Commodity Derivatives and Risk Management
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Lecture 34
Agri commodity Seasonality, Crush Spread Futures, Salmon Futures

Welcome to the 34th lecture on Commodity Derivatives and Risk Management. And today we will be discussing about Agri-Commodity-Seasonality aspect which we were also discussing in the previous session. In addition to that we will also be discussing various aspects related to Crush-Spread Futures contract and Salmon Futures. Please recall in the previous session we have discussed little bit of a seasonal index calculation and seasonal index is nothing, but an index which measures the price of any given month relative to the annual average price. And prices are normally high during the pre-harvest period because the extent of commodity available in the market goes down and hence price increases. So, prices are normally higher during the pre-harvest period and fall post-harvest. When the new crop comes to the market price normally goes down. And as you can see from this picture which we had discussed also in the previous session, this particular block shows the spot price seasonal index for soyabean as well as the near month future price seasonal index which is the near month future price traded at Chicago Mercantile Exchange. And as you can see from the month of February to May these are high seasonal period in the sense there is higher price in this period of times. Hence, we are having a high seasonal index values compared to the other periods which are coded in the red color these are the low seasonal months in the sense the price is lower. So, this green period corresponds to the period of pre-harvest and the red period corresponds to the period of post-harvest when the prices have in general have gone down and, in this case, prices are in general have gone up. So, by plotting this kind of data we will be able to know which months are seasonal months and which are not non-seasonal months for an any given commodity. Now, we have also discussed in the earlier sessions that backwardation as a concept is very common for agricultural commodities during the pre-harvest period. And what is what do we mean by a backwardation market backwardation market is a market where the spot price is higher than the future price and a near month future price that is M 1 will be higher than a future price which is little later maturing at a later date. And in a backwardation market, there is a very high convenience yield which is higher than compared to the cost of carry and convenience yield which we have also discussed in greater detail, convenience yield is defined as the benefit which accrues to the owner of a physical inventory but does not accrue to the owner of an owner of a person or owner who is holding the futures contract. Let me repeat convenience yield is the benefit which is accruing to the person who is holding the physical commodity or

physical good, but not to the owner of a contract who is holding a futures contract. Now this example of contango backwardation for soybean prices based on the near month future prices and spot prices is given in this particular block. This again I have calculated from the soybean spot price and the future price and basis is nothing but the spot price minus the future price. As you can see, at some period of time the basis has gone positive and basis has become negative. And the same particular table or same particular chart has been represented in a different manner and this is the period where we have a backwardation market means the spot price is higher than the future price. So, these are the dates when we have a backwardation means spot is greater than the futures hence positive value and the periods where we have contango market when the spot is less than the futures market which is a normal market. As we know we have discussed earlier that the future price is going to be normally higher than the spot price because of the cost of carry model. And when the future price is higher than the spot price which is known as a contango market in that case basis is going to be negative and basis is positive in a backwardation market. And as you can see there is a period of consecutive months and years the backwardation market has remained. So, this could be the reason that during this period of time soybeans may be in a scarce the amount of physical inventory may not be available with many people. So, that could be the reason why we have a very prolonged period of backwardation while also there could be other there are other time period which is a prolonged period of contango which is very normal backwardation is not normal market and backwardation happens when we have a spot price is greater than the futures price. Now, coming to the interesting aspect with respect to the soybean futures contract which we have also very briefly discussed, which is known as your crush margin, or a crush spread. So, what exactly do we mean by a crush margin, or a crush spread? Please note that the soybean is crushed to generate soy oil and soy meal. Normally if 100 kgs of soybean is crushed we will probably be getting about 18 kgs or 18 liters of soy oil and 82 percent of soy meal or 82 kg of soy meal. And how do we calculate the crush margin? Crush margin is nothing, but the price of output minus the price of input. So, in this case the price of output is your soy oil price plus the soy meal price. So, this is our output price minus the input price which is the price of soybean and in addition to the price of soybean a crusher will also be incurring certain additional cost which will be crushing cost of soybean plus refining cost of crude soy oil. Please note that when a soybean is crushed the crude soy oil is refined to generate edible soy oil. So, when we are talking about crush margin so, price of output minus the price of input plus the processing cost is taken into consideration for the calculation of a crush margin. And this crush margin is also known as a gross processing margin which is basically a profit of a crusher or a profit of a refiner. In this context I would like to draw your attention that in India there are about 115 soy processing units and more detail about the Indian soybean industry the processors all this will be available at an organization website that is known as your SOPA or soybean processor association of India. So, this 115 soybean

processing units' price is going to be governed by the extent of crush margin. And it is also very important to understand that the soybean, soy oil and soy meal prices do not move in a similar manner. If soy oil prices are increasing does not mean that soybean price will increase or vice versa. Because the factors which influence soybean prices, soy oil and soy meal prices are significantly different. Soy oil is for human consumption, and it is for it is an edible oil if the prices of other edible oil increases obviously, soy oil price will increase may not lead to a corresponding increase in soybean and soymeal price. Similarly, soy meal is predominantly used for animal feed and if there is going to be significant increase in demand for animal feed then soy meal price may go up, but not the soy oil price and soybean prices. Now, let us take a numerical example to understand how the crush margin varies from time to time depending upon how the movement of the price of soybeans, soy oil and soy meal changes. So, this is the example let us say the spot price of a soybean is 4476 rupees for 100 kilograms. Soy oil which is normally quoted for 10 kilogram which is let us say 800 rupees per 10 kilograms and soy meal price which is normally quoted at a price of 1 ton or 1000 kg which is about 40,850. With this let us calculate what is going to be the crush margin in addition to these three prices we also require the crushing cost and the refining cost these details are given here. So, based on these numbers just simple excel calculation has been done and you can see the crush margin comes to 1955 rupees for a crusher who is crushing about 1000 kgs of soybean. So, if he is crushing about 1000 kg of soybean and buying soybean at 4476 rupees for 100 kg and also selling the output at the respective prices mentioned that is soy oil and soy meal price the particular person particular crusher is selling, buying soybean selling in these selling and generating revenue from soy meal and soy oil and incurring also the processing and refining cost. In that case this crusher's profit is going to be 1955 rupees. Now, just to understand how the crush margin changes with the input and output prices for a for a very simple calculation, we have only increased the soybean prices by 200 rupees keeping everything else constant as the input price has gone up and as you can see that from a profit of 1955 this particular crusher is incurring a negative profit or a loss of 45 rupees. So, this particular excel calculation shows how the profit of a crusher will move or change depending upon the price of these 3 commodities. Now, how can a crusher be able to mitigate the risk? The same can be done if there is a futures contract available. Please note that in India as of now we do not have any crush spread futures contract available, but in international markets such as CME the futures contract on crush spread futures contract on soybean is available. So, let us understand how exactly a refiner or a crusher will be able to utilize this futures contract to mitigate the price risk. So, let us understand the crush spread contract at CME crush spread contracts which is available at Chicago Mercantile Exchange is based on the future price and this is popularly known as the board crush spread. So, let us understand how exactly this board crush spread is calculated. This is a particular panel which I have taken from the Bloomberg data. So, this snapshot shows the crush spread value and for different

maturity as you can see July 2023 the soybean price which is denominated in cents per bushel as you can see USD cents per bushel. So, that is your 1352.50 or that is your 13.525 US dollar. Similarly, you have a soybean meal which is denominated in short ton, short ton is equivalent to basically your 2000 pounds. One bushel is equivalent to 60-pound, one short ton is equivalent to 2000 pounds. So, the soybean July futures is quoting at 397.80 US dollars per short ton and soybean oil is quoting at 49.50 cents per bushel. Please see the denominations which is very clearly mentioned USD capital D indicates dollar value USD small d indicates cents per US dollar. So, soybean oil futures are trading at 4949.50 cents per one bushel. Now, from here we will be able to calculate what is going to be the crush spread margin. Please note that as per the CME data, CME uses that a bushel of soybean will be producing about 44 pounds of soybean meal and 11 pound of soybean oil. So, this is the basis based on which the crush spread data is calculated and reported by the by the CME. As you can see this is the producing margin as you this is the right-side panel indicates the crush spread margin. And I have taken one done one calculation to explain how exactly the crush spread margin is calculated and reported. Again, I would like all of you to please pay attention to the quantity specification associated with the futures contract. Soybean prices are quoted cents per bushel, soybean meal price is always quoted in US dollar per short term and soy oil price is quoted in cents per bushel. So, this information is available to us based on this let us calculate what is going to be the crush spread. So, as an example I have calculated the crush spread for 2023 August futures. So, this formula is given here I do not want to read out this particular formula. Basically, this considers the price of soy meal and price of soy oil minus the price of soybean which we have already discussed that is price of output minus the price of input and so and crush spread soybean crush spread is reported always in a bushel terms. So, to convert all this term into bushel terms different amounts have been multiplied that is 0.022 have been multiplied with the price of soy meal and so and so forth to arrive at the August 2023 crush spread which is 1.44 dollar and that you as you can see here this is also mentioned here that is the 1.44 dollar per bushel is the crush spread margin for the month of August 2023. Similarly for other months of the crush spread margin is available here as you can see it peaks at 1.88 for the month of September and progressively it has gone down and again it is again it is picking up. So, depending upon the expectation related to the price movement of soy oil soybean and soymeal the crush spread margin will be varying from month to month or from time to time. And again, this particular panel which I have just taken directly from the CME website. So, this CME website indicates that calculation of the crush or crush processing margin will be done in this formula and exactly the same formula I have utilized to arrive at the August 2023 crush spread. So, let us understand a little more on the crush spread futures contract, which is listed and traded at Chicago Mercantile Exchange, but before we go and discuss about this particular futures contract in detail let us first understand what do you mean by narrowing of crush margin and widening of the crush margin. And

crush margin is nothing, but the price of output minus the price of input and how or when this crush margin will be narrowing, when the output price increases at a lower rate as compared to the input price. So, both prices will be increasing, but the output price will be increasing at a lesser rate as compared to the input price or vice versa the narrowing of spread will happen when the output price will be falling at a higher rate as compared to the input price. And please note that this will happen in the case of a soybean futures contract or soybean crush spread contract because the price or because the factors which influence the price of soybean, soy oil and soy meal are different. And we have discussed this aspect just couple of minutes ago that soy oil and soy meal are used by human beings as well for an animal feed the supply demand conditions are very different. Hence the price of soybean, soy oil and soy meal will be changing in a different manner and whenever the prices change that will lead to a widening or narrowing of the crush margin. Similarly, a crush margin will be increasing when the price of output will be increasing more than the price of input. Now, why are we discussing this narrowing of crush margin or widening of the crush margin because narrowing of the crush margin is the profit margin of a standalone refiner. Please note that a standalone refiner will buy soybean and crush it to generate soy oil and soy meal and its profit depends upon the price movement of the output as well as the input. Now, if any soybean crusher is fearing that the crush margin is going to go down and hence its profitability is going to go down it will be able to mitigate that risk by entering into futures contract. So, let us understand the different parameters associated with the crush spread futures contract which is listed and traded at Chicago Mercantile Exchange. So, on every futures contract there will be a seller of a futures contract or somebody who will be taking a short position in this futures contract and the counterparty will be taking a long futures position. So, the person who takes a short futures position on a crush spread takes a short position short futures position on soybean oil and meal futures and simultaneously takes a long position on a soybean. And the counterparty to the short futures position will always be a long futures position and that party will be entering into long position on soy oil and soy meal futures and short position on soybean futures. And that particular position is normally known as a reverse crush spread. This is the crush spread. So, somebody who is taking a position on a crush spread he or she is entering a short position on the crush spread futures contract. And somebody who is taking a long futures position on a crush spread is entering into a reverse crush spread position. Now, a standalone refiner always fears the narrowing of the crush spread. So, if the crush spread goes down this particular party a standalone refiner will incur loss. So, it will be able to mitigate that particular risk by entering into a short futures position on the crush spread contract. And as we know that if actually my fear materializes as a refiner and the narrow narrowing of the crush spread happens, I will be benefiting from entering into a short crush spread futures position. And whenever a standalone refiner takes a short futures position on a crush spread there will be a counterparty who will be entering into the long futures position on crush spread or will be

entering into a reverse crush spread. And as I just now mentioned if the fear comes for a standalone refiner that refiner will be benefiting from the short crush spread futures position. With this we will come to an end on this particular session where we discuss different aspects about the seasonality and seasonality associated with Agri commodity derivatives as well as agricommodity spot prices. We also discussed about a pre-market how to calculate the crush margin depending upon the price of soybean and soy oil and the soy meal prices. And this crush margin indicates the profit of a standalone refiner and how the standalone refiner will be able to mitigate the risk associated with narrowing of the crush margin by entering into crush spread futures position. We will be continuing with the discussion on crush-spread futures and other aspects in the next session. So, again I eagerly look forward to interacting with all of you.