In “Knowledge Center : Learning Derivatives - Session I”, we gave a brief introduction of derivative contracts. What are forward and future contracts? What is the difference between the two? How they can be used for hedging and speculative purposes? What are Call and Put Options and how they permit non-linear payoffs… and so on. In this session, we will dwell further into the functioning of Future contracts.

Future Contracts

A future contract is a standardized contract to buy or sell an underlying on a specified date for a pre-determined price and is traded on an exchange. The basic utility of the product is that it helps in managing the price risk of the underlying. Let us now understand the pay-off of future contracts.

Let us take an example of Reliance Industries, whose lot size is say 75 and the current market price is Rs 1200. Suppose Mr A is LONG 1 lot of Reliance Industries February Future at Rs 1220 (meaning that he has agreed to buy 75 shares of Reliance Industries on 26th Feb 2009 at a price of Rs 1220). On the other hand, Mr B is SHORT 1 lot of Reliance Industries February Future at Rs 1220 (meaning that he has agreed to sell 75 shares of Reliance Industries on the expiry date of 26th Feb 09 at a price of Rs 1220).

1. Payoff for Long position (Mr A): A has agreed to buy 75 shares of Reliance Industries on expiry at a rate of Rs 1220 per share. If on the expiry date, the actual price of Reliance Industries is Rs 1300, he can buy the shares at Rs 1220 and sell them at Rs 1300, thereby gaining Rs 80 per share (Total = 80 \times 75 = Rs 6000). If however, the price on expiry is Rs 1150, he will have to bear a loss of Rs 70 (Rs 1220 - Rs 1150) per share (Total = 70 \times 75 = Rs 5250)
2. **Payoff for Short position (Mr B):** B has agreed to sell 75 shares of Reliance Industries on expiry at a rate of Rs 1220 per share. If on the expiry date, the actual price of Reliance Industries is Rs 1300, he has to sell the shares at Rs 1220 but will have to buy the shares at Rs 1300, thereby making a loss of Rs 80 per share. If however, the price on expiry is Rs 1150, he will gain Rs 70 per share.

An important thing to note here is that all the transactions in stock and index futures are currently cash settled in India and hence no actual buying/selling of the underlying has to be done on expiry. Had it not been the case, it would have been quite difficult to give actual delivery where the underlying is an index number (say Nifty), as all the stocks in Nifty had to be delivered physically in the same proportion.

**Application of Future Contracts**

- **Speculation**
  - Bullish: Buy Future
  - Bearish: Sell Future
- **Hedging**
  - Have portfolio/security, Sell Index Futures
- **Arbitrage**
  - Will receive cash inflows later, Buy Futures now

**NSE maintains the value of a futures contract between Rs 2 lacs and Rs 4 lacs. Adjustments are made to lot sizes whenever the contract value goes out of this range.**

In case of Dow Futures, the contract size is $10 multiplied by the index level. At current level, the contract size is approximately equal to $125,000 i.e. around Rs 70 lacs!
1. **Speculation:** Future contracts are extremely attractive for speculators as they provide tremendous leverage. By paying a small margin amount, speculators can take higher exposure of the underlying, thereby increasing their reward potential as well as the risk. A person who is bullish on the price of the underlying can BUY a future contract while a person who is bearish would SELL the future contract.

   ![Leverage Illustration](image)

   The above images illustrate the use of leverage in normal life by which less effort is required to lift a weight. In Future contracts, leverage means that instead of paying the full amount to buy the underlying in the cash market, the same exposure can be taken by paying only a smaller margin amount. However, it must always be kept in mind that financial leverage also increases the risk significantly and must be used judiciously.

2. **Hedging:** Hedging is an act of protecting or guarding the investment against an undesired price movement. Suppose a long term investor owns a portfolio of stocks worth Rs 10 lacs. Although he is optimistic about the stocks he has in the portfolio, he is not very comfortable with the overall movement of the market. The price movement of a stock is dependent both on the micro (profitability of the company, its growth potential, business model, management competency etc) and the macro factors (GDP growth of the country, interest rates, overall state of economy etc). Such an investor can hedge his portfolio by selling Index Futures (like Nifty future) and thereby removing the risk of macro variables from his portfolio.

   Another way to hedge using future contracts is by buying the futures of an index/stock when the cash to buy the underlying would be available on a future date. Say a person is sure to receive cash inflows of Rs 5 lacs in 2 months’ time, which he wants to invest in stocks. However, he is very bullish on the markets and wants to invest as early as possible. What can he do? He can simply pay the margin amount and take the relevant LONG exposure in future contracts. This will hedge him from the risk of losing out on the profits if market were to go up in the next 2 months.

   It must be noted here that hedging does not necessarily mean reduced possibility of losses. Like the long term investor we discussed above might lose on both cash and futures positions if market moved up while his stocks fell!

3. **Arbitrage:** An arbitrageur gains by buying the stock and going short in its future contract when the price of the future contract is higher than its theoretical price. When the price of the future contract is less than what it should be, the arbitrageur gains by going long in the future contract and selling the underlying in cash market. In the next section, we see what is the theoretical price of a futures contract?
Pricing of Future Contracts

How is the theoretical price of a future contract determined? If the future is trading at a significant premium (price of future contract is higher than the price in spot market) does it mean that the stock price will definitely increase in the cash market?

Mathematically, the price of a future contract is calculated as under:

\[
\text{Future Price} = S \times e^{rT}
\]

where

- \( S \) = Spot price
- \( e \) = 2.7183
- \( r \) = Risk free interest rate
- \( T \) = Time to expiry

The formula explains that the theoretical price of the futures contract is nothing but the future value of the spot price continuously compounded at the risk free interest rate.

Let us take a hypothetical example with the following variables:

- Spot Price of Nifty = 5000
- Risk-free interest rate = 8%
- Time to expiry = 1 month

The theoretical price of Nifty future would be:

\[
5000 \times 2.7183^{(0.08 \times 0.0833)} = 5033
\]

As the expiry date comes near, the premium/discount reduce and on expiry both the spot and future prices converge. Hence, the theoretical price of a futures contract is dependent on the spot price, risk free interest rate and time to expiry. In reality, both the underlying and its future contract are traded in separate markets and the demand and supply in the respective markets lead to the price discovery. However, the process of arbitrage keeps both the prices move in tandem.

An important aspect in the pricing of future contracts is the impact of Dividends. A person having exposure in the futures contract is not the owner of the company (like a shareholder) and hence does not receive any dividend inflows. On the other hand, once a company declares dividend, the spot price falls to that extent on the ex-date. This known fall in the spot price due to dividend is beneficial for a person having short position in futures contract. Consequently, the price of a future contract adjusts itself for both the announced as well as anticipated dividend flow in the underlying security.

Chart showing price movement of SBI in cash and futures market

In the above chart, the blue line represents the cash market price of State Bank of India while the purple line is for the January futures. Observe how the process of arbitrage leads to the prices moving in tandem and how both the prices converge to 1099.25 on the expiry date.
Open Interest

Open Interest is the number of shares remaining outstanding in the future contract. For example, say on 27th Feb a new futures contract is introduced on the underlying scrip Larsen & Toubro for May expiry and the lot size is 400 shares. The first transaction takes place when Mr A buys 1 lot LT May future @ Rs 680/- and Mr B sells 1 lot at the same rate. Now the open interest is 400 shares (Mr A is long and Mr B is short). Next, Mr A sells 1 lot to Mr C @ Rs 700, thereby gaining Rs 20 per share. There is no change in the open interest as there has only been a change of hands and the outstanding exposure in future contract remains at 400 shares (Mr C is long 400 shares and Mr B is short 400 shares). Now, Mr D being bullish on the scrip buys 10 lots in futures at an average price of Rs 730. Mr C sells 5 lots and Mr E short sells 5 lots. Now what is the open interest? It is 10 lots, or 4000 shares (D is long 10 lots, B is short 1 lot, C is short 4 lots and E is short 5 lots). It is evident that for every long position there is a short position and vice-versa. Higher the amount of open interest, more is the leveraged exposure in the market.

<table>
<thead>
<tr>
<th>Sl</th>
<th>Transaction</th>
<th>Long Position (Lots)</th>
<th>Short Position (Lots)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A B C D E Total (OI)</td>
<td>A B C D E Total (OI)</td>
</tr>
<tr>
<td>1</td>
<td>A buys 1 lot, B sells</td>
<td>1 - - - 1</td>
<td>- 1 - - - 1</td>
</tr>
<tr>
<td>2</td>
<td>A sells 1 lot, C buys</td>
<td>0 - 1 - - 1</td>
<td>- 1 - - - 1</td>
</tr>
<tr>
<td>3</td>
<td>D buys 10 lots, E sells 5 lots and C books profit in 1 lot and short sells 4 lots</td>
<td>- - 0 10 - 10</td>
<td>- 1 4 - 5 10</td>
</tr>
</tbody>
</table>

Implications of change in Open Interest

A change in open interest gives valuable indications when considered along with the price movement.

<table>
<thead>
<tr>
<th>Open Interest</th>
<th>Price</th>
<th>Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases</td>
<td>Increases</td>
<td>Indicates fresh Long build up</td>
</tr>
<tr>
<td>Increases</td>
<td>Decreases</td>
<td>Indicates fresh Short build up</td>
</tr>
<tr>
<td>Decreases</td>
<td>Increases</td>
<td>Indicates short-covering</td>
</tr>
<tr>
<td>Decreases</td>
<td>Decreases</td>
<td>Indicates covering of long positions</td>
</tr>
</tbody>
</table>

Besides the change in open interest and the price action, volume also gives some indication about the future price action.
Margin Requirements

A strong risk management system is a pre-requisite for an efficient futures market. The exchange safeguards its interest by charging Initial margin from the clearing member who in turn collects it from the trading members. Clients are required to pay upfront margin in order to mitigate the default risk. NSCCL (Clearing Corporation of NSE) uses the SPAN (Standard Portfolio Analysis of Risk) system for the purpose of margining, which is a portfolio based system. Initial margin requirements are normally based on 99% value at risk over a one day time horizon. The settlement takes place on a daily basis and the profit/loss for each day is termed as Mark-To-Market margin.

The initial margin requirements are higher for the future contracts in which the volatility of the underlying is high and low for the contracts in which the price of the underlying is relatively stable. The margin requirements are continuously monitored and is done on-line, on an intra-day basis. When there is extreme price volatility, the initial margin requirement could be as high as 100%. It is very important to understand that higher margin requirement means that the system is safer and there is minimal default risk.

It is worth noting that Future contracts are leveraged instruments and must be used in a prudent manner. A “wrong use” of an instrument does not mean that it is a “wrong instrument”!!

The average SPAN margin requirement currently is around 12% for the future contracts available at National Stock Exchange and the range is between 7% and 33%. Generally, the margin requirements for index future is lower as they are less volatile than individual stocks.

FOR PRIVATE CIRCULATION ONLY

Disclaimer

The content discussed in this report are meant solely for educative purposes. Investors should use this content as one input to enhance their knowledge. This is not an offer (or solicitation of an offer) to buy/sell the securities/instruments mentioned or an official confirmation. Microsec Capital Limited is not responsible for any error or inaccuracy or for any losses suffered on account of information contained in this report. This report does not purport to be offer for purchase and sale of share/units. We and our affiliates, officers, directors, and employees, including persons involved in the preparation or issuance of this material may: (a) from time to time, have long or short positions in, and buy or sell the securities thereof, of company (ies) mentioned herein or (b) be engaged in any other transaction involving such securities and earn brokerage or other compensation discussed herein or act as advisor or lender or borrower to such company (ies) or have other potential conflict of interest with respect to any recommendation and related information and opinions. The same persons may have acted upon the information contained here. No part of this material may be duplicated in any form and/or redistributed without Microsec Capital Limited’ prior written consent.