Currency Futures, Options and Swaps

1. Derivative markets

1) Since the floating system was established in 1970s, there have been great increased attention to find some methods to hedge foreign currency risk. And, also many investors have taken the international risk in the foreign currencies for the speculative profits. Thus, the derivative markets have developed very rapidly, providing greater flexibility for those seeking to hedge risk and take speculative positions for gain. Some derivatives instruments are available to hedge interest, currency and stock markets. Especially in this chapter, we will focus on currency-related derivatives.

Generally, two approaches have been used to hedge foreign currency risk;

i) The customized deals either through forward exchange contracts or through currency swaps.

ii) The standardized currency contracts on markets organized for that purpose such as Future contract, Option contract, and Option on futures.

2) Derivatives Instruments

i) Derivative instruments are financial claims with value based on that of the underlying securities. Thus, the changes in the value of an underlying security (ex: US T-bond) is expected to be accompanied by the similar change in the value of the related derivatives instruments (T-bond futures)

ii) Derivatives are originated and traded both on organized exchanges and over-the-counter.

a) Exchange-traded instruments: interest rate futures, interest rate options, currency futures, currency options, stock market index futures, and stock market index options.

- This instrument markets provide liquidity through large volume, standardized contracts, price transparency, and the interposition of the clearing house as a central counterparty.

b) Over-the-counter traded instruments: interest rate swaps, currency swaps and other swap-related derivatives.

- This instrument markets provide users with contracts that can be customized to individual requirements.

3) Leading exchange centers: Chicago Mercantile Exchange (CME), Chicago Board of Trade (CBOT) and the London International Financial Futures and Option Exchange (LIFFE)

2. Swap

1) Swap transaction is that one currency is bought at spot rate and sold for the future delivery (forward) simultaneously. In a swap transaction, the amount of "buy" of a currency is always equal to the amount of "sells". So, there is no the net exchange position.

2) The advantages of the swaps are; i) they improve the liquidity of the long-term market in the major foreign currencies, and ii) they reduce the risk of the foreign currency more effectively.

3) Representation of Swap rate

i) the forward premiums or discounts are quoted in basis point ,1/100 percent, or 0.0001 as the swap rates.

ii) the swap rate indicates the number of points at which the quoting party is willing to swap a currency spot against a future maturity of the same currency.

- Example: for three month swap rate for £/$, 190-180 with spot rate for £2.40/$.
    a) The first number 190 means that one is willing to sell spot pound against dollars at the going spot rate, and buy three-month pound against dollar at 190 point below that spot rate (£2.381/$ = 2.4-0.0190).
    b) The second number 180 means that one is willing to buy spot pound against dollars at the going spot rate, and sell three-month pound against dollar at 180 point below that spot rate (£2.382/$).

4) Swap transaction and Covered Interest Arbitrage

i) Covered Interest Arbitrage: swap one currency into another on a hedged basis to benefit from the interest differential.

ii) Calculation of the percent per annum (swap profit or cost)

- Swap rate can be usefully converted to the percent per annum term to make them comparable to the interest differentials.

→ Example: Spot rate is £2.4/$, and the swap rate is 180 (forward premium or discount is 0.0180) for three months. The percent per annum of the swap rate is (0.0180/2.4)/(3/12) = 0.03, or 3%.

iii) If the interest rate differential for three month maturity between US and UK is less than 3%, there is an incentive to engage in covered interest arbitrage (swap transaction): Sell pound against dollar in the spot market and purchase pound against dollars in the forward market for three month maturity.

➔ However, there is no golden rule that guarantees a profit on swaps from low interest to high interest rate currencies.

5) Currency swap

- Currency swap was first developed by the World Bank, The Bank could get two basic advantages from currency swap:

a) they can improve the liquidity of the long term market in major foreign currencies.
b) they reduce the risk of foreign currency exposure more effectively than traditional alternatives

- Currency swap by the World Bank

The World Bank generally borrows a high nominal interest rate currency like US dollar or British sterling) in the Euromarkets or in a domestic capital market, and then convert the major currency into a preferred currency by selling the currency in the spot market for the preferred currency. Since the main objective of the World Bank is to operate as a lender in low coupon interest currencies, the borrowing countries can be less encumbered with the debt service.

3. Currency Futures

1) Comparison of the future contracts with the forward contracts

i) Similarity: foreign currencies may be bought and sold for the delivery at a future date ii) Differences:

a) Futures contracts are trading in standardized contracts and only in a specific geographic location such as the International Monetary Market (IMM) of the Chicago Mercantile Exchange (CME), which is the largest currency futures market.

b) The currency futures are traded only for a few currencies, the British pound, Canadian dollar, Japanese yen, Swiss franc, Australian dollar, Mexico peso, French franc, German mark, and ECU.

c) Future contracts mature on the third Wednesday of March, June, September, and December, while the forward contracts are typically 30, 90, or 180 days long.

d) Future contracts are written for fixed amounts, such as C$100,000 or DM125,000, while the forward contracts are written for any amount agreed on by the parties.

e) The prices in the two markets are a little different even for the same contract maturity date because the futures market involves daily cash flow settlement, but the forward market does not.

2) The advantages of the future contracts over the forward contracts are;

i) Market Liquidity: the future contracts can be sold in the liquid markets.

ii) Flexibility: the future contracts can alter the hedging or speculative position as conditions or needs change.

→ Thus, trading currency futures can help institutional investors or multinational company offset the exchange risk related to an investment position.

3) Important services of the future contracts for the investors in the exchange market

i) price discovery: Hedgers and speculators come together to discover the future price of a currency

ii) liquidity: the ability of market participants to buy and sell at any time when the markets are open for trading.

iii) customer protection: it is provided by the enforcement of the exchange rules: two important protections are,

a) Margin Requirement:

- It is one way of protection for the customers in trading currency futures.

- Margin requirement and daily settlement: In order to trade in the futures market, a trader must deposit money with a broker, and the amount is different depending on the broker and the contract. This money is called "margin requirement". And, traders are required to realize any losses in cash on the day whenever it occurs (the daily settlement). The daily settlement involves deducting the daily loss from the margin deposited by the broker. Traders must keep the margin sufficiently.

b) Clearing Housing System

- The clearing house system directly protects members of the system such as the trader, brokers and clients. So, the clearing house functions as guarantor of performance for each futures and options by ensuring timely delivery by the seller and the timely payment by the buyer.

- In addition to the protection of the members, the clearing house provides clearing services for its members. All transactions go through its book, and all open positions are recorded.

4) Market quotations for the future contracts (Handout).

i) the information of each column

- Months: the maturity month of the contracts
- Open: price of contract at the beginning of business that day
- High: high price of contract on that trading day
- Low: low price of contract on that trading day
- Settle: price at which contracts are settled at the close of trading that day.

- Change: change in the settlement price from the previous day
- Lifetime high: highest price at which the contract has ever traded
- Lifetime low: lowest price at which this contract has ever traded
- Open interest: number of outstanding contracts (buying and selling futures) on the previous trading day

ii) Example of the contract

- Look at the September British Pound contract:

On September 9, the contract began trading at $1.6552 per pound so that for £62,500, the contract value was $103,450. Over the course of the day, the price rose to a high of $1.6882, dropped to a low of $1.6510, and settled at $1.6670. The settlement price was up $0.0130 from the previous day. And, over the life of trading in this contract, the highest price was $1.6890, and the lowest price was $1.5690. On the previous day, there were 36,579 outstanding contracts.

In regarding to the margin requirement, suppose the contract require the initial margin of $5,000. Then, if the price decreased by$ 0.0175on one day, the decrease in the settlement price of $0.0175 represents a loss of $1,093.75 on the £62,500 (0.0175*62500 = 1,093.75). Thus, with the initial margin of $5,000, the loss of $1,093.75 would be deducted from the margin and the margin reduces to $3,906.35. If this amount is below a certain level of the requirement (75% of the initial margin), the traders must deposit more money to raise the margin to its initial level.

5) <u>Hedging, Speculation and Currency Futures</u>

Currency Futures provides a hedging facility and a speculative opportunity for the investors and firms involved in the international currency trade. So, the speculator can get a

profit when they accurately forecast a future price for a currency that differs significantly by more than the transaction cost. Look at the following Example:

- Assuming there is no transaction costs, suppose in September, the British pound will sell for $1.60 at the spot market, and September futures contract is currently priced at $1.6670. Then, we would sell pound a September future contract, and at maturity we will receive $1.6770 per pound so that the total amount will be $104,187,50 for £62,500. But if the actual (spot) price of pound at that time decreases to $1.60, we could buy £62,500 for $100,000 (1.60*62,500). Thus, the difference of $104,187.50-$100,000 = $4,187.50 would be the profit.

4. Currency options

- The currency options have been traded only since December 1982, when Philadelphia Stock Exchange offered a market.

1) A foreign Currency option is a contract that provides the right to buy or sell a given amount of currency at a fixed exchange rate on or before the maturity date.

- American Option: the options can be exercised at any time before the maturity date
- European Option: the options can be exercised only at the maturity date.
- Call Option: it gives the holder the right, not the obligation, to purchase the currency at a price (strike or exercise price) set in the contract.
- Put Options: it gives the holder the right, not the obligation, to sell the currency at a price set in the contract.

2) Two parties of Option contract: Option buyer and Option writer (seller)

- Option buyer who can be a hedger or a speculator essentially purchase a commitment that the option writer will stand ready to sell or purchase a specified amount of the underlying currency on demand. So, the option buyer's cost for this right, the premium, is paid to the option writer. This premium can be very expensive to use so that the use of options is limited compared to the futures.

3) Option Market Quotations (Handout)

- The Philadelphia exchange offers contracts for A$50,000, £31,250, C$50,000, DM62,500, FF250,000, ¥6,250,000 and SF62,500

- the first row for each currency: the currency being traded and its current spot exchange rates

- the first column: the alternative strike prices available for different months.

- the next two columns: the call option volume and prices or premiums existing at the close of business for different maturity months.

- the final two columns: the put option volume and premium for different maturity months.

- the prices are in "cents per unit" of currency, so a price of 0.85 is 0.85 cents or $0.0085.
- A option is said to be "in the money" when the option can generate profit for the holder.

→ at the money: the strike price is the same as the spot price

→ out of money: the option can generate loss for the holder.

4) Hedging and Options

Suppose US importer is buying equipment from a Swiss manufacturer, with SF 1m. payment due in December. The importer can hedge against the appreciation of SF by buying a call option at a specific price.

→ Example (Hedging with call option): Assume the current spot exchange rate is $0.70 per SF, and the SF 1m.would cost $700,000. If the SF expects to appreciate to $0.75 over the next three months, the value of the imports would change to $750,000 over the next three months in the spot market (the increase in the price of imports by $50,00). So, the call options can provide hedge against the change. In order to hedge against the unexpected exchange rate change, the importer can buy a December option. Suppose the importer wants a strike price of $0.71, so that the upper bound on the value of the imports is $710,000. In the table of the handout, a December option with a strike price of 71 sells for $0.0178 per SF (the bottom line where a 71 strike for December costs 1.78). So, one contract for SF62,500 costs $1,112.50 (62,500*$0.0178). To cover SF1 million, the importer must buy 16 contracts since 16*SF62,500 = SF1,000,000, and it costs the premium $17,800 (16*$1,112.50). Then, if the December spot price is $0.75, which is greater than the strike price $0.71, the imports will cost $750,000. Thus, by exercising the option contracts to ensure the price of $710,000 for the imports, the importer can save $40,000 ($750,000-$710,000) (Actually the net saving is $22,200 ($40,000-$17,800, the contract premium). However, if the spot rate is changed less than the old price, $0.70, the importer will expire the option just paying the contract premium, $17,800.

→ Another examples in the textbook (Handout)

5) Factors controlling option premiums

According to Recent Innovations in International Banking (April 1986), there are two values of the option, intrinsic value and time value.

i) Intrinsic Value: the financial benefits to be derived if an option is exercised immediately. It reflects the difference between the spot rate and the exercise price.

ii) Time Value: It is related to the possibility that the price of underlying currency will change over the remaining lifetime of the option contract so that it can give the option greater value. This value can be calculated subtracting intrinsic value from the premium.

→ Some option pricing models like Black-Scholes Option Pricing Model calculate the value, the intrinsic and time values of an option. In the models, some important variables in calculating the premium in the currency options are.

a) The larger the differential between the spot rate and the strike price, the larger the intrinsic value.
b) If all other things are equal, the longer maturity option contracts have the greater value than the shorter maturity.
c) If the interest rate differential between the two countries increases, the call values rise and the put values fall.
d) The price volatility of the underlying currency is closely related to the time value of the option.
e) The demand and supply for some option contracts are depending on several factors like seasonal, cyclical and episodic events.

5. Options on futures

1) It is option contracts where the underlying asset is a financial futures contract.

- So, if a hedger is short the currency amount and desire protection against the appreciation in the price of the currency, he can purchase a call option on a given futures contract in that currency.

2) The maturity of options on the futures affects their value. As the maturity lengthens, the prices of call and put options increase.