Interest Rates and Foreign Exchange

1. Swap Fixed-Float

   Assume that Company A and Company B enter into an interest rate swap agreement with a notional value of $10 million and a term of 5 years. Company A agrees to pay a fixed interest rate of 3.5% per annum, while Company B agrees to pay a floating interest rate linked to the 3-month LIBOR rate, currently at 2%.

   If the 3-month LIBOR rate increases to 3% over the term of the swap agreement, Company B will pay a higher floating rate of 3% to Company A, while Company A will continue to pay the fixed rate of 3.5%. As a result, Company B will make a net payment of 0.5% per annum ($10 million x (3% - 2.5%)), or $500,000 over the term of the swap agreement.

   On the other hand, if the 3-month LIBOR rate decreases to 1.5% over the term of the swap agreement, Company B will pay a lower floating rate of 1.5% to Company A, while Company A will continue to pay the fixed rate of 3.5%. As a result, Company A will make a net payment of 2% per annum ($10 million x (3.5% - 1.5%)), or $2 million over the term of the swap agreement.

2. Swap Cross Currency Basis

Suppose Company A is based in the United States and needs to borrow Japanese yen (JPY) for a 5-year project, while Company B is based in Japan and needs to borrow U.S. dollars (USD) for a 5-year project. Both companies can benefit from a cross-currency basis swap by exchanging their respective currencies at a fixed exchange rate, then swapping the fixed interest rate payments on the borrowed amounts.

Assume that the current exchange rate is 110 JPY/USD, and Company A wants to borrow JPY 100 million while Company B wants to borrow USD 1 million. The parties agree to a fixed exchange rate of 110 JPY/USD for the term of the swap.

Company A will pay fixed interest rate payments on the USD 1 million to Company B, while Company B will pay fixed interest rate payments on the JPY 100 million to Company A. The interest rates are negotiated and agreed upon based on market rates and credit risk.

Suppose that the fixed interest rate for USD 1 million is agreed at 2% per annum and the fixed interest rate for JPY 100 million is agreed at 0.5% per annum. If the cross-currency basis swap agreement lasts for 5 years, the net payment for each party can be calculated as follows:

Company A: pays JPY 5.5 million per year (JPY 100 million x 0.5%) to Company B and receives USD 20,000 per year (USD 1 million x 2% x 110 JPY/USD) from Company B. Therefore, Company A makes a net payment of JPY 5.48 million per year to Company B.

Company B: pays USD 20,000 per year to Company A and receives JPY 5 million per year (JPY 100 million x 0.5% x 110 JPY/USD) from Company A. Therefore, Company B makes a net payment of USD 1,818 per year to Company A.

3. Swap Cross Currency OIS

A cross-currency OIS (Overnight Index Swap) is a type of derivative that enables counterparties to exchange floating interest rate payments based on overnight rates in two different currencies. The OIS rate is based on an index, such as the Fed Funds Effective Rate in the US or the EONIA rate in Europe, which is the overnight rate for unsecured lending between banks in a particular currency.

Here is an example of a cross-currency OIS swap:

Suppose Company A in the United States needs to borrow Japanese yen (JPY) for a 5-year project, while Company B in Japan needs to borrow US dollars (USD) for a 5-year project. Both companies can benefit from a cross-currency OIS swap by exchanging their respective currencies at a fixed exchange rate, then swapping the floating interest rate payments on the borrowed amounts.

Assume that the current exchange rate is 110 JPY/USD and both parties agree on the exchange rate of 110 JPY/USD for the term of the swap.

Company A borrows JPY 100 million from a Japanese bank at a floating rate based on the JPY Overnight Index Average (TONA), while Company B borrows USD 1 million from a US bank at a floating rate based on the USD Overnight Index Swap (OIS) rate.

The parties agree to exchange payments every quarter, based on the notional amount of the loan. The floating rate payments are calculated by multiplying the notional amount by the quarterly overnight rate in each respective currency.

Suppose that the quarterly OIS rate for USD is 0.25% and the quarterly TONA rate for JPY is 0.05%. The net payment for each party can be calculated as follows:

Company A: pays JPY 1.25 million per quarter (JPY 100 million x 0.05% x 3 months) to Company B and receives USD 2,750 per quarter (USD 1 million x 0.25% x 3 months x 110 JPY/USD) from Company B. Therefore, Company A makes a net payment of JPY 1.24 million per quarter to Company B.

Company B: pays USD 2,750 per quarter to Company A and receives JPY 1.25 million per quarter from Company A. Therefore, Company B makes a net payment of USD 22 per quarter to Company A.

4. PUT under FLOOR under CAP?
5. Cap call option

A cap call option is a financial instrument that gives the holder the right, but not the obligation, to receive a payment if a specified interest rate (known as the strike rate) is

exceeded. In the context of a floating rate loan, this means that if the interest rate on the loan (such as the 3-month LIBOR rate) increases above the strike rate, the holder of the cap call option will receive a payment from the counterparty. This payment offsets the increased cost of borrowing due to the higher interest rate. The cap call option is a form of interest rate hedging that protects against upward movements in interest rates.

The investor purchases a cap call option with a strike rate of 4% and a premium of $100,000 for a $10 million loan with a floating rate tied to the 3-month LIBOR index. If the 3-month LIBOR rate goes above 4%, the investor will receive a payment from the counterparty that offsets the increased interest rate on loan.

6. Cap put option

The investor purchases a cap put option with a strike rate of 2%, which means that if the 3-month LIBOR rate falls below 2%, the investor will receive a payment from the counterparty. Let's assume the premium for the cap put option is $75,000.

If the 3-month LIBOR rate falls to 1%, the investor will receive $75,000 (the difference between the LIBOR rate and the strike rate of 2%) from the counterparty. This payment will offset the reduced interest rate on the loan, resulting in a net cash flow of zero.

7. Cap Straddle option

An investor purchases a cap straddle option with a strike rate of 3% and a premium of $150,000. The option includes both a cap call option and a cap put option, both with a strike rate of 3%. If the 3-month LIBOR rate remains at or below 3%, the investor will not receive any payments from the counterparty. However, if the LIBOR rate rises above 3%, the investor will receive a payment from the counterparty that offsets the increased interest rate on the loan. Similarly, if the LIBOR rate falls below 3%, the investor will receive a payment that offsets the reduced interest rate on the loan. The cap straddle option provides more flexibility than a single cap option, as it hedges against both upward and downward movements in interest rates.

8. Put Swaption

Assume that a buyer purchases a put swaption with a notional value of $10 million and an exercise date of 1 year from now. The strike rate is 3%, and the buyer pays a premium of 0.5% of the notional value, or $50,000. If interest rates decrease to 2.5% at the exercise date, the buyer can exercise the option and sell the interest rate swap agreement at the strike rate of 3%, making a profit of $250,000 ($10 million x (3% - 2.5%)) after deducting the premium.

9. Call Swaption

Assume that a buyer purchases a call swaption with a notional value of $5 million and an exercise date of 2 years from now. The strike rate is 4%, and the buyer pays a premium of 0.8% of the notional value, or $40,000. If interest rates increase to 5% at the exercise date, the buyer can exercise the option and buy the interest rate swap agreement

at the strike rate of 4%, making a profit of $500,000 ($5 million x (5% - 4%)) after deducting the premium.

10. Straddle Swaption

Assume that a buyer purchases a straddle swaption with a notional value of $8 million and an exercise date of 1.5 years from now. The strike rate for the call option is 3.5%, and the strike rate for the put option is 2.5%. The buyer pays a premium of 0.75% of the notional value, or $60,000. At the exercise date, if interest rates increase to 4%, the buyer can exercise the call option and buy the interest rate swap agreement at the strike rate of 3.5%, making a profit of $320,000 ($8 million x (4% - 3.5%)) after deducting the premium. If interest rates decrease to 2%, the buyer can exercise the put option and sell the interest rate swap agreement at the strike rate of 2.5%, making a profit of $320,000 ($8 million x (2.5% - 2%)) after deducting the premium.

11. Bond Options PUT and CALL

12. Bond Forward

A bond forward is a type of derivative contract that allows two parties to enter into an agreement to buy or sell a bond at a future date for a predetermined price. The price of the bond forward is determined at the time of the contract, and the actual exchange of the bond and payment occurs at a later date, known as the delivery date.

In a bond forward, the buyer agrees to purchase the underlying bond at a future date, while the seller agrees to sell the bond. The price of the forward is typically based on the current market price of the bond, adjusted for the time between the contract date and the delivery date, as well as the expected interest rate and credit risk of the bond.

For example, suppose an investor enters into a bond forward contract to purchase a 10-year Treasury bond with a face value of $1,000 in one year's time for $1,100. If interest rates rise over the next year, causing the price of the bond to fall, the investor will still be obligated to pay $1,100 to purchase the bond at the delivery date. Conversely, if interest rates fall, causing the price of the bond to rise, the investor will benefit from the lower purchase price agreed upon in the bond forward contract. Bond forwards are commonly used by institutional investors and traders as a way to hedge against interest rate risk and speculate on future movements in bond prices.

13. IR - FRA

FRA stands for Forward Rate Agreement, which is a type of financial derivative that allows two parties to enter into a contract to fix the interest rate on a notional loan or deposit for a future period of time.
Suppose a company expects to borrow $1 million in six months for a one-year period, and it is concerned that interest rates might rise in the meantime. To hedge against this risk, the company enters into an FRA contract with a bank.

The FRA contract specifies that the company will receive a fixed interest rate of 3% on the $1 million notional amount for a one-year period starting in six months. If the prevailing market interest rate at the time of settlement is higher than 3%, the bank will pay the company the difference. If the market rate is lower than 3%, the company will pay the bank the difference.

Suppose that at the end of six months, the prevailing market interest rate for a one-year loan is 4%. At settlement, the bank will pay the company $10,000 (the difference between the fixed rate of 3% and the market rate of 4% on the $1 million notional amount).

14. FX NDF

FX NDF stands for Foreign Exchange Non-Deliverable Forward, which is a type of financial derivative contract used to hedge against currency risk. It is commonly used in emerging markets where currency exchange controls or other regulations may make it difficult or impossible to execute a traditional deliverable currency forward contract.

In an FX NDF, two parties agree to exchange a fixed amount of one currency for another at a predetermined exchange rate on a specified date in the future. Unlike a traditional forward contract, no physical exchange of currencies takes place at the settlement date. Instead, the settlement is made in cash based on the difference between the contracted exchange rate and the prevailing spot rate on the settlement date.

For example, suppose a company in the United States is planning to make a payment of 1 million Brazilian reais to a supplier in Brazil in six months' time. The company is concerned that the Brazilian real may depreciate against the US dollar during that time, increasing the cost of the payment. To hedge against this risk, the company enters into an FX NDF with a bank, agreeing to exchange US dollars for Brazilian reais at a fixed rate of 5 reais per dollar in six months' time.

If at the settlement date the prevailing spot rate is 4 reais per dollar, the bank will pay the company the difference between the contracted rate of 5 reais per dollar and the spot rate of 4 reais per dollar, multiplied by the notional amount of 1 million reais. On the other hand, if the spot rate is 6 reais per dollar, the company will pay the bank the difference between the contracted rate and the spot rate, multiplied by the notional amount.

15. FX Forward

FX Forward is a financial derivative contract that allows two parties to exchange currencies at a predetermined exchange rate at a future date. It is commonly used by companies and investors to hedge against currency risk, as well as by speculators to make bets on the direction of exchange rates.

In an FX forward, the two parties agree to buy or sell a specified amount of one currency for another currency on a specific future date at an agreed-upon exchange rate. Unlike spot transactions, which settle within two business days, FX forwards have a longer settlement period, typically ranging from a few days to several years.

For example, suppose a US-based company needs to pay 1 million euros to a supplier in six months' time. The company is concerned that the euro may appreciate against the US dollar during that time, making the payment more expensive. To hedge against this risk, the company enters into an FX forward contract with a bank, agreeing to exchange US dollars for euros at a fixed rate of 1.15 dollars per euro in six months' time.

If at the settlement date the prevailing spot rate is higher than the contracted rate of 1.15 dollars per euro, the company will have saved money by entering into the FX forward contract. On the other hand, if the spot rate is lower than the contracted rate, the company will have lost money on the hedge but will have the peace of mind of knowing its costs are locked in.

FX forwards can also be used for speculation, with traders making bets on the direction of exchange rates. In this case, the parties to the FX forward contract are not using the contract to hedge a specific transaction but instead to profit from changes in exchange rates over time.

16. FX Spot

FX spot refers to the exchange of one currency for another at the prevailing market exchange rate, with settlement usually taking place within two business days. It is the most common way that currencies are traded and is used by businesses and individuals for a variety of purposes, including international trade, tourism, and investment.

For example, if a US-based company needs to pay a supplier in Japan for goods or services, they would need to exchange US dollars for Japanese yen. The company could use the FX spot market to buy yen at the prevailing market rate, which fluctuates based on supply and demand factors, such as economic data releases, geopolitical events, and market sentiment.

The FX spot market is decentralized, meaning that there is no central exchange or clearinghouse. Instead, currency trading is conducted through a network of banks, brokers, and other financial institutions around the world. The largest trading centers for FX spot are located in London, New York, Tokyo, and Singapore.

FX spot is often used in conjunction with other financial instruments, such as FX forwards and options, to hedge against currency risk or to speculate on the direction of exchange rates. It is also closely watched by central banks and policymakers, as movements in exchange rates can have significant impacts on trade, inflation, and economic growth.

17. FX Roll - Spot

FX Roll is a type of currency trade that involves rolling over the settlement date of an existing FX spot transaction. In a typical FX roll, the settlement of the first leg of the transaction is delayed, and the value date is moved forward to coincide with the value date of a new FX spot transaction. This allows the trader to maintain their existing exposure to the currency pair while resetting the settlement date.

For example, suppose a trader has bought 1 million euros against US dollars in an FX spot transaction with a value date of two business days from today. If the trader wishes to extend the settlement date of this transaction, they could enter into an FX roll by simultaneously selling 1 million euros for US dollars with a value date that is two business days beyond the original value date. This would effectively cancel out the original transaction, while still allowing the trader to maintain their exposure to the euro-dollar exchange rate.

In the context of FX roll, the term "spot" refers to the settlement date of the original FX spot transaction. For example, if the original FX spot transaction had a value date of two business days from today, then the "spot" in the FX roll transaction would also be two business days from today. The value date of the new FX spot transaction in the FX roll would be the same as the new settlement date.

FX roll transactions are commonly used by institutional traders and corporations to manage their currency exposures and to optimize their cash flows. They are often executed through electronic trading platforms or over-the-counter (OTC) markets, with pricing based on the prevailing market exchange rates and interest rate differentials between the two currencies.

18. FX Roll - Forward

In an FX roll, the forward refers to the new settlement date of the rolled-over FX spot transaction. When a trader enters into an FX roll, they are essentially extending the settlement date of their existing FX spot transaction by simultaneously executing a new spot transaction with a later settlement date.

For example, suppose a trader has an existing FX spot transaction to buy 1 million euros against US dollars with a settlement date in two business days. If the trader wishes to extend the settlement date by another two business days, they could execute an FX roll by selling 1 million euros for US dollars with a settlement date four business days from today.

In this example, the forward in the FX roll would be four business days from today, representing the new settlement date for the rolled-over transaction. The spot in the FX roll would be the original settlement date of the first leg of the transaction, which in this case is two business days from today.

The pricing of an FX roll depends on the prevailing market exchange rates and the interest rate differentials between the two currencies involved in the trade. The trader will typically pay or receive a rollover interest rate to cover the cost of extending the settlement date of their original FX spot transaction.