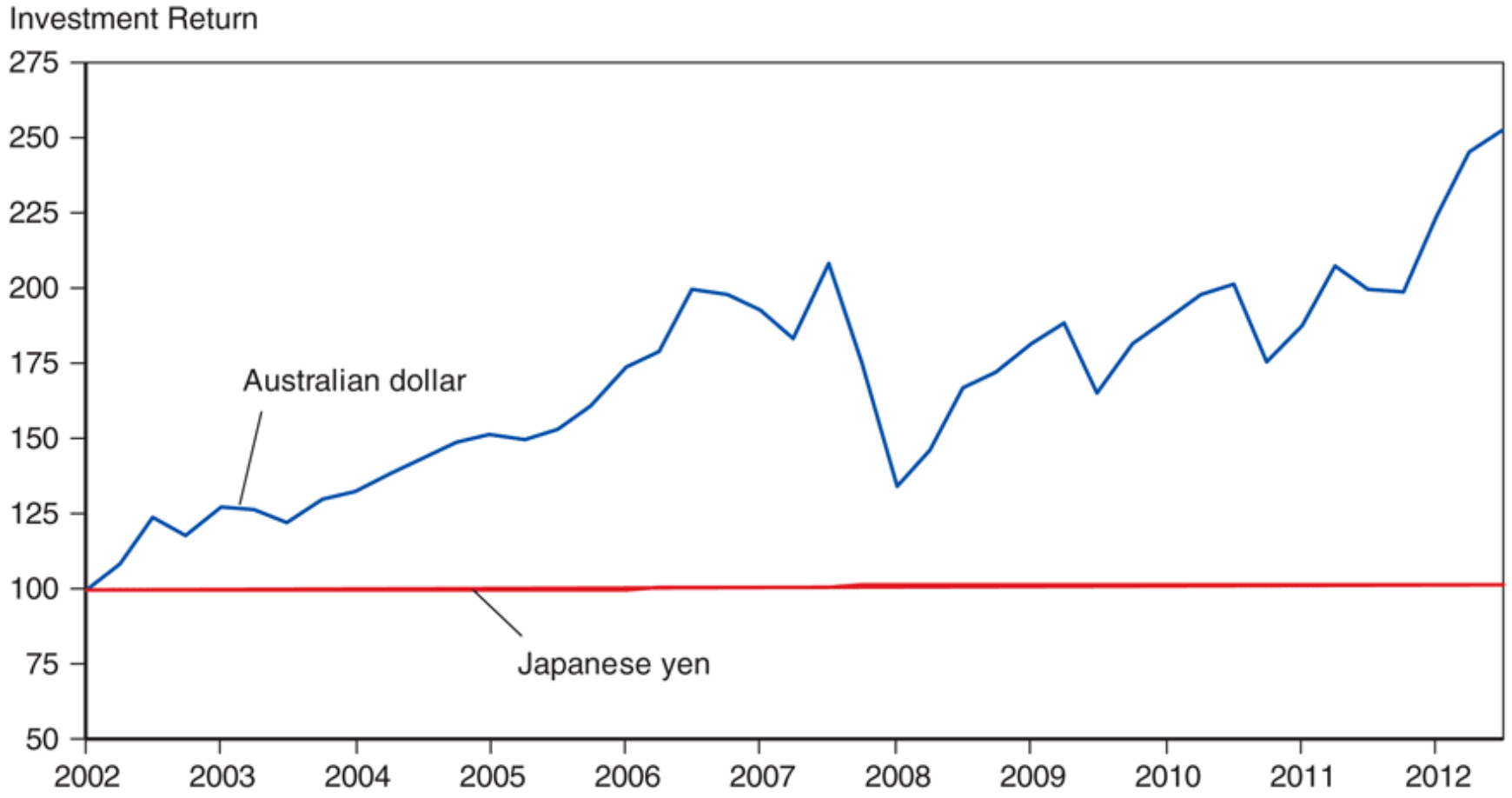
The Effect of an Expected Appreciation of the Euro (Depreciation of the Dollar)



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.

What Explains the Carry Trade?

- 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**.

What Explains 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.

What Explains the Carry Trade?

- If an investor did not change his carry trade strategy after the Australian dollar depreciation in 2008, then in five years the value of his investment doubled again.
- 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.

What Explains the Carry Trade?

- 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:

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

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

- It says that rates of return on dollar deposits and "covered" foreign currency deposits are the same.
- 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.
3. 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

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.
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*.

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.
9. Covered interest parity says that rates of return on dollar deposits and "covered" foreign currency deposits should be the same.