Commodity Derivatives and Risk Management
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Week-05
Lecture 24
Introduction to Commodity options (Contd.), Hedgers Vs. Speculators

Welcome to Commodity Derivatives and Risk Management. This is the 24th lecture and today we are going to discuss various aspects of commodity options and in addition to that we will also discuss the role of hedgers and speculators and how these two categories of investors or traders use commodity options. And please note that this is a continuation of the previous session where we had discussed various aspects of the commodity option. Now, let us just recapitulate what did we discussed in the previous session. As you recall that we had a company which is a branded atta manufacturer and this particular company fears that the wheat price is going to go up and it wishes to buy wheat which is about 130 tons of wheat let us say after 36 days and its fear that price is going to go up. Now, to mitigate that price risk it enters into a long call position and at an exercise price of 23 rupees a kg and as part of the long call position it pays a premium of 2 rupees to the counterparty. Now, let us move to day 36. Now, on day 36 this particular branded at a manufacturing company will exercise the option if the prevailing spot price on day 36 is higher than 23 rupees because in the market if the price is more than 23 rupees it will not go and buy wheat from the market it has an option to exercise and it will exercise the option and go and reach to the counterparty and say that I am going to buy wheat from you at a 23 rupees a kg. Now, coming to the next interesting aspect or important aspect is the breakeven spot price. This breakeven spot price on the expiry date is going to be 25 rupees. Why are we calling this a breakeven point? Please note that the moment price is 25 rupees in the in the spot market price is 25 rupees the long call option holder will exercise the option and buy wheat at 23 rupees. So, by doing so, it will be benefiting 2 rupees as a profit, but please recall that it had already paid a premium of 2 rupees. So, whatever profit it is going to get from exercise the option is exactly the same as the premium it paid. So, it is going to be in a no loss no profit situation at a price of 25 rupees and this particular company will benefit from the option when the spot price is higher than 25 rupees. So, any price higher than 25 rupees is going to be beneficial for the branded at a manufacturer. Exactly in the same manner we had also discussed about another company which happens to be a potato wholesaler. So, what is the potato wholesaler fear? The fear is that potato price may go down it is already bought the potato storing the potato and it now wants to sell it. But if price goes down it will be benefiting, or its margin is going to go down. So, to mitigate this risk it will enter into a long-put option and as we had discussed let us say it had entered into a long-put option at an exercise price of 19 rupees and time to maturity is 27 days and for buying this put option

it had paid a premium of 3 rupees a kg. Now, on day 27th, it will exercise the option if the prevailing spot price is less than 19 rupees. So, let us say in the spot market potato price is 15 rupees. So, why should it go and sell potatoes at 15 rupees when he has the option to sell it to somebody at 19 rupees. So, obviously, it will exercise the option. Now in a similar line as that of the previous case the breakeven spot price is going to be 16 rupees. How exactly the 16 rupees is going to arrive? Please note that this particular party will definitely exercise its option when the price is 16 rupees because in the spot market price is 16 by exercising the option it will be able to sell potato at 19 rupees a kg. That means, it will make a profit of 3 rupees a kg by exercising the option, but please recall that it had paid 3 rupees premium beforehand. Hence it will be a 0 profit 0 gain situation at a price of 16 rupees. Hence, we call these 16 rupees a breakeven spot price for the long-put position holder. And please note that this particular party will start benefiting from the option when the option price on the expiry is less than 16 rupees. Let us say there is a bumper production of the potato and potato price crashes to let us say 6 rupees a kg. So, without this particular option this particular party would be forced to sell potatoes at let us say 6 rupees a kg, but with the option this party will be able to sell it at 19 rupees a kg benefiting 13 rupees a kg. However, after adjusting for the premium of 3 rupees the net benefit is going to be 10 rupees a kg. And this particular these two diagrams show the shows the payoff diagram for the call and put option. As you can see the benefit and cost associated with the option for long call long put short call short put is mentioned here. And as you can see here in case of a long call this long call party will exercise at any price higher than 23 but will be at a 0 profit 0 loss situation at 25 rupees. Any price higher than this this long call position will benefit from the option holder option position. Similarly, let us go to the other you know other counter party point of view that is your long-put position holder. Please note that the any price less than 19 rupees the party will be the long-put position holder will be exercising the option. And any price less than 16 he will be in a positive or beneficial situation. As we had mentioned in the previous session let us say price falls to 11 rupees this particular party will be selling potato at 19 rupees benefiting 8 rupees a kg, but it had paid an option premium of 3 rupees. So, the net benefit is going to be 5 rupees a kg. So, this is how the long call and long put option position holders are able to mitigate the risk and finalize or benefit from the option as a you know risk mitigation mechanism. Now let us come to understand how you know options help these two parties or what is the relationship between options and hedging. Please note that the brand at a manufacturer which was fearing that wheat price is going to go up it enters into a long call option at 23 rupees a kg and paid 2 rupees a premium. In fact, by doing so, it has fixed the maximum purchase price of wheat which is 23 rupees a kg. Irrespective of whatever happens to the wheat price in the market it will be able to buy wheat at 23 rupees. How if the actual market price is 23 rupees it will exercise the option and buy the wheat at 23 rupees.

If the actual market price is less than 23 rupees it will forgo the option and it will go and buy the wheat from the open market at the prevailing market price. So, as you can see from these two situations, at no point it will be paying more than 23 rupees to buy a kg of wheat. So, the maximum purchase price for the wheat will be 23 rupees. Of course, with the you know option it has already paid 2 rupees as the option premium. So, the maximum outgo for the purchase of wheat will be 25 rupees. So, 23 rupees of maximum purchase price plus 2 rupees of option premium. So, its maximum outgo for purchase of wheat will be 24 25 rupees, it cannot be more than that. Similarly, let us come to the other situation where the potato wholesaler fears that the price is going to go down and it has entered into a long-put option at 19 rupees a kg and it has paid a premium of 16 rupees a kg sorry it has paid a premium of 3 rupees a kg. Now, please note that by entering into a long-put position it has set the minimum floor price for selling potato at 19 rupees a kg. Irrespective of what happens to the market it will be able to sell potatoes at 19 rupees a kg. As I had mentioned couple of minutes ago let us see the actual market price is 6 rupees bumper production lot of potato is available market price crashes and potato is selling at 6 rupees a kg. In that case the party will exercise the option this whole seller will exercise the option and sell potato to the counter party at 19 rupees a kg. If the contrary happens let us say the price in the open market comes to 23 rupees. So, obviously, it will not exercise the option it will go and sell the potato at the open market at the market price. In any case it will be selling potatoes at 19 rupees a kg and by doing so, it has set the minimum floor price for selling potatoes. Of course, it has already paid a premium of 3 rupees. So, the lowest price it is going to receive for selling potato is going to be 16 rupees a kg. Hence by entering into a long call and long put position both parties have been able to mitigate the price risk. So, this is an example of how hedgers will be using options to mitigate the price risk. Now coming to the counter parties who have entered into a short call and short put position as part of the discussion.

Now please recall that wheat cooperative and grocery value chain companies' grocery and vegetable chain company had entered into short call and short put positions respectively. When the branded atta manufacturer entered into long call wheat cooperative took a short call position, when the potato wholesaler took a short put position grocery and vegetable chain took a long. Now, let us analyze the positions taken by the counterparties which are wheat cooperative and the grocery and vegetable chain. Please recall that when the branded at a manufacturer company took a long call position wheat cooperative took a short call position. Similarly, when the wholesaler potato wholesaler was taking a long-put position grocery and vegetable chain took a short put position.

Now, have these two companies been able to mitigate the price risk by taking short call and short put position the answer to this question is no. Please note that the wheat cooperative which owns wheat should fear price decline and to mitigate this price, it

should enter into a long-put position. In comparison, it has taken a short call position. Now coming to the grocery and vegetable chain which sells potatoes, you should fear that price increase is a risk for it because it will be buying potato at a higher price. So, an increase in the purchase price of potatoes will lead to the decline in its profit.

Hence, it should enter into long call position on a potato. However, what has it taken instead of taking a long call position it has taken a short put position. Now, even though these two companies have entered into option contracts they are not hedgers. So, this is the very important or very interesting aspect of hedgers versus speculators. Please note that these two parties have entered into short call and short put positions respectively, but they are not hedgers they are speculators.

Now, to summarize, a hedger can take only long call or long put position. Parties which enter into short call or short put positions are default speculators. Of course, a speculator can take long call long put position as well. In fact, speculators can take long call long put short call short put any combination or any kind of option they can take, but by default a hedger will be taking long call and a long-put position and anybody who is taking a short call or short put positions are speculators. Now, coming to the another very important aspect related to options is the concept of moneyness. So, what do we mean by the concept of moneyness? Please note that the option can be in the money, at the money or out of money option. In the money, at the money and out of money options are popularly represented as ITM, ATM and OTM. So, what do we mean by in the money option? In the money option is an option which is beneficial for the long position holder to exercise the option. And what do you mean by out of money option? It is not beneficial to exercise. Let us look at this particular table to understand the difference between in the money, at the money and out of money options.

So, in case of a call which is of European nature, please note that in case of a call when a long call position holder will exercise the option. Please note that it will exercise the option when the spot price is greater than the strike price. So, ST represents the spot price prevailing on the expiry date, contract expiry date. So, if spot price ST is greater than X, obviously, it will be very happy to buy the underlying at X when the same thing is selling at a much higher price in the market. So, from a call point of view when ST is greater than X, it will be known as a in the money option. Similarly, from a put point of view a person who has taken a long-put position when it will be an in the money option when ST is less than X, why so? In the market something is selling at a lower price than the exercise price and by entering the long-put position this particular party will be able to sell the underlying at a much higher price, which is at X. So, it will be a beneficial situation for the long-put holder. So, when ST is greater than X, we call it a in the money option for a call option. When ST is less than X, it will be in the money option for a put option. Similarly, the logic is same only thing we are changing is the denomination of the T. ST stands for the price prevailing on the day the long call person is exercising the

option. Please note that in case of an American option the long call and long put party are free to exercise the option on any day. So, where the day it will be a in the money when it is ST is greater than X. Similarly, at the money option will be ST is equal to X and out of money option will be exactly the reverse situation when the spot price is less than X for the call option or spot price is greater than the exercise price for the put option. Now, it is very important to note that buyers and sellers negotiate the call or put premium to be paid and received. When we are talking about you know trading of options, so what gets traded in the market is the call premium and put premium. Just to give a perspective in case of a future and forward contract, buyers and sellers negotiate the price at which the underlying will be bought and sold which is equivalent to the strike price in case of an options. But it is important to note here that when buyers and sellers go to an exchange platform, they do not negotiate the strike price. What they negotiate is the call premium or the put premium. Given the strike price, what should be the call premium and what should be the put premium and please note that everything else remaining constant American option premium will always be higher than the European option premium.

Why the option sellers have more risk in case of an American option? Because the option buyers can exercise their rights any day up to the maturity. In contrast, in case of a European option, the long call or long put position holder will be able to exercise only on the expiry date. But in case of an American option, the long call and long put position holder will be able to exercise any day up to the maturity. So obviously, by becoming a counterparty to an American option, by becoming a counterparty to long call or long put American option, the option sellers are taking a greater amount of risk. Hence, they demand a higher premium. Now coming to the factors which influence option premium, what we just now discussed is that what gets traded or what gets negotiated between long call, short call, long put short put position holder is the option premium. So, now the question comes what factors influence option premium. Please note that call and put premium is a function of spot price or the underlying asset price, strike price, time to maturity, underlying asset volatility and interest rate. So, these are the five factors which influence the option premium. This particular table shows the relationship or influence of these five factors on the call premium or put premium.

Let us compare the two options. Let us say everything else remains constant, the option with a higher spot price will be having a higher call premium and a lower put premium. So, what do we mean by that? Let us say, we have two options to buy at our disposal and we have to find out what is going to be the premium for both options. So, everything else remaining constant, higher the underlying asset price or the spot price will lead to the higher call premium and lower put premium. Why will this show? Let us understand intuitively. Let us see in this particular table when a long call position holder is exercising what is the benefit it is going to get? It is going to get S_T -X. The fact that long call is exercising means spot price will be higher than the exercise price. Similarly, when a

long-put position holder will be exercising when the exercise price is greater than the spot price. As you can see that call will be more valuable if S_T is more than the x. So, as you can see, the higher the spot price, higher is going to be the call premium and lesser is going to be the put premium. In fact, from these two equation S_T-X, so higher S_T, higher is going to be the call value, X-S_T, so higher is your spot price, lesser is going to be your call premium. Similarly, higher strike price, if the strike price is higher, you will have a lower call premium and as you can see intuitively, it will have a higher put premium. Now coming to the underlying asset volatility. In fact, if a particular asset is more volatile means the price of this particular asset is fluctuating very much, then that particular asset will be having a higher call premium as well as a put premium. Why so? Please note that the higher underlying asset volatility increases the risk for the short call or short put position holder, and they would like to be compensated with the higher premium. So, higher risk is higher volatility leads to higher risk for the short call or short put position holder and they would be demanding a higher premium. Hence the higher the volatility your call premium will increase as well as put premium will also increase. The longer time to maturity or longer time to expiration as also intuitively one can understand, longer the time to you know longer the time to expiry call premium will also be higher and put premium is also going to be higher. And with higher interest rates the call premium is going to be higher and the put premium is going to be lower. The logic for the impact of interest rate on call and put premium will be little complex. I would want all of you to those who want to know why this particular relationship holds true, I would appreciate all of you to read a book by Hull Basu that is futures options derivative by John C Hull and Sankarshan Basu to understand more about the impact of interest rate on option premium. Now, let us come to some real-life use of options. Do people really take certain initiatives or activities where we use options knowingly or unknowingly? Let us take some examples. Let us say all insurance contracts are option contracts. How so, let us understand this. Buyers of insurance products pay insurance premium and take long position and insurance companies take short position. Let us take an example of a life insurance product, for example, a term life product. And in the case of a life insurance individual pays premium all of us know when we are buying any insurance product, we pay premium. And in the case of life insurance the underlying asset is the person's life and if the person is no more the life value comes to 0 and insurance company pays the sum assured. In fact, by paying the premium the individuals have taken a long-put option and the person's family benefits when the life value declines in case of a death in fact, the life value becomes 0. So, as you can see in a purchase of an insurance contract is an example of a put option and the buyer of the insurance product like people like you and me are they take long put position and the counter party which is your insurance company takes a short put position. Similarly, another example with respect to option is minimum support price announced by the government of India. In fact, as you know every year government of India announces minimum support price for farmers and as

part of this minimum support price program government of India stands guaranteed to buy a Greek product at a preannounced minimum support price and farmers have the right to exercise. Now, if the farmer gets a better price somewhere in the spot market or anywhere, they forgo the option otherwise they sell the underlying at MSP to the government of India and by doing so, farmers have taken a long-put position, they have the right to sell the underlying at an MSP to government of India. When farmers have taken a long-put position the government of India takes a short put position.

Now, one may ask what the premium is paid by farmers in case of a life insurance product the individual buys the insurance product and pays an insurance premium, but in case of a you know MSP the farmers do not pay any explicit premium. In fact, I am sure all of you will agree with me that just being a farmer is the premium paid by the farmer. I am sure all of you will also agree with me that we can barely stand outside for half an hour in a temperature of 30-35 degrees, but farmers stand daily in the unlimited amount of physical hardship they take to do farming. So, just being a farmer is the premium paid by the farmers. Now, coming to the third example, investing in a share of a company, many of us invest in shares of a company we buy and sell shares of the company and when we buy shares of the company, we take a long call option position. And why are we saying it is a long call option position please note that my maximum loss is limited to the share price. If the company vanishes or the company becomes bankrupt the maximum loss I am going to incur as an investor of a share is the price which I have paid to buy the share, but I have an upside potential which is an unlimited upside potential. If the company does well, I will end up getting a good significant amount of return. As you can see, this relates to the long call position which we have discussed. Long call positions have a limited downside risk and unlimited upside potential. So, I am sure you will be able to recollect the diagram related to the long call position holder and relate the same to investment in a share of a company. With this, we end today's session we will be continuing with the pricing and valuation of option premium in the next session. So, thank all of you and I look forward to interacting with all of you in the next session.