Commodity Derivatives and Risk Management
Prof. Prabina Rajib
Vinod Gupta School of Management
Indian Institute of Technology, Kharagpur
Week-05
Lecture 22
Commodity Index (Contd.)

Welcome to the 22nd lecture on Commodity Derivatives and Risk Management. Please recall that in the previous session we had discussed different aspects of commodity index creation and calculation, and we will be continuing with the remaining part of the commodity index creation and calculation and what are the uses of this commodity index in a greater detail in today's session. Now, let us proceed with the recapitulation of what we discussed in the previous session. Please note that the commodity indexes use commodity futures as constituent entities, and these commodity indexes may consider commodity futures traded at a single exchange or at multiple exchanges. They can consider future price denominated in a single currency or a multiple currency. As you can see from the right-hand side block that S&P GSCI index considers commodities traded in different commodity exchanges, but all denominated in US dollar. While Rogers International Commodity Index considers commodity traded commodity derivatives traded in many different exchanges and they are denominated in different currencies. Now, in the case of equity indexes the weights of each constituent company is based on free float market capitalization and these weights change daily. And please note that the change of weight on daily basis is not because the number of free float shares changes daily, but the price of the shares changes. The calculation of this commodity index based on commodity futures varies significantly with the equity index calculation on two counts and these two counts are identification of the weights. How do we identify or arrive at the weights for individual commodity futures which are part of a commodity futures index that is the first major difference. And the second major difference comes from the way future prices are factored into the futures index calculation. Now, every commodity index has an index administration committee, and that committee identifies all commodity futures which can be part of any index. Normally this index administration committee uses trading liquidity that is total traded value or average daily traded value as a parameter to select the commodity futures and decides whether a particular commodity future will be part of the index or not. For example, MCX iComdex index, the index administration committee requires average daily traded value for a commodity futures to be more than 10 crore rupees. And any commodity futures that do not satisfy this particular criterion will not be part of the index. Now, once the broad list of this commodity futures is identified the index administration committee calculates the weight. And as we have also discussed in the previous session the weights for individual commodity futures are based on any one of the three parameters and these three

parameters could be average global production of that commodity, average liquidity measure by the futures trading volume for that commodity future or a combination of both. And please note that when we are using the word average that average is calculated based on rolling 3 to 5 years of production or trading volume data. And why the rolling 3-to-5-year data is used that to accommodate for very high or low production of that commodity or a trading volume of a commodity futures each year. Now, with this method the index administration committee identifies the weights associated with each commodity futures which are going to be part of the index. Now, let us take a real-life example. In addition to the weights calculation the IAC also identifies a preannounced minimum or maximum weight limit for a commodity future. The right-side block as you can see is the minimum and maximum weight limit as prescribed by the index administration committee for MCX iComdex. And if a particular commodity futures calculated weight is less than the minimum weight limit that commodity futures will be removed from the index and its weight will be reallocated with the other commodity futures. In contrast if the calculated weight is more than maximum weight limit the weight of that commodity futures will be reduced by the excess amount and this excess weight will be redistributed among other commodity futures. And the most important aspect of this commodity index creation is that the weights arrived at in the process remain unchanged till the exchange rebalances the weight for the next year. Normally these new weights are applied from a given date onwards. So, the index administration committee will announce that the new weights are going to be applicable from such and such date. And normally these new weights are arrived or announced or changed on an annual basis because most of the production statistics, most of the official products the production statistics are announced or published once a year. Now, let us take the real-life example for MCX iComdex. Please see that this is the total list of commodities MCX iComdex has considered and based on the physical market activity based on the trading volume different weights are calculated. As you can see, for a commodity called Mentha oil futures the total weight calculated is 0.48 percent. Please recall that MCX iComdex sets a minimum weight of 0.75 percent and maximum weight for a single commodity futures to be 40 percent. As this particular commodity that is Mentha oil future which is having 0.48 percent as the weight is less than the 0.75 percent this particular commodity futures will not be part of the index.

In addition to removing this particular Mentha oil index I want you to pay attention to the last line or the detail which is given next to the star. It mentions that cardamom was excluded from the weight calculation as the average daily turnover of MCX futures contract value for the year 2015 to 18 is less than 10 crore rupees. So, first of all the exchange identifies whether a particular commodity futures will be part of the index or not based on the futures trading volume. So, by that major cardamom could not be part of the index. However, it went ahead and found out the index for remaining commodities and once the weights are calculated for the remaining commodity the index

administration committee realized that Mentha oil will not be part of the commodity index because it does not have the minimum weight criteria.

Now as you can see this is the revised criteria for gold, silver, crude, palm oil and other commodities, as you can see, Mentha oil is not part of this particular commodity futures index. Now I would want you to please pay attention to two commodity futures, that is gold and silver, which are having 19.86 percent and 9.57 percent. Why am I mentioning to pay attention to the weights of these two commodities because we will be discussing these two commodities at a later point in today's session. Now the index administration committee identifies which futures which futures contract to be part of the index, and what is going to be the weight associated with each of the futures contract. Now the third most important aspect which needs to be considered is the future price. Now which future prices to use for a given commodity futures. Please note that on a given day there could be 8 to 10 different future prices or even more depending upon the length of the forward curve. Now the most important part to be understood here is that commodity indexes use the nearby or the front month future price, but as we know this nearby, or the front month future prices are going to expire or mature very soon. So, in that case which prices are going to be used for calculation of commodity index. So, to smoothly transfer from the near month commodity prices to the next month commodity prices index administration committee decide a mechanism which is known as a rollover mechanism and this rollover is done over a rollover period. So, what do we mean by the rollover period? The rollover period is the days within which a contract moves from the near month contract to the next month contract. Let us take a hypothetical or a hypothetical example to understand how a contract moves from or near month contract to the next month contract. Please note that there is a contract on crude oil futures contract which expires on the last Thursday last Wednesday of the month which happens to be let us say on 24th May 2023. And as you can see from 19 May 2023 onwards the future price for the near month contract and the next month contract is given here. And on 19 May 2023 the near month price is 1200 and this 1200 rupees will be used to calculate the index. But when we are coming to the 20th of May 2023 this particular contract has entered the rollover period. In the case of a crude oil contract let us say the index administration committee has mentioned that the rollover period for the contract is going to be 4 days before the expiry excluding the expiry date. So, the rollover period starts from the 20th of May 2023 and rollover percent is 20 percent. So, what do we mean by that? Even if the future price is 1205 for the near month contract and the far month contract is 1249 the price which will be considered for the index calculation will be based on the rollover mechanism that is it is going to consider 80 percent of the near month price plus 20 percent of the next month price. So, 80 percent of 1205 and 20 percent of 1249 will be used to calculate the price which will be considered for the index calculation. The same process will go on till the contract expiry as you can see, on 24th May 2023 this particular contract near month contract will come to an end and this 1213 is nothing, but your final settlement price as we have discussed in

the earlier sessions of this particular discussion. So, on 24th May 2023 this 1213 rupees will have no relevance. Only 1229 rupees is going to be used for the calculation of the index and subsequently the prices prevailing in the near month contract will be used for the index calculation. And as you know on 25th May 2023, there will be no price for this series, the near month price is going to be 1237 and that is going to be used for the calculation of the index. So, this is the process of the rollover and please note that this rollover process is not constant for all commodities. This may be 3 days this may be 4 days this may be 5 days, or this may be 2 days depending upon commodity to commodity. And it is also very important to understand here at this point in time that the different constituent commodity futures rollover period start at different dates in a given month depending upon the expiry date for the commodity futures and the index administration committee will be keeping track of which is going to be the expiry date for every commodity futures contract and accordingly will be undertaking the rollover transfer from the near month contract to the next month contract. Now, to summarize what are the factors which goes into the calculation of a commodity index as we have discussed as the first step index administration committee identifies as liquid futures contract to form the superset of futures contract which can be part of a commodity index. So, this futures contract may be selected from single exchange or multiple exchanges this could be denominated in a single currency or multiple currency. Once the superset of futures contracts is identified the index administration committee proceeds with the identification of the weight and they may use the weights based on the production weight based on the trading liquidity weight or a combination of combination of both these methods to identify or arrive at the weights.

And also, this index administration committee clearly mentions what is going to be the weight cap, what is going to be the minimum and maximum weight which a particular commodity futures can have in a commodity index. Re-balancing frequency as we have discussed how often the weights change, roll frequency indicates the period over which the commodity futures shift from the near month to the far month futures price and launch date is the date the index comes into existence for the first time. So, this particular table shows these facts for S&P GSCI index. As you can see, the weighting method used by S&P GSCI is the world production method, rebalancing frequency is annual reconstitution, roll frequency is monthly, calculation frequency is real time. So, as long as the exchanges are open the commodity derivative commodity futures trading is happening S&P GSCI calculates and publishes this particular index and calculation currencies are in different currencies.

Please note that the main calculation is done in US dollars and the S&P GSCI converts this US dollar rate to other currencies rate to arrive at the index value in different currencies. Launch date this particular index was started on April 11, 1991, and first value date which is very interesting aspect please note that the first value date is

December 31, 1969. Even though this index came into the existence in 1991, but the index values were calculated for a much earlier date and S&P GSCI calculated these older data and they call it a back dated data or back dated index value and the same was informed to the market at large. Now, let us look at the performance of some of the popular commodity indexes. Please see this S&P GSCI and Bloomberg commodity indexes are broad based index. So, what do we mean by a broad-based index? This broad-based commodity index futures broad based commodity index considers commodity futures contracts from a wide array of sectors. It could be agricultural sector, base metal, precious metal, livestock, and softs. And as you can see this S&P GSCI and Bloomberg commodity index have almost moved in very closely with each other because both of them are broad-based index. In addition to this broad-based index, the index administration committee also publishes many sectors specific indexes. As you can see, the Bloomberg mineral index is a sector specific index and it considers the future price of aluminum, copper, nickel, zinc etcetera to arrive at the Bloomberg mineral index. Similarly, Bloomberg Agri index considers the future price of many Agri commodities. And what is so interesting about these innovative indexes is that index administration committees also calculate single commodity index. For example, Bloomberg crude oil index tracks the performance of crude oil futures with 100 percent weight as crude oil. And as you can see the right most panel which is the performance measurement of the crude oil index and all of us know that the crude oil futures price turned negative during the COVID period. And as you can see there is a significant decline in the crude oil index value during this period of time and time and subsequently this index has increased because the crude oil future prices have gone up. In this context we will also understand what you mean by a single commodity index and how it is different than a single commodity futures.

As you can see these are also some of the examples of sectoral commodity index and single commodity index. And this particular table shows different kinds of sectoral and single commodity index calculated and reported by MCX. There are also similarly different kinds of sub index sectoral sub index and individual commodity futures index are calculated and reported. And in this context, I would like to draw your attention to how exactly the MCX bullion index is calculated. MCX bullion index considers the price of the gold and silver future price. And the same rollover mechanism is used, but in this case of bullion index as you can see the weight of gold future is 67.48 percent and weight of silver future is 32.51 percent. So, this is the weight of gold and silver in the MCX bullion index. Now how exactly these weights are calculated? These weights are calculated from the broad-based MCX iComdex index. Please recall in the initial part of today's lecture we had discussed that gold futures had 19.86 percent weight and silver futures had 9.57 percent weight in the broad based MCX iComdex index. So, collectively these two-index weight is going to be 29.4357 percent and when we are dividing 19.86 percent divided by 29.43 percent, we are getting a weight of 67.48 percent for the gold

and the silver weight silver futures weight is 32.51 percent. Now the question is why there are so many commodity indexes, sub-indexes, and single commodity indexes.

So, who uses these indexes? In fact, these indexes have significant use. So, what is one of the prominent uses that these indexes are used as a floating leg in commodity swaps. Please recall in the commodity swap section we have discussed extensively related to the swap agreement between two counterparties and these swap contracts are bilateral contracts or OTC contracts and being OTC contracts swap counterparties expect that the floating leg cannot be manipulated by the other party. These indexes are derived from the most liquid futures contract and calculated and reported by very well-known independent entities such as Standard and Poor's, RICI, Bloomberg etcetera. These have become a significant acceptability to swap counterparties as a floating leg. And another significant use of this commodity index is that commodity exchanges are now offering futures contract on this commodity index. So, I want to draw your attention to this futures contract on the commodity index. Please note that the commodity spot is used to price commodity futures. Commodity futures are used to calculate the commodity index and this commodity index forms the basis for the futures contract on the commodity index. So, you can see the level of financial innovation with respect to this future commodity future indexes.

These are the snapshots of the futures contract on commodity indexes traded at CME and exactly the way we had discussed that futures contract will have contract unit underlying delivery all that detail will be very clearly mentioned the details are available in this particular website. And as we have discussed that futures contracts require an initial margin, daily mark to market margin, open interest limit, daily settlement price calculation. So, all these are applicable to these commodity futures which are basically based on commodity index. Similarly, at in India MCX iComdex prepares and reports many sectoral specific sectoral specific commodity future indexes and many you know many futures contract on these indexes is available as you can see this particular detail which I have taken from the MCX website. This shows the contract specification related to MCX iComdex bullion index future. So, this is a future contract on the underlying which is MCX iComdex bullion and this MCX iComdex bullion derives its value from the gold futures and the silver futures in respect of the market value. It derives its value from the gold futures contract and silver futures contract as we discussed couple of minutes ago based on the 67 percent and 38 percent weightage. Now coming back to who invest in these commodity indexes please note that the commodities in general has emerged as a new asset class and why this is happening this is happening because commodities are providing a good diversification benefit, and they tend to have low correlation with other asset classes such as equity bonds and debenture and they provide inflation adjusted rate of return to the investors. And somebody can take exposure to the commodities in any one of the four methods; the first method could be investing in

physical commodity. Second could be investing in equity shares of commodity companies third could be futures options and swaps on individual commodities. Fourth could be investment in commodity index futures and other derivatives based on commodity index. Out of these four choices investment using futures on the commodity index that is the last option is emerging as one of the favorite ways to take exposure to the commodity because it seems to be the better one. Now, why we are saying that the fourth option is the better one, let us compare the parameters associated with all these four investment choices. As you can see, investment in physical commodities requires significant upfront investment to buy and hold different commodities and with physical investment we need to also worry about the quality assessment storage delivery all this pose lot of logistical challenges. So, a lot of people do not want to invest in commodities by buying physical commodities. Now the next option is equity shares in commodity companies. So, what do you mean by investing in equity shares of commodity companies that is people will be buying and selling the shares of commodity producing or commodity consuming companies. So, when somebody does that that particular trader has to undertake significant upfront expense to buy and hold shares of many companies and they also have some other negative side to it in the sense that the operational and financial inefficiency of companies may work the investment return. Now coming to the third category that is investing in individual commodity future. So, if somebody wants to do that the trader has to take care of different initial margins, different mark to market margin payments and receipt and futures role yield could be an issue. We will discuss what do you mean by role yield in another couple of minutes. Finally coming to the last option, that is futures contract on commodity index as you can see, this solves the major issues associated with other three types of investment. Hence this has become a preferred mechanism for many traders to take position in a broad group of commodities. Now coming now coming quickly to understand the difference between a single commodity futures and single commodity index. Now, as you can recall, we have discussed MCX crude oil futures vis a vis MCX icomdex crude oil index. This MCX icomdex crude oil index is a index which is prepared only considering the crude oil futures price. Then the next question arises what the difference between MCX crude oil futures is and MCX icomdex crude oil index. The difference comes from the concept of the role yield. Now let us understand what do you mean by a role yield. Let us say a trader who is long in the near month futures contract which is trading at M1 might wish to keep his position open even though the near month contract is due to expire. So, the trader sells the expiring near month futures contract which is trading at M1 and simultaneously has to buy the next maturing futures contract trading at M2. And in this process roles its position from the near month contract to the far month contract. Now in case of a market futures market is in backwardation that is M1 near month future price is greater than M2 the trader will earn a positive role yield. What do you mean by positive role yield? Please note that the trader will be selling the contract at M1 and buying contract at M2 and if M1 is greater

than M2 it will be selling at a higher price and buying at a lower price hence it will earn a positive role yield. In the case of a contango market M1 will be less than M2 and the trader will be incurring a negative role yield. Now this role yield makes a difference between a single commodity futures and a single commodity index. Now let us understand through an example of a swap. Let us say one has entered into a swap

agreement and this person who has entered into a swap agreement has an option to price the floating lake by receiving the average of the near month future price or it has an option to go for option to receive average of the commodity index. Please note that future price is for single commodity future and this commodity index is also considered as a single commodity also consist of a single commodity. Now let us take the example to understand how the return from both these options will be different for the party which has entered into a swap contract. We will be going back to the same data which we had used for the you know roll over calculation. So, as you can see in the case of a single commodity as a floating lake and this particular person will be getting the average of this price series. This price is nothing but the price for the near month future price at any given point in time. So, this whole series of price plus 1237 will be used to arrive at the nearby future price and the average of that is coming to your 1206. Now when the particular trader is receiving a payment based on the index, please note that index price calculation will be different than the future price calculation because this index price will be based on the rollover mechanism. And as you can see based on the rollover mechanism the price which is going to be calculated price which is going to be used for calculation of the index is mentioned here in this column the average of that is going to be 1214. So, if the trader would have you know agreed to receive average of the future price the trader would have received 1206, if the trader would have gone for a single commodity index the trader would have received 1214. Now this difference is coming because there is a more pronounced role in the case of a futures market as compared to a single commodity index. So, with this we come to today’s session on different aspects of commodity index creation, calculation, and use of it. Let me summarize commodity index ah indexes are based on commodity future prices and the weights of these commodity future indexes are decided annually. And the unique methodology of roll over mechanism is used to identify which price will be considered for calculation of this commodity indexes. And commodity indexes are forming an underlying for commodity futures contract and many traders who want to take exposure to the commodity market are entering into futures contract on this commodity index. So, with this we will end we will come to an end on today's discussion I sincerely look forward to interacting with all of you in the next session. Thank you all of you.