

The Foreign Exchange Market

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Introduction

- How is foreign exchange traded?
- What moves exchange rates?
- Other foreign exchange trades
- Looking forward

How is foreign exchange traded?

The customer perspective

- Customers are corporations, hedge funds, mutual funds, pension funds, central banks, ...
- Customer requests quotes from dealers
 - By phone
 - Electronically over individual bank portal
 - Electronically over multibank portal
 - (e.g. FXall, FXConnect, Currenex)
- Customer might compare quotes with market prices
 - Bloomberg, Reuters (FXFX page), futures markets (CME)
- Customer trades with a dealer

How is foreign exchange traded?

The dealer perspective

- Dealers (mostly large banks) take customers orders
- Dealers trade with each other (interdealer market)
 - Direct dealing
 - Phone
 - Electronically (Reuters Dealing 2000-1, EBS Trader)
 - Indirectly (brokered trades)
 - Phone (voice brokers)
 - Voice brokers often used for harder to fill larger trades and trades in less liquid currencies
 - Electronically (EBS, Reuters Dealing 2000-2)
 - EBS dominates \$, €, and ¥ trading
 - D2000-2 dominates £ and smaller currency trading

Exchange rate quotes: I

- **Exchange rate is price to buy or sell currency.**
 - Exchange rate is terms currency per unit of base currency
 - Base is the currency bought or sold
 - Terms is the pricing currency
- **Example: Euro-dollar quote of \$1.2120**
 - Base currency (always comes first) is euro
 - Terms currency is dollar
 - Price of 1 euro is \$1.2120

When exchange rate **increases**, the base currency **appreciates**.
When exchange rate **decreases**, the base currency **depreciates**.

Exchange rate quotes: II

- **Currency pairs quoted in direct (American) terms**
 - Base currency is foreign
 - Euro-dollar
 - Sterling-dollar (cable)
 - Australian dollar - U.S. dollar
 - New Zealand dollar - U.S. dollar
- **Currency pairs quoted in indirect (European) terms**
 - Base currency is dollars
 - Dollar versus most currencies (e.g. dollar-yen)
- **Non-dollar currency pairs (cross-rates)**
 - Example: Euro-yen

Exchange rate quotes: III

- Exchange rate quotes are “two-way”
 - Different price to buy or to sell
 - Customer sells base currency at bid price
 - Customer buys base currency at offer (ask) price
- Euro-dollar quote of

\$1.2120	\$1.2123
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 - Sell euros at \$1.2120 (bid)
 - Buy euros at \$1.2123 (offer)
 - Bid - ask spread is .0003 (or 3 pips)
 - Smallest quote increment (.0001) is called a pip
 - For dollar-yen, one pip = .01

Exchange rate quotes: IV

- Other terminology
 - The quote is composed of “the big figure” and the “pips.”
 - Euro-dollar quote of \$1.2120
 - the big figure is “1.21”
 - the pips are the “20” (last two digits)
 - Euro-dollar quote of \$1.2100
 - The pips are 00, referred to as “the figure”
 - The quote is \$1.21 “the figure”

Settlement and settlement risk: I

- Foreign exchange trades are usually settled two days after the trade date.
 - On the settlement date, payment is made and foreign currency is delivered
- Settlement risk occurs when payment and delivery are not simultaneous.
 - Risk that payment is made but no delivery
 - Risk that delivery is made but no payment
- In 1974, the Herstatt bank in Germany was declared insolvent at end of German business hours. It had taken in foreign currency, but not made dollar payments.

Settlement and settlement risk: II

- **Methods to mitigate settlement risk include:**
 - Reducing credit risk
 - Counterparty exposure limits
 - Counterparty credit risk monitoring
 - Reducing settlement amounts
 - Bilateral or multilateral netting of offsetting payments
 - Reducing overnight exposures
 - Intraday settlement through real-time gross settlement systems (increased hours of operation of RTGS)
 - Simultaneous execution of payment and delivery
 - Payment versus payment systems such as CLS Bank

What moves exchange rates? I

- Exchange rates are determined by supply and demand for currencies.
- Supply and demand for currencies depends on:
 - Macroeconomic conditions
 - Domestic and foreign interest rates
 - Other factors
- Importance of each factor can change over time.

What moves exchange rates? II

- **Macroeconomic conditions**

Andersen, Bollerslev, Diebold, and Vega (2003)

Faust, Rogers, Wang and Wright (2003)

- Positive macroeconomic news strengthens dollar

- *GDP*
- *Non-farm payroll*
- *Retail sales*
- *Consumer confidence*

What moves exchange rates? III

- **Interest rates**

Fatum and Scholnick (2003)

- Federal fund target rate increase strengthens dollar

- **For three commodity currencies (CAD,AUD,NZD), key factors include:**

Djoudad, Murray, Chan, and Daw (2000)

- Non-energy commodity terms of trade
- Real terms of trade for energy
- Interest rate differential

What moves exchange rates? IV

- **Order flow**

- Order flow measures the volume of currency transactions initiated by buyers or sellers.

When most trades are initiated by foreign currency **buyers**:
the foreign currency **appreciates**.

When most trades are initiated by foreign currency **sellers**:
the foreign currency **depreciates**.

- Evans and Lyons (2004) find that order flow predicts future exchange rates.

Other foreign exchange trades: I

- A **currency forward trade** is a transaction to buy or sell currency three or more days in the future at a fixed price.
 - Fixed price is called the *forward exchange rate*.
 - Forward rate quoted as premium or discount of spot rate.
 - Forward rate depends on interest rate differential.

<u>Example:</u>	spot rate	1.2120 \$/€
	+ <u>premium</u>	<u>-.0010 \$/€</u>
	= forward rate	1.2110 \$/€

Other foreign exchange trades: II

- An **FX swap trade** is a transaction to:
 - (1) In 2 days: buy foreign currency at spot rate.
 - (2) Future date: sell foreign currency at today's forward price.
 - The reverse transaction is also an FX swap.
 - FX swap rate quoted as premium or discount of spot rate.
 - FX swap rate depends on interest rate differential.
 - Temporarily obtain foreign currency without exchange rate risk.

Other foreign exchange trades: III

- **Currency futures contract**
 - Exchange-traded contract for future delivery of currency.
 - Traded on Chicago Mercantile Exchange and others.
- **Non-deliverable forward contract (NDF)**
 - No delivery of foreign currency.
 - Net gains or losses are settled in a major currency.
 - Used for currencies that are not easily settled locally.
- **Currency option contract**
 - Convey right (but not obligation) to buy or sell foreign currency.

Looking forward

- **Electronic trading likely to continue growth**
 - Key benefit will be more efficient trade processing, reduced back office costs
- **Consolidation of FX dealers likely to continue**
 - Driven by wave of bank mergers and economies of scale in FX business
- **Net effect on market liquidity is unclear**
 - Bid-ask spreads have narrowed, reflecting use of competitive centralized pricing mechanisms
 - But, the diminished role of dealers as liquidity providers could reduce overall liquidity.

References

- Sam Cross, *All About ... the Foreign Exchange Market in the United States*, Federal Reserve Bank of New York, 1998. <http://www.ny.frb.org/pihome/addpub/>
- Bank of International Settlements, Annual report, Foreign Exchange Markets, Chapter 5. <http://www.bis.org/publ/regpubl.htm>.
- Bank of International Settlements, Central Bank Survey of Foreign Exchange and Derivatives Market Activity, Triennial report. <http://www.bis.org/publ/regpubl.htm>.
- Rime, D. (2003), *New Electronic Trading Systems in Foreign Exchange Markets*, Norwegian School of Management. <http://www.georgetown.edu/faculty/evansm1/New%20Micro/Rime%20New%20Electronic%20FX1.pdf>
- Basel Committee on Banking Supervision (2000). Supervisory guidance for managing settlement risk in foreign exchange transactions. <http://www.bis.org/publ/bcbs73.htm>
- Ramdane Djoudad, John Murray, Tracy Chan, and Jason Daw (2000). *The Role of Chartists and Fundamentalists in Currency Markets: The Experience of Australia, Canada, and New Zealand*, <http://www.bankofcanada.ca/publications/working.papers/2000/murray.pdf>

References

- Tim Bollerslev, Francis X. Diebold, and Clara Vega (2003). Micro Effects of Macro Announcements: Real-Time Price Discovery in Foreign Exchange, *American Economic Review* 93, 38-62. http://www.simon.rochester.edu/fac/vega/pdf/abdv_aer.pdf
- Rasmus Fatum and Barry Scholnick (2003). Do Exchange Rates Respond to Day-to-Day Changes in Monetary Policy Expectations? Evidence from the Federal Funds Futures Market. <http://ideas.repec.org/p/kud/epruwp/03-18.html>
- Martin Evans and Richard Lyons (2004). Do Currency Transaction Flows Forecast Fundamentals? http://www.georgetown.edu/faculty/evansm1/wpapers_files/flowsnber.pdf
- Christopher Swann (2003). The Global FX Industry: Coping with Consolidation.
- Yin-Wong Cheung and Menzie David Chinn (2001). Currency Traders and Exchange Rate Dynamics: A Survey of the US market *Journal of International Money and Finance*, Volume 20, Issue 4, pp. 439-471.

Appendix

The forward exchange rate

The forward exchange rate: I

- **Forward exchange rates depend on:**
 - Spot exchange rate
 - Domestic and foreign interest rates
 - Exact relationship is called **covered interest parity**.
- **Covered interest parity**
 - Home currency lending returns the same amount as covered (hedged) foreign currency lending.
 - Why? Otherwise,
 - Lenders would choose the higher return transaction and avoid the lower return transaction.
 - Forward rates would then adjust upward or downward to equalize returns.

The forward exchange rate: II

- Covered interest parity formulas

$$(1 + \text{domestic interest rate}) * S_t = (1 + \text{foreign interest rate}) * F_t$$

Return to domestic lending

Return to covered foreign lending

Or,

$$F_t = \frac{(1 + \text{domestic interest rate}) * S_t}{(1 + \text{foreign interest rate})}$$

Forward rate equals spot rate adjusted for interest rate differential

S_t is the spot exchange rate, F_t is the forward exchange rate

The forward exchange rate: III

- **Understanding covered interest parity**

Return to domestic lending = $(1 + \text{domestic interest rate}) * S_t$

Today: Invest S_t dollars at domestic interest rate.

One-month: Receive $(1 + \text{domestic interest rate}) * S_t$ dollars.

Return to covered foreign lending = $(1 + \text{foreign interest rate}) * F_t$

Today:

Exchange S_t dollars for 1 euro.

Invest 1 euro at foreign interest rate.

Sell forward anticipated proceeds at forward rate (F_t).

One-month:

Receive $(1 + \text{foreign interest rate})$ euros.

Deliver $(1 + \text{foreign interest rate})$ euros to settle forward contract.

Receive $(1 + \text{foreign interest rate euros}) * F_t$ dollars.