Commodity Derivatives and Risk Management
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Lecture 60
Real Estate Derivatives and Derivatives Losses

Welcome to the last lecture session on Commodity Derivatives and Risk Management and today is our 60th lecture session. And today we are going to discuss on Real estate derivatives, and we will also discuss some of the major losses which have been incurred by the companies because they have entered into commodity derivative contracts. And from the discussion related to the major derivative losses, it will give us an indication that how companies have mismanaged that commodity derivative trading and it has led to significant loss for the company at times companies have become bankrupt. So, all along since the beginning of the lecture session I have said that the commodity derivatives are mechanism which benefits the company, but today we are going to also discuss how commodity derivatives have been used or misused by companies and this has led to significant amount of loss for companies. In fact, Mr. Warren Buffett had said at one point in time that derivatives are weapons of mass destruction and many a times you may have also read the statement that derivatives are double edged sword. So, in a double-edged sword normally swords have to have one side in edge. So, so that whenever a person who is holding the sword that particular person will be able to kill the opponent, but if somebody is holding a sword which has a double side then there is a risk that the same person may harm himself or herself. So, derivative contracts are like a double-edged sword, they may give significant amount of benefit to the companies. In fact, many companies for years and years and years together, they are utilizing derivative contracts various types of derivative contracts to mitigate different kinds of risk. However, there are many instances when companies have mismanaged their derivative contracts trading and incurred a significant amount of losses. So, today we are going to also discuss some of the interesting cases with respect to how companies have incurred derivative losses. But before that let us understand the real estate derivatives and how real estate derivatives are calculated or how real estate as an underlying commodity is calculated and how real estate indexes are calculated and how the same indexes are utilized to create commodity derivatives that part we will discuss. Now, let us come to understanding the real estate spot and derivatives market. Please note that the real estate market can be categorized into two groups, that is commercial properties as well as residential properties. And commercial properties are related to retail stores and office buildings and residential properties are the houses our individual houses. And owners of these commercial units as well as residential units lease both types of properties and lease periods tend to be very

short duration for the residential properties than commercial property. In fact, in India we have a maximum lease period of 11 months and once that lease period expires one has to renew the lease period. However, the commercial properties lease period can run into 10-15 years. And in the context of commercial properties please note that the lessee or the party which has taken rental for that commercial property takes care of the house in a much better manner as compared to the residential property. So, the party who takes rent of the residential property tends to manage the house in a much less manner as compared to a commercial property. And in the context of commercial properties please note that in case of an economic downturn the demand for new commercial properties slows down significantly compared to residential property demand. In fact, residential property demand does not go down to that extent as compared to the commercial property demand. If there is an economic downturn happens then companies do not require lot of commercial properties, they do not start new offices, new recruitments of employees do not happen. So, that leads to a reduction in the demand for the new commercial property. However, residential property demand goes down at times, but not to the extent the way commercial property slows down in case of an economic downturn. Now, coming to understanding the real estate prices please note that when we are talking about real estate derivatives the real estate prices are used to calculate the real estate indexes and these real estate indexes forms the basis for real estate derivatives. Hence, let us understand how these real estate indexes are calculated, before that let us understand some unique characteristics associated with the real estate price. Please, note that the housing prices are normally sticky even in the downturn. So, the word sticky relates to the concept that the sellers or the owners of the house are reluctant to sell the house at a price below the psychological price and that psychological price is the price at which the property was initially purchased or acquired. So, in this context I am sure all of you will be able to understand the concept of the stickiness of the price because many a times even if we want to sell a particular house, if any one of us have ever sold the house we would never would be willing to sell a house at a price which is much below or lower than the lower than the price at which we have initially acquired. So, this concept of stickiness concept will be used to calculate the real estate index. So, that we will come that we will discuss about couple of minutes later how the real estate index is calculated, and the concept of stickiness is applicable there. And in the context of new property please note that the residential new property sales normally exhibit strong seasonality. For example, people in USA, UK and Australia they normally do not buy houses during Christmas time. So, the price during Christmas time of any house sale if it is happening is little less as compared to the other time of the year. Similarly, in case of India most of the new residential property purchase happens during the October till March. So, because of the tax reason because of lot of our social been leave related to Dhanteras and so on so forth, lot of new houses or new residential property purchase happens during the month of October to March. Now, in this context let us understand how some real estate indices or indexes are

calculated and reported. There are many real estate indexes available, but for today's session we will only discuss two real estate index that is S&P Case Shiller Home Price Index and also, we will discuss the NHB Residex Index of India. So, in addition to these two indices, we also have Halifax House Price Index of UK, Financial Times, FTSE Commercial Property Index series of UK. So, many countries have the real estate index, but for today's session we will only discuss the first and the last one. Please note that the Residex is the index which is calculated by National Housing Board of India and in India we do not have a derivative contract, futures contract on Residex as of now, but I feel that again it is only a matter of time when this our commodity exchanges are going to introduce contracts, futures and option contracts on the underlying Residex. So, with this now let us understand how the S&P Case Shiller Home Price Index is calculated and NHB Residex Index is calculated. Now, let us now let us first focus on the S&P Case Shiller Home Price Index. Please note that this S&P, Standard and Poor prepares this index for 23 locations 23 cities in US and India. So, this index in addition to that also produces 3 composite indexes. Basically, it calculates and reports residential home price index for 20 different cities in the USA and 3 composite indexes. Hence 23 indexes are presented on a every month basis. And these 3 composite indexes are 1 national index, 1 is 10 10 city index and a 20-city index. Basically, the logic for calculation of these different indexes goes towards indicating how does the house price is moving on a country level on a different region level as well as just some specific location level. And please note that all these indices have a value base value of 100 which is in January 2000. And the index calculation methodology is the value weighted repeat sales methodology. So, let me repeat this method the method of calculation of the indexes value weighted repeat sales methodology. Calculation frequency of these indexes is monthly. Now, what is the meaning of value weighted repeat sales methodology? Please note that in a given month or in a any given month the actual resale price of the homes are collected and compared with the first sale price which is known as a sale price pair. So, a particular person if somebody has sold a house suppose let us say June or July of July 2023 that particular price the price at which the house got sold it will be compared with the initial price at which this particular house was bought. This house could have been bought by the seller maybe 5 years ago maybe 10 years ago. So, that price, the purchase price and the sales price will form a sales payer. And as you can make out that if somebody has bought a house at some price and because of the concept of stickiness of the price the price at which it will be selling the price will be much higher. So, obviously, the price difference between the sales prices as well as the buy price will go into the calculation of the index. And each sale pair is assigned a weight based on the price difference between the pairs. So, the higher the price difference, the higher the weight. I am sure you can intuitively understand that if a sale price is much more than the buy price obviously, the index should go up. So, in that sense the index gives a higher weight to the higher price difference. Similarly, sales pairs with longer time intervals are given less weight to reflect

the probability of physical change in the house. So, if somebody has sold a house after 5 years of buying, the price difference will be given a higher weight as compared to somebody who has bought the house some 10 years ago and sold it this year. So, if the calendar year between the date of purchase and the date of sale is higher that particular price combination will be given lesser weightage. Because the index also knows is in index also is known as the constant quality house price index. And please note that all sales pairs in a city are collated to form the index. So, in a given city whichever house how many houses have been sold that all sales pairs will be conducted, all sales pairs will be given a weight is and based on the weight is index value will be calculated. And also, please note that the sales pairs which are not conducted at arm's length prices are not taken into consideration. Suppose family members are buying and selling with each other or a one company is transferring the particular property to another member, another company of this another company belonging to the same group. So, if there is a transaction happening not at an arm's length manner or not at an independent manner that price combination will not be taken into consideration. Now, based on the Bloomberg data, I have downloaded the data related to three places in USA. So, you have the Miami area and you also have as you can see the first block, this shows the national house price index which is in the blue line. And you have New York home price index which is in the grey which is in the orange line and the Miami price index which is in the grey line. As you can see over the last 10 years the house price index in Miami has always remained much higher as compared to the national price index as well as the newer home price index. So, this is an example of how S&P case-Shiller index is calculated and reported. Similarly, now let us come to the Residex of India. This index is calculated and reported by National Housing Bank of India, and this is prepared for many cities if you go to the NHB website it is a very interesting and very interactive and lot of data it is freely available at this particular website. So, this considers only the new house price sales. Please note that in the case of a Case-Shiller index these are not the absolute new houses these are resale prices somebody had already bought the house and the that particular person is selling that house and from that resale house the index is calculated. Butin case of India we have only, or Residex is calculated based on the new house purchase sales. May be because it is very easy to collect the data related to new house purchase. So, the Residex of India calculates the new house purchase, sales, and the base year is 2000 base year is 2016 and 17 when the index value has been equated to 100 and for each city it prepares sub-indexes for different zones. Please note that this lower panel data shows the information related to four metropolitan cities in India, but in addition to this metropolitan city let us say for example, Kolkata, here I have given the composite index and composite price related to Kolkata, Bombay, Delhi, and Mumbai. For Kolkata, there are about 3 to 4sub regions if you go to NHB website you will be able to see that area prices for Vidhan Nagar area, prices for Rajarhat, you can see the area prices for Howrah. Similarly, for other cities not only the city index is available, the specific regions within a

city index within a city is also available. Now, coming to the comparing the values of the Residex India data for four metropolitan cities as you can see it is a very important area. The Mumbai area has for the last sums 4 to 5 years the index value has not changed significantly Kolkata has shown significant up and down and over the period of time from June 2018 this index value in Kolkata has gone up. So, Kolkata prices have risen much faster as compared to any other city the daily composite index has remained nearly flat. So, not much has changed. Now, this is based on the index value and please note that the Resid X prepares the data for quarterly basis in case of S&P Case Shiller index that is done on a monthly basis, but in case of India you have a Residex data is available for a quarterly basis. Now, even though the Kolkata prices has gone up significantly as compared to the base year of 2018, but in absolute price the Bombay price is significantly higher in terms of the per square foot carpet area. As you can see over the from June 2018 onwards the price is somewhere between 23000 rupees per square foot, but while compared to other cities Kolkata, Delhi and Bangalore has a per square foot prices are much lesser as compared to as compared to the Mumbai prices. Even though the Mumbai index has remained pretty much that blue index has remained pretty much flat, but in absolute terms you can see the price is much higher compared to the other three metropolitan areas. Now, coming to the futures contract on real estate. Chicago Mercantile Exchange offers futures contract on different city S&P Case Shiller index. The right panel shows the contract specification related to house price as you can see the contract unit is 250-dollar times the S&P Case Shiller metro area home price index. So, the S&P, standard and Poor calculates the index and based on the index CME has introduced futures contract. And price quotation one point is equal to 250 dollars and as you can see you have the underlying contracts the futures contract on composite index on futures contract on Boston, future contract on Chicago, Denver and so on so forth. And these contracts futures contracts are financially settled, and the settlement procedure is governed by the S&P Case Shiller house price index future settlement procedures. So, it is like a any futures contract financially settled contract. The only unique thing about this particular contract is this contract is not only having an underlying of a composite index. If somebody is operating let us say from Boston area and fears that the house price is going to go up that particular company or that particular entity can enter into a futures contract on Boston did not enter into a futures contract on the composite index. So, depending upon the area of operation of a particular person that that person can choose a specific futures contract or choose a specific contract which is specific to the to a given location. And please note that not much of a trading happens in the real estate index in USA. However, these indexes are used significantly for forward contracts as well as swap contracts. So, there are many counterparties OTC counterparty trading happens where these indexes are based, or payment is based on the index values. So, swaps on property index forward contract on property index trade in OTC market futures contract and option contracts are listed, but not much of a trading is happening currently at this point

in time. Now, who would enter into a long futures position in a house price index or index future. So, someone who is fearing an increase in house price index in a particular location can enter into long futures position on these indexes. And please note that a lot of real estate investment trust. So, in the USA lot of real estate investment trust who fear that the house prices are going to decline those investment trust can enter into a long futures position or long forward position or enter into a swap contract with this index as the underline. With this we will come to our end of discussion related to price risk management of real estate and how real estate indexes are calculated. With this now let us come to and discuss some of the major derivative trading losses which have happened in all over the world. In fact, there are about 15 to 20 major derivative losses, but today we will not be able to discuss all these cases in detail. In this context, I will only highlight couple of interesting cases and more details about these cases are available on the internet. In this context I would like to share that I have a book called commodity derivatives and risk management. This book I was published about 5 to 6 years ago and based on this particular book I offer elective to MBA students and financial engineering students of IIT Kharagpur. And in fact, many of the concepts which I have discussed over the last 59 sessions I have taken from this particular book. So, one some of you may be thinking that why I did not inform you about this particular book at the beginning of the session. Somehow, I felt that as a as a teacher we write the book for the love of writing the book and we do not market it the book at the slightest opportunity. So, I am taking the liberty of sharing the image of this particular book on the last session of this particular topic. And as I said, many of the concepts which I have discussed throughout these 59 sessions I have taken from this particular book. With this I will also be today sharing some case studies which I have discussed in this book in detail related to commodity derivative losses. Let me take you to the slide, here I have listed some of the major commodity derivative losses. In fact, if you recall we have discussed about Hunt brothers silver futures market manipulation and how the Hunt brothers were brought to bankruptcy because of the silver futures price manipulation. We have also discussed as part of our discussion in some of the sessions I do not exactly recall. We have also discussed the Metallgesellschaft oil futures loss. We have also discussed extensively the Amaranth advisor natural gas future with respect to a March April widow maker future. I am sure you can recall the discussion related to widow maker future which is related to the calendar spread. How the Amaranth advisor as a hedge fund lost about 6 billion dollars over a period of 15 to 20 days it has entered into the natural gas future. So, out of all these major commodity derivative losses we have discussed to certain extent related to Hunt brothers, Metallgesellschaft, Amaranth advisor natural gas future. Of course, today we will discuss a couple of couple of cases as I mentioned more detail about each of these cases are available on the internet as well as my book. Now, coming to one of the interesting cases where in the case of with respect to the soybean futures market it is a pretty old case, but it relates to something called squeezing the shorts. In the year 1990

the Chicago board of option trading alleged that this particular company the Italian agribusiness firm was trying to create a short squeeze and somebody a company can create a short squeeze when the company enters into long futures position and simultaneously also goes on buying the underlying asset. So, in this case this particular company was buying futures position on swabbing and simultaneously through it is subsidiary it had taken it had bought significant amount of soybean. So, the exchange feared that there may be a there may be a situation where the short position holder will not be able to deliver soybean because not enough of soybean is available in the market because the subsidiary of this Italian company has already bought swabbing and has already holding the soybean. And the market regulators CFTC gave an order to liquidate a large position of the soybean futures to this particular company and the company lost about 17 million dollars in over a single day. So, this is one of the very important or very interesting cases related to soybean short squeeze and how the regulator kind of controlled the situation by asking the company to close the soybean futures it had already taken. Now, coming to another interesting case, this particular case is related to spoofing up trades that is in 2013. This case is a very significant case in the sense that is the first time the commodity market regulator of the USA has found a high frequency algo trading firm. Before that none of the algo trading firms have been found or algo trading firms activities were very on a moderate scale. So, this is the first time the in 2013 the regulator finds an algorithmic trading firm. So, what this particular company was doing, panther energy trading limited was doing is that they were undertaking something called a trade spoofing. So, what does spoofing mean? Spoofing is a form of destructive trade practice in which traders give false bids which they cancel before anyone else can execute and these false orders create an impression of liquidity in the market. Basically, they try to manipulate the price by giving a lot of orders very quick order sand very quickly they will give the order and cancel the order before the order gets execute order gets executed. And because they have an algo trading firms and they have ahigh frequency, they had they were able to do this by giving by requiring or asking the computer to give lot of buy orders as well as buy and sale order and immediately cancel those orders. And the CFTC found about this and this particular company and the mister Michael J. Cosica was fined about 2.8 million dollars. Now coming to another interesting coming to another interesting aspect again it is a pretty old case. In the year 1994, The Codelco as a state-owned copper company, they have been company of Chile. This particular company reported a derivative loss of 207 million, which is about 44 percent of the reported profit in the year 1993. So, the derivative loss, that is copper futures derivative loss, was 44 percent of the total profit generated in the previous financial year. And please note that this particular case attracted so much attention and so much public outcry against this loss. And so much of media reporting happened that it threatened the Chilean president the then president's presidential tenure and this particular derivative loss came to be known as a copper gate. And a very interesting aspect about this particular case is that the

case this loss happened because of the derivative trader, Juan Pablo Davila was the derivative trader associated with Codelco and he was the chief trader for copper futures at Codelco. Interestingly during September 1993, due to a data entry error, he bought futures contract instead of selling this futures contract. He was supposed to sell futures contract please note that the Codelco is a producer of copper. So, if they are fearing that the price is going to go down, they should be selling the futures contract. So, instead of selling the futures contract he entered into a long futures contract and that resulted in 30 million losses. Now to cover of that loss he sold 1 million tons of copper future much higher than he is permitted to trade. And that he did because he was anticipating that the copper price is going to decline and instead of copper price declining copper price increased and that lead to 207 million dollars of loss for the particular company. Now in addition to as I mentioned a couple of minutes ago in addition to these losses there are many companies which have undertaken derivatives both commodity derivatives and financial derivatives. I have not discussed anything related to financial derivatives products or financial derivative contracts as part of this particular course because our objective is commodity derivatives. So, many companies have lost a significant amount of money because they have undertaken derivative contracts. In this context I would like to draw your attention to the fact that many a times people say that derivative contracts companies lose money because of the derivative contracts. Here I would like to correct the notion that derivative contracts per say is not a loss, does not ensure that the company is going to make loss, but the unauthorized trading the speculative activity leads to a significant amount of loss. Derivative trading is a risk mitigation strategy. So, if a company is utilizing this particular strategy well enough then the company will be able to mitigate the price risk to a very significant extent. In fact, many companies which are successful commodity companies they are employing commodity derivatives for you know for the last 60 70 years very effectively, but many companies who do incur loss because they do not have their robust internal processes checks balances and so that the derivative trading the extent of derivative trading the companies are undertaking that is under control. So, these are the cases which highlight the pitfall of derivative trading and more importantly these cases also highlight the importance of robust internal processes checks balances to mitigate the derivative losses by companies. Hence, if any one of you are doing this particular course because you are going to be working for a derivative desk for a particular company please do ensure that you have a robust internal processes you have checks and balances such that one particular trader or a group of trader belonging to a company will not be able to bypass the limit set by the company to the extent of number of futures or option contracts they are taking position. So, with this I end my session it has been an excruciatingly involved effort on my part as well as very joyful experience I am learning a lot I tried my level best to give as many as practical examples and today I will not be able to say that I look forward to interacting with all of you in the next session because today is our last session. Of course, I am ending with the

notion that that all of you will be continuing with your journey related to learning this particular subject. In fact, the best way to learn this this particular subject is to subscribe to a newspaper financial newspaper or a business newspaper, be it economic times, business standard, financial express, business line, mint, any one of the your favorite one and start reading on anything related to commodity market and I am sure you will start enjoying this particular subject and become much more knowledgeable when you are keeping track of whatever is happening in the in the in the actual market. So, with this I end my session and I am very eager to interact with all of you in the NPTEL forum. So, thanking all of you and it has been once again I say it has been a very enriching and very fruitful time for me coming and recording these 60 sessions on commodity derivatives and risk management. So, thank you all of you.