Commodity Derivatives and Risk Management
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Lecture 58
Freight Rate Derivatives (Continued)

Welcome to the 58th lecture on Commodity Derivatives and Risk Management. And today, we will continue with our discussion related to various aspects of Freight Rate Derivatives. In the context of Freight Rate Derivatives, it is very important to understand the role of a very important or well-known exchange which is known as your Baltic exchange. And in the previous session, we had discussed that Baltic exchange calculates and reports various types of indexes and for example, it reports different types of indexes on clean tanker, dirty tanker, Panamax index, handy size and many different indexes. And let us understand how the exchange goes about calculating the particular index value. Please note that it calculates and reports these index values or index number on a daily basis. Of course, we will take some numerical, we will see how this index values are changing. I have downloaded certain data from the Bloomberg terminal. We will be analyzing how these indexes are moving after maybe 5-7 minutes of our discussion. We will go into the discussion related to the movement related to various indexes calculated by Baltic exchange. But let us first understand how the exchange goes about creating or calculating a single index. In this context, I have taken the example of a Baltic dirty tanker index. So, my apology this should be a mistake, there is a mistake which will be Baltic dirty tanker not Balti dirty tanker index. So, let us understand the index composition related to dirty tanker index and based on the actual export of crude oil from major exporting and importing nations, the exchange will first identify which routes it should consider. So, that is the first starting point for the exchange. So, exchange will identify, let us say 15 or 20 routes actual export import sea routes where the export import related to crude oil is happening. And once the routes are identified, the exchange will also associate a specific weight with respect to each route. How the exchange will go ahead and associate or identify the weight associated with every route we will discuss later. But once the routes are identified and then the subsequently the weights have to be identified and once the route and weights are identified, the exchange will collect the data only from the ship brokers that to ship brokers who do not operate in a market they report. So, for example, if a ship broker is doing business for companies operating in TD1 route. So, that particular ship broker will not be giving data to the Baltic exchange. Baltic exchange will be collecting data for the freight rate from other ship brokers who are not operating in TD1. So, that there is no conflict of interest and also please note that the ship owners and chatters cannot be the panelist. So, the panelist means the parties who are

giving or providing data to the Baltic exchange. So, ship owners and chatters they have lot of stakes in how this index move does will come to the concept of why the ship owners and chatters cannot be part of the or cannot be the panelist who are supplying the data or who are submitting the data to the Baltic exchange. And for different routes or different indexes, the exchange identifies who are going to be the ship brokers who will be supplying or submitting the data and depending upon the different types of indices there will be different ship brokers. Please note that Barry or Bassoe, this particular company, which is a ship broker, this may be only doing the ship broking business for tanker trades, crude oil tanker trades they may not be doing a business or ship broking business for dry cargo. So, depending upon their line of expertise, the exchange will identify who are going to be the ship brokers who will be the panelist. Now please note that the Baltic exchange has an index monitoring committee, that committee is known as your FIFC that is Freight Index Futures Committee and FIFC identifies the component routes for an index and also decides the weight to be given to these routes and the weights are determined based on the geographical balance and the chosen routes should not be concentrated in one geographical location. So, as much as diversified geographical location the exchange can identify that will be going into the trade routes. So, different trade routes represent the underlying asset underlying commodity which is being exported or imported. For example, let us say dry cargo, dry cargo whichever the major routes where dry cargo goes those geographical location will be identified and from those geographical locations some routes will be identified. And also, in addition to the geographical balance the exchange will also give predominance to those routes which will have a significant amount of shipping activity. So, a route which remains closed for some specific region in a for a given time of the year, those routes will not be chosen. So, if a particular route has a higher activity, lot of ships are crossing those routes, then that route will have a higher amount of liquidity. And also, a route will be given a higher weightage if the standard preferred voyage terms are negotiated upon. Please note that if a particular route has very unique requirement of exporters and importers and the terms and the price negotiation is very unique then that particular route may not be chosen by the index management committee. They would choose those routes where the ship owners as well as charterers would be negotiating prices based on certain standard parameters related to the export and import. So, these three parameters are taken into consideration geographical balance liquidity and standard preferred voyage terms. So, these three parameters are taken into consideration for by the exchange to arrive at the weight. Please note that many a times we have discussed how the indexes are calculated. These are very standard black and white ways of weight identification. I am sure we have discussed some time in this particular series how the index let us say Sensex or nifty is calculated based on the market capitalization. So, that weight calculation is very straight forward, very black and white there is no way there is not this way or that way, but here there is no specific standard methodology, it is left to the Baltic exchange index

monitoring committee to identify the weights based on certain quantitative manner as well as some qualitative issues also they take into consideration. Now, I am giving the snapshot which I have directly taken from the Baltic exchange. This exchange of the first blocks relates to the formula for Baltic cap size index. Please note that the capesize has certain route codes. So, you have C2, C3, C5, C7, different routes are mentioned. For example, let us say C5 relates to the West Australia to Kingdow. So, this is your route 5. So, each route has been identified and associated with each route there is a weight as you can see C814 that is your Gibraltar to Hamburg transatlantic round voice that particular that particular route has been given some weight. So, different routes have been given different weights. So, route price means on a given day the exchange will ask ship brokers that on an average what has been the rate at which the ship owners and charterers have negotiated a price for C1014 route. So, that particular information will be coming from many ship brokers and from those price data will be arrived to give a value to C10 underscore 4 and multiplied by the weight and this formula again will be used by the exchange to arrive at the Baltic cap size index value. Again, as I mentioned, how exactly the exchange went about identifying the weights that are not available in the public domain. As I mentioned it is not a black and white way of identifying the weights lot of judgments, lot of industry knowledge goes into the calculation or identification of the weights. Hence there is no document in the public domain available for me to share with all of you that how Baltic exchange has gone ahead and identified the weight. Other than other than explaining that the geographical distribution liquidity and standard voyage terms are considered by the Baltic exchange to arrive at the weights for a specific route. In addition to the Baltic cap size index from the same route the exchange also identifies or calculates an index which is known as your 5TC weighted time chatter average. So, this particular index considers few routes not all routes. So, from the main this is the main route main index which Baltic capesize index is considers all routes and 5TC weighted time chatter average considers few routes out of these all 10 or 12 routes mentioned. And as you can see this is the data which I have downloaded from the Bloomberg data this chart plots the chart related to panamax index, supramax index, cap size index and handy size index. Exactly in the same manner the manner I explained related to cap size index, cape size index the same manner the other indexes are calculated and reported by Baltic exchange and from the Bloomberg data I have plotted a line chart related to all these 4 different indexes. And as you can see not only each of these indexes have been quite volatile it is very interesting to note that the cape size index turned negative at some point in time. So, this is something which is again I thought that I must share that how or why an index will turn negative. In this context I would also want you to pay attention to the C16 route which is something known as your revised backhaul. So, we will understand the role of this particular route in making this particular index a negative index. So, coming to the cape size index here I have plotted only the cape size index as a line chart and as you can see during the COVID period coinciding

with the COVID period this particular index turned negative and on 9th March 2020 it had the most negative value. I have downloaded the data from I think from 2018 January till 2023 June. So, during this period of time on 9th March 2023 the index turned negative most negative 372. In fact, during the COVID period for many days the index remained in the negative territory. However, interestingly this particular index also turned negative on 31st January 2020. So, then the cap size index had a negative value of 20 on the 31st of January 2020. So, it was not exactly only the period coinciding with the COVID much before almost about 3 months or 2 months before the COVID onset of COVID the cape size index turned negative. And now let us understand why the index will go negative. Please note that at time ship owners or operators even lease the ship at 0 fee. So, the ship owner and the charterer will enter into an agreement where the ship owner agrees to apply for the ship or lease the ship at a 0 fee. And please note that the ship owner is paying for the fuel cost and all other cost the manpower cost, the fuel or bunker cost as well as loading unloading, but all cost is being borne by the ship owner. And it is receiving 0 fee from the charterer, it is paying significant amount of another fee hence this leads to a negative Freight rate. This is one component why Freight rate could be negative. Now one may ask why a ship owner would lease a ship on a 0 fee. Please note that this many a times the ship owners do that because at the end of the charter period the vessel will be better positioned for the next shipment. So, if a particular vessel remains unused for some point in time, then a lot of issues crop up. So, obviously, the ship owner wants the ship to be in a running condition. So, that is a precise reason even at a 0 fee sometimes they lease out the ship. And also, please note that at time ship owners operate or even sell cargo free to another port where there is a greater demand and hence, they pay the full fuel cost. So, what happens that may be if a particular ship is at port A and there is not enough business volume at a port A, that particular day one particular cargo ship may go to another port without any cargo. And whenever there is no cargo then obviously, there is no fee to be earned by the ship owner and the ship owner is anyway incurring all costs. So, that could be the reason why you have the index turning negative. So, the ship is selling cargo free to another port. So, that it will be able to do better business on some other day, but at least on that day the index value turns negative. Now coming to another component which relates to the backhaul routes. So, what exactly does backhaul means? Backhaul refers to a journey of the vessel or a container from its port of destination back to the original port of origin. So, suppose we are from IIT Kharagpur one particular truck is going to Calcutta, depositing goods and it is returning empty handed from Calcutta to Kharagpur. So, the returning from the Calcutta to Kharagpur will be treated as a backhaul. So, many a times what happens on backhaul routes. So, if the ship does not have any materials to transfer. So, it may ferry the material of some other charterer, but at a zero fee with the part of the fuel cost shared with the charterers. Please note that if the particular ship comes back from the port of destination to the port of origin without any goods, any way the ship owner is going to spend considerable

amount of money on fuel cost. Now it may charge a zero fee to a charterer, it may carry the goods at a zero fee with the condition that the charterer covers a part of the bunker fuel cost or the fuel fee. As I have mentioned, the cost of bunker fuel is significant. Almost 60 to 70 percent of operating a particular ship goes into the bunker fuel cost. So, this is the reason at times on the backhaul journeys the company ship owners may not charge any fee to the charterer with the condition that the charterer pays a share the bunker cost with the ship owner. At that point in time, you may have the freight rate turning negative. And please note that the routes which normally do not have high volume, backhaul rates may go negative. So, there could be a route where you will have lot of business from point A to point B, but the return journey return business I mean a return journey business will be very low point B to point A may not be enough business. So, on those routes you may have the on those backhaul routes the freight rate may turn negative. But the freight rate turning negative is not a very unique event in the past freight rate has turned negative. The way we had discussed that crude oil futures turning negative is like a once in a black swan event during the COVID period. The future price of crude oil turned negative, and it had its own ramification, and this happens only once in a blue moon, or we call it a black swan event. But in the case of a freight rate specifically the cap size index turning negative is not very common periodically the index turns negative. In fact, the index started turning negative sometime around 2012. So, intermittently at different points in the time cape size index has turned negative. Now coming to two other popular indices again the data I have taken from the Bloomberg data. So, the first index shows the Baltic dirty index Baltic dry index. So, as you can see this dry index has been very volatile and please note this dry index is not an index which is calculated based on the routes and routes have weights and so on so forth. This Baltic dry index is a composite of three indexes. So, these three indices have Baltic cap size index has a 40 percent weight, Baltic panamax index values have 30 percent weight and Baltic supramax index is 30 percent weight is. So, this Baltic dry index basically is a global index lot of companies refer to this particular index Baltic dry index which kind of indicates the freight rate at a given point in time and a global scale and this is not with respect to any specific route this derives its value from three different indexes at 40, 30, 30 percent weightage. In respect to your Baltic tanker index as you can see again, I have plotted the blue line relates to your dirty tanker index and the orange line relates to your clean tanker index. So, the dirty tanker is mostly for edible oil and petrol as well and natural gas, petrol and edible oil will be you will have the clean tanker, but the dirty tanker will be mostly that dirty tanker will be for crude oil and asphalt. And as you can see that the volatility associated with or the price movement of this both indexes dirty tanker index and clean tanker indexes significantly different from each other. Though the at periods of time they have kind of a moved in tandem, but there could be a period of time when you can see both indexes are moving in a very different manner. Now coming to another set of indices which gets calculated by another exchange which is known as

your Shanghai containerized freight index. When we are talking about the container ships as you can see these are the as the image you can see this these are your containers which gets loaded on top of a ship and this this Shanghai containerized freight index represents the cost or the price of the containerized freight rates. And this particular index is calculated by Shanghai shipping exchanges and this index is the spot rate of 15 designated routes and these routes cover from Shanghai to Europe and Shanghai to other parts of the India other parts of the world. So, as that China has been one of the largest exporters of many types of goods as exporter and importer of many types of goods and commodities. So, thus containerized freight index basically represents the movement of goods to and from China. And this particular index calculation is little different than the Baltic exchange and though this particular this index that is Shanghai export containerized freight index this has 15 designated routes, but the calculation is done in a different manner. Let me explain how this particular index gets calculated in two steps. As you can see in the step 1 freight rate for an individual shipping routes are collected from many panelists. So, whoever is the panelist which the exchange has empaneled the from many panelists it will collect the freight rate for the individual shipping route. Please recall that this particular index has 15 different routes for every route it will collect the rate at which ship owners and the ship charters have leased out or entered into a contract negotiation. So, that price will be supplied by different individual companies for every route. So, based on the number of participants the exchange will calculate an average price for a given route and for all 15 routes please note that for all 15 routes. So, Pi is the average of one particular route Pi into the weight associated with a particular route. So, again each of these 15 routes has been given a given a particular weight. So, this price of the route price for a given route into the weight a summation of that divided by an index base value that will give the index on a given date. As you can see the index base value is 16th October 2009 with the index starting at a on that day the index was equated to 1000 points and based on this data every day the exchange calculates and reports the container freight export containerized freight index. So, as you can see this particular data point has picked sometime around March 2022 and it has started declining and that also kind of indicates that the amount of export from China is going down and all of us, we are talking about the recession and all those economic activities in the economy in the world is going down. So, these indexes also give an indication what is the economic activity is happening all over the world. Now one may ask what are the factors which affect the freight rates. So, as we saw this freight rates or freight rate indexes are exhibiting a significant amount of volatility over the last 5 to 6 years of data which we have analyzed and there are various reasons why freight rates change. The first and foremost reason is the demand and supply factor. Please note that the demand for the freight rate is a derived demand and it depends upon the seaborne trade. If the seaborne trade increases the freight rate will increase and when will the seaborne a trade will increase when the world economic activity increases. In this context, please note that

natural resources like coal, crude oil, and different types of minerals are not evenly distributed all over the world. There is uneven distribution. So, some specific regions are well endowed with coal, crude oil, and minerals. Hence whenever there is going to be whenever world economic activity is expected to go up there is going to be lot of export and import happening. So, export from the mineral rich locations or nations to the locations where maximum amount of production happens. As we know in the world context China is the largest importer of many commodities because China's manufacturing activity is significantly higher. And China takes those raw materials does manufacturing manufactures different goods and exports those goods. And in fact, these goods normally exported goods go in the container form that is why we just now discussed about the Shanghai containerized export index. In the context of demand for the freight rate political events also influence the demand for seaborne trade. Right now, we have seen that the impact due to Russia-Ukraine war, we are able to see that the demand for seaborne trade has significantly increased from other parts of the world because Russia being one of the largest exporters of crude oil and wheat. So, this is not coming from Russia. So, a lot of other countries are fulfilling the need. So, the trade pattern, the price related to export price related to a freight rate has changed significantly. In the context of supply please note that the supply of the or supply factors relates to the available fleet size, fleet productivity and capacity addition in near future. Please note that the rate at which old ships are scrapped and new ships are ordered also affects the supply side. And please note that the number of ships which will be available that can change from the medium to long term, but the number of ships does not change on a short term because constructing a ship and making it a sea worth, it takes on an average 3 to 4 years. And with technological advancement the buyers or the owners of the ship are interested to buy very large, huge mega ships and as you can see maybe 100 maybe 50, 60 years ago nobody would imagine a ship of evergreen size. Ships used to be cargo ships used to be a smaller size, but late cargo ships are becoming much bigger because this is economically economies of scale comes into picture. And the moment ships become bigger, it is not only very expensive to make it also takes a longer delivery time. So, that is the precise reason we cannot have the availability of ships does not change in the short term. So, if there is less number of ships available at a given point in time than the demand, keeping everything else constant, the freight rate is going to go up. In the context this context lets understand how companies mitigate the risk. Please note that all exporters and importers face a significant amount of risk because of the increase or decrease in the freight rate. And most of these risk management revolves around forward freight forward agreements or FFAs. Freight forward agreements are nothing, but your swap contracts we have discussed about swaps many a times in this context FFAs are OTC contracts and both parties agreed on the route, both parties agree on the settlement date, both parties will agree on the number of days and both parties will also agree the fixed price which will be paid by a freight forward agreement buyer. And the floating rate

will be as we know it will be always paid by the swap seller, in this case FFA seller and this is where the role of the different index come into picture. So, if a particular importer let us say Indian oil Indian oil imports lot of crude oil and refines this crude oil and sells refined product to people like I mean all of us we buy petrol diesel and so on so forth for from Indian oil. If Indian oil is fearing that the freight rate let us say dirty tanker index price is going to go up and if that happens then its cost of importing crude oil is going to be significantly higher, it will be entering into a long term freight forward agreement in that case it will be a FFA buyer, it will be paying a fixed rate and receiving the floating rate. And that floating rate could be the rate related to let us say Baltic dirty tanker index. So, the Indian oil is exposed to the freight rate related to dirty tanker index, hence it will be entering into a freight forward agreement with the underlying as Baltic dirty tanker index. And that is a precise reason you have the Baltic exchange is preparing and reporting 40 to 50 different types of indices because these indexes are part of different kinds of freight forward agreement signed by different parties. Now coming to derivative risk management using the futures contract. Please note that exchanges also offer freight futures contracts at various freight rates. I have given a snapshot of some of the futures contracts which are traded at Chicago Mercantile Exchange and ICE. Please note that the first three futures contracts are listed at CME, Chicago Mercantile Exchange and the last three contracts are from ICE. Please note that this is not the total list of contracts, there are many more contracts. I have just randomly selected three contracts futures contract from each of these exchanges. And what is so interesting about these three sets of, or two sets of contracts is, as you can see, the first contract relates to a specific route. Please note that as an exporter or importer one is exposed to a price on a specific route. So, that is why exchanges are also offering futures contracts on specific routes, in this case TD3C. So, that is basically freight route from Middle East to China and that is the underlying that is that is the underlying for the futures contract. In contrast to a specific route future contract please see this kept size time chart of freight future. So, this particular future has the underlying as the kept size index. This index again derives its value from some routes as we have discussed. So, we have a futures contract for specific routes we have also futures contracts related to different indexes. And the lowermost panel indicates the ICE future Europe contract specification that is specification related to Panamax time charter Baltic freight futures index. As you can see the underlying is one day of time charter and unit of trading is any multiple one-day time charter. So, somebody wants to enter into a charter contract time charter contract for 7 days or 8 days accordingly that is particular party will be bidding for it. And the contract series is up to 48 consecutive months. So, standing today if somebody is anticipating that 2 months from hence the freight rate in a given particular given route or for a given index is going to go up and this particular company incurs loss if the index goes up then this party will enter into a long futures contract and or otherwise if the party will benefit if the index goes up it will enter into a short futures contract. And I want you to please pay attention to the last sentence related

to the final settlement. In respect of the final settlement the floating price will be priced in US dollar and cents per day based on the average of the spot assessment made by made public by Baltic exchange for the Panamax time charter index for each business day in the determination period. So, the actual settlement will be made based on the underlying index, in this case the Panamax time charter index value. So, this is how the futures contract will be used by ship owners and charterers to mitigate the risk associated with freight rate. So, with this we will end today's discussion. Today basically we discussed how Baltic exchange or Shanghai exchange goes about calculating and reporting different indexes and how these indexes are used by ship owners, charterers to mitigate the risk associated with changing or fluctuating freight rate. One of the very prominent ways of mitigating the risk has been on the OTC market that is your freight forward agreement. Only recently the futures contract has been getting listed and traded. However, the number of or the quantity of futures contracts traded in the exchanges remains much less as compared to the freight forward agreement or risk management in the OTC market. So, ship owners and charterers are utilizing the service of ship brokers not only to finalize the price at which they will be leasing the ships, they also finalize the rate at which the freight forward agreements will also be signed. So, the ship brokers are able to bring a lot of value to the table and probably that could be the reason why we do not see a lot of trading volume in the futures contract in the regular exchanges. Nevertheless, there are some trading that is happening and trading of in the futures contract is happening in exchanges to go on to indicate that exchanges are providing exchange contracts are providing risk mitigation strategy for freight rate. So, with this we will end our discussion today. So, in the next session, that is the 59th lecture, we will be discussing related to water derivatives and some other interesting derivatives which are currently available though not traded in a significant manner, but these are very interesting underlines. So, we will be discussing at least the water derivative as well as the real estate derivative in the 59th lecture we will be discussing that aspect.