Introduction to Foreign Exchange

Slides for International Finance (KOMIF Chapter 3)

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2017-09-14
Preview

- Basic exchange rate concepts
- Exchange rates and the cost of foreign goods
- The foreign exchange markets
- The demand for currency deposits and other assets
- A model of exchange rate determination
  - effect of interest rates
  - effect of expectations
What Is An Exchange Rate?

Exchange Rate

- The price of one currency in terms of another currency
- The number of units of the *quote currency* that it takes to buy one unit of the *base currency*
  - *quote currency* synonyms: *terms* currency or *counter* currency
  - *base currency* synonyms: *quoted* currency or *underlying* currency
Textbooks usually write the quote currency first. Financial markets state the base currency first.
**Exchange Rate Example**

**USD-EUR 0.7**
- USD is base currency; EUR is quote currency
- quote is in euros per dollar ("European terms")
- textbooks typically write 0.7 EUR/USD

**EUR-USD 1.43**
- EUR is base currency; USD is quote currency
- quote is in dollars per euro terms ("dollar terms" or "American terms")
- textbooks typically write 1.43 USD/EUR
Direct rate: domestic currency per unit of foreign currency.

- in US, 1.4 USD per EUR
- in US, EUR-USD 1.4

Indirect rate: foreign currency per unit of domestic currency

- in US, 0.7 EUR per USD
- in US, USD-EUR 0.7

In class we will use the direct rate, but markets use both.

http://finance.yahoo.com/currency-investing
## Indirect and Direct Rates

<table>
<thead>
<tr>
<th>Currency</th>
<th>1 USD</th>
<th>in USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro</td>
<td>0.837193</td>
<td>1.194467</td>
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<tr>
<td>British_Pound</td>
<td>0.741134</td>
<td>1.349283</td>
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<td>Indian_Rupee</td>
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<tr>
<td>Australian_Dollar</td>
<td>1.255004</td>
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<td>Canadian_Dollar</td>
<td>1.223212</td>
<td>0.817520</td>
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<td>Singapore_Dollar</td>
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<tr>
<td>Swiss_Franc</td>
<td>0.962134</td>
<td>1.039356</td>
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<tr>
<td>Malaysian_Ringgit</td>
<td>4.188005</td>
<td>0.238777</td>
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<td>Japanese_Yen</td>
<td>111.497052</td>
<td>0.008969</td>
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<tr>
<td>Chinese_Yuan_Renminbi</td>
<td>6.570169</td>
<td>0.152203</td>
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</table>

USD-JPY

Source: [http://research.stlouisfed.org/fred2/series/EXJpus?cid=95](http://research.stlouisfed.org/fred2/series/EXJpus?cid=95)
Introduction to Exchange Rates

Interest Parity

Introductory Concepts

International Financial Markets

GBP-USD

Source: http://research.stlouisfed.org/fred2/series/EXUSUK?cid=95
Source: http://research.stlouisfed.org/fred2/series/EXCAUS?cid=95
EUR-USD

Source: http://research.stlouisfed.org/fred2/series/EXUSEU?cid=95
Cost of Foreign Goods

Exchange rates allow us to

- express prices in a common currency
- make easier cost comparisons

Example: In 2010, the Mercedes-Benz SLS AMG cost about EUR 150k. What was the dollar cost?

- Exchange rate (dollar terms): EUR-USD 1.3
- Foreign price: EUR 150K
- Domestic price:
  - \[(\text{exchange rate}) \times \text{(foreign price)}\]
  - \[(\text{USD} \ 1.3/\text{EUR}) \times \text{EUR} \ 150k = \text{USD} \ 195k\]
Depreciation and Appreciation

**Depreciation**  a *fall* in the *exchange value* of a currency.
  E *rises* (direct rate!)
  raises (cet. par.) the price of foreign goods relative to the price of our goods.

**Appreciation**  a *rise* in the *exchange value* of a currency.
  E *falls* (direct rate!)
  lowers (cet. par.) the price of foreign goods relative to the price of our goods.
A depreciated currency buys a smaller amount of foreign currency.

**Example:** EUR-USD 1.0 → EUR-USD 1.50

- the dollar has depreciated relative to the euro. The dollar is now less valuable.
- Equivalently, the euro has appreciated relative to the dollar: the euro is now more valuable.

Given prices, a dollar buys fewer foreign goods after depreciating.

**Example:** Suppose an AMG costs €150k

- €150k x $1/€1 = $150k
- €150k x $1.5/€1 = $225k

Dollar depreciation → imports into US become more expensive. Domestically produced goods, including our exports, are *relatively* less expensive.
Appreciation Example

An appreciated currency buys a larger amount of foreign currency.

Example: JPY-USD 0.0125 → JPY-USD 0.0100
- the dollar has appreciated relative to the yen; the dollar is more valuable.
- Equivalently, the yen has depreciated relative to the dollar; the yen is now less valuable.

Given prices, a dollar buys more foreign goods after appreciating.

Example: suppose a Honda accord costs ¥1.5M
- ¥1,500,000 × $0.0125/¥1 = $18,750
- ¥1,500,000 × $0.0100/¥1 = $15,000

Dollar appreciation → imports into US become less expensive.
Domestically produced goods, including our exports, are relatively more expensive.
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 $5.1T in 2016, $5.4T in 2013, $4T in 2010, and $3.2T in 2007.
  - About 85% of transactions involved the USD
  - USD-EUR transactions are just over 1/4 of the total

Source: http://www.bis.org/publ/rpfx10.htm
Currency Composition

OTC foreign exchange turnover by currency pair

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Amount</td>
<td>%</td>
<td>Amount</td>
<td>%</td>
<td>Amount</td>
<td>%</td>
</tr>
<tr>
<td>USD / EUR</td>
<td>372</td>
<td>30.0</td>
<td>541</td>
<td>28.0</td>
<td>892</td>
<td>26.8</td>
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<tr>
<td>USD / JPY</td>
<td>250</td>
<td>20.2</td>
<td>328</td>
<td>17.0</td>
<td>438</td>
<td>13.2</td>
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<td>USD / GBP</td>
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<td>10.4</td>
<td>259</td>
<td>13.4</td>
<td>384</td>
<td>11.6</td>
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<td>USD / AUD</td>
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<td>4.1</td>
<td>107</td>
<td>5.5</td>
<td>185</td>
<td>5.6</td>
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<tr>
<td>USD / CAD</td>
<td>54</td>
<td>4.3</td>
<td>77</td>
<td>4.0</td>
<td>126</td>
<td>3.8</td>
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<tr>
<td>USD / CNY</td>
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<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>USD / CHF</td>
<td>59</td>
<td>4.8</td>
<td>83</td>
<td>4.3</td>
<td>151</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Source: BIS
Foreign Exchange Market 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.
## Global Foreign Exchange Turnover

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Foreign exchange instruments</td>
<td>1,239</td>
<td>1,934</td>
<td>3,324</td>
<td>3,973</td>
<td>5,357</td>
<td>5,067</td>
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<td>Spot transactions</td>
<td>386</td>
<td>631</td>
<td>1,005</td>
<td>1,489</td>
<td>2,047</td>
<td>1,652</td>
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<tr>
<td>Outright forwards</td>
<td>130</td>
<td>209</td>
<td>362</td>
<td>475</td>
<td>679</td>
<td>700</td>
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<tr>
<td>Foreign exchange swaps</td>
<td>656</td>
<td>954</td>
<td>1,714</td>
<td>1,759</td>
<td>2,240</td>
<td>2,378</td>
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<tr>
<td>Currency swaps</td>
<td>7</td>
<td>21</td>
<td>31</td>
<td>43</td>
<td>54</td>
<td>82</td>
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<tr>
<td>Options and other products</td>
<td>60</td>
<td>119</td>
<td>212</td>
<td>207</td>
<td>337</td>
<td>254</td>
</tr>
</tbody>
</table>

Source: BIS (2016)
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.
Foreign exchange market activity is concentrated in a few of global financial centres:

Global FX trading in 2016, main players:

- the United Kingdom (36.9%)
- the United States (19.5%)
- Singapore (7.9%)
- Hong Kong SAR (6.7%)
- Japan (6.1%)

Source: BIS (2016, table 6)
Arbitrage buying at a low price and selling at a high price for a profit.

When other factors are the same, people will buy assets where they are cheapest. If HKD are cheaper in New York, people will start buying them in New York and stop buying them in Hong Kong. As a result, the price of HKD in New York rises and the price in Hong Kong falls, until they are equal in the two markets.

- Computer and telecommunications technology transmit information rapidly and have integrated markets.
- The integration of markets implies that there are no significant arbitrage opportunities between markets.
Suppose geographical arbitrage equates bilateral exchange rates in all centers.

Q: Are any arbitrage opportunities left?
A: Possibly a synthetic cross rate differs.

An *imaginary* opportunity.

<table>
<thead>
<tr>
<th>↓ buys</th>
<th>USD</th>
<th>CAD</th>
<th>JPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>USD</td>
<td>1</td>
<td>1.25</td>
</tr>
<tr>
<td>Canada</td>
<td>CAD</td>
<td>0.8</td>
<td>1</td>
</tr>
<tr>
<td>Japan</td>
<td>JPY</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Spot Rates and Forward Rates

**Spot rate** exchange rate for currency exchanges “on the spot”; trading is executed in the present.

**Forward rate** exchange rate 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 exchange occurs in the future.
Spot Transaction

Exchange two currencies at a rate agreed on the date of the contract, for value or delivery (cash settlement) within two business days. Note: the spot legs of swaps are never included among spot transactions.
Outright Forward

Exchange two currencies at a rate agreed on the date of the contract for value or delivery (cash settlement) at some time in the future (more than two business days later). This category also includes non-deliverable forwards (NDFs) and their ilk. (See below.) Outright forwards are generally not traded on organised exchanges, and their contractual terms are not standardised.
GBP-USD (spot and 90 day forward)

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

90-day forward and spot exchange rates (end of month).
Source: KOM Figure 3-1 (14-1) (Data Source: Datastream).
Covered Interest Parity

\[ R = R^* + \left( \frac{F - E}{E} \right) \]

E is the spot (direct) exchange rate, F is the forward exchange rate, R is the domestic interest rate, and R* is the foreign interest rate.

- Covered interest parity relates interest rates across countries and the rate of change between forward exchange rates and the spot 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.
Uncovered Interest Parity

\[ R = R^* + \left( E^e - E \right) / E \]
Carry Trade vs. Interest Parity

Source: Exchange rates and three-month treasury yields from Global Financial Data.
Possible Reconciliation: Uncertain Crash

AUD expected appreciation

- 90% chance of 1 percent per year
- 10% chance of -40 percent per year
- average = 0.9 x 1% + 0.1 x (-40%) = -3.1%

Furthermore, suppose these expectations are correct. The probability of a crash in the next six years is less than half.

$$1 - 0.9^6 = 0.47$$
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 on exchanges, 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.

- Standardized contracts can be bought and sold on exchanges, but OTC is most common.
- A contract gives the owner the option, but not obligation, of buying or selling currency if the need arises.
Foreign Exchange Swaps

The actual exchange of two currencies (principal amount only) on a specific date at a rate agreed at the time of the conclusion of the contract (the short leg), and a reverse exchange of the same two currencies at a date further in the future at a rate (generally different from the rate applied to the short leg) agreed at the time of the contract (the long leg).
Both spot/forward and forward/forward swaps are included.
For turnover, only the forward leg is reported as such. The spot leg is not reported at all, ie neither as spot nor as foreign exchange swap transactions.
Short-term swaps carried out as “tomorrow/next day” transactions are also included in this category.
Currency Swaps

Contracts which commit two counterparties to exchange streams of interest payments in different currencies for an agreed period of time and/or to exchange principal amounts in different currencies at a pre-agreed exchange rate at maturity.
Options

Option contracts that give the right to buy or sell a currency with another currency at a specified exchange rate during a specified period. Mostly traded OTC, but some exchange trading. OTC options include:

- **Currency swaption**: OTC option to enter into a currency swap contract.
- **Currency warrant**: long-dated (over one year) OTC currency option.
Nondeliverable Forward Contracts

- counterparties settle the *difference*
  - "cash settled": only difference flows
  - contracted price vs. “fixing” price
  - usually: fixing price = realized spot rate

- traded over-the-counter (OTC)
  - direct trade between two parties
  - (vs. trading on an exchange)

- offshore *nondeliverable* forward markets:
  - NY (esp Latin America), London, Hong Kong, Singapore
NDF market became significant in early 1990s
  - Initially mostly Latin American currencies

NDFs are often a response to capital controls
- E.g., China restricts foreign ownership of renminbi deposits
  - ISO: CNY; common: RMB; Latinized symbol: ¥
- China loosened CNY trade restrictions in 2010 (shrinking NDF mkt as pct of fwd transactions)

2013 BIS Triennial Survey reported $127 billion in daily NDF turnover
China’s State Administration for Foreign Exchange prohibited offshore conversion. Result: offshore banks could not deliver CNY to fulfill forward contracts.

One possibility: try to find a domestic (Chinese) bank that can offer forward delivery domestically. Not always possible.

Another possibility: NDFs (all flows are in another currency (e.g., USD))

Often called the RMB NDF market.
NDF Example

Use NDF contracts to hedge future payments in Chinese yuan

- You need to pay CNY 10M in six months for equipment purchases.
  This exposes you to currency risk.
- Possible hedge: buy CNY six months forward at the NDF rate of CNY 6.7200 per U.S. dollar from an offshore bank.
  This bank cannot deliver CNY!
- Six months later, make a net settlement in dollars for the NDF contract.
  If fixing rate (Ef) is at par, there are no cash flows.
  If Ef > 6.72, the CNY is cheap. You fulfill your NDF contract by paying the bank USD(10M/6.72 - 10M/Ef)
  If Ef < 6.72, the CNY is expensive. The bank fulfills your NDF contract by paying you USD(10M/Ef - 10M/6.72)
- Because of your NDF hedge, your total cost is a certain USD 10M/6.72.
Changing Role of CNY

July 2010: Hong Kong banks allowed to settle in Renminbi.
- called the CNH market
- diminishes (relatively) NDF demand
- capital restrictions mean CNH price and CNY price can differ
USD-CNY: Recent History

Source: http://research.stlouisfed.org/fred2/graph/?g=JQG
CNY Nondeliverable Forwards

Spread has never been wider

CNY Spot

CNY 12 month NDF
Example: CNY NDF

8 Sep 2009

USD-CNY 6.83 (spot)
- Daily reference rate
- 20% appreciation since July 2005
  (when fixed rate scrapped)

USD-CNY 6.7415 (12 month NDF)
- implies (6.7415-6.83)/6.83 = -1.3% “expected” change
Example: CNY NDF

10 Sep 2010  PBoC fixes “mid-point” at USD-CNY 6.7625

13 Sep 2010

**USD-CNY 6.7625 (spot)**  vs. 6.7415 “predicted” by the NDF market a year before

**USD-CNY 6.6449 (12 month NDF)**  12-month implied yuan appreciation: 1.74%

\[
\frac{(6.6449-6.7625)}{6.7625} = -1.74\%
\]

Example: CNY NDF

13 Sep 2011

**USD-CNY 6.40 (spot)** vs. 6.449 “predicted” by the NDF market a year before

23 Sep 2011

**USD-CNY 6.4125 (12 month NDF)** 12-month implied yuan depreciation: 0.2%

\[ \frac{6.4125 - 6.40}{6.40} = 0.2\% \]
Example: CNY NDF

13 Sep 2011

**USD-CNY 6.40 (spot)** vs. 6.449 “predicted” by the NDF market a year before

23 Sep 2011

**USD-CNY 6.4125 (12 month NDF)** 12-month implied yuan depreciation: 0.2%

\[
(6.4125 - 6.40)/6.40 = 0.2%
\]
China Foreign Exchange Trade System (CFETS) also known as the National Interbank Funding Center (the Center) a sub-institution of the People’s Bank of China (PBC) provides systems for foreign exchange (FX) trading, RMB lending and bond trading handles settlement and clearing of FX trading head office in Shanghai, with subcenters throughout China website: http://www.chinamoney.com.cn
Before 2004, the yuan was restricted to China. In 2004, Hong Kong began to offer renminbi personal accounts. Since then, China has continually relaxed the rules on international transactions in renminbi. Current account transactions are liberalized. Capital account transactions are slowly liberalizing. In September 2011, China agreed that the City of London would become an offshore trading center for the renminbi. By the end of 2014, London accounted for more than 40% of all offshore CNY trading, catching up with Hong Kong.
Rate of Return

**Rate of return** the percentage change in value that an asset produces during a time period.

**Real rate of return** inflation-adjusted rate of return (approximately: interest rate - inflation rate) the addition to purchasing power (control over goods & services)

**Example:** $1000 saving deposit, R=2%/yr, inflation = 1%/yr

- After 1 year the deposit is worth
  $1000 \times 1.02 = $1020
- So its rate of return is
  \((1020 - 1000)/1000 = 2\%/yr\)
- The real rate of return is (approximately):
  \(2\% - 1.0\% = 1.0\%\)
A rise in $P$ reduces the goods and services controlled by a given nominal wealth.

- Suppose the inflation rate is 0%. Then prices are fixed, 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 reasonable assumption to make for the short run.
Other Influences on the Demand for Currency Deposits

**Risk:** The volatility of real wealth

**Liquidity:** the ease with which one can turn the asset into goods and services

We will assume that the risk and liquidity of currency deposits does not depend on currency denomination.

Assume: risk and liquidity are of secondary importance to individuals deciding to buy or sell currency deposits.

Implication: investors in currency deposits are primarily concerned about the rates of return.
The rate of return that an investor expects to earn on an interest bearing assets is determined by

- interest rate
- expected exchange rate movements

**Domestic currency assets:** expected return is just $R$

**Foreign currency assets:** expected return is $R^* + (E^e - E)/E$

interest + expected depreciation of the domestic currency
Summary: Demand for Currency Deposits

Influences on the demand for deposits

- Risk
- Liquidity
- Expected rate of return
  - we will emphasis this for now

Deposits

- bear interest (at annual rate)
- denominated in domestic or foreign currency
- Foreign currency deposits additionally have capital gains or losses
  - Exchange-rate risk
Dollar and Yen Interest Rates (3 month rates, annualized)

Source: KOM Fig 3-2 (14-2) (Original Data Source: Data Stream)
Suppose $R = 1\%/yr$ and $R^* = 2\%/yr$.

Does a euro deposit yield a higher expected rate of return?

To answer this, we must consider the expected change in the value of a euro.

Suppose today the exchange rate is EUR-USD 1.5, and the expected rate one year in the future is EUR-USD 1.3.

- USD 150 can be exchanged today for EUR 100.
- These EUR 100 will yield EUR 102 after one year.
- These EUR 102 are expected to be worth $(1.3 \ USD/EUR) \times EUR 102 = USD 132.60$ in one year.

Clearly USD 151.50 from investing at home is better than USD 132.60 from investing abroad.

The return is higher on domestic assets, despite the higher interest rate abroad.
Recap

- $R = 1\%$
- $R^* = 2\%$
- $E = 1.50$
- $Ee = 1.30$

The rate of return from investing domestically is simply the interest rate, $R=0.01=1\%$.

The expected rate of return from investing abroad

\[
\frac{132.60 - 150}{150} = -0.116 = -11.6\%.
\]

The euro deposit has higher interest rate but a lower expected rate of return.

All investors should be willing to hold dollar deposits and none should be willing to hold euro deposits.
The Demand for Currency Deposits (cont.)

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

2% + -13.3% = -11.3% (which is approximately our -11.6%)

Return on foreign currency deposits:

\[ R^* + (E^e - E)/E \]
Recap: our expected rate of return on euro deposits is

\[ R^* + \frac{E^e - E}{E} \]

- interest rate on euro deposits, plus
- expected rate of depreciation of the dollar
  - expected exchange rate
  - current exchange rate
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. 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 raising the expected rate of return of foreign currency deposits.
## Exchange Rate and Asset Return

<table>
<thead>
<tr>
<th>Case</th>
<th>$E$</th>
<th>$\frac{E^e - E}{E}$</th>
<th>$R^* + \frac{E^e - E}{E}$</th>
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<tbody>
<tr>
<td>1</td>
<td>1.39</td>
<td>-4.0%</td>
<td>-3.0%</td>
</tr>
<tr>
<td>2</td>
<td>1.36</td>
<td>-2.0%</td>
<td>-1.0%</td>
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<tr>
<td>3</td>
<td>1.33</td>
<td>0.0%</td>
<td>1.0%</td>
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<tr>
<td>4</td>
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<td>2.0%</td>
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<tr>
<td>5</td>
<td>1.28</td>
<td>4.0%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

Constants: $R^* = 1.0\%$, $E^e = 1.33$
The Relation Between the Current Dollar/Euro Exchange Rate and the Expected Dollar Return on Euro Deposits

Note: compare KOM 11 Fig. 3-3 (14-3)
Equilibrium in the market for foreign exchange requires equal desirability of competing assets.

**Interest parity**

- comparable assets must bear comparable expected rates of return

\[ R = R^* + \left( E^e - E \right)/E \]

- implies that deposits in various currencies are equally desirable.
- is the basic component of our first model of foreign exchange markets.
- expected return on dollar denominated deposits \( R \) must equal expected return on foreign currency denominated deposits \( (R^* + (E^e - E)/E) \)
Interest parity says:

\[ R = R^* + \left( E^e - E \right) / E \]

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:
Domestic Interest Rate in the FX Market

\[ E \]

\[ R \]

returns
Equilibrium in the FX Market

\[ R^* + \frac{E^e - E}{E} \]
Equilibrium in the FX Market

\[ R^* + \frac{E^e - E}{E} \]

Note: compare KOM 11 Fig 3-4 (14-4)
Effect of changing R:

- 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.
Introduction to Exchange Rates

**Interest Parity**

\[ R^* + \frac{E^e - E}{E} \]

Note: compare KOM 11 Fig 3-5 (14-5)
Note: compare KOM 11 Fig 3-6 (14-6)
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).
Interest Parity

\[ R^*_1 \pm \frac{E^e_2 - E}{E} \]

\[ R^*_1 \pm \frac{E^e_1 - E}{E} \]

returns
Summary

**exchange rate (direct rate)** the domestic-currency price of foreign exchange.

**foreign exchange** interest-bearing deposits foreign currencies. (for the most part)

**spot exchange rate** a contracted rate at which foreign exchange will be bought on sold “on the spot”.

**forward exchange rate** a contracted rate at which foreign exchange will be bought on sold on a *future* date. By “foreign exchange” we primarily mean interest-bearing deposits foreign currencies.
Depreciation (of the domestic currency)  E (direct rate) rises; the currency becomes less valuable. Goods priced in it (e.g., our exports) become relatively less expensive. Imports become relatively expensive. A depreciation hurts consumers (who buy imports) but helps exporters.

Appreciation (of the domestic currency)  E (direct rate) falls; the currency becomes more valuable. Goods priced in it (e.g., our exports) become relatively expensive. Imports become relatively cheap. An appreciation helps consumers (who buy imports) but hurts exporters.
The primary players in the market for foreign exchange are commercial and investment banks. Their arbitrage activities ensure interest parity holds: comparable assets should bear comparable rates of return.

- This implies covered interest parity.
- Ignoring risk factors, this implies “uncovered” interest parity.
Covered interest parity  \[ R = R^* + \frac{(F - E)}{E} \]
the rate of return on domestic currency deposits must equal the rate of return on “covered” foreign currency deposits. Foreign currency deposits can be “covered” with a forward exchange contract.

Uncovered interest parity  \[ R = R^* + \frac{(Ee - E)}{E} \]
Expected rates of return on foreign and domestic currency deposits are equal
Expected rates of return on currency deposits and determined by interest rates and expected exchange rates.
An increase in the domestic interest rate (an increase in its expected rate of return) leads to an appreciation of the domestic currency.

An increase in the expected future exchange rate lead to a depreciation of the domestic currency.