

Chapter V

FUTURES

Introduction

A Futures contract is simply an agreement to give or take delivery of a specified quantity of a particular grade of a certain commodity at a definite location on a future date.

To be traded freely, a contract must be standardised so that only the price is negotiable. All commodity futures contracts traded on futures exchanges, for instance, are standardised with respect to quantity, grade, delivery month and place of delivery.

The evolution of standardised futures contracts was a result of the need to reduce the risk associated with perishable or seasonal commodities vulnerable to price fluctuations. The factor of time along with unpredictable market conditions relating to supply and demand create risk which may be unacceptable to the buyer or seller of a commodity. Standardised futures contracts have evolved as a vehicle which allows business risk to be transferred from producers and users of commodities to speculators who are prepared to bear this risk in anticipation of substantial profits.

Background History

The origin of commodity futures can be traced back to the previous century. In response to the risks which farmers and livestock owners faced owing to price fluctuations, Chicago Board of Trade was established. By 1865, the Board had established standards for contract size, quality and delivery and a set of trading rules. This year marked the arrival of futures trading in USA. Over the years, futures trading has grown in both diversity and volume. Besides commodity futures, we also have currency and interest rate futures. The Chicago Board of Trade is the world's largest and oldest futures exchange. A close second in terms of size and importance is the Chicago Mercantile Exchange. Other famous futures exchanges include the Coffee, Sugar and Cocoa Exchange, Commodity Exchange Inc. (COMEX), New York Cotton Exchange, New York Futures Exchange, New York Mercantile Exchange, Mid America Commodity Exchange (Mid Am), Kansas City Board of Trade, Minneapolis Grain Exchange and Philadelphia Board of Trade.

Difference between futures and forwards contracts

When a person places an order today for delivery of an item in the future on a specified date and at a predetermined price, it is nothing but a forward contract. A futures contract is essentially based on a similar principle but works in a slightly different way. In more than 95% of the contracts, no actual delivery takes place. Rather, the deal is canceled through an offsetting transaction. Thus, a farmer who sells wheat futures to protect

himself against a fall in price will buy back his futures on the day his wheat is ready for sale. He will then sell the wheat in the cash market. The reason for his doing so is that he might find it cumbersome to make the delivery as per the highly standardised terms and conditions of the futures contract. Even in the unlikely event of actual delivery, the supplier may be allowed to choose a different grade of the commodity or a different destination. In that case, the necessary adjustments are made to the settlement price.

Another important point to note is that in a futures contract, the exact time of delivery is usually not specified. Though a futures contract is identified by its delivery month, delivery can often be effected during the course of the month on specified days.

Modern Futures trading

To ensure that transactions are orderly, transparent and honest, modern futures exchanges operate as per well defined rules and regulations.

Exchanges specify the following :

- a) amount of asset to be delivered as per the contract
- b) how the price of the contract is to be quoted
- c) limits on the amounts by which prices can move on a single day
- d) quality (in case of a commodity)
- e) delivery location (in case of a commodity)

Exchanges also specify daily price movement limits and position limits. If the price moves down to the specified limit, it is said to be limit down. Similarly, if the price moves up to the defined upper limit, it is said to be limit up. Once the price limit is reached, trading usually stops for the day. However, in some cases, the exchange authorities may intervene and change the limits suitably. Exchanges also specify position limits which refer to the maximum number of contracts that a speculator might hold.

The Clearing House is an integral part of a futures exchange. All clearing house members are members of the exchange but not every exchange member is a member of the clearing house. The clearing house serves a number of important functions :

- i) exchange of funds as business transactions are executed.
- ii) settlement of all transactions
- iii) taking the opposite side of all the contracts traded on a day thus guaranteeing the contractual obligations of each transaction.

Exchanges stipulate minimum capital requirements for clearing house members. They also closely monitor the financial soundness of each clearing member. Different exchanges also share vital information with each other in order to minimise the possibility of default.

Any exchange member wishing to trade on the exchange must either be a clearing member or have a relationship with a clearing member. All trades must be registered with and settled through that clearing member.

At the end of each trading day, the clearing house becomes a seller to all the buyers and a buyer to all the sellers. When the trade is cleared, traders no longer have an obligation to the opposite party in the original transaction. This serves three vital functions. A trader liquidate his position through an offsetting transaction and he need not deal with the original trading partner who might not be agreeable to cancelling the contract at that point of time. A second reason is that delivery if at all it happens is much more easily facilitated when the clearing house is the counter party. Finally, if one party to a contract defaults for any reason, the fulfillment of the contracts ensured by the clearing house which assumes the role of the counter party.

In futures trading, the commission is charged only when a trader's position has been offset or liquidated. Thus, the commission represents payment for two transactions: entering the market and leaving the market.

There are two common forms of futures trading.

Position trading refers to attempts by traders to profit from longer term price movements by taking a position and then waiting for the market to move far enough to yield significant profits.

Day trading on the other hand attempts to capitalise on price movements that occur during the course of a trading day.

Margin money and Marking to Market

A futures contract is essentially an understanding that a transaction will take place later. Actual buying or selling of the underlying instrument does not take place till the settlement date. To guarantee that both parties abide by the terms of the contract, it is necessary they commit themselves financially. Initial margin which has a value of about 5-10% of the contract is the mechanism used to ensure that the contract will be honored. At the end of each trading day, the outstanding contracts are repriced on the basis of the settlement price prevailing. This is referred to as marking to market. The margin account is accordingly adjusted. Before the settlement date, the market may move adversely. To safeguard against the possibility of default owing to such movements, exchanges stipulate a maintenance margin which is the minimum amount that must be maintained in the margin account to hold a position. Once the account balance goes below the maintenance margin, a margin call is issued and the trader has to deposit enough money so that the amount in the margin account reaches the initial margin. This deposit amount is referred to as the variation margin. However, day trades, i.e., trades which will be closed by the end of the

day may not be subject to margin requirements. An investor can normally withdraw any balance in the margin account beyond the initial margin. Further, the amount in the margin account is not an idle balance as interest is usually paid. In some cases, the exchanges may also allow traders to deposit margin in the form of securities and shares rather than cash. While an investor has to deposit the initial margin with a broker, a clearing house member has to deposit a clearing margin with the clearing house. Each day, the account balance is adjusted to reflect the change in the number of outstanding contracts. Brokers who are not clearing house members have to maintain a margin account with a clearing member.

Contract months

For each underlying asset, there are several different contracts available, each designed by a certain month. The closest month is called the front or spot month and the months further away are called back months. In a normal commodity futures contract, the further a contract is from the spot month, the higher the price. Otherwise, it is called an inverted contract. The highest volume of trading occurs in the front months, creating maximum liquidity. For short term traders, the best month is thus the front month whereas for longer term position traders, the back months provide the appropriate trading opportunities.

With so many contracts available for the same underlying asset, the question naturally arises as to which contract is to be selected. Several factors influence this decision. Contrary to common perception, it may not be advisable to choose a contract whose delivery period coincides with the end of the period of the hedge. This is because, price fluctuations often tend to be the maximum during the delivery month. Also, in the case of a long position, holding futures during the delivery month is accompanied by the distinct possibility of having to take delivery. On the other hand, basis risk, which is the possibility of an adverse movement of the gap between futures and spot prices, often increases with the passage of time. Thus, it may be a good idea to choose a delivery month later than the point of time at which the hedge expires but as close to it as possible. This rule is however not sacrosanct. When liquidity becomes the critical parameter, it may be appropriate to use shorter maturity futures and keep rolling them forward till such time as necessary.

Relationship between futures and spot prices

As the delivery month approaches, the theoretical difference between futures and spot prices for the same asset has to be zero when the necessary adjustment is made for transaction costs. If this is not the case, arbitraging profits are possible. Suppose dollar futures are priced less than the spot dollar. A smart trader would then buy futures, hold till delivery and sell it in the spot market to book profits. Similarly, when the futures price is more than the spot price, a trader can go short on futures and effect delivery by buying it cheaper in the spot market. As mentioned earlier, the difference between spot and futures prices is called the basis. When the spot price rises faster than the corresponding futures

price, it is referred to as the strengthening of the basis. When the futures price goes up by more than the spot price, it is called weakening of the basis.

Types of Orders

Different types of instructions may be issued to brokers.

- a) **Market order** : This means an order to buy or sell at whatever price is being quoted in the pit of the exchange when the order instructions reach the pit.
- b) **Market not held order** : This means an instruction to the floor broker to use his or her discretion to get the best price.
- c) **Market on close order** : The broker is asked in this case to execute the order at the end of the trading day.
- d) **Market on the open order** : The broker is advised to execute the order at the beginning of the trading day.
- e) **Market if touched order** : In this case, the broker executes the order only when a particular price is reached.
- f) **Limit or price order** : This type of order is used when a trader enters the market at a particular price but will not accept a price that is worse than the designated price.
- g) **Stop order** : It is an order to buy if the price hits a specified level above the market or an order to sell if the price hits a specified level below the market.
- h) **Buy stop order** : This is an order to buy at a given price above the markets
- i) **Sell stop order** : This is a generic term applied to sell at a given price below the market.
- j) **Stop loss order** : This is a generic term applied to orders that are intended to limit losses.
- k) **Exchange for physical order** : Such an order implies the exchange of a futures position for a physical position. Essentially, the futures position is liquidated by taking/giving delivery outside the futures exchange. The concerned parties however are expected to notify the exchange.
- l) **Spread order** : Such an order involves two different contracts. Typically, one is sold and the other bought.

Hedging with currency futures

Hedging implies taking a position in the futures market that is opposite to the position held in the spot market. The basic hedging principles involved are fairly simple. If you own or buy a currency, you would sell futures. If exchange rates move adversely during the holding period, you lose in the spot market but gain in the futures market. Profits and losses tend to offset each other but not exactly as explained elsewhere. On the other hand, if the exchange rate movements are favourable, you gain in the spot market but lose in the futures market. Similarly, when one needs a currency, say after three months, one would go long in futures. This means that if the exchange rate moves adversely, he would make a loss in the spot market but a gain in the futures market where he would be buying low and selling high. On the other hand, in the event of a favourable exchange rate movement, he would book a gain in the spot market and a loss in the futures market. Hedging thus reduces the possibility of losses but also eliminates the chances of making windfall profits. This may be quite acceptable to a normal risk averse individual or corporate who feels that such potential windfall profits may not be worth the risk involved.

The difference between spot and futures prices for the same asset at any given point of time is known as the basis. For a hedge to work perfectly, the basis has to remain constant throughout the period of hedging. Because the basis is likely to change with time, the hedge will not be perfect. Even in the unlikely event of the basis remaining constant, the quantities associated with the standardised futures contracts will often not match exactly the exposure involved. Thus, hedging with futures rarely eliminates risk completely.

A Direct currency hedge involves the two currencies which are directly involved in the transaction. Thus, an Indian firm which has a dollar payable maturing after three months may buy dollar futures priced in terms of rupees or sell rupee futures priced in terms of dollars. If such futures are not available owing to the limited trading associated with the rupee, **cross hedging** may have to be used. Let us assume that the rupee and sterling movements are strongly interlinked. In that case, the firm can buy dollar futures priced in terms of sterlings or sell sterling futures priced in terms of dollars. For a cross hedge to be effective, the firm has to choose a contract on an underlying currency which is almost perfectly correlated with the exposure which is being hedged.

Speculation using futures

Speculators differ from hedgers in that their basic objective is to capitalise on the difference between their own forecasts and market expectations. When a speculator is betting on the price movement associated with a particular contract, it is called **open position**. When the speculator is trying to take advantage of movements in the price differential between two separate futures contracts, it is called **spread trading**. This type of trading can involve:

- i) the same currency but contracts of different maturities
- ii) two contracts of same maturity but different currencies
- iii) a combination of the above.

Interest Rate Futures

Interest rate futures involve an underlying debt instrument such as a treasury bill or a bond. These futures are used to minimise the risk associated with fluctuating interest rates. When we are net investors, we want to protect ourselves against a fall in interest rates and when we are net borrowers we want to be insured against a rise in interest rates.

A commonly used interest rate future is based on the US Treasury bill with a face value of \$ 1 million and maturity period of 90 days. The price of the future is calculated as $(100 - \text{Discount yield in \%})$. Suppose you are a net investor and buy the treasury bill future. If interest rates fall, you gain from the rise in futures prices. Similarly, if you are a net borrower, you would sell T bill futures. In this case, if interest rate rises, the futures price falls and you gain from the fall in price of the futures contracts.

Another commonly traded interest future has the three month Eurodollar deposit as the underlying instrument. The standard size is \$ 1 million and the futures price is calculated as $(100 - 3 \text{ month LIBOR in \%})$

Effective price using hedging

Let S_1 be the spot price at time t_1
 S_2 be the spot price at time t_2
 F_1 be the futures price at time t_1
 F_2 be the futures price at time t_2

Let $S_1 - F_1 = b_1$, basis risk at t_1
 $S_2 - F_2 = b_2$, basis risk at t_2

Suppose we hedge a receivable by going short in futures at time, t_1

Profits made in futures market by closing out position at time, $t_2 = F_1 - F_2$

(Of course, this represents a loss if $F_1 < F_2$)

Price paid for asset while selling in the spot market = S_2

Then, the effective price at which the asset is sold

$$\begin{aligned}
 &= S_2 + (F_1 - F_2) \\
 &= S_2 + F_1 - F_2 \\
 &= F_1 + (S_2 - F_2) \\
 &= F_1 + b_2
 \end{aligned}$$

Since b_2 is unknown, the futures transaction is exposed to basis risk. If $b_2 = b_1$ then the effective price at which the transaction takes place is $F_1 + S_1 - F_1 = S_1$. Thus, the risk is totally eliminated and the transaction takes place at today's spot price.

In the case of financial assets, the basis risk, which is primarily determined by interest rates, is usually small. However, for commodities such as oil, there could be imbalances between supply and demand. In addition, complications may arise out of difficulties in storing such items. As a result, the basis risk may be much higher.

Optimal Hedge Ratio

The hedge ratio is the ration of the value of the futures contract to that of the underlying position.

Let S_F = Change in spot price during the period of hedging
 F = Change in futures price during the period of hedging
 s_s = Standard deviation of S
 s_F = Standard deviation of F
 p = Coefficient of correlation between S and F
 h = Hedge ratio

Suppose hedging is done by selling futures.

Change in position owing to Spot market

fluctuation = S

Change in position owing to Futures market

fluctuation = hF

Net change in position during period of hedging = $S - hF$

Variance of net change in position, $V = \text{Var}(S - hF)$

$$\Rightarrow V = \text{Var}(S) + \text{Var}(hF)$$

$$- 2 \text{Cov}(s, hF)$$

$$\Rightarrow V = S^2 s + h^2 s^2 F^{-2} h p s S F$$

To find the optimum value of h at which the variance is minimised, we differentiate with respect to h and equate to zero.

$$\frac{dv}{dh} = 2hs_F^2 - 2p s_s s_F = 0$$

$$\Rightarrow h = p S_s / S_F$$

$$\frac{d^2V}{dh^2} = 2S_F^2, \text{ is always positive}$$

$\Rightarrow h = p s_s / S_F$ represents a minima, i.e., point at which variance or risk is minimised.

Thus the hedge ratio which minimises risk is $p S_s/S_F$ and may not necessarily be equal to 1 as is often assumed.