Commodity Derivatives and Risk Management
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Week-02
Lecture 09
Futures Contract (Different Types of Margins)

Welcome to the 9th lecture on Commodity Derivatives and Risk Management. And today we are going to discuss various types of margins which are applicable to a futures contract. But before we proceed with today's agenda of understanding different types of margins, let us understand or let us recapitulate what we discussed related to open interest with respect to futures contract. Now let us do a simple calculation to understand how exactly open interest is calculated and reported by commodity exchanges. Let us say a contract is starting on 1st May 2023 and this particular contract is going to expire on 20th October 2023. Let us say on the 1st May the day contract starts let us say at 9.30 AM a trader A took long futures position for 10 units and the counterparty is B who took short futures position for 10 units. In that case, please note that the total traded volume is going to be 10 units and the open interest is going to be 10 units. Let us say after 15 minutes another trader took 25 units of long futures position the counterparty is also the same trader who is B and took short futures position for 25 contracts and total traded volume is 35 and open interest also changes to 35. Now see throughout the day the same process will go on let us say by 3:50 PM Mr. A want to change or close it is open position. Earlier it had taken a long futures position, and it would be able to close or square up this position by taking a short futures position. Now if Mr. A want to take a short futures position then somebody must be taking a long futures position. Let us say the long futures position is also taken by a trader who had earlier taken a position. Please note that sometime earlier in the day Q had taken a short futures position for 27 units. So, now Q wants to square up and A also wants to square up and this Q and A become counterparty to each other. In that case, as you can see the total traded volume increases from 142 to 152, but please note that the open interest reduced from 142 to 132. And now let us come to the last trading of the day let us say Mr. C also wants to square up the position, but earlier he had taken 25 units of long futures position.

He does not want to square up fully he wants to close or square up by you know some partial number so that is the 15 units it wants to square up. So, who is going to be the counterparty? A new member joins the counterparty please note that D is the counterparty and D is not part of the earlier contracts. So, D takes long futures position, C takes short futures position and, in that case, total volume traded increased by 167 and open interest remained unchanged. So, as you can see throughout the day open interest

increases decreases so that is the reason why you can have the change in open interest can be positive, change in open interest can be 0 or change in open interest can be negative. However, open interest will always be positive, the lowest value of open interest can be 0, but open interest can never be negative. So, with this so let me summarize what exactly happened with respect to the trading position. A opened the contract and closed the contract throughout the day. So, A could be known as an intraday trader. Now similarly C partially closed the contract and by the end of the day had 10 long futures positions. Similarly, Q partially closed its position and has 17 long futures position and end of the day throughout the day or by end of the day the total open interest is going to be 132 contracts and total trading volume is going to be 167 contracts.

And number of trades, how many trades have happened, how many times the order matching between long futures position and short futures position will be known as your number of trades. So, the number of trades is 8 this is just the simple number calculation here. So, how many times people have taken buy position and a sell position and these 132 contracts you know is summarized in this panel below. So, as you can see the sum total of the open position by the long position holder is 132 similarly, the sum total of the position held by the short futures position is also 132. So, open interest at any given time will indicate how many long futures position or how many short futures position are available in the market for that particular contract and that particular expiry.

So, on 1st May 2023 the exchange will report at the end of the day that is 1st May 2023 expiry date is 20th October 2023 open high low close these are 4 different price points the exchange will inform to the people to the world in general that these are the price points at which different buy and sell has happened throughout the day and total traded volume is 162 and open interest is 132. As I mentioned open interest will always be positive or at best 0, but while change in open interest can be positive 0 or negative. Now what is the thumb rule related to the open interest calculation? The thumb rule is if two if new members take position open interest will increase let me repeat if new members take position open interest will increase and if existing members square up with new members open interest will remain unchanged and if existing members square up with each other open interest will reduce. And open interest conveys a very important information regarding a particular futures contract higher the open interest higher is the liquidity I have just taken some example let us say on a trade date that is 1st May 2023 the expiry date two futures contract, one contract is expiring on 20th October, the next contract is expiring on 20th November 21st November and for the first contract the open interest is 15,664 while the open interest for the second contract is 960. So, as you can see the first contract will be treated as a more liquid contract because many traders will be able to enter and exit this contract with much more ease than the October than the November maturity contract.

So, in that sense, the October contract will be treated as a more liquid contract as compared to the November expiry contract. Now coming to the next concept which is our understanding related to daily settlement price. Daily settlement price is also known as the closing price. Please note that on a daily basis, exchanges will inform the details which is given in this particular table to the world at large. So this is our trade date, let us say on 3rd October for 18th April 2023 a turmeric contract opened at 7300 throughout the day it went up to 7484 as the high price low price and close price and volume is your traded volume open interest is 55 we just now discussed how open interest is calculated.

Now with respect to the closing price I would like to mention here that the closing price is not the last traded price, the closing price is different than the last traded price. Basically, closing price is a volume weighted average price of all trades that had been done during the last half an hour of the trading day. So let us say the exchange closes at 5 o'clock from 4.30 till 5 o'clock whatever number of contracts have been traded based on the volume weighted average price the exchange is going to close. So, calculate and inform what is going to be the closing price and at times if enough number of trades during the last half an hour is less than trade then the daily settlement price will be based on the volume weighted average price of the last 10 trades executed during the day.

Now what is the importance of this daily settlement price? In fact, this is a very important aspect of futures trading. One of the important requirements of daily settlement price is that we calculate, or exchanges calculate daily price limit based on the closing price that is based on the previous closing price. Let us say on the 3rd of October the closing price is 7394. Now the exchange let us say has informed that the daily price limit is going to be plus minus 5 percent of for the turmeric futures. So, what that plus minus 5 percent means that next day which is our 4th October 2022 the price limit is going to be plus minus 5 percent of 7394 which is the closing price of the 3rd of October 2022 closing price.

So, this plus minus 5 percent gives a range. So, on 4th October long and short futures holders can buy and sell futures within this price limit only. So, nobody will be able to buy or sell contract below 7200 and nobody will be able to buy or sell futures contract above 7764 on 4th October 2022. And what is the relevance of a daily price limit and why do exchanges set this daily price limit? This daily price limit protects investors from sudden and extreme price movement. So, this kind of acts as a barrier price will not be allowed to fall below 5 percent or price will not be allowed to go above 5 percent.

So, if on a given day the price touches the upper and lower limit the trading is halted for some time to allow the market to cool off. So, this is popularly known as a circuit break or circuit filter. So, exchanges normally inform the time let us say on 4th October if price touches 7764, the exchange will stop trading for this Turmeric Futures contract for some

time. So, the time duration of the trading halt is again given by the regulator. In this case, SEBI (Security Exchange Board of India) prescribes the trading halt period if the contract touches the higher limit or the lower limit. With this let us come to today's agenda which is understanding different types of margin and most importantly we will understand how exchanges set initial margin. Please note that the exchange requires traders to pay different types of margin. So, one of the most important margin exchanges that require short futures and long futures holders to pay is the initial margin. Now when a trader takes a long or short futures position in futures contract, the trader pays the initial margin, and this initial margin amount is margin percent into number of contract into price for contract. Please note that the number of contracts is the choice of a short or long futures position holder, price is also the choice of a long or short futures position holder that how much he or she is willing to pay to enter into long or short futures contract.

Now the margin percent is fixed by the exchange as you can see this is again a snapshot, I have taken from the NCDEX website. So, the contracts different contracts so you have underlying as turmeric you have underlying as Bajra, Guar seed, jeera etcetera. So, on a given date that is 15th May 2023 for turmeric let us say you have may contract, may maturity June, August and October maturity and as you can see the exchange has set or informed the traders a different initial margin. So, now the question comes how exchanges go about deciding the initial margin and this clearing house collects the margins from the trading member in the form of cash fixed deposit and bank guarantee. Suppose anybody wants to enter into let us say turmeric contract on 20th June 2023.

So, if the trader is interested to take 5 contracts 5 contracts into the price for contract into 16.9 percent is going to be the initial margin which the trader has to give it to its broker and broker in turn will be depositing the same amount to the clearing house associated with the exchange. Now the question one may raise does initial margin vary from commodity, commodity to commodity and contract to contract for a given commodity the answer is yes and this is very clearly visible here for turmeric contract for different maturity the initial margins is varying of course, from commodity to commodity the initial margin is also varying. Now how exchanges go about setting the initial margin initial margin is set by the exchanges based on value at risk methodology. So, VAR measures the potential loss of an asset or a portfolio of asset over a given time horizon for a given level of confidence. So, this is the definition of value at risk. So, let me repeat VAR measures the potential loss of a asset or a portfolio of asset over a given time horizon for a given level of confidence and this block which I have taken from the NCDEX website which mentions that the exchange uses 99 percent VAR and the you know period of risk is 3 days. So, here as you can see in this case the exchange uses a level of confidence of 99 percent and time horizon is for 3 days. Now what exactly this VAR will be calculated? So, annualized volatility of the return of the futures contract adjusted for the given time horizon please note that the given time horizon is 3 days. So,

we will be finding out the volatility of the futures contract and this volatility over this 3-day period into the standard normal value for the given confidence level.

So, we will take some numerical examples to understand what is the meaning of this standard normal value for a given confidence-level. Now let us come to understand how exactly the annualized volatility of a futures contract based on its return series is calculated. This particular formula which I have again taken from the multi commodity exchange. So, this AAV stands for your annualized volatility. So, this is multiplied 100 into square root of 252 by D, D is your number of days, and you have this LN PT by PT minus 1 is the future price of today divided by future price of yesterday the square of natural logarithm of PT by PT minus 1 square of this return series and this basically this formula is used to calculate the annualized volatility.

Now I have taken some random examples to calculate the annualized volatility. So, I have taken some this 4 price series for 15 days M1, M2, M3, M4 and as you can see M1 or M1, M2, M3, M4 are the closing price for let us say 4 different commodities. As you can see the closing price for M1 is very volatile it is going up and going down and M2 and M3 basically they are mirror images as you can see this you can see also from the data points, the M2 is starting at 2420 and the M3 is closing at 2420. So, I have just reversed the number between M2 and M3 and M4 is again the price associated with another commodity which is showing very little volatility or very little fluctuation. So, based on this formula as you can see the volatility associated with M1 is very high, that is your 58.383 percent. Please note that the calculation related to the annualized volatility will be available. This is a link file excel file is available I will be providing this Excel file as part of this NPTEL program. So, you have for M2 you M2 and M3 because these are the same data points basically the order has been reversed the annualized volatility remains the constant which is 19.98 percent and M4 exhibits the lowest amount of volatility which is 4.85 percent. So, why did I show 4 different combinations just to show that the volatility numbers will be varying depending upon how the underlying future price moves over a period of time. Now coming to a numerical example how a exchange will be calculating the value at risk. Let us say on 1st May 2023 based on the annualized standard deviation or annualized volatility of 28.35 per cent for cotton futures, we have to find out the VAR for 99 per cent 3 day and please note that the number of trading days in a year is 252. Traders do not offer trading contracts for Saturday and Sunday hence we have 252 is the number of trades in a given year. So, annualized volatility is 28.35 percent, volatility for the VAR horizon 3-day volatility is going to be 28.35 percent into square root of 3 divided by 252. So, this is very intuitively easy to understand, the volatility is 28.85 percent for 252 days and for over 3 days it is going to be 3.093 percent. Now we have to also find out the confidence interval for the 99 percent and this particular data we collect from the standard normal table and this standard name normal table values shows the 2.33. I am sure all of you must have used the concept of the standard

normal table at some point in time in your basic statistics course. So, if you have not done, I would like to urge each of you to understand what is the relevance of standard normal distribution table and how one would be using this particular table.

So, basically how we are getting this 2.33 as you can see this is a 0.9901. Our requirement is to find out the z value. Please note that this x axis is the z value, and you have a y axis is your probability cumulative distribution function of any particular normal distribution and we want to find out the 99 percent area. So, in this you will be able to we will be able to find out that the corresponding z value is 2.

33. So, now we have a daily volatility is 3.09 percent and we have the corresponding standard deviation standard normal value coming to your 2.33 percent. So, where margin for cotton future is going to be 7.21 percent. So, the exchange will be informing to the traders that if somebody wants to take cotton futures contract of course, some expiry cotton futures contract that particular party has to give a open initial margin of 7.21 percent. Of course, exchanges may increase this particular number depending upon whether exchanges are risk averse. So, to be on the safer side the exchange may inform a little higher rate than the initial margin. So, as I had already reported, this particular table. So, on spot date of 15th May 2023, turmeric contracts maturing on 18th May 20th June 18th August 20th October have different kind of initial margin and the same process as you can see that this process has must have been followed by the exchange to arrive at this initial margin numbers. Now, coming to the other aspects of exchanges, not only inform exchanges not only collect initial margin from the long and short futures position holder exchanges also collect many other margins. So, this particular table which I have taken from the MCX India website. So, as you can see the exchanges take an initial margin, they also take an additional margin for both long and short, they also take special margins for long and short and also, they have something called an ELM, that is an extreme loss margin. So, let us understand what you mean by extreme loss margin. This extreme loss margin covers the losses that could occur outside the cover of buyer margin. So, if the exchange has announced that the initial margin is going to be 7.5 percent and it has gone ahead and collected 7.5 percent and subsequently this particular futures contract exhibits a very high amount of volatility. So, exchanges levy extreme loss margin at that point in time. So, this extreme loss margin is applicable to both long and short futures position. Similarly, additional margin now if the future price becomes more volatile exchanges may levy additional margin again both long and short side of the business, but interestingly the special margin is always levied either on the long position holder or the short position holder. Let us say the price is increasing, the future price is increasing significantly, maybe every day it is touching the daily price limit. So, exchanges may set a higher margin that is exchanges may levy special margin only for long future position holder. There will be no margin for the short futures position holder, margins will be applicable to only long futures position holder. Similarly, if the price is continuously

going down and maybe touching the daily price lower limit in that case the exchangesmay may levy a special margin only for the short futures position holder. So, exchanges keep that freedom to levy different kinds of margins for different futures contract depending upon their understanding whether the market is becoming more volatile or less volatile.

As you can see for some contracts you have additional margin, you have additional short margin, additional long and short margin is there. There is no special long or special short margin at this point in time when I had taken the snapshot of this particular table from the MCX website. And for all contracts across this series, you have an extreme loss margin of 1.25 percent. In addition to these margins exchanges also sometimes take delivery period margin.

So, please note that the 4 to 5 days before a contract expiry the contract enters into a delivery period. So, the contract entering into a delivery period means if anybody is holding a short futures position by that time that party has to deliver the underlying. Similarly, if anybody whoever is holding the long futures position when the contract enters into the delivery period that particular party has to take delivery of the underlying contracts. So, at that point in time exchangeslevy some other margin which is known as your delivery period margin. Now please look at this particular table which again I have taken from the MCX India website.

Please note that the long and short futures positions have to pay margin to the trading members of brokers. They do not pay any margin directly to the exchange. Exchange collects the margin from the trading member and the brokers and trading member and brokers in turn will be depositing the margin which they have collected from the clients means those who are taking long, and short futures position they will be depositing to the clearing house. Basically, clients will be paying money to the trading members of brokers and brokers in turn will be depositing themargin different type of margin to the exchange clearing house. And as you can see this table indicates schedule for collection of margin by members from their clients.

So, exchanges also regulate this activity by requiring their trading members to collect the margin from the clients as per the SEBI guideline. So, the initial margin has to be collected upfront, extreme loss margin has to be collected upfront, other margins like additional margins, special margin, tender period margin, delivery period margin all these have to be calculate collected within t plus 2 days. And the most important aspect of the margin calculation which is known as your daily mark to market margin which is basically the essence of the futures contract that we will be discussing in the next session. So, with this we will end our today's lecture session which is predominantly focusing on understanding how open interest is calculated, what is the relevance of daily price limit and how daily price limit is calculated and different types of margins set by the

exchanges. And in the next session we will be discussing more on mark to market margin. With this we will end our session for today and as usual I eagerly look forward to interacting with all of you in the next session. Thank you.