Ch. 7 Foreign Currency Derivatives

Topics

- Foreign Currency Futures
- Foreign Currency Options

- A word of caution – Financial derivatives are powerful tools in the hands of careful and competent financial managers. *They can also be very destructive devices when used recklessly*.

Financial Derivatives

- Derivatives: Financial instruments whose payoffs and values are derived from/depend upon underlying assets.
  - Forwards
  - Futures
  - Options
- Raison d'être for derivatives
  - Hedging: To reduce one's risk exposure
  - Speculating: To increase one's risk exposure

Currency Futures Market

- Foreign currency futures contracts specify a standard volume of a particular currency to be exchanged on a specific settlement date.
- A foreign currency futures contract is an alternative to a forward contract and It calls for future delivery of a standard amount of currency at a fixed time and price.
  - They are used by MNEs to hedge their currency positions, and by speculators who hope to capitalize on their expectations of exchange rate movements.
  - The contracts can be traded by firms or individuals through brokers on the trading floor of an exchange (e.g. Chicago Mercantile Exchange), on automated trading systems (e.g. GLOBEX), or over-the-counter.

Currency Futures and Forwards Compared

Characteristic	Foreign Currency Futures	Forward Contracts
Size of contract	Standardized contracts per currency	Any size desired
Maturity	Fixed maturities, longest typically being one year	Any maturity up to one year, sometimes longer
Location	Trading occurs on an organized exchange	Trading occurs between individuals and banks with other banks by telecom linkages
Pricing	Open outcry process on the exchange floor	Prices are determined by bid and ask quotes
Margin/Collateral	Initial margin that is marked to market on a daily basis	No explicit collateral, but standard bank relationship necessary
Settlement	Rarely delivered upon; settlement normally takes place through purchase of offsetting position	Contract is normally delivered upon, although the taking of offsetting positions is possible
Commissions	Single commission covers both purchase and sale (roundtrip)	No explicit commission; banks earn effective commissions through the bid-ask spreads
Trading hours	Traditionally traded during exchange hours; some exchanges have moved to 24 hours	Negotiated by phone or Internet, 24 hours a day, through bank global networks
Counterparties	Unknown to each other due to the auction market structure	Parties are in direct contact in settling forward specifications
Liquidity	Liquid but relatively small in total sales volume and value	Liquid and relatively large in sales volume compared to futures contracts

Foreign Currency Futures

- Contract Specifications
  - Size of contract: Called the notional principal, trading in each currency must be done in an even multiple.
  - Method of stating exchange rates: "**American terms**" are used; quotes are in US dollar cost per unit of foreign currency, also known as direct quotes for US MNCs.
  - Maturity date: Contracts mature on the 3rd Wednesday of January, March, April, June, July, September, October or December.
  - Last trading day: Contracts may be traded through the second business day prior to maturity date.
  - Collateral & maintenance margins: The purchaser or trader must deposit an initial margin or collateral.
    - At the end of each trading day, the account is marked to market and the balance in the account is either credited if value of contracts is greater or debited if value of contracts is less than account balance.

Foreign Currency Futures

- Contract Specifications
  - Settlement: Only 5% of futures contracts are settled by physical delivery, most often buyers and sellers offset their position prior to delivery date. The complete buy/sell or sell/buy is termed a round turn.
  - Commissions: Customers pay a commission to their broker to execute a round turn and only a single price is quoted.
  - Use of a clearing house as a counter party: All contracts are agreements between the client and the exchange clearing house. Consequently clients need not worry about the performance of a specific counterparty since the clearing house is guaranteed by all members of the exchange.

Using Foreign Currency Futures

- Any investor wishing to speculate on the movement of a currency can pursue one of the following strategies:
  - Short position – selling futures expecting that currency will fall in value
  - Long position – purchase futures expecting that currency will rise in value

Example: Amber McClain believes that Mexican peso will fall in value against the US dollar, she looks at quotes in the WSJ for Mexican peso futures:

Maturity	Open	High	Low	Settle	Change	High	Low	Open Interest
Mar	.10953	.10988	.10930	.10958	...	.11000	.09770	34,481
June	.10790	.10795	.10778	.10773	...	.10800	.09730	3,405
Sept	.10615	.10615	.10610	.10573	...	.10615	.09930	1,481

All contracts are for 500,000 new Mexican pesos. "Open" means the opening price on the day. "High" means the high price on the day. "Low" indicates the lowest price on the day. "Settle" is the closing price on the day. "Change" indicates the change in the settle price from the previous day's close. "High" and "Low" to the right of Change indicate the highest and lowest prices this specific contract (as defined by its maturity) has experienced over its trading history. "Open Interest" indicates the number of contracts outstanding.

Using Foreign Currency Futures

- Amber believes that the value of the peso will fall, so she sells a March futures contract.
- By taking a short position on the Mexican peso, Amber locks-in the right to sell 500,000 Mexican pesos at maturity at a set price above their current spot price.
- Using the quotes from the table, Amber sells one March contract for 500,000 pesos at the settle price: $.10958/Ps.

Value at maturity (Short position)

= - Notional principal × (Spot – Futures)

Using Foreign Currency Futures

- To calculate the value of Amber's position we use the following formula:

Value at maturity (Short position)

= - Notional principal × (Spot – Futures)

- Using the settle price from the table and assuming a spot rate of $.09500/Ps at maturity, Amber's profit is:

Value

=

Using Foreign Currency Futures

- If Amber believed that the Mexican peso would rise in value, she would take a long position on the peso.

  Value at maturity (Long position)

  = Notional principal x (Spot – Futures)

- Using the settle price from the table and assuming a spot rate of $.11000/Ps at maturity, Amber's profit is:

  Value

  =

Currency Futures Market

- Short hedge: Selling a futures contract

  Short hedges are used when
  - you will be making delivery at a future date and
  - you wish to minimize the risk of a drop in price.
- Long hedge: Buying a futures contract

  Long hedges are used when
  - you will be making purchase at a future date and
  - you wish to minimize the risk of a rise in price.
- Currency futures may be purchased by MNEs to hedge foreign currency payables, or sold to hedge receivables.
- Speculators often sell currency futures when they expect the underlying currency to depreciate, and vice versa.

Foreign Currency Options

- A foreign currency option is a contract giving the purchaser of the option the right to buy or sell a given amount of currency at a fixed price per unit for a specified time period.
  - The buyer of the option is the holder and the seller of the option is termed the writer.
  - The most important part of clause is the "right, but not the obligation" to take an action by the buyer of the option.
- Two basic types of options, ***calls*** and ***puts.***
  - Currency call option: Grants the holder the right to buy a specific currency at a specific price (called the exercise or strike price) within a specific period of time.
  - Currency put option: Grants the holder the right to sell a specific currency at a specific price (called the exercise or strike price) within a specific period of time.

Foreign Currency Options

- Every option has three different price elements
  - The strike or exercise price is the exchange rate at which the foreign currency can be purchased or sold.
  - The premium, the cost, price or value of the option itself paid at time option is purchased.
  - The underlying or actual spot rate in the market.
- There are two types of option maturities
  - American options may be exercised at any time during the life of the option.
  - European options may not be exercised until the specified maturity date.

	Buyer/Holder	Seller/Writer
Call Option	Right to buy asset	Obligation to sell asset when exercised
Put Option	Right to sell asset	Obligation to buy asset when exercised

Currency Options Market

- The standard options that are traded on an exchange through brokers are guaranteed, but require margin maintenance.
- U.S. option exchanges (e.g. Chicago Board Options Exchange) are regulated by the Securities and Exchange Commission.
- In addition to the exchanges, there is an over-the-counter market where commercial banks and brokerage firms offer customized currency options.
- There are no credit guarantees for these OTC options, so some form of collateral may be required.

Currency Call Options

- A call option is
  - in the money if spot rate > strike price
  - at the money if spot rate = strike price
  - out of the money if spot rate < strike price
- Option owners can sell or exercise their options. They can also choose to let their options expire. At most, they will lose the premiums they paid for their options.
- In both forward/futures contracts, the buyer and the seller have the obligation, not the option, to settle the contract at the future date.
- Call option premiums will be higher when:
  - (spot price – strike price) is larger.
  - the time to expiration date is longer.
  - the variability of the currency is greater.

Swiss Franc Option Quotations (U.S. Cents/SF)

		Calls—Last			Puts—Last		
Option and Underlying	Strike Price	Aug	Sep	Dec	Aug	Sep	Dec
58.51	56.0	–	–	2.76	0.04	0.22	1.16
58.51	56.5	–	–	–	0.06	0.30	–
58.51	57.0	1.13	–	1.74	0.10	0.38	1.27
58.51	57.5	0.75	–	–	0.17	0.55	–
58.51	58.0	0.71	1.05	1.28	0.27	0.89	1.81
58.51	58.5	0.50	–	–	0.50	0.99	–
58.51	59.0	0.30	0.66	1.21	0.90	1.36	–
58.51	59.5	0.15	0.40	–	2.32	–	–
58.51	60.0	–	0.31	–	2.32	2.62	3.30

Each option = 62,500 Swiss francs. The August, September, and December listings are the option maturities or expiration dates.

Foreign Currency Options Markets

- The spot rate means that 58.51 cents, or $0.5851 was the price of one Swiss franc.
- The strike price means the price per franc that must be paid for the option. The August call option of 58 ½ means $0.5850/Sfr.
- The premium, or cost, of the August 58 ½ option was 0.50 per franc, or $0.0050/Sfr.
  - For a call option on 62,500 Swiss francs, the total cost would be:

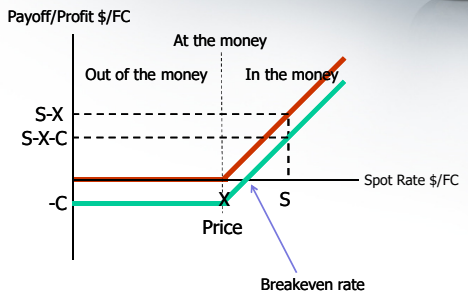
Currency Call Options

- Firms with open positions in foreign currencies may use currency call options to cover those positions.
- They may purchase currency call options
  - to hedge future payables.
  - to hedge potential expenses when bidding on projects.
  - to hedge potential costs when attempting to acquire other firms.

Currency Call Options

- Speculators who expect a foreign currency to appreciate can purchase call options on that currency.
  - Profit = selling price – buying (strike) price – option premium
- They may also sell (write) call options on a currency that they expect to depreciate.
  - Profit = option premium – buying price + selling (strike) price

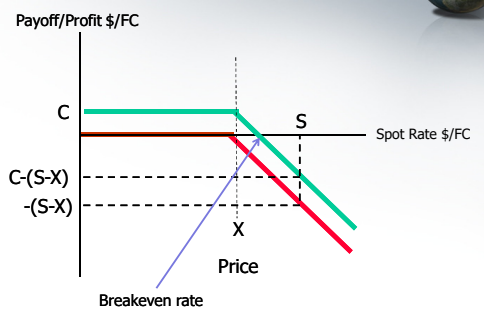
Currency Call Option Payoff: Buyer



Currency Call Options

- The purchaser of a call option will break even when
  selling price
  = buying (strike) price + option premium
- The seller (writer) of a call option will break even when
  buying price
  = selling (strike) price + option premium

Currency Call Option Payoff: Seller/Writer



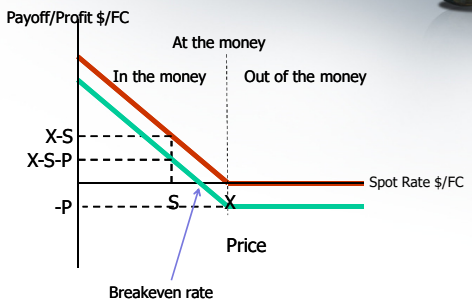
Currency Put Options

- A put option is
  - in the money if spot rate < strike price
  - at the money if spot rate = strike price
  - out of the money if spot rate > strike price
- Put option premiums will be higher when:
  - (strike price – spot rate) is larger.
  - the time to expiration date is longer.
  - the variability of the currency is greater.
- Corporations with open foreign currency positions may use currency put options to cover their positions.
  - For example, firms may purchase put options to hedge future receivables.

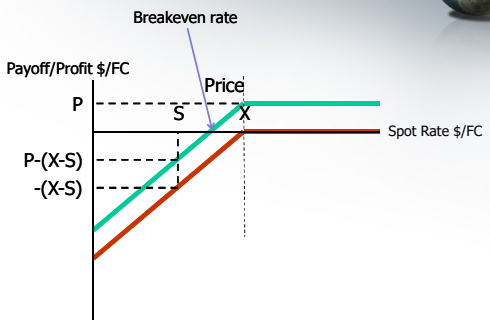
Currency Put Options

- Speculators who expect a foreign currency to depreciate can purchase put options on that currency.
  - Profit = selling (strike) price – buying price – option premium
- They may also sell (write) put options on a currency that they expect to appreciate.
  - Profit = option premium + selling price – buying (strike) price

Currency Put Option Payoff: Buyer



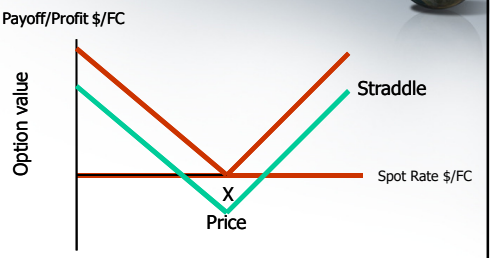
Currency Put Option Payoff: Seller/Writer



Currency Options

- Straddle: Purchasing both a put option and a call option at the same exercise price.
  - Strategy for profiting from high volatility: By purchasing both options, the speculator may gain if the currency moves substantially in either direction, or if it moves in one direction followed by the other.

Currency Options - Straddle



European Currency Options

- European-style currency options are similar to American-style options except that they can only be exercised on the expiration date.
- For firms that purchase options to hedge future cash flows, this loss in terms of flexibility is probably not an issue. Hence, if their premiums are lower, European-style currency options may be preferred.

Efficiency of Currency Derivatives

- If foreign exchange markets are efficient, speculation in the currency futures and options markets should not consistently generate abnormally large profits.
- A speculative strategy requires the speculator to incur risk. On the other hand, corporations use the futures and options markets to reduce their exposure to fluctuating exchange rates.

Interest Rate Risk

- All firms are sensitive to interest rate movements in one way or another.
- Largest interest rate risk of the nonfinancial firm is debt service; the multicurrency dimension of interest rate risk for the MNE is of serious concern.
- The second most prevalent source of interest rate risk for the MNE lies in its holdings of interest-sensitive securities.

International interest rate calculations differ by the number of days used in the period's calculation and their definition of how many days there are in a year (for financial purposes). The following example highlights how the different methods result in different one-month payments of interest on a $10 million loan, 5.500% per annum interest, for an exact period of 28 days.

			$10 Million @ 5.500% per Annum	
Practice	**Day Count in Period**	**Days/Year**	**Days Used**	**Interest Payment**
International	Exact number of days	360	28	$42,777.78
British	Exact number of days	365	28	$42,191.78
Swiss (Eurobond)	Assumed 30 days/month	360	30	$45,833.33

Credit Risk and Repricing Risk

- Credit Risk or roll-over risk: Possibility that a borrower's creditworthiness at the time of renewing a credit is reclassified by the lender.
- Repricing risk: Risk of changes in interest rates charged (earned) at the time a financial contract's rate is being reset.
- Interest Rate Futures: Widely used and their popularity stems from highly liquid markets, simplicity in use, and the rather standardized interest rate exposures firms posses.

Exposure or Position	**Futures Action**	**Interest Rates**	**Position Outcome**
Paying interest on future date	Sell a Futures (short position)	If rates go up	Futures price falls; short earns a profit
		If rates go down	Futures price rises; short earns a loss
Earning interest on future date	Buy a Futures (long position)	If rates go up	Futures price falls; long earns a loss
		If rates go down	Futures price rises; long earns a profit

Interest Rate Swaps

- Swap agreement to pay fixed and receive floating to protect from rising debt-service payments.
- Swap agreement to pay floating and receive fixed to take advantage of lower debt-service payments.
- The cash flows of an interest rate swap are interest rates applied to a set amount of capital, no principal is swapped only the coupon payments.

Position	**Interest Rate Expectation**	**Swap Strategy**
Fixed Rate Debt	Rates to go up	Do nothing
	Rates to go down	Pay floating and Receive fixed
Floating Rate Debt	Rates to go up	Pay fixed and Receive floating
	Rates to go down	Do nothing

Interest Rate Swaps

- The interest rate and currency swap markets allow firms that have limited access to specific currencies and interest rate structures to gain access at relatively low costs.
- A cross currency interest rate swap allows a firm to alter both the currency of denomination of cash flows in debt service, but also to alter the fixed-to-floating or floating-to-fixed interest rate structure.