Commodity Derivatives and Risk Management
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Lecture 21
Commodity Prices Determination (Part 2)

Welcome to the next session on Commodity Derivatives and Risk Management and just to refresh your memory in the last session we discussed about different aspects of different parameters which is influencing the soybean prices, soybeans, soya meal and soya oil prices. We will be continuing with the remaining part of the same 3 commodities. Now we ended up the last session by discussing what would be the decision hedging decision for a company which has already committed to selling soya meal at a fixed price, it does not have a soybean inventory in its at its disposal.

It has to buy soybean from the open market and considering the global prices and whatever is happening in India, he is expecting the soybean price is going to go up, he does not have a freedom to increase the soya meal prices, he also does not have the freedom to increase the soya oil price because it is facing stiff competition from other soya oil branded manufacturer as well as it is also it cannot increase the soya oil prices because the price of competing product is less in the sense the mustard oil and sunflower oil and palm oil, which people can alternatively use in place of soya oil that those oil prices are not also not increasing. So that is the reason why the company feel that it will not be able to increase the soya oil prices as well as it will not be able to increase the soya meal price however it has to buy soybean price at a higher price from the spot market.

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In that case, what is going to be the decision of how this particular party is going to mitigate this risk? Now let us go to, so if you recall we ended up in this particular slide in the previous session, so let me as I have already summarised, so the last point which is mentioned in the slide is that unless the company does something it will end up incurring loss, as it margin is getting squeezed. So when we are talking about margin that means it is it is going to get a fixed price for its revenue and it will be but its input cost is going to go up because its soybean prices is going up. Now in this context I would like to in this context I would like to discuss something called a Crush margin or a Crush spread.

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So what is exactly is a crush spread, so soybean as we have discussed quite a few times, soybean is processed into two products; soybean meal and soybean oil or soya meal and soya oil and this process is also known as crushing and if you recall last session also I showed a small YouTube video, brief YouTube video on the process of extraction of soybean to soya oil and soya meal and when we are talking about crush margin or crush spread, we talk about the difference between the combined value of the product and the value of the soybean.

So price of soya meal + price of soybean - the price of sorry, price of soya meal + price of soya oil - the price of soybean give us the crush margin. However, whenever a company is undertaking a crush, undertaking activities related to crush it has some cost associated with it. Normally companies do not own the crushing mills, there are independent crushing mills and these companies enter into some kind of a leasing agreement and pay the crushing cost to these companies and collect the soybean soya meal and soya oil from these crushers. So they provide soybean and based on the metric ton of crushing done by the independent crusher, the company which is crushing the soybean, they these companies give crushing fee as well as a refining fee.

So now when we are talking about crush margin, crush margin is as you can see in the formula given, price of soya oil + price of soya meal - the price of soybean + crushing cost of soybean and refining cost of crude soya oil. So uh, ok let me at this point of time say I, I tend to pronounce soybean and soya meal in Indian, Indian context mostly we use the word soya meal but in a, in a probably in a some other countries or some other places it would be soy meal or soybean, so I am used to pronounce it as soybean, soya meal etc, so I hope it is fine with you all. Ok, now let us go to continue with our discussion on crush margin, so what is a crush margin, crush margin is price of output - the price of input + some cost associated with the conversion of input to the output, so that is basically the margin, crush margin.

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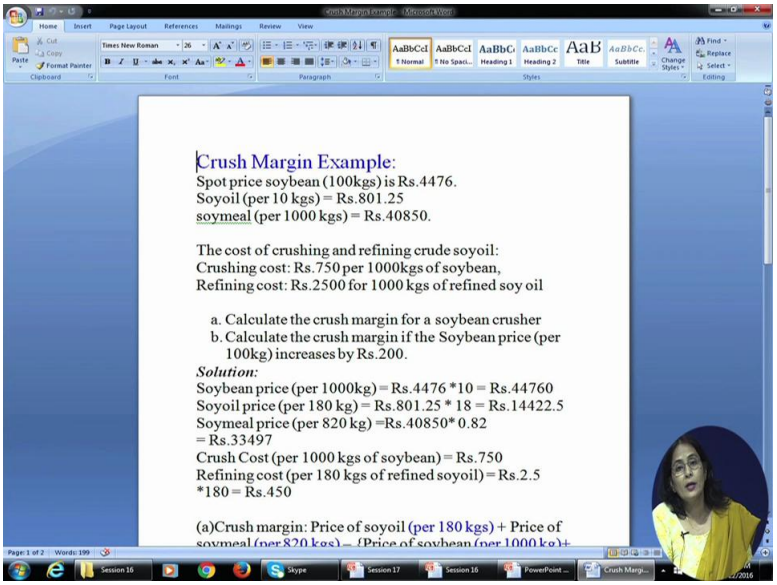

So let us take an example, real life example how this crush margin is calculated. So this is a example, I hope it is visible to all of you. this some information pertaining to soybean soya oil and soya meal spot price is available to you and the cost of crushing and refining of crude soya oil, that is the cost of crushing soybean and the cost of refining crude soya oil is also available. One thing I would like to repeat here is that companies, normally companies who are into branded soya oil manufacturer or sometimes companies do not sell branded soya oil, they produce soya meal sell it to the local animal and plant food manufacturer, plant feed manufacturer and they sell the refined crude soya oil to other companies who are in the business of of selling branded soya oil.

So all these companies pay a refining cost and crushing cost and these cost normally, normally varies around 750 – 800, 900 rupees per metric ton of crushing cost and around 2 - 2.5 rupees per kg of crude soya oil which gets refined. So this data maybe varying some amount year to year but remains in this range. So using this value calculate the crush margin with for a soybean crusher so if a crusher is company which is buying soybean and crushing it and refining and selling the oil and soya meal what is going to be the profit margin and calculate the crush margin if soybean price increases by 200, so simple calculation is nothing, I mean it is just a simple calculation and it indicates if you see the answer to the first part of the question is.

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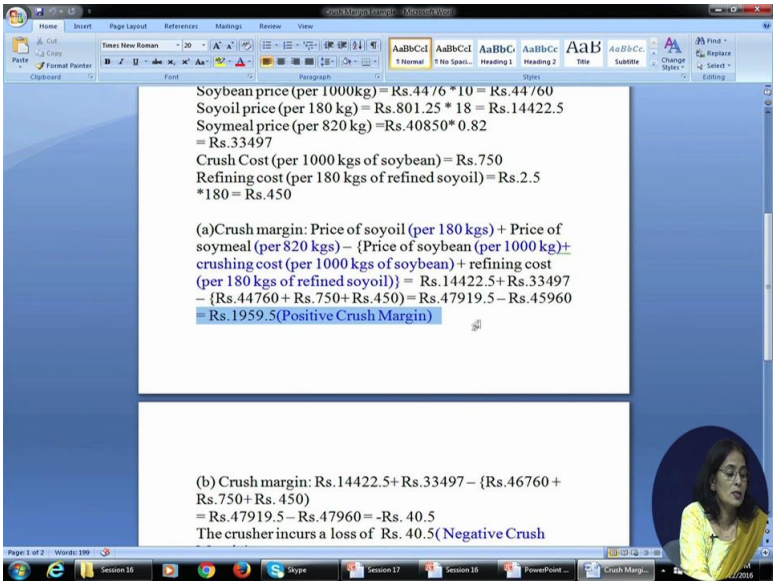

It is positive crush margin, so that means by crushing soya oil, by crushing soybean and selling soya oil and soya meal and paying for crushing and refining cost the crusher or the company which is in the business of branded soya oil manufacturing, it is incurring a profit of 1960 rupees and with only 200 rupees increase in in the soya oil soybean prices everything else remaining constant, the crush margin turns to negative 40.5 rupees or I would say 41 rupees per every metric ton of soybean getting crushed.

Now umm, so the next question as we have we have I have reiterated substantial number of times that even if soya oil and soya meal is derived from soybean, but the price movement of these 3 commodities can be substantially different leading to a substantially high positive crush margin to a substantially low or substantially negative crush margin. Now let us take the real life example to find out what is going to be the crush margin or what has historically been the crush margin in Indian context.

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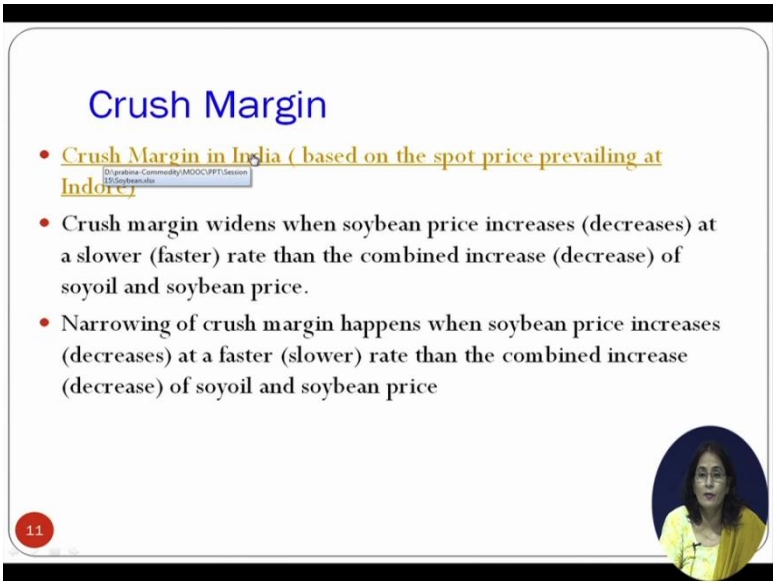

So this particularly shows the crush margin in India based on the spot price prevailing at Indore. So spot price prevailing spot price of soybean and soya meal and soya oil prevailing at Indore has been considered for calculation of crush margin, so let me take to the link file.

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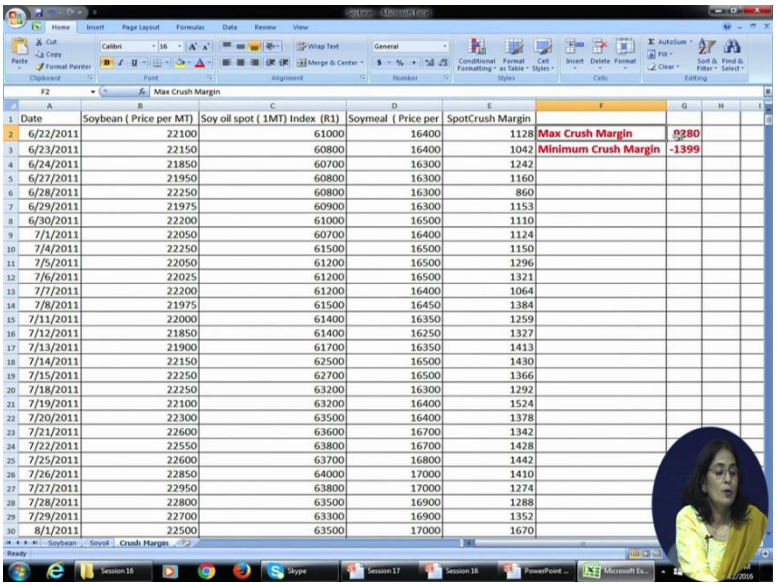

Date	Soybean (Price per MT)	Soy oil spot (1MT) Index (R1)	Soymeal (Price per	SpotCrush Margin		
6/22/2011	22100	61000	16400	1128	Max Crush Margin	9280
6/23/2011	22150	60800	16400	1042	Minimum Crush Margin	-1399
6/24/2011	21850	60700	16300	1242		
6/27/2011	21950	60800	16300	1160		
6/28/2011	22250	60800	16300	860		
6/29/2011	21975	60900	16300	1153		
6/30/2011	22200	61000	16500	1110		
7/1/2011	22050	60700	16400	1124		
7/4/2011	22250	61500	16500	1150		
7/5/2011	22050	61200	16500	1296		
7/6/2011	22025	61200	16500	1321		
7/7/2011	22200	61200	16400	1064		
7/8/2011	21975	61500	16450	1384		
7/11/2011	22000	61400	16350	1259		
7/12/2011	21850	61400	16250	1327		
7/13/2011	21900	61700	16350	1413		
7/14/2011	22150	62500	16500	1430		
7/15/2011	22250	62700	16500	1366		
7/18/2011	22250	63200	16300	1292		
7/19/2011	22100	63200	16400	1524		
7/20/2011	22300	63500	16400	1378		
7/21/2011	22600	63600	16700	1342		
7/22/2011	22550	63800	16700	1428		
7/25/2011	22600	63700	16800	1442		
7/26/2011	22850	64000	17000	1410		
7/27/2011	22950	63800	17000	1274		
7/28/2011	22800	63500	16900	1288		
7/29/2011	22700	63300	16900	1352		
8/1/2011	22500	63500	17000	1670		

So this is the file, if you see this data again starts from this 22nd June 2011, it runs into 29 January 2016, again data has been downloaded from the Bloomberg website, Bloomberg data source, I am sorry it is not website, it is Bloomberg data source and if you see the crush margin, maximum positive crush margin I want you all of you to focus this 2 data points, maximum crush margin is 9280 rupees to a minimum crush margin is negative of 1399 or 1400 rupees. And for calculation of crush margin, I have not factored in any change in the

crushing cost and refining cost, I have assumed around 1200 rupees per metric ton as the combined cost associated with crushing and refining of 1000 metric ton of soybean.

With this you can see the in actual reality how the crushing crush margin is change has changed from a high of 9280 to a negative value of 1400. So if crush margin is going to be negative that means by doing a business of buying soybean and selling soya oil and soya meal, the company is going to incur loss, so in that case what is going to be the strategy of the company, how this risk can be mitigated? Because a company cannot say that we are not going to crush soybean and make soya oil and sell make soya make and sell soya oil and soya meal, it cannot say that because a company who is earns its revenue by selling this product has to continue to do it for some foreseeable time period.

So maybe it can defer this decision of not crushing for some time, but it cannot say that we will not do it for over a long period of time because all of us know that of the company does not generate revenue, even if it is not generating any revenue it, it will still be incurring certain fixed cost and so a company cannot afford to be ideal for a long period of time. So now the next question is, how this company can mitigate the risk. Ok, now let me again summarise what we discussed with respect to crush margin. So when we say the widening of the crush margin happens when the price of soybean increases at a lesser rate, feasibly the price increase of soya oil and soya meal combined together and narrowing of crush margin happens when soybean in price increases at a faster rate as compared to the combined increase of price of soya oil and soybean.

Uh ok one thing I forgot to mention in previous part of my discussion or during previous discussion is that 1 kg leads to 18 grams 18 grams of soya oil and 82 grams of soya meal. Now the future price of this 3 commodity can give us an indication regarding whether what is going to be the movement of the crush margin at a later point of time. So how do we calculate the crush margin based on the futures price, so instead of using the spot price prevailing in the in a at a given point of time we let us we have to consider the futures price traded at let us say in cedes, so if we are considering the near month futures price, so M1 prices of soya oil, soya meal and soybean after factoring in the processing cost and refining cost we will be able to calculate what is going to be the future crush rate prevailing at this point of time today.

So that is going to give us an indication whether the crush margin is going to increase or decrease. So if let us say at today point of time if future crush margin is greater than the sport crush margin, it is profitable for us to defer crushing. So a company can defer or reduce the

crushing activity for some time to come if it feels that the crush margin is going to improve at a later point of time. Similarly other the other way round, if futures crush margin is going to be lesser is lesser at this point of time, feasibly the spot margin crush margin, it is better to crush now and sell soya oil and soya meal sell soya oil and soya meal and not defer the activity or increase the activity at this point of time. And if there is conducive market situation it should it should crush and sell the output and do not defer its decision to defer its crushing activity to a later point of time.

Unfortunately in Indian exchanges Indian commodity derivative exchanges you do not have soya meal futures contract available so because of that I am not able to show you what is the futures crush margin and compare with the spot crush margin. However, in international commodity exchanges, many commodity exchanges have soybean and soya oil and soya meal derivative contracts listed because soya as I mentioned soya oil soybean is one of the largest oil seed being produced in India, produced in all over the world, so 55% of the total oil seeds which is being produced all over the India is constitutes soybean.

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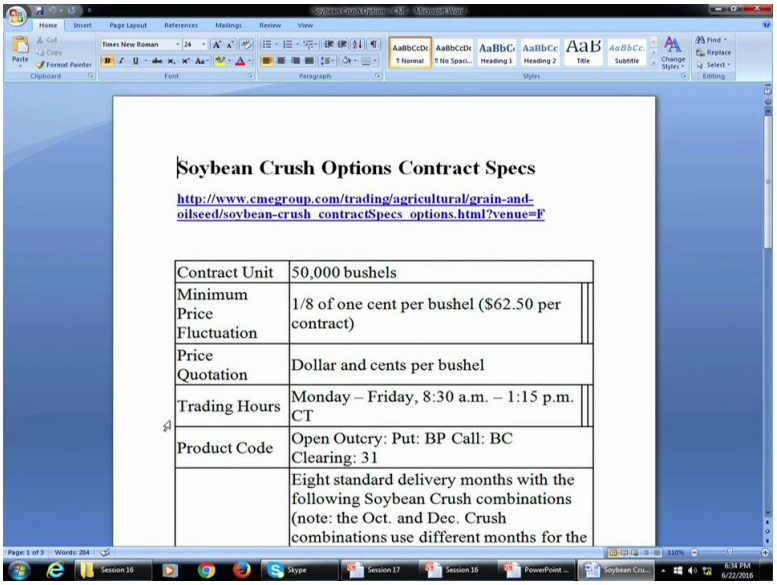

Now I will just give you an example of how derivative contracts combining these three products are available for trading at Chicago Board of Chicago Board of exchange, so I will just show you the contract specification of CBOE, so please see this one, this is a soybean crush option contract specification and this the link from where I have downloaded this contract specification is given, this is CME Group and Agricultural Commodity. And I just want you to focus on the focus on the underlying, please see this one what is the underlying, the underlying is a crush futures contract. Please recall we discussed in some earlier sessions

that option contracts have futures as underlying, so it is the it is a future contract but it is not a futures contract on a individual commodity.

It is the future contract which is derived its value from a crush the crush margin, so the underlying is soybean crush synthetic future, so based on the futures price prevailing at CBOE, the underlying value is calculated, so this the word synthetic means it is not a traded value it is futures is not traded, earlier at one point of time at CBOE you had soybean crush futures was traded but now this trading of this particular contract has not be is not being done uh, however the value is calculated as I mentioned just a couple of minutes back, the synthetic crush soybean crush margin can be calculated by subtracting the price of into M1 prices of soybean M1 prices of soya meal and soya oil prices to soybean prices after factoring in the factoring in the refining and refining and crushing cost will be getting futures crush spread.

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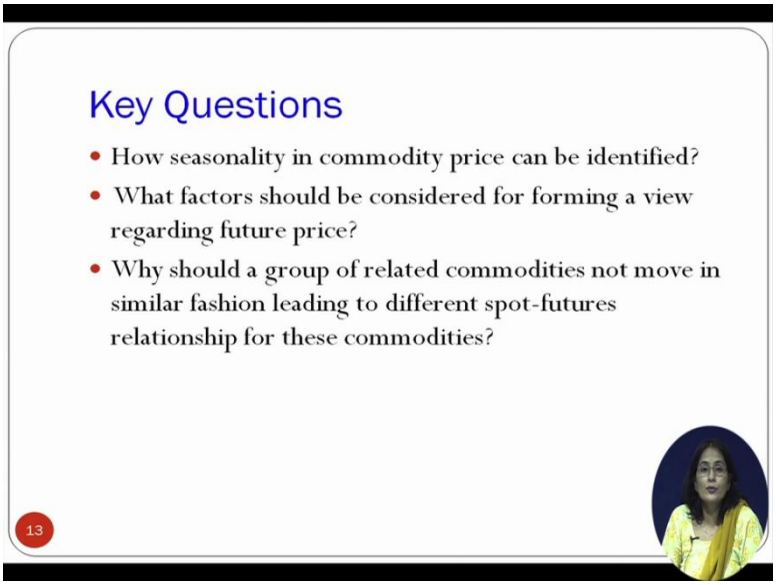

So because these values are calculated from the futures price series, we will be calling it as a futures crush spread. So this soybean crush synthetic future is the underlying and this being an option it can be call option and put option, so if and we also have discussed when an option will be an in the money and out of money and in with respect to call and put option. And the same concept learned in your financial in your financial derivative subjects, the same concept is applied, we also have discussed this aspect in detail in one of the earlier sessions.

So if the soybean crush synthetic futures is going to be compared with the exercise price, so depending upon whether it is a call or put option, if exercise happens please see this one.

If call option is exercised the call long call position holder will take 11 soybean meal futures and 9 soybean oil futures contract. So if I am if I have taken a long call position holder and it is in the money with respect to the synthetic soybean crush futures value, then I will take long position in soya meal and soya oil futures and I will simultaneously take short position on 10 soybean futures contract.

Similarly if I have taken a long put position and I am in the money, I will be taking short position in soya meal and soya oil futures and I will take long position in soya oil futures contract. So this kind of a futures and option contract based on soybean crush margin gives an opportunity to a company which is in the business of buying soybean and crushing and selling soya oil and soya meal to mitigate the price risk associated with the or mitigate the risk associated with the fluctuating crush margin by entering into one contract. otherwise this the company has to enter into 3 contracts and pay 3 different mark to market margin etc, so with one of this contract the company will be able to mitigate its risk associated with the with the varying crush margin.

So let me summarise what we have discussed in this session and in fact this is going to be our last session on understanding different aspects of agricultural commodity derivatives. We will be discussing about the crude oil commodity derivatives in our next session, so as part of the discussion over last 4 session covering the risk associated with agricultural commodity, we discussed about different aspects of seasonality we also discussed a different aspect of backwardation Contango, we also discussed different aspect pertaining to getting in understanding of what factors which could have a bearing on a commodity prices and how different consumers or producers and value chain partners can use this futures and option contracts to mitigate the price risk.

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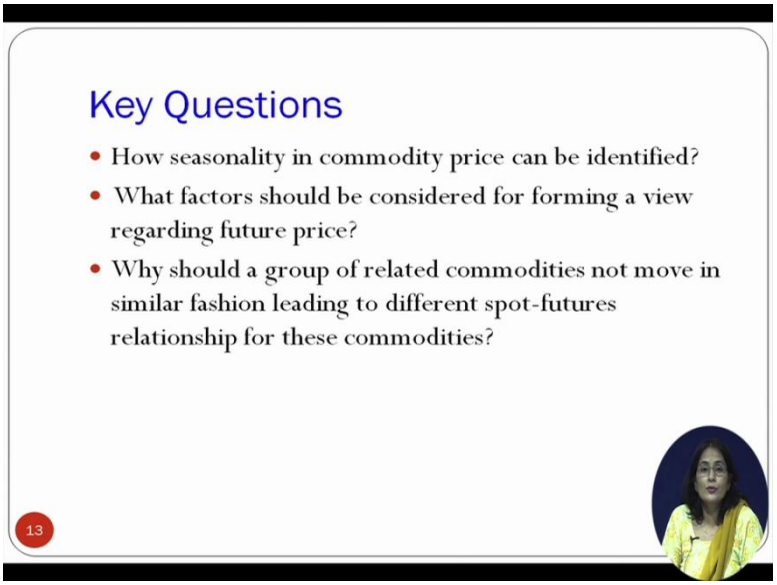

So, so what is the key questions with respect to the last couple of sessions, so how seasonality in common commodity prices can be identified and what factors should be considered for forming a view regarding a future price and why should a group of related commodities that is for example your soybean, soya oil and soya meal, they are absolutely related commodities. However, even if they are related commodities, they do not move in similar fashion leading to different spot future relations for different commodities and also how this commodity prices can be hazed using single contracts such as crush trade option contracts. So this brings an end to our discussion and as I mentioned we will be starting our discussion on different aspect of crude oil and other associated product or risk manage management in our next class. And customarily every time I say that and today also I am going to say this I am looking forward to interacting with you all very soon, thank you all of you.