Commodity Derivatives and Risk Management
Prof. Prabina Rajib
Vinod Gupta School of Management
Indian Institute of Technology, Kharagpur
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Lecture 35
Crush Spread Futures, Salmon Futures, Agri Commodity Risk Management Practices

Welcome to the 35th lecture on Commodity Derivatives and Risk Management. And today we will be continuing with the discussion related to crush spread margin as well as we will also be discussing very interesting aspect which is on a Salmon future. And in addition to these two topics, we will also be discussing risk management practice followed by a company. And let us go to the discussion on the crush spread futures contract. And this aspect we have also discussed in the previous session. So, crush spread is nothing, but the price of output minus the price of the input. In this case output price is your price of soya meal and soya oil and price of input is your soya meal. And when the spread narrows when the price of output will increase at a slower rate as compared to the input price or vice versa that is price of output falls at a faster rate as compared to the input price. And this narrowing of the crush spread is the risk faced by a standalone crusher. The crusher basically buys soya beans, crushes it and sells the soya oil and soya meal. So, the price movement of these three commodities is going to decide how much profit this particular standalone crusher or refiner is going to get. And depending on the fear of the crusher this crusher can take huge of the futures contract on the crush spread which is available at Chicago Mercantile Exchange. And using this futures contract this particular crusher can mitigate the risk. So, like any futures contract crush spread futures contract will have a short futures position as well as a long futures position. So, what do you mean by a short futures position? In the case of a short futures position a trader would take a short futures position on the output, that is your oil and the meal futures and simultaneously take long futures position in the soya bean futures contract. And the counter party who would take a long futures position on this crush spread we will be taking long futures position on the output oil and meal futures and simultaneously take a short futures position on soya bean. And this long futures position is also known as a reverse crush spread. So, as just discussed couple of minutes ago a standalone soya bean oil refiner fears the narrowing of the crush spread. And if the narrowing of the crush spread happens then this particular refiner is going to generate or get less profit. And that risk this particular refiner will be able to mitigate by entering into short futures position on the crush spread and the counter party will be taking long position. And in reality, if the refiner fear comes true and crush spread really declines it benefits from the short

futures position. Now let us summarize how different members of a soya bean, soya oil and soya meal value chain partners will be able to mitigate the risk. And this word soya complex relates to the price of all these three commodities. So, please note that the farmers and producers will always be long on soya bean, and they will be able to mitigate the risk by entering into short futures position on soya bean. Similarly bulk buyer of soya oil let us say any packaged soya oil selling company will always be short on soya oil and it will be able to mitigate the risk by entering into long futures position on soya oil. Let us say another example of another company which derives its in a business from the soya complex that is bulk buyer of soya meal which is the animal feed manufacturing company will always be again short on soya meal it will be able to mitigate the same risk by entering into long futures on soya meal. Different traders, wholesalers of soya bean, soya oil and soya meal can either be long or short depending upon their inventory position this aspect also we have discussed in the previous session. So, depending upon the inventory situation they will be entering either the long futures or short futures on soya bean, soya oil or soya meal depending upon whichever commodity they are acting as a trader or a wholesaler. And just now we have discussed a standalone crusher of soya bean will always be long on soya oil and soya meal and short on soya bean and will be able to mitigate the risk by entering into short futures on a crush spread. Now the question one may ask who will take long futures position on a crush spread. Please note that any company or any trader, wholesaler whoever is dealing with anything to do with soya oil, soya meal or soya bean does not have to enter into the long futures position on crush spread to mitigate the risk. So, the question arises then who will be taking counterparty position to the crusher when the crusher wants to take a short futures position somebody must be taking a long futures position. Now, the answer to this question is that the speculators are the members who take long futures position on a crush spread or they take reverse crush spread. So, here also I would like to draw your attention that for this kind of a situation speculators position is mandatory unless we have speculators this trading will not be done. In fact, without the speculators standalone crushers will not be able to mitigate their price risk. Now coming to the crush spread futures contract at CME which we have also discussed in yesterday's or one session before. So, please note that the refiner can compare the spot crush margin with the board crush margin to take certain decision. Here I would like to again draw your attention that the crush spread futures contract can also be having certain information content somebody can merely look at this crush spread margin which is calculated here and given here in this part of the table that margin itself will be conveying lot of information to the crushers. So, what is that information, if that information will be coming from how it is related to the spot crush margin. So, a refiner can compare the spot crush margin which is based on the spot price prevailing today let us say a crusher will be able to find out what is the price of soybeans, soy oil, soy meal and will be able to calculate the spot crush margin. And that crush margin can be compared with the board crush margin which is

based on the futures price. And if this futures crush margin is available from the Chicago Mercantile Exchange, if this futures crush margin is greater than the spot crush margin it is profitable for the crushers to defer the crushing. So, it will be benefiting more if it defers the crushing and sells it at a later point in time. And vice versa if the futures crush margin is less than the spot crush margin, it is better to crush now and sell soy oil and soy meal at the current spot market. So, a crusher need not enter into a futures position if the crusher does not want to do it, but just merely comparing the actual or current crush margin to the forecasted or the future crush margin this particular crusher, or a refiner will be able to take its own business decision. Now in addition to the futures contract on crush spread Chicago Mercantile Exchange also offers option contract on crush spread. So, let us understand what do we mean by an option contract on crush spread. This option contract gives the buyer the option or the right, but not the obligation to buy or sell the crush at a specific strike price. And please note that again this particular table which is a snapshot of the previous table given in the previous slide the crushing margin based on the future price is listed here I have just identified the August 2023 crush margin which stands at a 1.44 dollar per bushel of soybean. And all of us know also a call option will be in the money when the spot price will be greater than the strike price and a put option will be in the money when the spot price is less than the strike price. So, with this understanding let us go ahead and understand how exactly refiners or crushers will be able to use the spread option to mitigate the price risk. So, suppose on 1st June 2023 a crusher takes a long put on a soybean crush option at a strike price of 1.65 for August 2023 underlying. So, the underlying is August 2023 crush spread futures position. So, this particular position is taken by the crusher on 1st June 2023 and the position is long put option. Now, let us move to 13th June. So, let us assume that 13th June is today's date or a spot date. So, on 13th June 2023 the underlying is 1.44, this 1.44 is being calculated and reported by the CME based on the prevalent future price. So, the underlying is 1.44, when the underlying is 1.44 or spot is 1.44 and our strike is 1.65 and it is a put option. So, as you can see, the put option is in the money when the spot price is less than the strike price. So, the spot price is our 1.44 and the strike price is 1.65 hence it becomes an in the money put option. So, assuming let us say 13th June is the option expiry. Please note that August 2023 contract will not be expiring on 13th June but let us assume had this been a June contract and expiry is happening on 13th June with this combination, that is strike price of 1.65 and underlying asset price is 1.44 then what would have happened. So, on 13th June 2023 short put will pay 21 cents to the long-put position for every bushel of the underlying. So, how exactly we are calculating that is your spot price is less than the strike price or strike is higher than the spot price so that means, the long-put position holder is benefiting by 21 cents. So, the short put position holder will pay 21 cents for the long-put position and then both these long put and short put position holder will be taking position on the underlying futures contract. So, what position will be taken by the long put? Long put position holder will be entering into

short futures on soy meal and soy oil and long futures on soybean. Similarly, the counterparty will be taking exactly the opposite position that is long futures on soy meal and soy oil and short futures on soybean. So, this is how a standalone refiner or crusher will be able to mitigate the risk using your option contract on crush spread. Now let us go to the example who will use a long call position on this crush spread option. Let us say again same on 1st June 2023 a trader took takes a long call on soybean crush option at a strike price of 1.35. I want you to please pay attention to the strike price here in the previous case strike price was 1.65 here in this case we have taken a hypothetical strike price of 1.35 and let us assume that 13th June is also the expiry date and on 13 June 2023 the underlying is closing at 1.44. So, that means, this particular option is going to be a in the money option because we know that when the spot is greater than the strike. So, our spot is 1.44 strike is 1.35 this is a call option. So, this is going to be an in the money call option. So, again assuming 13th June as the option expiry date the short call position holder will pay 9 cents that is your 1.44-dollar USD minus 1.35 USD will be resulting into 9 cents. So, the short call will pay 9 cents per bushel to the long call and both positions both long call and short call will be entering into futures contract, and I do not want to repeat. So, the position whatever the long call and short call will be taking that is very clearly mentioned here. With this we will come to our discussion related to all things related to mitigating a price risk associated with one of the Agricultural commodities. Now let us go to one of the very interesting aspects related to derivative contracts related to fish and in India we do not have any spot or derivative contracts on fish. So, I thought that I should be sharing this aspect with all of you and let us first understand what do we mean by a spot exchange related to the salmon and then we will also be understanding the derivative exchange or how derivative contracts are used by the producers of the fish and bulk buyers of the fish to mitigate the price risk. So, in London there is an exchange which is known as a London fish exchange, this is a spot exchange for wholesale buying and selling of the Salmon and Trout these are the two types of fish varieties which are predominantly bought and sold at this particular exchange. Please note that this is a spot exchange actual buying and selling of fish and delivery of the fish happens at this exchange more detail about this particular exchange is available at this website and as I mentioned because it is a spot exchange actual buyers and sellers take membership of the exchange and if a buyer wants to buy some specific amount of fish the buyer will be giving a request for quotation ranging from few selected to all seller. Suppose in that exchange there are three hundred fish sellers listed as a member, but a specific buyer wants to only buy from specific buyer. So, that particular IT system of the exchange will enable the buyer to only reach out to those selected sellers. So, the buyer will be giving a request for quotation ranging from few selected sellers to all sellers and negotiate the price privately. So, this price negotiation will be happening in privately between the buyers and sellers and subsequently the price will be relate by the exchange to all members and exactly the same process is done by the seller, seller if they want to sell the

fish they will be able to they will be starting an auction, they will be floating a request for quotation and reaching out to buyers and obviously, the trade will happen and leading to actual delivery of the fish. And this particular snapshot which I have taken from this website which shows the order and trade management system how exactly different types of orders are placed and how post order how the trade financial settlement and all that happen that clearly is is being explained by this particular snapshot. Now coming with this let us understand how exactly risk associated with fluctuation on price of salmon is mitigated the same is done at a derivative exchange and that derivative exchange is known as the European exchange for financial salmon futures and this particular exchange is also popularly known as a fish pool and the website detail is given here and one very interesting aspect of this particular derivative exchange is that these contracts are financially settled no actual delivery of the fish happens only buyers and sellers will be coming to the platform and mitigate the financial risk. And the trade clearing the exchange of the money and whatever margin money calculation settlement as we have discussed daily mark to market margin, initial margin all that discussion which we have done at the initial part of our lecture series related to the futures contract, all these things will be done by your company which is known as your NASDAQ clearing. So, this NASDAQ clearing will be undertaking the total trade clearing aspects. And let us understand little more on how exactly the trade and settlement happens at this particular derivative exchange which is known as your fish pool salmon futures exchange and in this exchange the futures contract is based on an index of price of salmon which is denominated in a Norwegian Krone. And Norway is the largest or world's biggest exporter of salmon having about 47 percent of the global export and let us understand how exactly the index is calculated as you can see this particular snapshot again the same thing which I have taken from the website. This index has two component one component is NASDAQ salmon index which is the 95 percent weight in the combined index. In addition to that the SSB custom statistics price salmon price provided by this particular body SSB custom statistics will have a 5 percent weight. So, these two combinations will be 100 percent in weight which will be forming the basis of the futures contract listed and traded at fish pool. And let us also understand how exactly NASDAQ salmon index is calculated. NASDAQ salmon index considers the price of salmon prices for 3 to 4 kg, 4 to 5 kg and 5 to 6 kg. As you can see the 3 to 4 kg prices will be having a weightage of 30 percent, 4 to 5 kg will have a weightage of 40 percent and 5 to 6 kg will have a weightage of 30 percent. NASDAQ will be using informing the world what is the price of the fishes less other weight other than 3 to 6 kg. This information will be made available to everybody, but NASDAQ will be only using the 3 to 6 kg varieties of fish and the price, the actual price at which buyers and sellers have transacted these fishes that fish that price will be used to calculate the index. And both this index 95 percent and 5 percent by the data provided by SSB custom statistics. Please note that SSB custom statistics is the official body which keeps track of price at which these exporters are

exporting fishes to different countries because Norway is the largest exporter of salmon. So, this particular body has access to the price at which these fish farmers are exporting the fish. So, that price will have a 5 percent weightage and NASDAQ salmon index will have a 95 percent weightage. And both of this will be forming the the index based on which the futures contract will be traded, and rest of the things remain same. And in this context if you can see this is again, I have taken from the NASDAQ website. So, this NASDAQ salmon index is the weighted average weekly reported sales price and corresponding volume in fresh Atlantic Superior salmon head ungutted. So, this is something unique with respect to this particular index head on gutted means gut have been removed from the fish, but the head has not been removed from the fish. So, the price of the fish which are having head, but has gut have been removed that prices are that price is used to calculate the index. And the rest of the discussion related to long futures on the fish, short futures on the fish, daily mark to market margin all that remains constant. So, I do not want to elaborate on this aspect. Basically, fish buyers bulk buyers of the fish and farmers of the fish farming companies are entering into this futures contract to mitigate the price risk. With this let us discuss a practical aspect related to Agri commodity risk management practice by one company. Please note that globally there are 4 to 5 companies which are well known for their Agri commodity related business. And these companies are ADM, Bunge, Cargill, Cofco International, Louis Dreyfus company, Glencore. These are all big multinational companies which operate in almost all countries in the world and predominantly generate their revenue from the Agri commodity space. And today I will take you through the commodity risk management practices at a company which is known as Bunge. And Bunge is a global leader in Agribusiness in food and ingredients and it was founded in the year 1888 almost more than 200 years in fact, 205 years have gone by since the day this particular company was founded. And Bunge deals with a wide array of Agri commodities with a major focus on oil seeds ranging from soybean, canola and coconut, olives. And as a discussion with respect to understanding risk management practices, I have taken some portions of the annual report. So, this annual report detail is available in this wavelength, and these are the quote unquote which I have directly taken from the annual report. And I am going to highlight or briefly discuss how this particular company mitigates the Agri price risk management. As you can see, as per the company's report this company sees that Agricultural commodities are subject to price fluctuation due to a number of unpredictable factors. And this particular company is subject to the risk of counterparty non-performing under the forward purchase and sale agreement. This aspect also we have discussed quite a few times that forward contracts have counter party risk. So, a company of such a big business also faces the same risk that the counterparty as part of the forward agreement does not abide by its side of the bargain. And coming to the other interesting aspect this company mentions that we enter into various derivative contracts with the primary objective of managing our exposure to adverse price movements in

Agricultural commodities. And they have established a policy that limits the amount of unhedged fixed pricing Agricultural commodity position. So, as part of the company's broader policy they have a very detailed or established policy related to how much of an unhedged position they can have at any point in time. And this unhedged limit is based on a combination of volumetric drawdown and value at risk limit. So, today I am going to take you through what do we mean by this volumetric drawdown and value at risk limits. And this value at risk also is calculated based on a net position and monitored at 95 percent confidence interval. Please recall we have had a one complete session on how exactly we will be able to calculate value at risk. We will be revisiting this concept once again today. So, what do you mean by a volumetric limit? So, volumetric limit indicates that suppose a company has bought 100 million tons of a commodity and yet to identify a buyer. Let us assume that the company's volumetric limit is 80 million tons. That means, at any point in time the company will be able to remain unhedged and not enter into any kind of a future, option, forward, swaps up to 80 million tons. The fact that the company is now holding 100 million tons of a commodity means it has to enter into a hedging position for these 20 million tons. And it is also very important to understand that volumetric limit does not mean that the total amount of readily marketable inventory or ready marketable inventory a company can hold. See, 80 million tons does not mean that the company will only be able to hold 80 million tons of inventory it can hold more than that provided that excess amount has been hedged in some form or other. Now coming back to what do you mean by drawdown limit? Let us say drawdown limit indicates the maximum observed loss from a peak to a trough. So, for example, let us the same company which we were discussing the same company has a volumetric limit of 80 million tons with a drawdown limit of 10 percent. Now suppose the company is holding only 75 million tons of readily marketable inventory. So, going by the volumetric limit the company need not hedge any risk, but let us check whether the company has reached the drawdown limit or not. Let us say the price of this particular commodity is varying on a day-to-day basis from the previous peak of 100 rupees, suppose on the current date it has fallen to 90 rupees. So, that means, if the company is holding inventory and its price is 100 and it has fallen down to 90 and with a drawdown limit of 10 percent means time has come for the company to hedge the risk. Based on the volumetric risk it need not hedge, but based on the drawdown risk sorry based on the drawdown limit it must hedge. Now coming to the third discussion, which is your value at risk, we have discussed this detail in session 9. Now let us revisit the same let us assume that the permitted VAR limit for this particular commodity, which is 95 percent one day, is only 3.5 percent. Now the company is holding 75 million tons of this inventory for this commodity and the current drawdown value is 6 percent. The limit is 10 percent volumetric limit is 80 million tons, this company is holding 70 million tons. So, it need not hedge based on the volumetric limit. Now the company's drawdown limit is 10 percent the current drawdown value is 6 percent. So, going by that it need not also hedge, but let us understand what is the value

at risk. So, the value at risk limit is 3.5 percent as given by the company. Now the value at risk for this particular company is coming to 4.34 percent. So, how exactly this 4.34 percent has been calculated? Please see suppose normally the volatility of this underlying commodity Agri commodity remains pretty flat not much of a volatility but let us say over the last some period of time the volatility has increased and the annual historical volatility previous one year data based on one year data historical volatility is coming to 42 percent and 95 percent one day varies coming to 4.34 percent. Again, I am not going into the detailed discussion related to the confidence interval and so on so forth because we have done this extensively in session 9. Now coming back to the 95 percent one day VAR is 4.34 percent and company's internal limit is 3.5 percent as the where is more than the internal limit the company has to hedge this risk. So, these are some of the internal limits set by the company to decide on how to go about hedging and to what extent hedging has to be done. Now coming back to and at some other interesting aspect as the company mentions we use exchange traded futures and option contracts to minimize the effect of the Agricultural commodity price risk. In addition to the exchange traded contract the company also enters into OTC commodity transactions including swaps which are settled in cash at maturity or termination based on the exchange quoted future price. So, basically this indicates that the floating leg of the swap will be exchange traded quoted price. We have also discussed extensively the fixed leg and floating leg aspect of swap contracts and how companies use swap contracts to mitigate the risk. Also, another very interesting aspect which the company mentions that we measure and review our commodity position on a daily basis. So, it is not that periodically maybe once in 2 months or once in 3 months the company checks the risk associated with the commodity underlying commodity which the company is dealing with considering this is a Agri commodity related company they review the commodity position on a daily basis. And also, periodically they employ stress testing techniques in order to quantify their exposure to price and liquidity risk under non normal or event driven conditions. So, what exactly the stress testing is done is that the company will be generating certain worst-case scenarios and if those worst-case scenarios happen what is going to be the company's profitability. So, that is that is known as your stress testing techniques. So, with this we will be coming to end of our today's discussion and today we discussed various aspects about crush spread futures contract crush spread option contract and how these futures and option contracts are used by refiners to mitigate the price risk. We also discussed salmon spot and derivative exchange, and we also discussed the how company called bunge is utilizing different kind of exchange traded and OTC contracts to mitigate the commodity price risk. So, with this we come to today's session and in the next session we will be introducing the various risks associated with gold as a commodity. So, thank you all of you. I eagerly look forward to interacting with you all in the next session.