

Transaction Exchange Risk

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3.1 Transaction Exchange Risk

- Transaction exchange risk
 - Possibility of taking a loss in foreign exchange transactions because future spot rate not known with certainty.
 - As a financial manager, you must be able to gauge where the exchange rate might head and how likely such fluctuations may be.
- Who incurs transaction exchange risk?
 - Corporations
 - Institutional investors
 - Individuals
- How to avoid?
 - Hedging: protect against losses and remove uncertainty
 - Forward foreign exchange market is the market for exchanges of currencies in the future. Its purpose is to manage foreign exchange risk in general and transaction exchange risk in particular.

Transaction Exchange Risk Example

- Fancy Foods

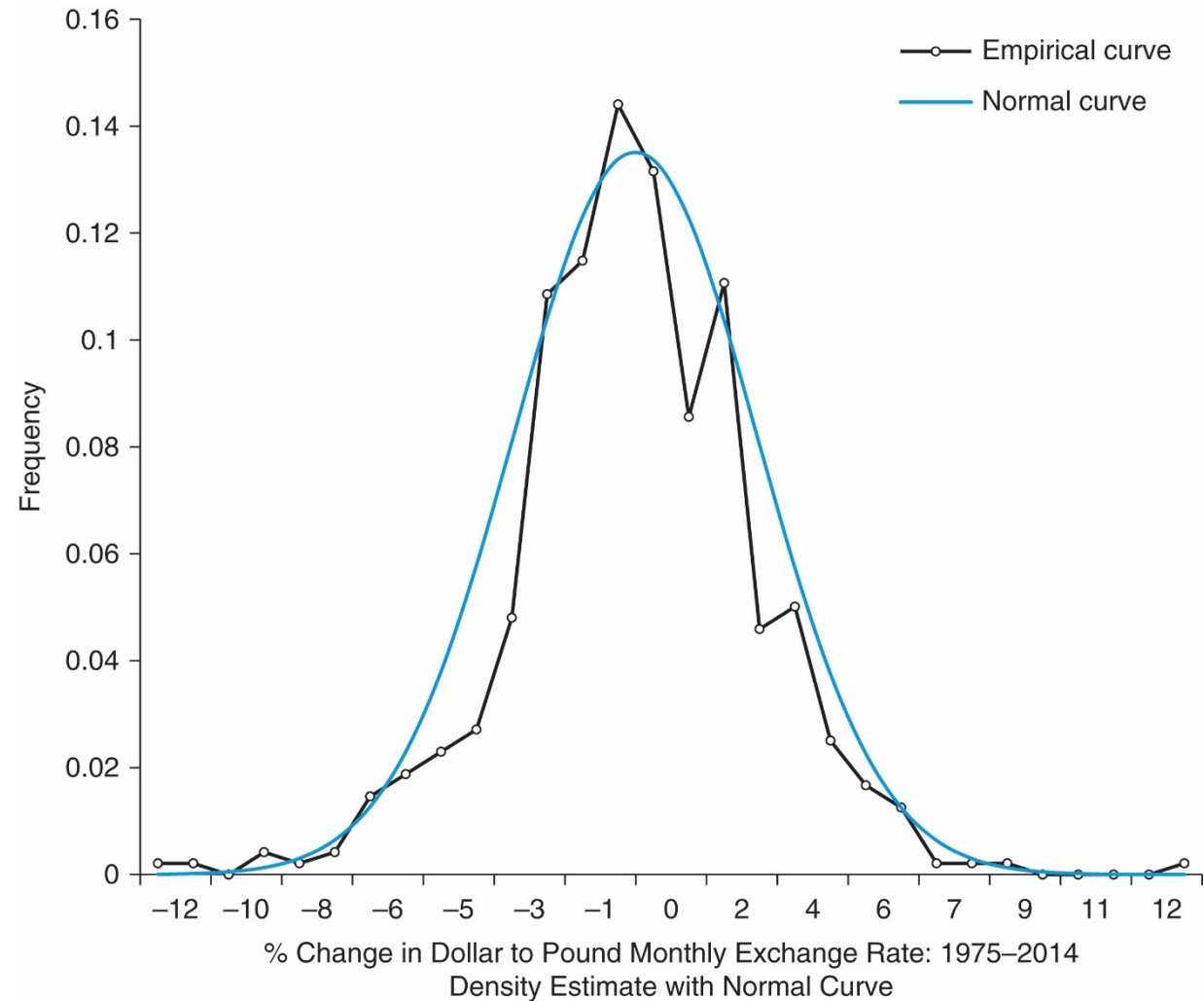
- FF (US company) has to pay £1,000,000 in 90 days in return for supplies
- The spot rate is \$1.50/£ and FF expects the £ to appreciate by 2%
- They can (i) wait and buy £'s on the market or (ii) hedge
 - No hedge (Fancy Foods's expectations are realized and the pound actually appreciates by 2%)
 - $Cost = S(t + 90, \$/\pounds) \times (\pounds 1M) = (\$1.53/\pounds)(\pounds 1M) = \$1.53M$
 - $S(t + 90, \$/\pounds) = (\$1.50/\pounds) \times (1 + 0.02) = \$1.53/\pounds$.
 - Hedge
 - Purchase a forward contract and lock in rate (No uncertainty)
 - Forward is the market's best guess as to what the spot will be in 90 days so if the market is right, you're only out the bid/ask spread
 - If the market is wrong, hedging could be good or bad
 - If £ appreciates (takes more \$'s to buy a £), hedging would have been better
 - If £ depreciates (takes fewer \$'s to buy a £), then hedging would have been worse.

3.2 Describing Uncertain Future Exchange Rates

- Assessing exchange rate uncertainty using historical prices
 - Percentage change:
 - $s(t) = \frac{S(t) - S(t-1)}{S(t-1)}$
 - Appreciation if positive
 - Depreciation if negative
 - Mean and standard deviation
 - Normal distribution for major currencies
 - Skewed distribution for emerging markets

Dollar/Pound Monthly Exchange Rate: 1975–2014

- Histogram of monthly % changes in the exchange rate of the U.S. dollar per British pound.
- Mean: -0.05%
- Std. Dev.: 3.03%



Peso/Dollar Monthly Exchange Rate: 1994–2014

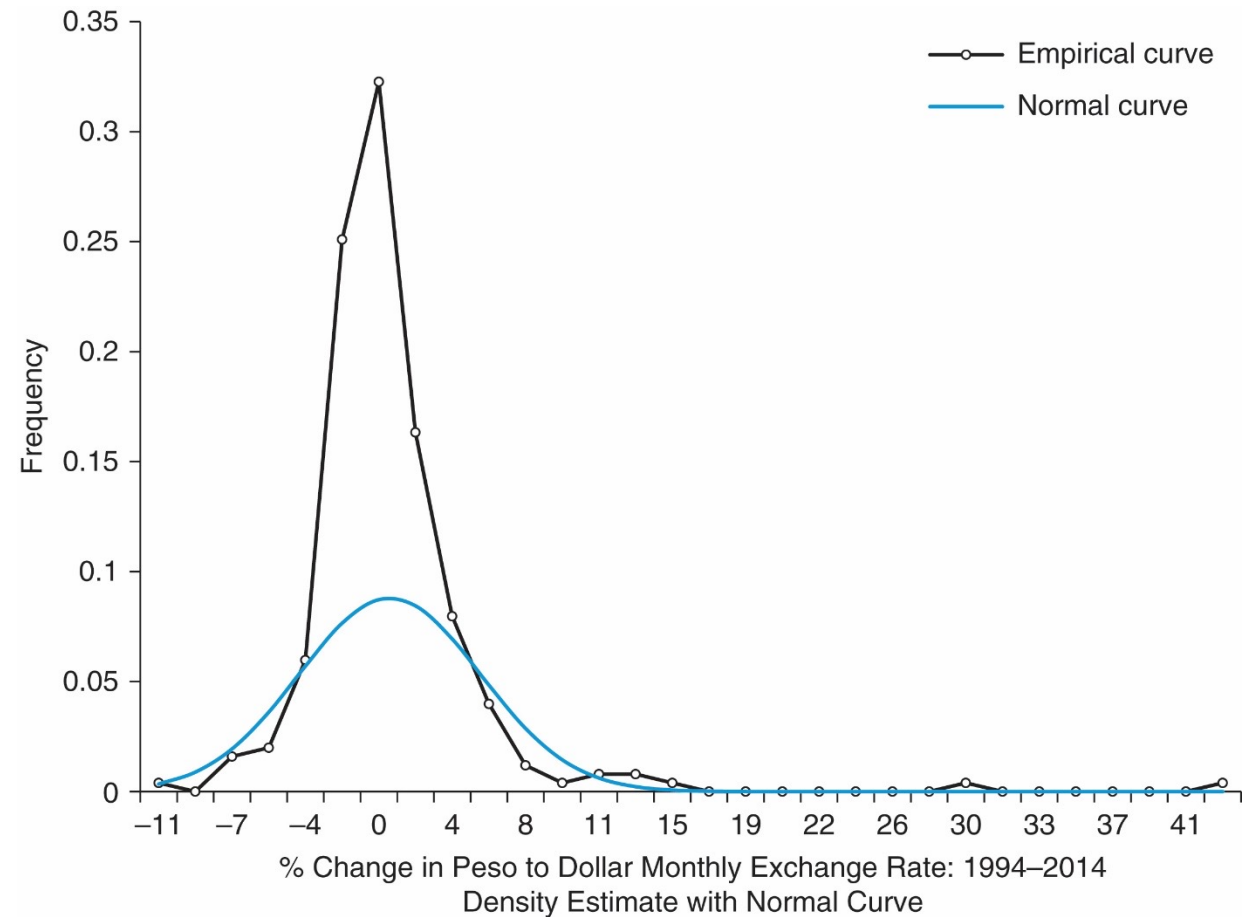
Mean: 0.79%

Std dev.: 4.76%

Long right-hand tail (skewed to the right). Large depreciations or devaluations of the peso relative to the dollar have occurred

(“fat tails”).

The absence of a large left-hand tail indicates there have been no analogously large appreciations or revaluations of the peso.

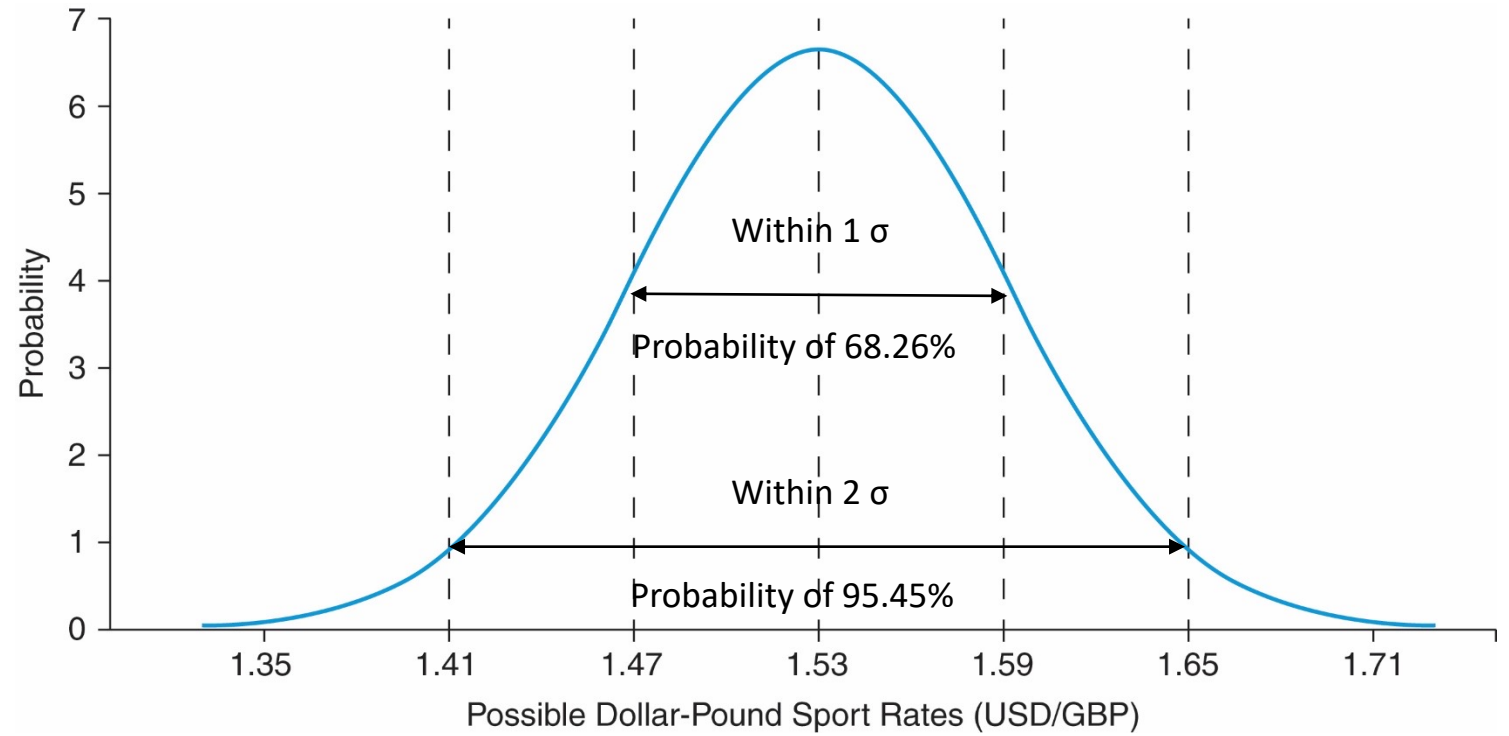


3.2 Describing Uncertain Future Exchange Rates

- The probability distribution of future exchange rates (financial managers are also interested in the probability distribution of future spot exchange rates).
 - Depends on all of the information available at time t , so we say it is “conditional”
 - Conditional mean/expectation at time t of the future spot exchange rate:
 - $S(t) \times (1 + \mu)$
 - $\$1.50/\text{£} \times (1 + 0.02) = \$1.53/\text{£}$ (possible future spot exchange rate)
 - $(1 + \mu)$ - percentage change in the exchange rate over the next 90 days
 - Conditional volatility (standard deviation = 4%):
 - $S(t) \times \sigma$
 - $\$1.50/\text{£} \times (0.04) = \$0.06/\text{£}$
 - Range (within 1σ) is therefore: $\$1.47/\text{£} - \$1.59/\text{£}$

Probability Distribution of future exchange rates in 90 days $S(t+90)$

- The range of future exchange rates that encompasses all but 4.55% of the future possible values of dollar–pound exchange rates is \$1.41/£ to \$1.65/£.



3.2 Describing Uncertain Future Exchange Rates

- Assessing the likelihood of particular future exchange rate ranges
 - How likely is it that the £ will appreciate in 90 days to \$1.60/£?
 - \$0.07/£ greater than conditional mean of \$1.53/£
 - $(0.07/0.06) = 1.167$ standard deviations away, or 12.16% for normal distribution

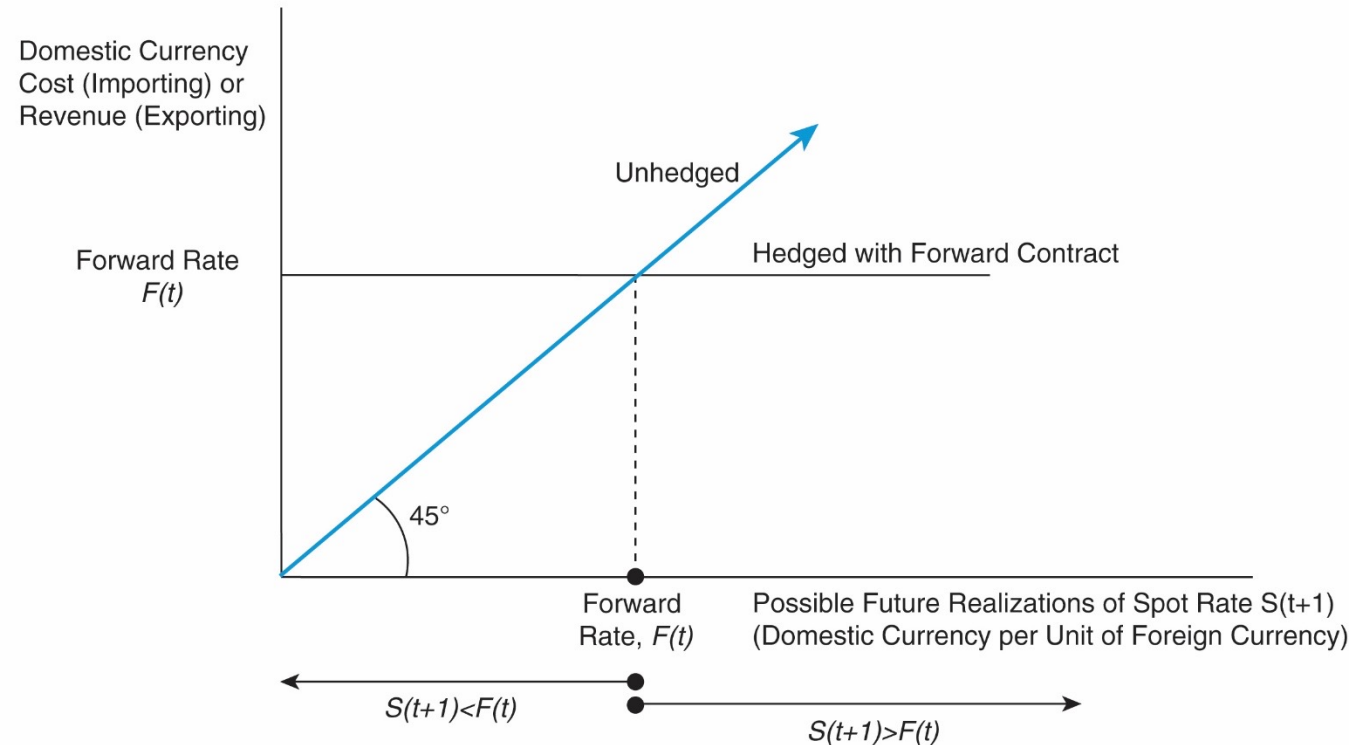
3.3 Hedging Transaction Exchange Risk

- Forward contracts and hedging
 - Forward rate
 - Forward contract between a bank and a customer calls for delivery, at a **fixed future date**, of a **specified amount of one currency against payment in another currency (fixed FX rate)**. The exchange rate specified in the contract, called the forward rate, is fixed at the time the parties enter into the contract.
 - Eliminates risk/uncertainty
 - Usually a large sum of money
 - With bank
 - Example: Fancy Foods can buy £1,000,000 at \$1.53/£
 - Which gives them an asset to match the liability
 - They will also only have a \$ liability (\$1,530,000)
 - No hedge: (Fancy Foods can wait to transact in 90 days, but it risks losing money if the pound strengthens against the dollar).

Gains and Losses Associated with Hedged Versus Unhedged Strategies

- The 45-degree line represents the unhedged strategy. Costs/Profits are unlimited.
- If you hedge by buying a forward contract today, your cost will be the same (equal to the forward rate) no matter what spot exchange rate is realized in the future. You bear no risk.
- **The forward contract eliminates your risk of loss, but it does so by keeping you from participating in possible gains in the future.**

Panel A : General Case



Think of being exporter and importer and also having assets and liabilities in foreign currency.

3.3 Hedging Transaction Exchange Risk

- Hedging import payments

- Example: You are US wine store. You are due to pay €4M in 90 days.
- What is the source of your transaction exchange risk, and how much could you lose?
- You are exposed to losses if the euro strengthens relative to the dollar unexpectedly to, say, \$1.12 /€.
 - Spot: \$1.10/€; 90-day forward: \$1.08/€
 - Hedged you will pay $€4M \times \$1.08/€ = \$4,320,000$
 - However, if dollar strengthens, you could lose money relative to remaining unhedged

- Hedging export receipts

- Example: You are British manufacturer shipping sweater to Japan. Hedge a ¥500M receivable to arrive in 30 days
 - Spot: ¥176/£; 30-day forward: ¥180/£
 - Hedged you will receive $¥500M / (¥180/£) = £2,777,778$
 - However, if the yen strengthens, you could lose money relative to remaining unhedged

3.4 The Forward Foreign Exchange Market

- Market organization
 - Outright forward contracts (OTC)
 - Only 13% of all transactions
 - Swap
 - Simultaneous purchase and sale of a certain amount of foreign currency for two different dates in the future
 - More than 42% of forex transactions are swaps

3.4 The Forward Foreign Exchange Market

- Forward contract maturities and value dates
 - Forward value or settlement date
 - Most active maturities are 30, 60, 90, 180 days
 - Highly customizable
 - Exchange takes place on the forward value date
- Forward bid/ask spreads
 - Larger than in spot market (due to lower liquidity and higher uncertainty)
 - Spreads higher for contracts with greater maturities
 - Less than 0.05% for major currencies
 - 90 day: Less than a pip wider than the spot spreads
- As soon as the trader records the forward trade, he may start looking for a counterparty in the interbank market to close the position by entering into an opposite contract.

3.4 The Forward Foreign Exchange Market

- Net settlement
 - Settling a contract by paying or receiving a net settlement that depends on the value of the contract
 - Can be used in the case where the situation differs from the original scenario
 - Often used in forex futures market

3.4 The Forward Foreign Exchange Market

- Foreign exchange swap types
 - Most common:
 - The purchase of foreign currency spot against the sale of foreign currency forward
 - The sale of foreign currency spot against the purchase of foreign currency forward
 - Others:
 - The purchase of foreign currency short-term forward against the sale of foreign currency long-term forward
 - The sale of foreign currency short-term forward against the purchase of foreign currency long-term forward
 - Use:
 - Protection against FX risk for portfolio managers who invests in foreign bonds, equities,... (to buy a foreign equity, these people must first buy the foreign currency in the spot market. To hedge the currency risk, they sell that currency forward).
 - The main reason swaps are so popular is that simultaneous spot and forward transactions in opposite directions occur quite naturally.

3.4 The Forward Foreign Exchange Market

- How swap prices are quoted
 - Spot: ¥/\$ 104.30 – 35
 - 30-day **swap points**: 15/20
 - Basis points that must be added/subtracted to/from the current spot bid/ask price to yield the actual 30-day bid/ask forward prices
 - ¥104.30/\$ spot bid + ¥0.15/\$ + = ¥104.45/\$ forward bid for dollars
 - ¥ 104.35/\$ spot ask + ¥0.20/\$ = ¥ 104.55/\$ forward ask for dollars
 - 30-day swap points: 20/15
 - ¥104.30/\$ spot bid - ¥ 0.20/\$ = ¥104.10/\$ forward bid for dollars
 - ¥1104.35/\$ spot ask - ¥ 0.15/\$ = ¥104.20/\$ forward ask for dollars
- A rule for using swap points
 - If first number in swap quote is smaller than the second, you add the points to the bid and ask prices to get the forward quotes; if larger - subtract

Cash Flows in a Spot-Forward Swap

Nomura quotes:

Spot: ¥ 104.30 /\$ - ¥ 104.35 /\$

30-day swap points: 20/15

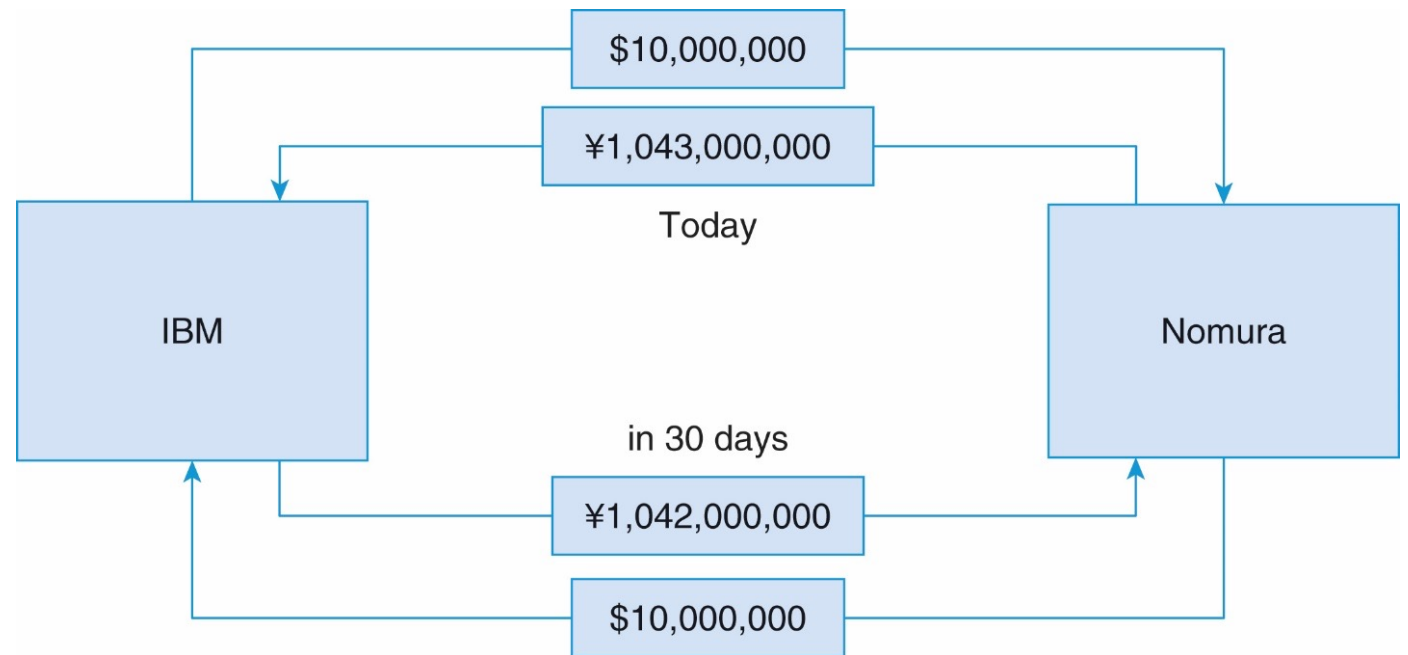
IBM swaps \$10,000,000 into yen for 30 days

Future payment:

¥ 104.35 /\$ - ¥ 0.15 /\$ = ¥104.20/\$

\$ 10,000,000 x (¥104.20/\$) = ¥1,042,000,000

The party that is receiving the high-interest-rate currency pays the party that is receiving the low-interest-rate currency the difference in basis points.



3.5 Forward Premiums and Discounts – related to interest rates

- Forward premium
 - Occurs when the price of the currency forward contract is higher than the spot rate
 - $F\$/\text{€} > S\$/\text{€}$ (the price of a € is higher for Forward.)
- Forward discount
 - Occurs when the price of the currency forward contract is lower than the spot rate
 - $F\$/\text{€} < S\$/\text{€}$ (the price of a € is lower for Forward.)
 - Calculation (Forward premium and Forward discount expressed as **annualized %**)
 - $$\text{Ann. Percent} = \left(\frac{\text{Forward} - \text{Spot}}{\text{Spot}} \right) \times \left(\frac{360}{N \text{ days}} \right) \times 100$$
, N is the number of days in the forward contract.

3.5 Forward Premiums and Discounts

- Forward premiums and swap points

- Because forward contracts typically trade as part of a swap, the swap points indicate the premium or discount for the denominator currency

1, USD/JPY: $IR_{USD} > IR_{JPY}$

- 1st > 2nd (swap points subtracted)

- base currency is the higher interest rate currency. As such, the base currency becomes Forward discounted currency.

2, USD/JPY: $IR_{USD} < IR_{JPY}$

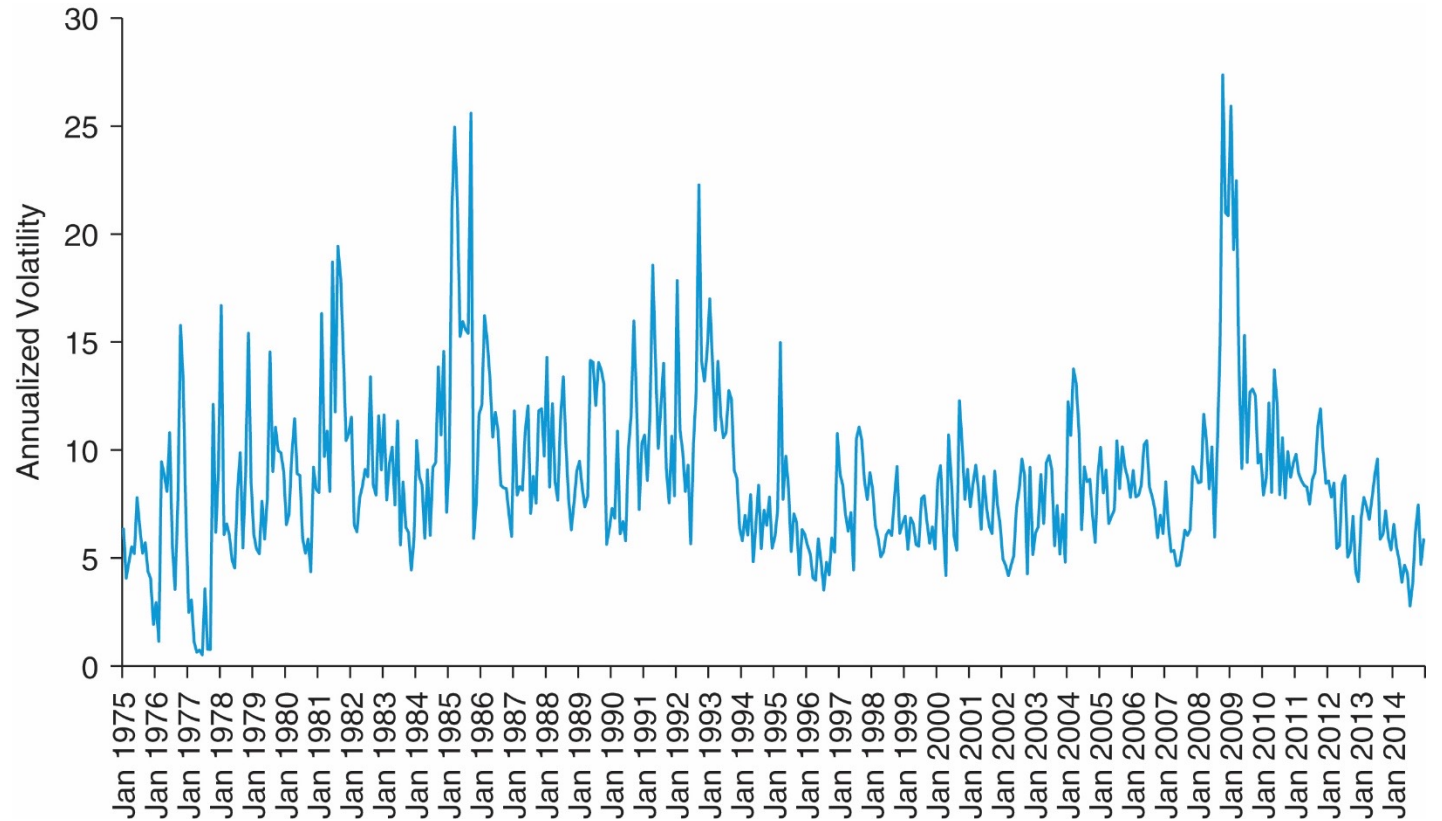
- 1st < 2nd (swap points added)

- base currency is the lower interest rate currency. As such, the base currency becomes Forward premium currency.

3.6 Changes in Exchange Rate Volatility

- Understanding how forex rates move involves more than just means and standard deviations
 - Volatility clustering: When standard deviations (volatility) in forex rate demonstrate a pattern
 - i.e., has been high and remains high
 - GARCH model
 - Developed by Tim Bollerslev (1986)
 - $V(t) = a + bv(t-1) + ce(t)^2$
 - A = minimum variance if past volatility and news terms = 0
 - B = sensitivity of current conditional variance to past volatility
 - C = sensitivity to current news
 - Other models exist, but none of which have received as much attention
 - Clustering of macroeconomic news events, reactions to changes in uncertainty regarding macroeconomic fundamentals, trading processes

Monthly Standard Deviations of Daily Rates of Appreciation



Questions:

- What is a forward exchange rate? When does delivery occur on a 90-day forward contract?
- If the yen is selling at a premium relative to the euro in the forward market, is the forward price of EUR per JPY larger or smaller than the spot price of EUR per JPY?
- How much of the probability distribution of future spot rates is between plus or minus 2 standard deviations?
- If you are a U.S. firm and owe someone ¥10,000,000 in 180 days, what is your transaction exchange risk?
- What is a spot–forward swap and forward–forward swap?