Foreign Exchange Market

- Encompasses:
  - Conversion of purchasing power across currencies
  - Bank deposits of foreign currency
  - Credit denominated in foreign currency
  - Foreign trade financing
  - Trading in foreign currency derivatives
- Largest financial market in the world
- Always open “24/7” somewhere in the world
- London is world’s largest trading center

Function and Structure of FX Market

- Spot and forward FX markets are over-the-counter markets
  - Trading uses electronic linkage of dealers
  - Reuters and Electronic Broking Services (EBS) are largest vendors of quote screens (majority of trades over these platforms)
- International banks are core of market
  - Wholesale (interbank market) – (about 85%)
  - Retail (client market)

Market Characteristics

- Dealers
  - International banks
  - Nonbank dealers (investment banks, hedge funds)
  - Hold inventory of currencies and trade for clients and for own speculative purposes
- FX Brokers
  - Match dealer orders to buy and sell currencies for a fee but do not take a position themselves

Trading in Markets

- Interbank trading (about 86% of FX trades)
  - Standard size trade: about $10,000,000
  - Part for adjusting inventory
  - Most are speculative or arbitrage transactions
    - Speculation: market participants try to correctly anticipate the future direction of price movements in currencies
    - Arbitrage: try to profit from temporary price discrepancies in currencies across dealers

Market Attributes

- Correspondent banking relationships
  - Large commercial banks maintain demand deposit accounts with one another
  - Facilitates the efficient functioning of the market
- Currency intervention
  - Process of entering the FX market to try to increase or decrease supply of one’s own currency to alter its “price”
Spot market

- Immediate purchase or sale of FX
  - Cash settlement typically in one to two days
  - Spot rate: the current rate of exchange

- U.S. perspective:
  - Direct quote: the price of one unit of foreign currency in dollars ($2.00 = £1.00)
  - Indirect quote: the price of one dollar in the foreign currency (£0.50 = $1.00)

### Spot Rate Quotations

<table>
<thead>
<tr>
<th>Country</th>
<th>USD equiv Friday</th>
<th>USD equiv Thursday</th>
<th>Currency per USD Friday</th>
<th>Currency per USD Thursday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Britain (Pound)</td>
<td>1.9077</td>
<td>1.9135</td>
<td>0.5242</td>
<td>0.5226</td>
</tr>
<tr>
<td>1 Month  Forward</td>
<td>1.9044</td>
<td>1.9101</td>
<td>0.5251</td>
<td>0.5235</td>
</tr>
<tr>
<td>3 Months Forward</td>
<td>1.8983</td>
<td>1.9038</td>
<td>0.5268</td>
<td>0.5253</td>
</tr>
<tr>
<td>6 Months Forward</td>
<td>1.8904</td>
<td>1.8959</td>
<td>0.5290</td>
<td>0.5275</td>
</tr>
</tbody>
</table>

Note that the direct quote is the reciprocal of the indirect quote: $1.9077 = \frac{1}{0.5242}$

Bid-Ask Spread

- Bid: price the dealer is willing to pay
- Ask: price the dealer wants you to pay

- The bid-ask spread is the difference between the bid and ask prices
  - The difference between the bid and ask prices represents the dealers expected profit

The Bid-Ask Spread

- A dealer could offer:
  - bid price of $1.4512 per €1.00
  - ask price of $1.4525 per €1.00

- OR, equivalently:
  - bid price of €0.688468 per $1.00
  - ask price of €0.689085 per $1.00

Bid-Ask Trading Cost

- Using the quotes on the previous page:
  - Suppose you buy $10,000,000 worth of Euros
  - Five minutes later you convert the Euros back to dollars and the quotes have not changed
    - Initial: $10,000,000/(1.4525) = €6,884,681.58
    - Reverse: $(€6,802,721.09)/(1.4512) = $9,991,049.91
  - Cost: $8,950.09
Cross-Exchange Rate (Cross-rate)

- Exchange rate between two currencies based on each of their exchange rates with a third currency
- U.S. perspective:
  - You have $/€ and $/¥ exchange rates
  - Cross rate would be €/¥ calculated using $ exchange rates
  - $/€ x ($/¥)

Cross-Rate Importance

- Most interbank trading goes through the U.S. dollar
- Suppose a bank customer wants to trade out of British pounds into Swiss francs (referred to as a currency-against-currency trade)
- The bank frequently handles this trade by selling British pounds for dollars and then selling dollars for Swiss francs
- Some banks do make markets in other currencies

Cross Rates

- Suppose that ($/€) = 1.50
  - i.e. $1.50 = €1.00
- and that ($/¥) = 0.01
  - i.e. $0.01 = ¥1.00
- What must the €/¥ cross rate be?

$$\text{€1.00} \times \frac{$0.01}{¥1.00} = \frac{€0.006667}{¥1.00}$$

or, €1.00 = ¥150

Triangular Arbitrage

- If markets exist for foreign currencies relative to the dollar and relative to each other:
  - There must be some mechanism to ensure that the “prices” in the various markets are “the same”
  - Triangular arbitrage serves that purpose for currency markets
  - The implied “cross-rate” and the actual exchange rate for the two foreign currencies must be “the same” or traders will profit from the difference

Triangular Arbitrage

Suppose we observe these banks posting these exchange rates.

Barclays: ¥/$ = 110
Credit Lyonnais: £/$ = 0.5
Credit Agricole: ¥/£ = 240

The implied cross rate using the dollar based quotes is:

$$\frac{£0.50}{$1.00} \times \frac{$1.00}{¥110} = \frac{£1.00}{¥220}$$

The difference in the implied cross rate and the actual exchange rate for ¥/£ offers an arbitrage opportunity

Triangular Arbitrage

- Implied cross rate: one pound costs 220 yen
- Actual exchange rate: one pound costs 240 yen
- More yen per pound with the actual rate
- How do we profit?
  - Convert dollars to pounds
  - Then covert pounds to yen (using actual rate)
  - Then convert yen to dollars
  - Use $100,000 for example
Triangular Arbitrage

Sell $100,000 for £ at $($\$/£) = 0.50
receive £50,000

Sell our £50,000 for ¥ at $($¥/£) = 240
receive ¥12,000,000

Sell ¥12,000,000 for $ at $($¥/$) = 110
receive $109,091

profit per round trip = $109,091 – $100,000 = $9,091

Here we have to go “clockwise” to make money—but it doesn’t matter where we start.

If we went “counter clockwise,” we would have a loss exactly equal to our gain from going clockwise.

Spot Market FX Microstructure

- Mechanics of how a marketplace operates
- Bid-Ask spreads in the spot FX market:
  - increase with FX exchange rate volatility and
  - decrease with dealer competition.
- Private information is an important determinant of spot exchange rates
- Traders indicate that adjustment to economic announcements take place in about 10 minutes
- 1/3 of traders say it happens in less than 10 seconds

Forward FX Market

- Forward contract: involves contracting today for the future purchase or sale of foreign exchange at a price agreed upon today
- Bank quotes for 1, 3, 6, 9, and 12 month maturities are readily available
  - Premium: forward prices are “stronger” than spot
  - Discount: forward prices are “weaker” than spot

Spot Rate Quotations

Long and Short Forward Positions

- If you have agreed to sell anything (spot or forward), you are “short”.
- If you have agreed to buy anything (forward or spot), you are “long”.
- If you have agreed to sell FX forward, you are short.
- If you have agreed to buy FX forward, you are long.
Hedging – Lower Risk

- U.S. firm to be paid £500,000 in one month
  - Enter 1-month forward contract at $1.9044/£1.00 to sell £500,000
  - Receive: (£500,000)(1.9044) = $952,200
- U.S. firm to pay £500,000 in one month
  - Enter 1-month forward contract at $1.9044/£1.00 to buy £500,000
  - Pay: (£500,000)(1.9044) = $952,200
- No exchange rate risk remains

Speculating – Increase Risk

- Use $1,000,000 as contract size
  - Expect pound to be worth more than $1.9044/£1.00 in one month – long forward (guarantees buy price)
    - If spot rate is $1.9144/£1.00 in one month
      - Buy pounds using forward contract:
        - $1,000,000/1.9044 = £525,099.77
      - Sell pounds in spot market:
        - £525,099.77 X 1.9144 = $1,005,251
      - Profit = $5,251
      - Note: If spot rate is less than 1.9044, you have a loss
- Use $1,000,000 as contract size
  - Expect pound to be worth less than $1.9044/£1.00 in one month – short forward (guarantees sell price)
    - If spot rate is $1.8944/£1.00 in one month
      - Buy pounds in spot market:
        - $1,000,000/1.8944 = £527,871.62
      - Sell pounds using forward contract:
        - £527,871.62 X 1.9044 = $1,005,278.72
      - Profit = $5,278.72
      - Note: If spot rate is larger than 1.9044, you have a loss

Summary

- Spot versus forward market
- Bid-Ask Spread
- Cross-Rates
- Triangular Arbitrage
- Hedging and Speculation