

Exchange rates and the foreign exchange market

International Finance

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This lecture

1. Introduction
2. Exchange Rates and International Transactions
3. The Foreign Exchange Market
4. The Demand for Foreign Currency Assets
5. Equilibrium in the Foreign Exchange Market
6. Interest Rates, Expectations, and Equilibrium
7. Main takeaways

Introduction

- Exchange rates are important because they enable us to translate different countries' prices into comparable terms.
- Exchange rates are determined in the same way as other asset prices.
- The general goal of this lecture is to show:
 - How exchange rates are determined
 - The role of exchange rates in international trade

After this lecture you should understand really well how the uncovered interest parity works, and the assumptions that allows us to use it.

Exchange Rates and International Transactions

The Foreign Exchange Market

An exchange rate can be quoted in two ways:

- Direct: the price of the foreign currency in terms of dollars
- Indirect: the price of dollars in terms of the foreign currency

The Foreign Exchange Market

CURRENCY TRADING

Wednesday, October 24, 2001

EXCHANGE RATES

The New York foreign exchange mid-range rates below apply to trading among banks in amounts of \$1 million and more, as quoted at 4 p.m. Eastern time by Reuters and other sources. Retail transactions provide fewer units of foreign currency per dollar. Rates for the 12 Euro currency countries are derived from the latest dollar-euro rate using the exchange ratios set 1/1/99.

	U.S. \$ EQUIV.		CURRENCY PER U.S. \$	
Country	Wed	Tue	Wed	Tue
Argentina (Peso).....	1.0001	1.0001	.9999	.9999
Australia (Dollar).....	.5083	.5075	1.9675	1.9704
Austria (Schilling).....	.06493	.06473	15.400	15.450
Bahrain (Dinar).....	2.6525	2.6525	.3770	.3770
Belgium (Franc).....	.0221	.0221	45.1482	45.2927
Brazil (Real).....	.3625	.3653	2.7580	2.7300
Britain (Pound).....	1.4290	1.4259	.6998	.7013
1-month forward.....	1.4266	1.4233	.7010	.7026
3-months forward.....	1.4219	1.4187	.7033	.7049
6-months forward.....	1.4155	1.4120	.7065	.7082
Canada (Dollar).....	.6354	.6363	1.5739	1.5717
1-month forward.....	.6351	.6360	1.5745	1.5723
3-months forward.....	.6348	.6357	1.5751	1.5731
6-months forward.....	.6345	.6353	1.5760	1.5741
Chile (Peso).....	.001408	.001408	710.15	710.35
China (Renminbi).....	.1208	.1208	8.2767	8.2768
Colombia (Peso).....	.0004309	.0004312	2320.50	2319.00
Czech Rep. (Koruna)....				
Commercial rate.....	.02682	.02679	37.291	37.326
Denmark (Krone).....	.1202	.1198	8.3226	8.3495
Ecuador (U.S. Dollar)-e...	1.0000	1.0000	1.0000	1.0000
Finland (Markka).....	.1593	.1595	6.5647	6.5647
France (Franc).....	.1362	.1358	7.3414	7.3649
1-month forward.....	.1361	.1356	7.3495	7.3735
3-months forward.....	.1358	.1353	7.3654	7.3886
6-months forward.....	.1354	.1350	7.3838	7.4074
Germany (Mark).....	.4568	.4554	2.1890	2.1960
1-month forward.....	.4563	.4549	2.1914	2.1985
3-months forward.....	.4554	.4539	2.2030	2.2085
6-months forward.....	.4542	.4528	2.2016	2.2086
Greece (Drachma).....	.002622	.002614	381.37	382.59
Hong Kong (Dollar).....	.1282	.1282	7.8000	7.7998
Hungary (Forint).....	.003538	.003550	282.69	281.71
India (Rupee).....	.02082	.02084	48.030	47.980
Indonesia (Rupiah).....	.0000978	.0000983	10230	10170
Ireland (Punt).....	1.1346	1.1308	.8814	.8843
Israel (Shekel).....	.2319	.2327	4.3130	4.2980
Italy (Lira).....	.0004615	.0004600	2167.06	2174.00

	U.S. \$ EQUIV.		CURRENCY PER U.S. \$	
Country	Wed	Tue	Wed	Tue
Japan (Yen).....	.008139	.008151	122.87	122.68
1-month forward.....	.008155	.008168	122.62	122.42
3-months forward.....	.008186	.008198	121.98	121.98
6-months forward.....	.008229	.008242	121.33	121.33
Jordan (Dinar).....	1.4104	1.4104	.7090	.7090
Kuwait (Dinar).....	3.2658	3.2658	.3062	.3062
Lebanon (Pound).....	.0006634	.0006614	1507.50	1512.00
Malaysia (Ringgit)-b.....	.2632	.2632	3.8000	3.8000
Malta (Lira).....	2.2212	2.2163	.4502	.4512
Mexico (Peso).....				
Floating rate.....	.1083	.1084	9.2300	9.2250
Netherlands (Guilder)....	.4054	.4042	2.4664	2.4743
New Zealand (Dollar).....	.4184	.4181	2.3901	2.3918
Norway (Krone).....	.1123	.1120	8.9071	8.9311
Pakistan (Rupee).....	.01623	.01626	61.600	61.500
Peru (new Sol).....	.2897	.2897	3.4515	3.4520
Philippines (Peso).....	.01927	.01925	51.900	51.950
Poland (Zloty)-d.....	.2429	.2432	4.1175	4.1125
Portugal (Escudo).....	.004457	.004443	224.38	225.10
Russia (Ruble)-a.....	.03381	.03382	29.576	29.564
Saudi Arabia (Riyal).....	.2666	.2666	3.7512	3.7510
Singapore (Dollar).....	.5472	.5477	1.8275	1.8258
Slovak Rep. (Koruna).....	.02048	.02046	48.824	48.869
South Africa (Rand).....	.1067	.1059	9.3716	9.4400
South Korea (Won).....	.0007731	.0007683	1293.50	1301.50
Spain (Peseta).....	.005370	.005353	186.22	186.81
Sweden (Krona).....	.0943	.0940	10.6050	10.6382
Switzerland (Franc).....	.6033	.6024	1.6575	1.6600
1-month forward.....	.6034	.6025	1.6573	1.6598
3-months forward.....	.6035	.6026	1.6571	1.6596
6-months forward.....	.6038	.6030	1.6561	1.6585
Taiwan (Dollar).....	.02896	.02896	34.530	34.530
Thailand (Baht).....	.02233	.02233	44.790	44.775
Turkey (Lira)-f.....	.00000062	.00000062	1615000	1610000
United Arab (Dirham)....	.2723	.2723	3.6730	3.6730
Uruguay (New Peso).....				
Financial.....	.07177	.07194	13.933	13.900
Venezuela (Bolívar).....	.001346	.001346	742.76	742.75

SDR..... 1.2687 1.2663 .7882 .7897
Euro..... .8907 1.192 1.127 1.127
 Special Drawing Rights (SDR) are based on exchange rates for the U.S., German, British, French, and Japanese currencies. Source: International Monetary Fund.
 a-Russian Central Bank rate. b-Government market. d-Floating rate; trading band suspended on 4/11/00. e-Adopted U.S. dollar as of 9/11/00. f-Floating rate, eff. Feb. 22.

Domestic and Foreign Prices

- If we know the exchange rate between two countries' currencies, we can compute the price of one country's exports in terms of the other country's money.

Example

The dollar price of a £50 sweater with a dollar exchange rate of \$1.50 per pound is

$$(1.50\$/\pounds) \times (\pounds 50) = \$75$$

Two types of changes in exchange rates:

- Depreciation of home country's currency:
 - A rise in the home currency prices of a foreign currency
 - It makes home goods cheaper for foreigners and foreign goods more expensive for domestic residents.
- Appreciation of home country's currency
 - A fall in the home price of a foreign currency
 - It makes home goods more expensive for foreigners and foreign goods cheaper for domestic residents.

Import and export demands are influenced by relative prices.

- Appreciation of a country's currency:
 - Raises the relative price of its exports
 - Lowers the relative price of its imports
- Depreciation of a country's currency:
 - Lowers the relative price of its exports
 - Raises the relative price of its imports

The Foreign Exchange Market

Table 1: 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.

- Exchange rates are determined in the foreign exchange market: the market in which international currency trades take place
- The major participants in the foreign exchange market are:
 - Commercial banks
 - International corporations
 - Nonbank financial institutions
 - Central banks

Interbank trading

- Foreign currency trading among banks
- It accounts for most of the activity in the foreign exchange market.

Some characteristics of the Market

- The worldwide volume of foreign exchange trading is enormous, and it has ballooned in recent years.
- New technologies, such as Internet links, are used among the major foreign exchange trading centers (London, New York, Tokyo, Frankfurt, and Singapore).
- The integration of financial centers implies that there can be no significant arbitrage: the process of buying a currency cheap and selling it dear.

Vehicle currency:

A currency that is widely used to denominate international contracts made by parties who do not reside in the country that issues the vehicle currency.

Example:

In 2001, around 90% of transactions between banks involved exchanges of foreign currencies for U.S. dollars.

Exchange Rates and International Transactions: Spot Rates and Forward Rates

If your businesses is to export and you have a friend who imports, you can hedge each other currency risk.

Spot exchange rates:

Apply to exchange currencies “on the spot”

Forward exchange rates:

Apply to exchange currencies on some future date at a prenegotiated exchange rate

Forward and spot exchange rates, while not necessarily equal, do move closely together.

Forward vs. spot rates

Figure 1: Dollar/Pound Spot and Forward Exchange Rates, 1981-2016



Foreign Exchange Swaps

Spot sales of a currency combined with a forward repurchase of the currency.

- Help reduce transaction costs, as these reduce two transactions into one.
- They make up a significant proportion of all foreign exchange trading.

The Foreign Exchange Market: futures and options

Futures contract

The buyer buys a promise that a specified amount of foreign currency will be delivered on a specified date in the future.

Foreign exchange option

The owner has the right to buy or sell a specified amount of foreign currency at a specified price at any time up to a specified expiration date.

The Demand for Foreign Currency Assets

The Demand for Foreign Currency Assets: returns

The demand for a foreign currency bank deposit is influenced by the same considerations that influence the demand for any other asset.

- Asset Returns: the percentage increase in value an asset offers over some time period.
- Real Rate of Return: the rate of return computed by measuring asset values in terms of some broad representative basket of products that savers regularly purchase.

The Demand for Foreign Currency Assets: risk and liquidity

Savers care about two main characteristics of an asset other than its return:

- Risk: the variability it contributes to savers' wealth
- Liquidity: the ease with which it can be sold or exchanged for goods

The Demand for Foreign Currency Assets: Interest Rates

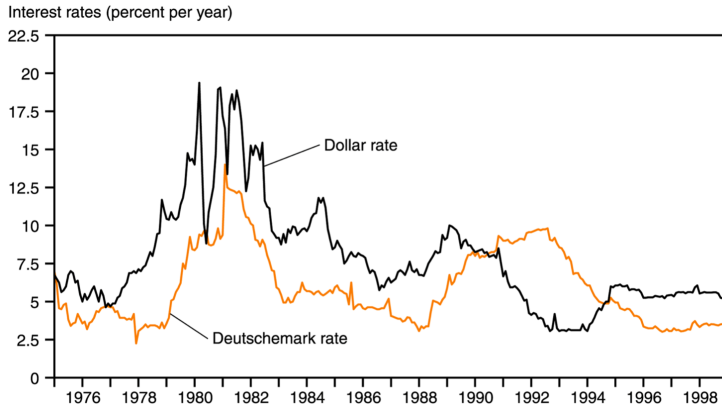
- Market participants need two pieces of information in order to compare returns on different deposits:
 - How the money values of the deposits will change
 - How exchange rates will change
- A currency's interest rate is the amount of that currency an individual can earn by lending a unit of the currency for a year.

Example:

At a dollar interest rate of 10% per year, the lender of \$1 receives \$1.10 at the end of the year.

The Demand for Foreign Currency Assets

Figure 2: Interest Rates on Dollar and Deutschemark Deposits, 1975-1998



The Demand for Foreign Currency Assets: Exchange Rates and Asset Returns

- The returns on deposits traded in the foreign exchange market depend on interest rates and expected exchange rate changes.
- In order to decide whether to buy a euro or a dollar deposit, one must calculate the dollar return on a euro deposit.
- A Simple Rule: The dollar rate of return on euro deposits is approximately the euro interest rate plus the rate of depreciation of the dollar against the euro.

Rate of depreciation

The rate of depreciation of the dollar against the euro is the percentage increase in the dollar/euro exchange rate over a year.

The Demand for Foreign Currency Assets

The expected rate of return difference between dollar and pound deposits is:

$$R_{\$} - \left[R_{\pounds} + \frac{(E_{\$/\pounds}^e - E_{\$/\pounds})}{E_{\$/\pounds}} \right] \quad (1)$$

where:

- $R_{\$}$ = interest rate on one-year dollar deposits
- $R_{\pounds}$ = today's interest rate on one-year euro deposits
- $E_{\$/\pounds}$ = today's dollar/euro exchange rate (number of dollars per euro)
- $E_{\$/\pounds}^e$ = dollar/euro exchange rate (number of dollars per euro) expected to prevail a year from today

UNDERSTANDING THIS IS IMPORTANT!!!

The Demand for Foreign Currency Assets

- When the difference in Equation (1) is positive, dollar deposits yield the higher expected rate of return.
- When it is negative, euro deposits yield the higher expected rate of return.

The Demand for Foreign Currency Assets

Table 2: Comparing Dollar Rates of Return on Dollar and Euro Deposits

Case	Dollar Interest Rate $R_{\$}$	Euro Interest Rate R_{ϵ}	Expected Rate of Dollar Depreciation against Euro $\frac{E_{\$/\epsilon}^e - E_{\$/\epsilon}}{E_{\$/\epsilon}}$	Rate of Return Difference between Dollar and Euro Deposits $R_{\$} - R_{\epsilon} - \frac{(E_{\$/\epsilon}^e - E_{\$/\epsilon})}{E_{\$/\epsilon}}$
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

The Demand for Foreign Currency Assets: Return, Risk, and Liquidity in the Foreign Exchange Market

- The demand for foreign currency assets depends not only on returns but on risk and liquidity.
 - There is no consensus among economists about the importance of risk in the foreign exchange market.
 - Most of the market participants that are influenced by liquidity factors are involved in international trade.
 - Payments connected with international trade make up a very small fraction of total foreign exchange transactions.
- Therefore, we ignore the risk and liquidity motives for holding foreign currencies.

Equilibrium in the Foreign Exchange Market

Interest Parity

The foreign exchange market is in equilibrium when deposits of all currencies offer the same expected rate of return.

- The expected returns on deposits of any two currencies are equal when measured in the same currency.
- It implies that potential holders of foreign currency deposits view them all as equally desirable assets.
- The expected rates of return are equal when:

$$R_{\$} = R_{\pounds} + \frac{(E_{\$/\pounds}^e - E_{\$/\pounds})}{E_{\$/\pounds}} \quad (2)$$

How Changes in the Current Exchange Rate Affect Expected Returns?

- Depreciation of a country's currency today lowers the expected domestic currency return on foreign currency deposits.
- Appreciation of the domestic currency today raises the domestic currency return expected of foreign currency deposits.

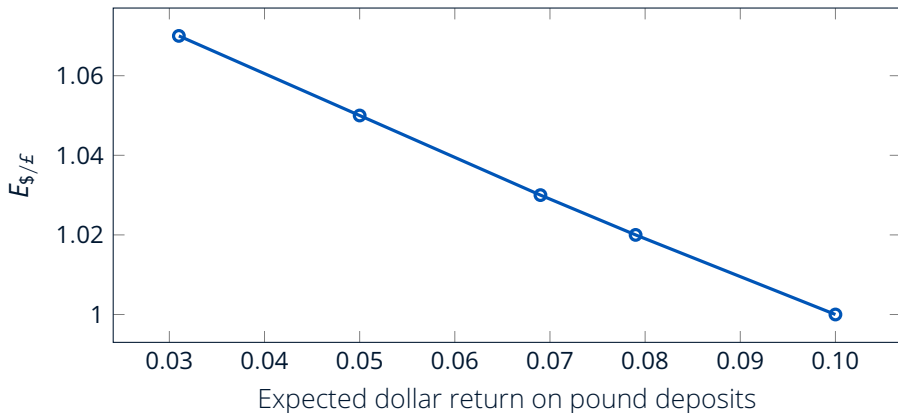
Equilibrium in the Foreign Exchange Market

Table 3: Today's Dollar/Euro Exchange Rate and the Expected Dollar Return on Euro Deposits
When $E_{\$/\epsilon} = \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
$E_{\$/\epsilon}$	R_{ϵ}	$\frac{1.05 - E_{\$/\epsilon}}{E_{\$/\epsilon}}$	$R_{\epsilon} + \frac{1.05 - E_{\$/\epsilon}}{E_{\$/\epsilon}}$
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

Equilibrium in the Foreign Exchange Market

Figure 3: The Relation Between the Current Dollar/Euro Exchange Rate and the Expected Dollar Return on Euro Deposits



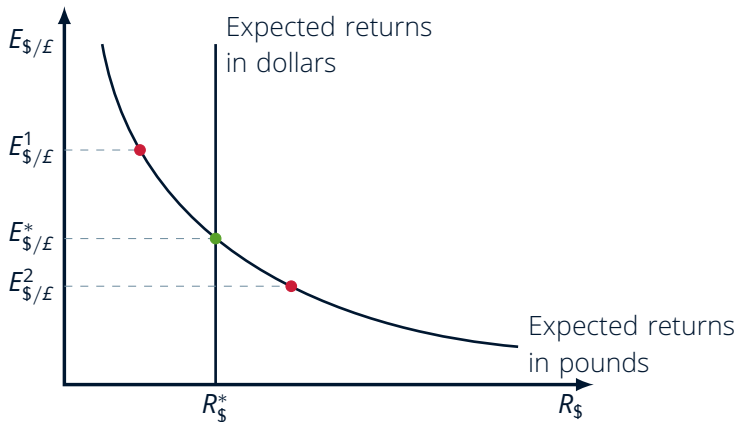
The Equilibrium Exchange Rate

Partial equilibrium assumptions:

- Exchange rates always adjust to maintain interest parity.
- Assume that the dollar interest rate $R_{\$}$, the pound interest rate $R_{£}$, and the expected future dollar/pound exchange rate $E_{\$/£}^e$, are all given.

Equilibrium in the Foreign Exchange Market

Figure 4: Determination of the Equilibrium Dollar/Pound Exchange Rate



Interest Rates, Expectations, and Equilibrium

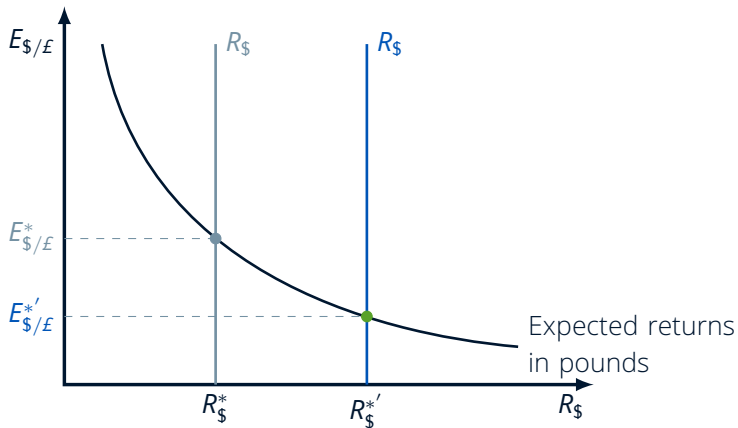
The Effect of Changing Interest Rates on the Current Exchange Rate

An increase in the interest rate paid on deposits of a currency causes that currency to appreciate against foreign currencies.

- A rise in dollar interest rates causes the dollar to appreciate against the euro.
- A rise in euro interest rates causes the dollar to depreciate against the euro.

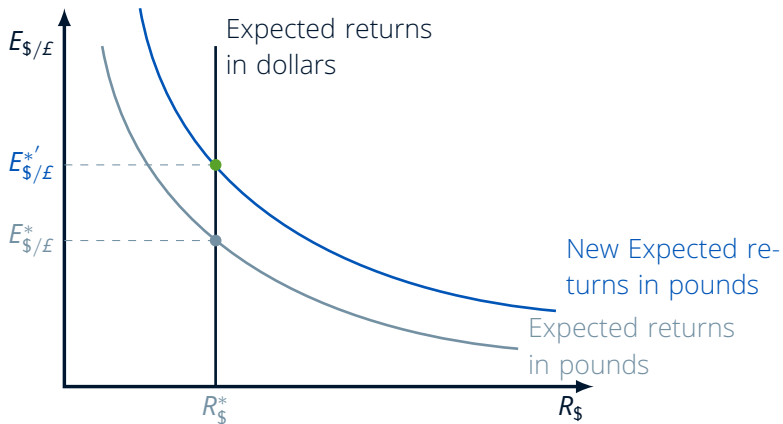
Effect of a Rise in the Dollar Interest Rate

Figure 5: Effect of a Rise in the Dollar Interest Rate



Effect of a Rise in the Euro Interest Rate

Figure 6: Effect of a Rise in the Pound Interest Rate



The Effect of Changing Expectations on the Current Exchange Rate

- A rise in the expected future exchange rate causes a rise in the current exchange rate.
- A fall in the expected future exchange rate causes a fall in the current exchange rate.

Main takeaways

- Exchange rates play a role in spending decisions because they enable us to translate different countries' prices into comparable terms.
- A depreciation (appreciation) of a country's currency against foreign currencies makes its exports cheaper (more expensive) and its imports more expensive (cheaper).
- Exchange rates are determined in the foreign exchange market.

- An important category of foreign exchange trading is forward trading.
- The exchange rate is most appropriately thought of as being an asset price itself.
- The returns on deposits traded in the foreign exchange market depend on interest rates and expected exchange rate changes.

- Equilibrium in the foreign exchange market requires interest parity.
 - For given interest rates and a given expectation of the future exchange rate, the interest parity condition tells us the current equilibrium exchange rate.
- A rise in dollar (euro) interest rates causes the dollar to appreciate (depreciate) against the euro.
- Today's exchange rate is altered by changes in its expected future level.