Commodity Derivatives and Risk Management
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Lecture 6
Commodity Basic Risk

Hi all welcome to the next session on Commodity Derivatives Interest Management and I as you recall, we discussed how the spot and futures priced price must converge on the contract expiry date. In today's session we will discuss more about the commodity basis risk. So, let us first understand what do you mean by basis or what is the definition of basis. Basis is defined as the difference between the spot price and futures price at a given point of time. So let me repeat, basis is defined as the difference between the prices of the spot difference between the spot price and the futures price prevailing at a given point of time.

Many textbooks or many websites or you may come across where they may define basis as future price minus spot price but let us as far as our discussion, it is a basis is the spot price - the futures price. Now, let us go to little bit on Quantum Go Market. So, my question to all of you is, in case of a Quantum Go Market, whether this is going to be positive or negative? Okay, the answer to my question is the basis is going to be negative in case of a Quantum Go market.

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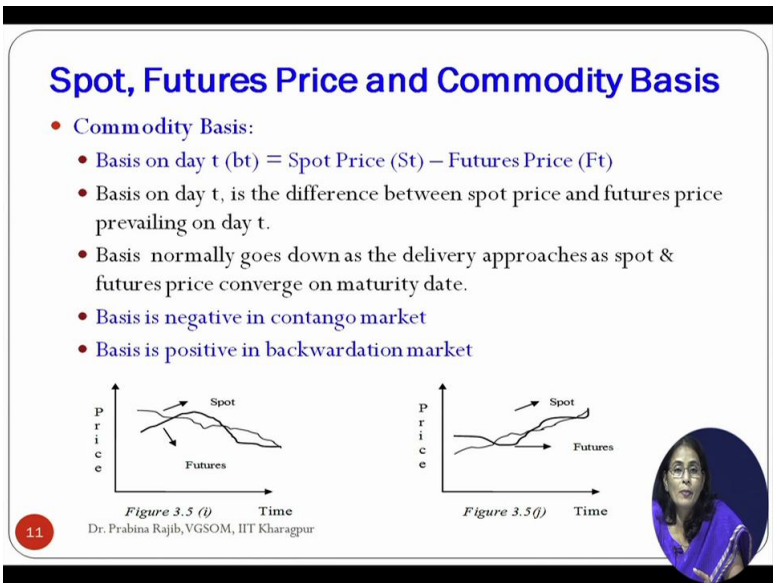

So, as mentioned in this particular slide you have a commodity basis on Day T, that let us define it as BT. So, BT is the spot price mm - the futures price prevailing on the Day T. And basis is normally goes down as the delivery approaches and spot and future price, converge

on the maturity date. If you recall, as we discussed in the last class, spot and future price converge, so whenever the spot and future price is converging, you will have a basis which is going down. So, contracts, which have longer time to maturity, will have a higher value of basis a as compared to contracts which are near the maturity and in fact, theoretically speaking, on the contract maturity date, basis would come to 0.

Now, as we discussed basis is negative in the Quantum Go market and basis will be positive in a backwardation market. And that future price is higher than the spot price in case of a Quantum Go market, so that gives rise to negative basis for Quantum Go market and positive basis for backwardation market.

Let us focus on this graph, let the picture which is given in this slide. So, if you see this particular at this point of time you have, spot is less than the futures contract. So sorry, the spot is higher than the futures contract, so this is a place where you will have a backwardation market. And after some point of time you will have a futures bb becoming more than the spot and this is the place where you will have a Quantum Go market so and so forth. So you can have spot and futures price can move from Quantum Go to backward edition or vice versa before the contract maturity. But ours S the contract mature, so this tip of the both the pictures, .This shows the contract's maturity date and which both spot and futures price converge, leading to 0 basis.

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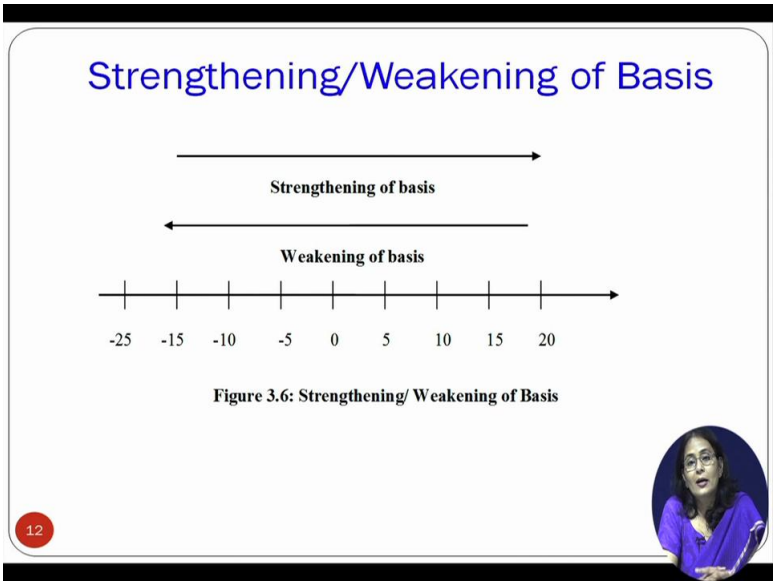

Figure 3.6: Strengthening/ Weakening of Basis

Now in this context let us understand what you mean by strengthening a basis or weakening a basis. So as we discussed, for a Quantum Go market, you will always have a negative

basis. So as the time progresses, basis this negative basis can be more negative or can be less negative or a positive basis can be more positive or less positive. So when we are talking about Strengthening a basis, so this particular picture, very clearly indicates, so when we are talking Strengthening a basis, basis uh basis or changes from more negative to less negative, and from less positive to more positive.

So let us say if basis is - 25 on the contract initiation date and at the later point of time, a basis reduces to - 5, we will say Strengthening a basis. And similarly, suppose on a contract initiation day, basis was 5 rupees, and at a later point of time, basis increases to 20 or 25 rupees, we will say Strengthening of basis. So this RO so minus to more minus to less minus or less positive to more positive is your Strengthening of basis. And what is weakening of basis, it is other way round, from more positive to less positive or from less negative to more negative. So if the basis is moving from more positive to less positive or less negative to more negative it is known as the weakening of the basis.

So with this, let us understand how basis, is an important risk for commodity futures trade. This is a very important concept which all of us must understand thoroughly because that is the essence of futures study.

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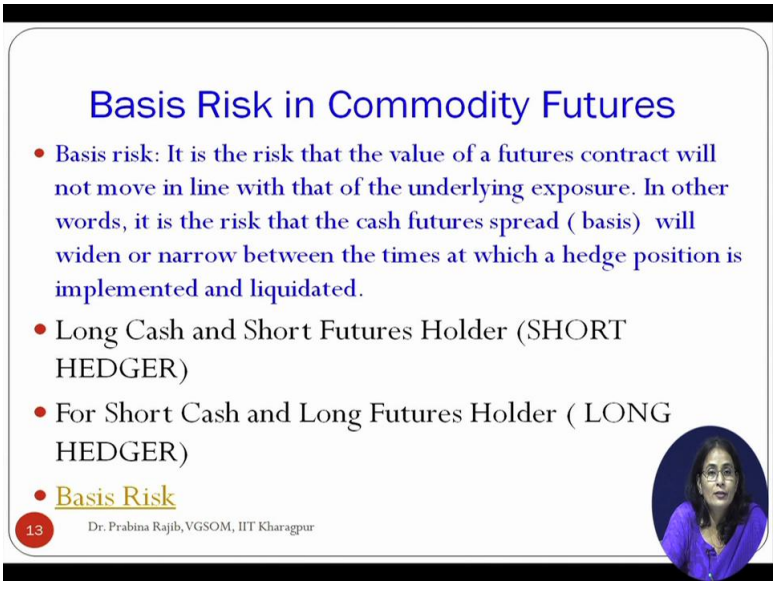

So, how do we define basis risk? Basis risk is defined as the risk that the value of the futures contract will not move in line with that of the underlying exposure. That is the spot market prices are moving in some directions while the futures contract may move in the same direction or may not move in the same direction. So if the basis changes, basis becomes wider

or less wide, basis becomes be shifting Strengths or basis weakens. That is going to give rise to a risk to the commodity futures trade.

Now let us take an example to understand how this basis, you know, how basis is calculated and basis risk basis is a risk for commodity futures trade. Before I go into this excel file let us, I would like to again remind you what is the difference between a long hedger and a short hedger. May be quite few substantial number of times I am saying this what is a who is a hedger and which is a long hedger because this is my way of probably reinforcing this very valuable concept of the difference between long hedger and a short hedger. So who is a short?

Short hedger is a party who owns the asset and that party's fare is that price is going to go down unless he does something, so he enters into a contract, the trader enters into a contract to sale the underlying or takes a short futures position. Hence, he is a short hedger. So, now take an example, of higher basis risk is uplifting short hedger.

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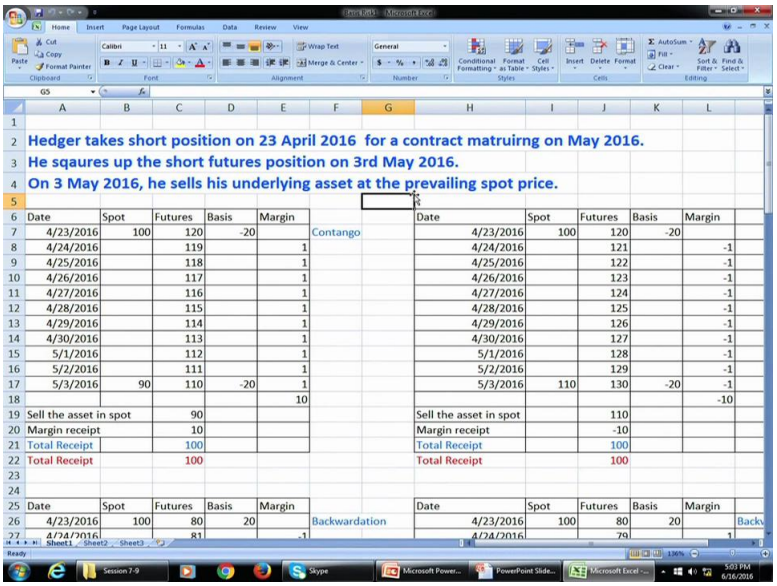

So you have , I hope you are able to see the screen properly, so you have a hedger, the left side is a the hedger takes a short position on 23rd April 2016, so on spot date is your 23rd April 2016 and the hedger is entering into a contract which is maturing on May 2016. And he would like to square up his short futures position on 3rd May 2016. Why would he be interesting in squaring up his position on third May 2016? Because the hedger who is let us say who is producing (())(09:25), he has already committed to deliver the underlying on 3rd May. So he will be as far its, cash of market operations, he will be delivering the underlying

and he does not need to keep its futures position open beyond this date. So he is interested to square up the short futures position which he has taken on 22nd April 2016 on 3rd May 2016.

Now let us say let us say on the spot date that is 23rd April 2016, what is the difference over to the spot and futures price prevailing, the spot price is 100 rupees and the futures price is 20 rupees. So going by our definition of basis, spot price - the futures price, so you will have a, you know, negative basis because it is a Quantum go market and this is also defined as spot - futures. So 100 - 20 is your - 20, so you have a basis as 20 rupees.

Now let us go to the next day that is we ignore what is happening in the spot market, so we do not care what is, I mean we do care what is happening but that is not you know, required, this information is not required at this point of time for understanding the impact of basis risk. Now, let us go to let us see this next date that is on 24th April, the futures price goes down by 1 rupee. So when futures price goes down by one rupee, the trader has taken short futures, so he is benefitting when the futures price goes down, so his gain is marked to market's gain is one rupee.

So our margin gain, margin receipt or margin gain he is getting is 1 rupee. Similarly, all those days 1 1 1 1 rupee futures price is going down. So every day, he is getting 1 1 rupee. So at the end of the that is third May, on 3rd May, what is not benefit on account of a margin receipt, he is getting 20 rupees.

Now let us see, he is going to the sell the underlying asset at the prevailing spot market price. So what has he done that he goes to the market and he finds out that the prevailing price has gone down which is his fear, 100 rupees has gone down to 90 rupees. So he would be selling the underlying asset in the market at 90 rupees. However, he will be getting 10 rupees as its profit from the futures contract, resulting in a net receipt, total receipt of 100 rupees, so this is one case let us go to the next case. Let us say, instead of futures price going down by 1 1 rupee, let us say futures price increases by 1 1 rupee. So what is happening, 120, 121, 122 so and so forth, so futures price is increased to 130.

And every day he is, because futures price is increasing, he will be paying mark to market's margin, so his net receipt is going to be - 1, - 1, - 1.So sum total of it, that is coming to a - 10, and on the contract expiry date or physical transaction date, the spot price, contrary to his expectation of decline price, price has gone up to 110. So he will be selling the underlying asset in the market at 100, but simultaneously he has already paid 10 rupees as a mark to

market loss. So his net receipt is going to be 100 rupees. In fact if you see the previous example which I gave and the current example, the basis has not changed. Basis has remained - 20 and - 20 here.

And so in both cases, basis has remained unchanged and what is its net receipt? Net receipt is the proceed he which he is going to get by selling the asset in the underlying market + any net receipt from the futures market through the margin. Of course we are ignoring the initial margin part of it because initial margin is a deposit which the trader, both buyers and sellers of futures contract pay and they get it back at the end of the when square up the contract when they square the contract. So this is margin initial margin payment or receipt does not, in any way, you know, get influenced or get factored into this calculation.

Now this total receipt is also, if you can see, total receipt is 90 + 10 that is spot market price + the margin receipt. This total receipt is also nothing but the futures price committed on contract on day 0 + the + the basis prevailing on the contract square up date. So 120 - 20 is going to give you a total receipt of 100.

Now let us take other situations. So we will be initially, we have taken Quantum go situation, let us take a backward edition situation for you have a spot is 100 and futures is 80. Similarly, the futures price is increasing 1 1 1 1 rupees and it is from 80 to 90 it is increasing and the spot price is also increasing, so giving rise to 20 as a basis both on the contract assigning date and the contract's squaring up date. So because the futures price is increasing, this long short futures holder will pay 1 rupee margin, so net receipt is going to be - 10. And he will be selling the underlying at a higher price of 110 and his net receipt is going to be 100.

Now let us go to the, again the same situation you have a backwardation market, 180 and instead of futures price increasing, futures price is going down by 1 1 rupee every day. So that is also resulting in net receipt of 100 rupees by when he when this particular party sells the underlying in in the spot market and also adjusts for the margin receipt or margin payment.

Now let us go to the situation when you have when u have you know, the basis moves in a different manner which S tarts with 100 and 120 it is a Quantum go market, basis is - 20 but if you see on the contract maturity date, basis is no more - 20, basis has weaken to - 32. As you recall, we discussed that when a basis sits from more negative to sorry less negative to more negative it is treated as a weakening of the basis. So it basis has weakened, so because

of that basis has changed and with the changed basis, this particular trader received 1 rupees for first four days and paid margin at a subsequent time period and net resulting in a net receipt of 2 rupees up from margin.

And he what is a prevailing price? Prevailing price is 90 rupees in the market and his net receipt is going to be 90 - 2 = 88 rupees. So even if he has contracted the futures price, you know, he is not getting futures price, he is not even getting the spot price which is prevailing in the market. In fact, he is getting the spot the price but after adjusting for the margin payment, his net receipt is going to be less than the spot price prevailing in the market. So this gives rise to the this is the basis risk.

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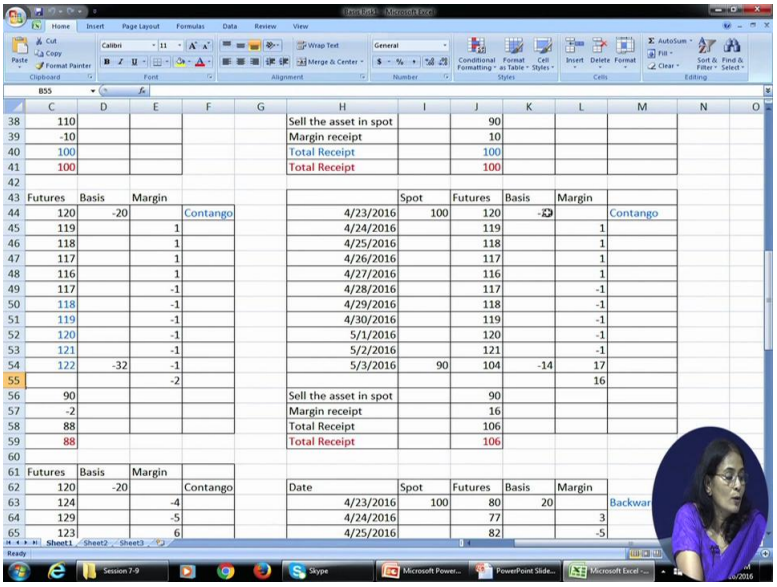

Now let us go to the next combination, similarly you have a Quantum go market, basis is basis changes on the contract squaring up date, basis is from - 20, it is - 14, so in this case, basis has Strengthened. If you remember, strengthening a basis means, from more negative to less negative. So from - 20 to - 14 is treated as a Strengthening of the basis. So when basis has strengthened, let us see what is happening. His total receipt is not 90; his total receipt is 90 + 16 that is coming to your 106. Again, let me repeat, this 106 can also be arrived at 0 that is the futures price prevailing on the contract initiation date and the basis prevailing on the contract squaring up date. So that is your 120 - 14 that comes to 106.

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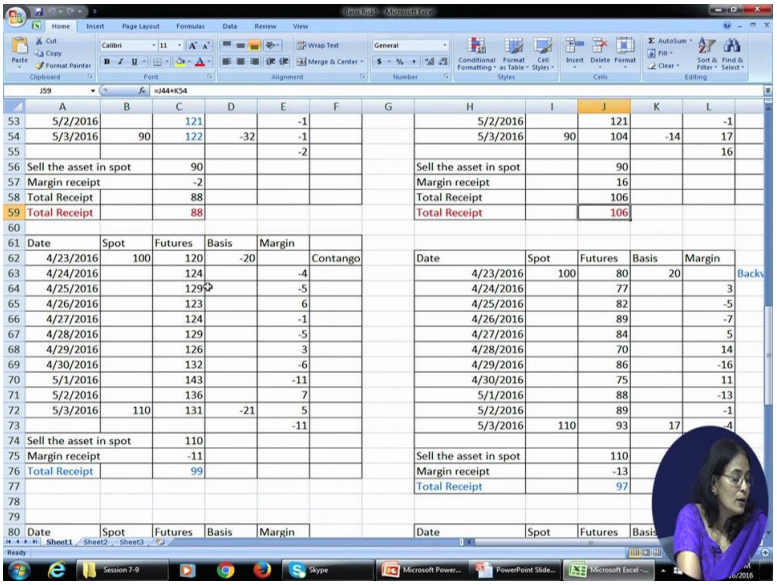

So I have just also taken similarly different combinations, so you will have you have, you know, spot price 100, futures price 20, Quantum go market, basis is - 20. But on the contract expiry date, contract the basis has weakened from - 20 to - 20 one, so going by that, how much is going to be the net receipt 110, he will be selling the underlying at 110 but he has already paid 11 rupees as the margin, so net receipt is going to be 99 rupees.

So similarly you will have other combinations, basis is 20 and basis changed to 17, so it is weakening of the basis. Weakening of the basis means he has already paid 13 rupees as margin payment, he will be selling the underlying at 110 but net receipt is going to be 97.

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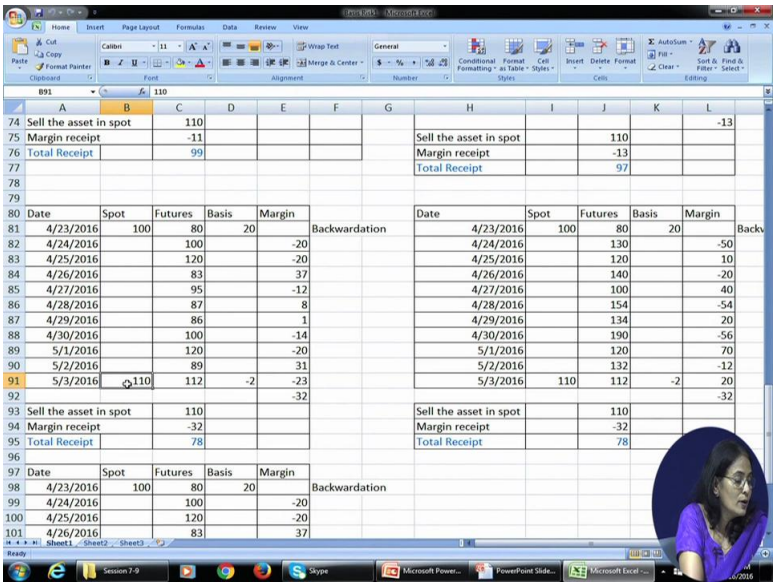

Now let us go to other combinations, so you have 110 - 32 gives rise to 78 as your net receipt. This is also 80 minus the basis prevailing on the contract square up date, 80 - 2 is 72. (())(21:22), this is also an extreme case, so you can have a case like let us say you have 110 is the spot price prevailing on the contract squaring up date, so the without the futures contract, this party would have been able to sell the underlying asset at 110. But because it has entered into futures contract, it has already paid a mark to market marginal fifty rupees. So his net receipt from the contract is 60 rupees.

So why it has resulted why this has happened? Basis has shifted from the 20 basis; it has gone down to - 20. So the movement of basis let us summarise from this particular excel, you will be able to see that is the receipt the actual receipt by a short hedger on the contract expiry date contract square up date, the day it is interested to take the physical undertake the physical transaction of selling the underlying asset in the spot market and squaring up the contract before the maturity. So the net receipt could be substantially different depending upon how the basis has changed over time period, so this gives rise to a risk called Basis risk.

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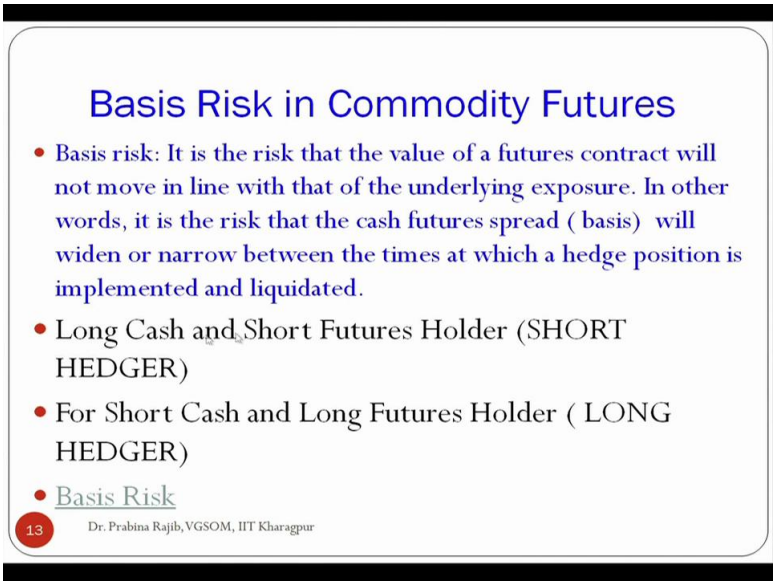

So similar exercise can be done for a long hedger, so this excel file which I showed to you, it is put in into the basis risk faced by a short futures holder or short hedger. Exactly the same thing can be done for a long futures position holder.

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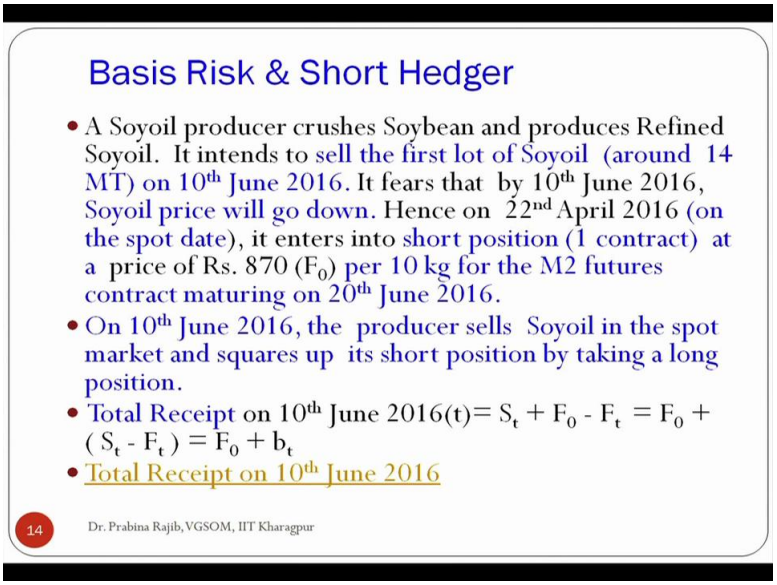

Now let us go to another example, let us say a soya oil produce crushed soya bean and produces refined soya oil. So it tends to sell the first lot of soya oil which is around 14 metric ton on 10th June 2016. So his physical transaction date, the day he will be actually selling the soya oil at a prevailing the spot price in a local market, let us say Indore that is on 10th June 2016, so it is fearing that the price will go down and hence it enters into a short futures contract at a price of 870 for 10 Kg for 2nd month futures contract which is maturing on 20th June. So let me write down you have spot date as. You have spot date is 22nd April 2016 and contract maturity date, contract maturity date is 20th June 2016.

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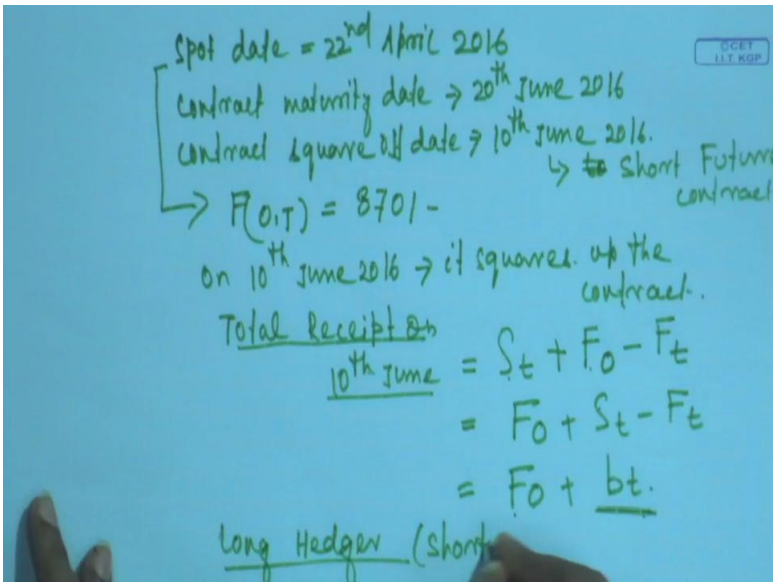

Contract square up date, the date is your that is your 10th June 2016. So on the spot date, it enters into the contract, so on spot date it enters into a contract F (0 T) as 870. So on 10th June 2016, it squares up the contract so it had taken earlier, it had taken a long sorry it had taken a short futures contract.

It is so total receipt on 10th June will be the price at which he will be selling the underlying at the local market that is the spot price prevailing on the this date, so let us name it as S t. It also it had agreed it it receipt it had agreed to receive F 0 and it is also, when it is squaring up its contract, it has agreed to pay F t. So net receipt, so total receipt on 10th June is going to be S t + F 0 - F t, so what we can write it as F 0 + S t - F t. So that is going to be F 0 + so total receipt for a short hedger is going to be F 0 + BT. So depending upon how the B T is moving, the trader may get more money than the F 0 or trader may get less money than the F 0.

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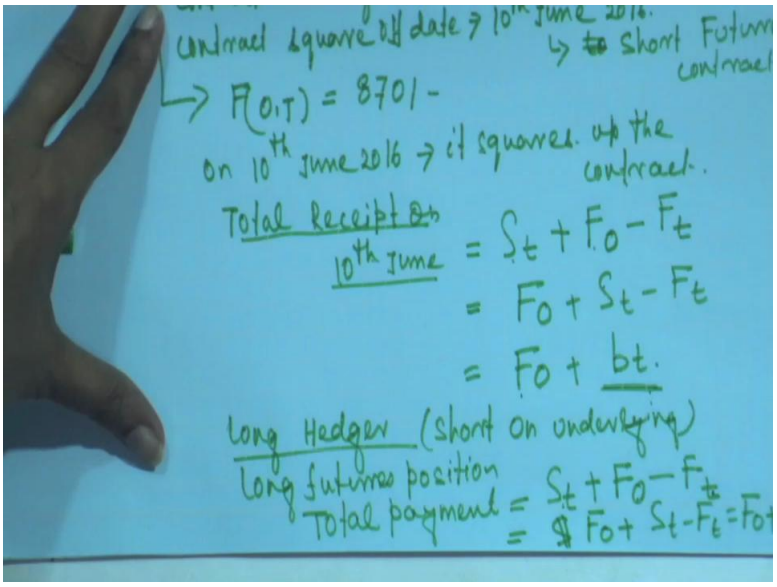

So this is what we discussed is basis risk from the short futures point of view. Similarly if we have a long hedger, a party who is short on, party who is short on underlying or who is a consumer and he would like to take long futures position. So his total payment, total payment will be, so he will be buying the underlying at the spot market by paying S t. He also had taken a he also had taken a long futures position, so he had agreed to pay F 0. So you will have, the payment is going to be so long futures position total payment is going to be S t + F 0 - F t. So you will have, it is same thing as F 0 + S t - F t which is equal to F 0 + B T.

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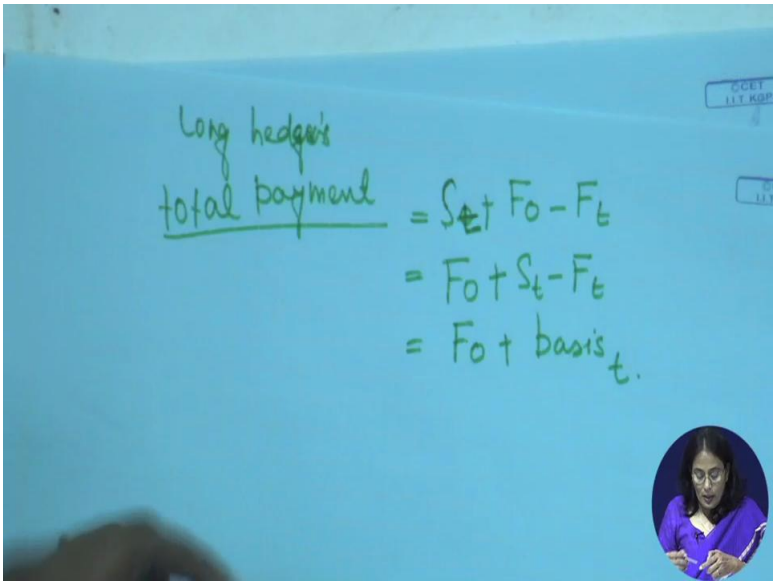

So let me repeat here, the long hedger, long hedger's payment total payment. Let me focus on the word total payment because in case of a short hedger it was total receipt but in case of long hedger it is going to be total payment. So total payment is going to be S 0 + F 0 - F t, so this is nothing but F 0 Sorry it will be S t + F 0 - F t so it is F 0 + S t - F t. So this is comes to F 0 + basis on, so this let me summarise that in case of futures contract, commodity traders are exposed to the basis risk and basis risk eliminates from the way the spot and futures price move with each other. Spot and futures price do not move in a similar manner, then the traders are exposed to the basis risk.

So with this, I am winding up this particular session on basis risk. In the next session we will be not only discussing little more on basis risk, we will also go to understanding what are the different hedger issue and how many contracts a trader should buy or sell to mitigate its exposure in the underlying market. Thank you all of you! Looking forward to meeting you all in again in the next session.