Commodity Derivatives and Risk Management
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Week-04
Lecture 19
Calendar Spread, Valuation of Futures Vs. Forwards, Commodity Swaps

Welcome to the 19th lecture session on Commodity Derivatives and Risk Management. And today we are going to discuss different aspects of calendar spread, we will also be discussing difference between the valuation of forward contracts and futures contract as well as we will also be discussing various aspects of commodity swaps. Now let us understand what you mean by calendar spread. Calendar spread position is a futures position, but in calendar spread a trader takes simultaneous position in two different futures contract on the same underlying, but for a different maturity. And the value of the calendar spread is nothing but the difference between the price of the far month futures contract and the near month futures contract.

And calendar spread contracts are also known as intra commodity calendar spread or intra market calendar spread contracts. As you can see from the right side block, a calendar spread has a buyer as well as a seller and the buyer will always be entering into the far month contract, buyer of a spread will buy the far month contract and sell the near month contract while the opposite position the seller of the spread contract will take a position which is equivalent to selling the far month contract and buying the near month contract. Let us go to this block which is given below this particular data I have taken from the multi commodity exchange, and this table shows the different kinds of calendar spread contracts are available to different traders for the months of May, June, July. So, let us see these two highlighted contracts on copper.

So, the first highlighted contract, that is your copper May July 23 is a spread contract between May 2023 maturity and July 2023 maturity and as you can see the near month contract is May 2023 and far month contract is July 2023 and please note that a trader will be able to take buy or sell spread position from first May 2023 onwards and the contract will come to an expiry on 31st May 2023 which is the last date of the near month contract maturity period. So, as is mentioned here, the spread contract expires with the expiry of the near month contract. With this let us go to understand why anybody would be interested to buy or sell spread. Now, let us take a simple example, let us say the futures price for the near month is 10 rupees and the futures price for the far month is 18 rupees. Hence the spread is 8 rupees.

Now, let us say a trader is expecting that both prices to fall within coming 3 days. He has certain information related to the underlying commodity market and based on certain you know assumption certain information he is expecting that both prices are going to fall, but the near month near month price decline will be much lesser compared to the far month price decline. So, as you can see you, have a near-month price decline is by 1 rupee and far month price decline is by 3 rupees and the spread is coming to 15 minus 9 is equal to your 6 rupees as spread. Please note that the spread has narrowed down from 8 rupees now he is expecting the spread to narrow down. Hence the trader would be interested to enter into a position that is today the trader will be taking a sell the spread position and later 3 days later he will buy the spread.

So, as part of the selling the spread position what the trader will do, he will sell the far month futures contract he will receive 18 rupees and he will be buying the near month futures contract he will be paying 10 rupees. So, his benefit is going to be 8 rupees. Now, if his expectation comes true and really the spread narrows down to 6 rupees 3 days later the trader would be squaring of the spread position by taking exactly the opposite position. In this case he will be buying the far month contract, and he will be selling the near month contract, and he will be in the process of incurring a 6 rupees loss. However, over the period of 2 days 3 days he will be benefiting 2 rupees.

So, a trader would be interested to take a spread position buy or sell spread position depending on his or her expectation related to how the spread is going to move in future days. Now, let us take some other examples to understand more on the calendar spread. This particular table shows the different combination of near month and future month prices and in detail explains how a particular trader will be benefiting or incurring loss depending on whether the spread is widening or spread is narrowing. Let us say our base case is your 10 rupees near month and 15 rupees far month. As you can see far month price is higher than the near month it is a contango market and the spread value is 5 rupees.

Now, let us compare this base case position with the next day which is your both prices are increasing 12 rupees and 19 rupees the market is contango spread has widened and if on day 0 the trader has taken a has taken a buy spread position in that case within it you know next day, he or she is going to get a benefit of 2 rupees. Similarly, let us go to the third situation compared to the first situation where the spread was 5 rupees and the third situation the spread is 4 rupees. Please note that the market has contango market structure has not changed, but the spread has narrowed down and because the spread has narrowed down this particular party will be incurring a loss of 1 rupee. So, this particular table shows whether the spread is narrowing or widening with respect to the day 0 and as you can see whenever the spread has widened as compared to 5 rupees the trader will be benefiting or you know be in positive in other cases trader will be incurring loss. And

exactly the mirror image of this same calculation is given to the counterparty position who would be taking a selling spread position.

Please note the moment, somebody is entering into buy the spread position some counterparty will be entering into selling the spread position. Obviously, as we know derivative contracts are 0 sum game. So, the benefit of one party is going to be the loss of the other party, as you can see in the you know first case, if the buyer of the spread has benefited by 2 rupees the seller of trade will be incurring the incurring loss of 2 rupees. So, why people enter into the spread position? So, if somebody is expecting the spread to widen that particular party will be buying the spread position, similarly if somebody is expecting the spread to narrow down that particular party will be selling the spread contract. And pretty much very regularly traders in commodity derivatives market enter into calendar spread of various types.

Now coming to the other kind of spreads which are known as your inter commodity or inter market spread. Please recall, what we just now discussed that is an intra commodity or intra-market spread intra commodity and intra market spread is related to somebody entering into futures position on the same commodity, but of different maturity. But in case of an inter commodity or inter-market spread, traders take a position in related commodity futures. Let us go to a very popular inter commodity spread which is known as your crack spread futures contract. In this case buyers and sellers enter into simultaneously enter into futures contract on refined products such as petrol and diesel and crude oil.

And please note that somebody who is buying a crack spread that particular party is buying futures contract on refined products and selling crude oil futures contract. Similarly, the seller of the crack spread will take the opposite position exactly he will he or she will sell the refined product futures and buy the crude oil futures contract. Similar as similar to the crack spread futures contract exchanges also offer cross spread futures. Normally cross spread futures involve futures contract related to soybean futures as well as soy oil and soy meal futures. And as you know that soybean is crushed to arrive or to generate soy oil and soy meal.

So, somebody who is entering into futures contract of soybean as well as soy oil and soy meal they are you know that kind of a futures contract is known as cross spread futures contract. In fact, all these you know different types of spread contract that is crack spread contract cross spread contract details we will be discussing in greater detail in subsequent lectures. And similarly, similar to the crack spread futures contract and cross spread futures contract, we also have exchanges offering dark spread futures contract. And dark spread futures contract involves futures contract related to coal as well as electricity. Please note that coal is used to produce electricity and this dark spread futures contract involves coal futures and electricity futures.

Similarly spark spread futures contract involves natural gas futures contract and electricity futures contract. With this we come to an end to discussion on calendar spreads as well as inter commodity or inter market spreads. Now, let us come to the next ah very interesting ah aspect of what is the difference between price and valuation of futures contract. So, price and valuation of forwards and futures. The important question is there a difference between price and value.

In fact, many a times we use this price and value synonymously or interchangeably, but there is a very important difference between a price and value. Now, let us understand what do you mean by price and value. It is a very simple example. Let us say one buys a house today and pays the price for the house as applicable today. Now, if the buyer wants to sell the same house today or the next day, he will still realize the same price.

In that case he will get some price, but the value of the house is 0. Now, the value will be positive or negative when the house price either increases or decreases as compared to the purchase price. So, price will always be positive, but value can be negative, value can be positive, or value can be 0. With this understanding let us understand, is there a difference between the price and valuation of the forward contract as well as futures contract. It is very important to understand the basic difference between futures and forward contracts.

We have discussed this in greater detail in the last you know 6 to 7 lectures back but let us refresh what is the difference between futures contract and forward contracts. We see that the futures contract is an exchange traded contract, they are standardized contracts, and the buyers and sellers have to pay various types of margins as applicable by the as mentioned by the exchange. And normally underlying assets are not delivered in the case of a futures contract and futures contract have 0 counter party risk and they are very highly regulated because these are exchange traded. Compared to futures contracts forward contracts are bilateral or OTC contracts, they are very structured to meet the needs of both parties. The contract terms and conditions can be anything, contract specification can be anything as long as both parties agree to it.

And no interim payment or receipt during the life of the forward contract and underlying assets are exchanged at the maturity counter party risk is high and these are not regulated. In addition to these differences there is also very significant difference between a value of a forward contract and a value of a futures contract. And what is that difference? Please note that the forward contracts have positive or negative value after the contract initiation date, but futures contracts will have a 0 value. And after we pay for the mark to market margin futures contract will not have any value, but forward contracts can have a positive value or a negative value. Now why forward contracts will have a positive value and negative value? Let us go to a simple example to understand this aspect.

This particular picture or these you know these two boxes indicates the future price and value. Let us take a very simple example. Let us say Mr. A takes a long futures position on day 0 at a future price of 400 rupees and the contract maturity is for 30 days. So, the future price on day 0 for a contract period of 30 days maturity is 400.

Let us say on day 5 the future price is 370. Please note that the Mr. A has taken a long futures position. On day 5 when the same futures are quoting at 370 rupees, Mr. A must have paid rupees 30 as mark to market margin for day 0 to day 5 on day 5.

So, as we know, any loss or gain is paid by the future position holder as mark to market margin. So, Mr. A took long futures at 400 rupees. So, he agreed to buy something for 400 rupees. The same thing is selling at 370 rupees, that means, he has incurred a loss of 30 rupees and if Mr. A has incurred a loss of 30 rupees means the counterparty has gained 30 rupees. So, whatever loss Mr. A has incurred is transferred to the counterparty as mark to market margin and this will be done on day 5. Of course, this is a very simple example in reality futures contracts are mark to market on a daily basis. Just to highlight the concept of mark-to-market margin, I have mentioned that as if the mark to market margin is paid or received on every fifth day.

Now once this mark to market margin has been paid or received then the value of futures contract is 0 because whatever he has incurred as a loss, he has paid that amount of money to the counterparty and after paying that money neither his position has no value, he has a 0-value position. Now let us come to the equivalent forward contract same thing Mr. A enters into a forward contract on day 0 at a forward price of 400 rupees. In this case, it is an exchange-traded, in the previous case it is an exchange traded, hence we are using the word long futures. Here it is a bilateral contract with some other counterparty Mr. A has taken and he has taken a long forward position on day 0 at a price of 400 rupees. Now let us say on day 5 the same contract, the same forward price could be entered by Mr. A with some other counterparty at 370 rupees. Now in the case of a futures contract whatever loss Mr. A makes he is supposed to him pays to the counterparty, but in the case of a forward contract there is no interim payment between Mr. A, and the counterparty. So, as there is no payment or receipt during the contract. So, value of the forward contract now will be calculated in this using this formula that is your F 0 t minus F 0 t plus F t t divided by e to the power r t minus t and why are we giving a negative sign to minus F 0 t because Mr. A has taken a long forward position. So, he would be buying some underlying at F 0 t hence a negative sign subsequently he will be he can he will be able to sell that contract at F t t hence it is a positive sign and all this is going to happen at a maturity day of t and if we want to find out what is the value of the forward contract today that we have to discount it to the today's day and that today is your 25 days please note that we are no more here we are at day 5 hence total time to maturity is 25 days. So, capital T value is 30 and small t is 5 and r is your continuous compounding rate in this case I have just taken some 6 percent as continuous

compounding rate and time to maturity is 25 days and discounting all this, we are getting a negative of 29.88. So, with this we come to a very important understanding with respect to the difference between the F 0 forward contract and futures contract. Futures contracts will have a 0 value after paying or receiving the mark-to-market margin, but forward contract can have a significant positive value or negative value during the life of the contract. Now, with this let us come to the third aspect of today's discussion, that is our commodity swaps. So, what exactly is a commodity swap? A commodity swap is a mechanism through which commodity producers, consumers and value chain partners can mitigate the price risk. Please note that consumers, commodity producers, consumers and value chain partners can mitigate the price risk using forward contracts as well as futures contracts.

Commodity swaps are another mechanism or an instrument which helps these commodity producers and consumers to mitigate the price risk. Again, like your forward contracts these commodity contracts are bilateral contracts and as part of this bilateral contract one party pays a fixed amount and another party pays a floating or variable amount. We will take numerical examples to understand what do we mean by one party paying a fixed amount and another party paying a floating or variable amount. But at this point in time let us understand or remember that buyer of a swap is a party who is paying a fixed amount, and a seller of a swap will be a party which is paying floating or variable amount. Please note in case of a commodity swap there will always be a buyer of a swap and there will always be a seller of a swap exactly the way in case of a forward or futures contract there will always be a buyer of a forward or futures contract and there will be a seller of forward or futures contract.

Similarly, in case of a swap there will be a buyer of a swap and seller of a swap and buyer of a swap will is the party which pays a fixed amount. Let us go to an understanding of a example how how you know commodity producers consumers use commodity swaps to mitigate the price risk. Let us come to a wheat farmer who is planning to sell let us say 170 quintals of wheat after 20 days and the farmer sells at a mandi called sehore mandi in Madhya Pradesh and what is the farmers fear? Farmers fear is price decline within 20 days price of wheat may go down. Now, to mitigate that risk farmer will enter into a swap contract with a counterparty and who will be a counterparty? A counterparty could be a bank or a financial institution. So, what both parties will be entering into agreement on day 0, let us say on 20th May 2023.

So, what both parties will enter into an agreement farmer will be receiving a fixed amount of 1800 rupees a quintal from the bank or financial institution on the 20th day from the day 0 and what farmer will do? Farmer will pay a floating price. So, that floating price is nothing, but the price which is going to prevail at the sehore mandi of on the 20th day. So, on the 20th day so, this is the day 0 agreement. Now, let us move to

20th day. Now, on the 20th day which is 9th June 2023 let us the sehore mandi price is 1760 rupees a quintal.

Now, without the swap contract this particular gentleman the wheat farmer would have sold wheat at 1760 rupees a quintal, but the fact that he has entered into a swap contract he would be receiving 40 rupees per quintal from the financial institution such that his total receipt of wheat is going to be 1800 rupees. Please note that the farmer has you know as part of the agreement farmer has this farmer you know is committed to receive a fixed amount of 1800 rupees a quintal. From the market he will be selling wheat at 1760 rupees a quintal and he will be receiving 40 rupees per quintal from the financial institution. Now, let us take the other situation where the farmer's fear is not true let us say sehore mandi price is 2035 a quintal. So, the farmer will be selling the farmer will be ah selling wheat in 2000 the farmer will be selling the wheat at 2035 rupees a quintal and farmer will be paying actually it will be 235 rupees a quintal to the financial institution.

Let me correct here that is little mistake here. So, the farmer will pay a net payment of 235 rupees a quintal to the financial institution such that the net receipt for selling wheat is going to be 1800 rupees. And the contract terms and details will be mentioned here. The contract trade rate is the day both parties enter into the contract, that is your 20th May 2020. What is the commodity? The commodity is wheat. What is the quantity 170 quintal, and, in this case, who is the buyer of the swap? Please note the financial institution is paying a fixed rate of 1800 rupees to the farmer. So, the buyer of the swap is the financial institution and in the counterparty the farmer is paying a floating rate, and the farmer is the seller of the swap and what the farmer is paying? Paying a floating price that is the spot wheat price which will prevail at sehore mandi of Madhya Pradesh after 20 days that is your 9th June 2023. And the reference date is 9th June 2023 fixed price is 1800 rupees per quintal and settlement and payment date is let us say 10th June 2023.

So, depending upon what price has prevailed if 1760 has prevailed the financial institution will pay 40 rupees per quintal into 170 quintals to the farmer on 10th June. Otherwise on 10th June farmer is going to pay 235 rupees a quintal into 170 quintals to the financial institution on 10th June. So, this particular example shows irrespective of what happens to the wheat price the farmer will be able to sell wheat at 1800 rupees a quintal. So, this is an example of a commodity swap. There are many different dimensions to the commodity swap.

In the next session we will be discussing in detail more you know variants of commodity swaps and how commodity swaps are used to mitigate the price risk. With this I look forward to interacting with all of you in the next session and. Thank you all of you.