Commodity Derivatives and Risk Management

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Week -01
Lecture - 01
Introduction to Commodity Market

Welcome to the first session on Commodity Derivatives and Risk Management. Before I take you through to today's session, I would like to briefly introduce myself. My name is Prabina Rajib, I am a professor of finance and accounting at the Vinod Gupta School of Management. And my research and teaching interests are predominantly in the area of finance and accounting. I teach subjects such as commodity derivatives, derivatives and risk management, financial accounting, corporate finance, financial institutions, and markets. In fact, in the year 2007-08 when I was working on a book on stock exchanges and derivatives, I realized that commodity derivatives in India is a growing market and not much is there in the academic domain on this particular area.

So, I started offering courses on commodity derivatives and commodity derivatives and risk management as an elective for management students of MBA students at Vinod Gupta School of Management, IIT Kharagpur. With this brief introduction, let us start today's session on commodity derivatives and risk management, the producer of that particular commodities. In fact, for example, a ton of steel or a bar of gold produced by you know just merely looking at that particular you know unit we will not be able to say who is the producer. Similarly, a ton of copper or rubber produced by any producer anywhere in the world will be categorized as a commodity.

And commodities also have another distinction. Commodities are normally used as a input in the production of other goods. And as I have already mentioned, usually these commodities are produced in large quantities by many producers. And another distinct feature of commodities is that the prices of these commodities are primarily determined by the supply and demand interactions. Now let me take a small quiz for all of you. Had it been a normal class, I would have probably asked you to identify which are among these pictures are your commodities. In fact, I will pause for half a minute to give you a time to think through which images will be you know can be categorized as a commodity and which images are not commodities. To give an answer to my question, a car manufactured by a reputable brand or for that matter any company will definitely never be categorized as a commodity. Similarly, a piece of jewelry, a necklace manufactured by any company will never be treated as a commodity. Other than that, the rest of the images may be steel bars, maybe a bar of copper, maybe a bar of gold or even diamonds will be treated as a commodity.

Similarly, just to take our discussion a little further, I have given the images of a packet of basmati rice in a white polythene and a packet of moong dal. Just merely looking at these two

packets, none of us will be able to make out which company has produced, or which company has manufactured or process these commodities. But the moment we focus ourselves on the lower images, that is the reputed brands which are producing, or which are packaging this product, then these products are no longer treated as a commodity. So, this is a very important understanding that what exactly is a commodity that is a first and foremost thing which we must you know understand and appreciate before we go to the remaining part of today's session. Now the next aspect or next important thing is why are we going to talk about commodities or why are we going to do a full course on commodities and commodity derivatives.

And we know since time immemorial human beings have traded commodities. In fact, as early as 2000 BC, traders were trading different commodities such as ivory, cotton, silk, porcelain, various kinds of metal, gemstones, gold, silver, spices etcetera. In fact, the spice route or the silk route which was stretching about 15000 kilometers starting from Japan to Indonesia, from Indonesia to India, from India to Middle East, from Middle East to Mediterranean to Europe developed for the sake of trading various kind of commodities. So, commodity trading per se is not new commodity trading is happening for you know since the day human beings are existing on this earth. But what is new is that commodity prices are increasingly volatile.

Earlier commodity prices were exhibiting some volatility, but as time is progressing the commodity prices are becoming much more volatile. So, just to share you know highlight this aspect. I have downloaded commodity price prices from the World Bank or from for about 20-25 years. As you can see this is the some of the charts which are showing for the price volatility or the price pattern of crude oil, yearly price of crude oil, palm oil, urea prices, copper prices and gold you know gold prices. In fact, you can see for the last 15-20 years the commodity prices for almost all commodities is exhibiting significant amount of up and down.

Hence understanding what factors influence the commodity prices, why commodity prices are fluctuating and what commodity producers, commodity consumers and value chain partners must do to mitigate the price risk has become a very important aspect. Hence understanding what commodity is, what factors influences commodity prices and how the consumers and producers can mitigate the price risk is becoming a subject of interest. And as an offshoot of this price volatility many derivative exchanges are coming up all over the world offering various kinds of derivative contracts. So, that this commodity producers, consumers will be able to mitigate the price risk. So, that is prompting us to understand more about this commodity derivative contracts, how these contracts are priced, how these contracts are valued, and different aspects of commodity derivative trading is increasingly becoming a in interest of interest for both academia as well as practitioners.

Also, the moment commodity derivative contracts are getting traded in the exchange, these commodity contracts are emerging as a new asset class. So, what do we mean by a new asset class? New asset class means people are investing in commodities not because they are producer, consumer or value chain partners or processor of commodities. They are investing in commodities just like they invest in stocks, bonds, or equity just to get financial return out of it. And why they are doing so? Because commodities are exhibiting negative correlation

with most other financial assets. And as we know whenever an asset is giving a negative correlation with another asset by incorporating these negatively correlated or less correlated assets into in a portfolio, we reduce the portfolio risk.

So, just to stress upon this particular aspect I have done a very simple analysis which shows that why negatively correlated asset or by adding negatively correlated asset into a portfolio we reduce the portfolio risk. This particular excel file indicates that let us say we have 1000 rupees at the beginning of the year 1 and let us say I want to invest 500 rupees in asset A and the rest 500 rupees I have a choice to invest in asset B or C or D. And the last 5-year return of each of these assets I have randomly given and if you can see the standard deviation of the asset is 9.36 percent. So, standard deviation of asset B and C and D are 9.86 percent, 9.26 percent and 9.38 percent respectively. And we have also I have also found out the correlation between the asset A and B which is 0.973, the correlation between assets A and C is 0.63 and the correlation between A and D which is -0.441 to indicate that the asset D has the negative correlation with asset A. Now, when we are combining these 3 asset in a 50-50 weightage, this particular calculation shows you the standard deviation of the portfolio return and if you can see when I am combining asset B with A my risk or portfolio risk a measure by standard deviation is 9.55 percent In case of a portfolio A and C my standard deviation is 8.37 and when I am combining asset D with the my portfolio A or when I am combining asset D with the my asset A existing asset A my portfolio risk is exhibiting the lowest standard deviation which is 4.95 percent. So, this simple example very clearly indicates that when we are combining assets which have a low correlation or negative correlation by doing so, we are able to reduce the portfolio risk. So, considering the fact that commodities tend to exhibit a negative correlation with most other financial assets. So, a lot of people, mutual funds and hedge funds have started investing in commodities and commodity derivatives. Now, another important aspect of commodity investment is that commodity investment also provides an effective hedge against inflation. Now, what do we mean by effective hedge against inflation? When inflation rises commodity prices also increase, that means, if inflation in an economy on a year-to-year basis suppose it is 5 percent and the commodity price increases 7 percent that means, we are able to say that this commodity is able to hedge against the inflation and traditionally we know that gold and silver have been considered as an inflation hedge.

Now, just to again show how exactly we calculate or corroborate that inflation hedge property of any particular commodity or any asset. I have just taken the yearly prices of gold prices 10 gram in rupees term and from here I have calculated the gold return. I have also taken the value of the consumer price index for this about 11 years from here I have calculated the inflation and the inflation adjusted return that is the return from the gold minus the inflation rate is giving me the inflation adjusted return. And when I am averaging it over of you know over these 11 years, I can see that the inflation adjusted return of gold is positive and averaging out averaging at 4.16 percent. So, this goes on to indicate that not every year that gold price is going to be higher than inflation, but on an average over a significant period of time or over a period of time the gold return is going to be higher than the inflation rate. So, if any asset is exhibiting this property, we say that that particular asset is providing a hedge against inflation. Now as I have mentioned just now, traditionally gold and silver have been

considered as a inflation hedge, but increasingly other commodities such as crude oil and copper is considered now as a inflation hedge. And this inflation hedge property is attracting financial investors to invest in commodities just as a financial asset and not for any underlying purpose. In fact, in the era of significant geopolitical turmoil commodity investment is also being considered as a good geopolitical risk hedge.

Now what do we mean by a good geopolitical risk hedge? Whenever there is a geopolitical risk geopolitical disturbance happens in a particular economy or in among a group of economy or group of countries the real activity in those countries goes down, the stock market underperforms, and capital investment moves out of those country or those region to other countries. In those periods investing in commodity provides a better hedge provides a better return than purely investing in the bonds or equity or financial asset of those particular countries which are affected by geopolitical risk. Hence lot of people have started investing in commodities just to mitigate the risk associated with you know geopolitical disturbances. Now, let us briefly understand what you mean by what is the difference between financial derivative and commodity derivatives. And let us first focus on what do we mean by derivative or derivative instruments.

A derivative instrument is a instrument which derives its value from an underlying asset. In fact, our popular equity index like your Sensex or nifty fifty are also considered derivative instruments at one level because they derive the value from the underlying shares. Similarly, shares also derive their value or share price of a particular company is a function of how the company is operating, what is the profitability, what kind of a business the company is doing. But we never or we do not categorize equity shares or index as derivative instruments. We categorize forwards, futures, options and swaps on these underlying instruments as derivatives.

So, financial derivative contracts have stocks, bonds, foreign exchange, interest rate, stock index, etcetera as underlying. Similarly, commodity derivatives have various types of commodities as underlying and commodity derivative contracts are nothing but futures, forward, options and swaps on various kinds of commodity underlying. Now, let us understand a little more on different types of commodities or different types of commodities or different types of commodity contracts on which derivative contracts are available in different derivative exchanges all over the world. In fact, commodity underlying can be categorized as a hard commodities or soft commodities. So, hard commodities are those commodities which are normally mined from the earth or extracted from natural resources.

So, any metal mining commodity be it gold, silver, crude oil, copper, nickel, coal, aluminum, crude oil, natural gas these are treated as or categorized as hard commodities and normally these commodities are not perishable, they have a longer self-life. In contrast to hard commodities another group of commodities which are known as soft commodities, these are normally agricultural commodities or processed or farmed commodities such as sugar, soybean, wheat, rice, mustard oil, mustard oil, mustard seed oil, biofuel, cotton, butter, lean, hog, cattle, egg, salmon, etcetera and these commodities have a significant perishable ability feature or they do not have a longer self-life. Now, all these commodity contracts which are

listed here in this particular slide, or I just now spoke about, all over world various commodity derivative exchanges are offering derivative contracts on these, you know commodities. And besides these standard commodities, commodity derivative contracts are being offered on certain exotic commodities such as carbon credits, commodity derivative contracts on underlying as hurricane, underlying on electricity, rainfall, payroll, freight rates, real estate, cryptocurrency are also started getting traded in different commodity exchanges. And as part of this particular course, we will be understanding many of these commodities in detail.

Now I will spend a couple of minutes sharing some of the important commodity derivative exchanges operating in the world. One of the largest commodity derivative exchange is the Chicago Mercantile Exchange. you know a wide array of commodity derivative contracts are you know are available in this So, the normal you know normal commodities I have put it in a black font and very peculiar very interesting commodity which is very peculiar to that particular exchange I have highlighted in this blue font. If you can see that you have cheese, you have milk contracts, you have whey contracts, you have you know different kind of cattle contracts, you have pork contracts, you have lumber contracts, you have also various contracts on commodity indices are available at CME. Similarly, in Japan you have you know besides the standard commodities such as gold, silver, crude oil you also have very interesting commodities on rubber and azuki beans, soybean etcetera trading at Japan Stock Exchange. Similarly, Zhengzhou Commodity Exchange of China you have very interesting commodity derivative contracts such as apple, Chinese jujube, peanut, thermal coal, methanol, glass, ferrosilicon etcetera available. Similarly, Singapore SHFE that is your Shanghai and Hong Kong futures exchange you have contracts on natural rubber and wood pulp. London metal exchange which is very famous for all kinds of metal and precious metal base metal and precious metal contracts. So, these contracts are available. You have Intercontinental exchange which is very famous for offering contracts on soft commodities such as sugar, canola, cocoa, butter and a frozen concentrate orange juice contract probably this is the only exchange which has this particular contract listed here.

You also have another exchange which is Bursa Malaysia which is popularly known as BMD. In that particular exchange you have commodity derivative contracts on crude palm oil, crude palm, kenel oil, arbidi palm oil, besides gold and tin contracts are available. Dubai gold and commodity derivative exchange has crude oil contract, gold contract and interestingly there is a contract called Saria compliant gold futures contract available there. And you have European exchange for salmon futures. This particular exchange offers only one contract which is on salmon the salmon fees futures contract on salmon fees.

And we have two you know Indian commodity derivative exchange which has increasingly making their presence felt in the global arena these are MCX and NCDEX that is multi commodity exchange and national commodity derivative exchange. They offer you know contracts on various hard commodities as well as soft commodities and as you can see MCX predominantly focuses on metal mining commodity derivative contracts while NCDEX predominantly focuses on agricultural commodity. In fact, in the NCDEX some of the unique

commodities such as bajra, barley, moong, turmeric, coriander, jeera, castor seed, isabagol, guar seed, guar gum are those commodity derivatives which are not offered in any other exchanges all over the world. You also have another exchange which is your European Union Energy Trading System i.e EUETS which offers various contracts on carbon credits or emission contracts.

And you also have another exchange called Baltic exchange which offers US derivative contracts on freight rates. And in these two slides I have given the link to each of these websites I would appreciate when you are you know going through this particular this particular session I would appreciate if you can spend some time going through each of these you know websites. So, that you get a better understanding of various kinds of commodity contracts offered by these internationally reputed exchanges commodity derivative exchanges. Also please note that commodity derivative exchange is not something very new it is operating for you know last 200, 300 years. The first commodity derivative commodity exchange to have come up you know historically recorded is the Dojima rice market in 1730.

You have the Baltic exchange which is started we started in 1744 is still functioning and still offering contracts on freight rate. You have a Chicago board of trade started in 1849 which is the predecessor of Chicago Mercantile Exchange or CME. You also have different commodity exchanges started in Argentina in Alexandria you have an international petroleum exchange which started in 1970, you have the Chicago climate exchange which started in 2003. And so, some of these exchanges have stopped functioning or they have evolved into or merged into different exchanges.

exchanges. Now, coming back to the historical prospective of commodity exchanges in India. Though MCX and NCDX started operating in 2003, but India has a very long history of offering commodity derivative contracts through organized exchanges. The Bombay cotton exchange limited started in the year 1893. In fact, by 1939 India had different India had about 300 different commodity exchanges offering various kinds of offering contracts on various kinds of commodities such as Gujarat, Vapuri, Mandali you have Calcutta Hessian exchange, you had East India Jute and Hessian limited, Indian paper and spice trade association. So, many regional commodity exchanges were offering where you know offering various kinds of contracts on various kinds of underlying in India.

In fact, government of India brought in a regulation forward contracts regulation act 1952 to bring in all these commodity regional commodity exchanges under a single regulatory you know governing body and the forward market commission came into existence. And all these 300 regional commodity exchanges were brought under forward market commission as the regulator. However, for various reasons government of India altogether banned commodity derivative trading in the year 1953. And subsequently, various committees were formed to look into the revival of commodity exchanges. So, you have Dantwala committee in the year 1966, you have Khusro committee, Kabra committee and expert committee on national agricultural policy in 2000.

This particular committee gave feedback on restarting commodity derivative exchanges in India and subsequently government of India allowed 4 multi commodity exchanges in multi commodity exchanges to come up in Indian context. These 4 multi commodity exchanges were national multi commodity exchange or popularly known as NMCE and NCDEX and MCX and Indian commodity exchange limited. For various reason NMC and Indian commodity exchanges are not doing so well. However, national multi commodity national commodity derivative exchange and multi commodity exchange in India limited that is MCX and NCDEX are offering various kinds of commodity contracts as we have discussed 2 or 3 slides before. And the regulator forward market commission was merged with the SEBI in September 2015.

Now, SEBI is the commodity market regulator as well as the financial market regulator. Now, let us understand something on commodity spot market vis-a-vis a commodity derivative market. Please note that the commodity exchanges offer derivative contracts on commodities. Basically futures, options and swap contracts on various commodity underlying. And when we talk about the spot market, spot market in case of a commodity is everywhere.

In fact, whenever we go and buy let us say 2 kgs of potato from our friendly neighborhood market, neighborhood a shop that is also called as a spot transaction. A farmer selling potatoes 200 quintals or 300 quintals of potato to a wholesaler in a mandi is also an example of a spot market transaction. And with the online trading facilities many wholesales market are shifting to online platforms, but still these are known as the spot exchanges or spot market. Here I would like to draw your attention to a difference between a financial market and a commodity market. In case of a financial market let us say I want to buy Infosys shares I can go and buy the Infosys shares from NSE national stock exchange or Bombay stock exchange.

If I want to also buy derivative contracts futures or option on Infosys shares, I will be able to do so in the same exchange itself Bombay stock exchange or national stock exchange. However, in case of a commodity if I want to buy a spot commodity, I have to go to a market which is completely different ah than the derivative market. If I want to buy futures and options, I will go to a commodity derivative exchange. And please note that the commodity derivative exchanges do not offer spot trading facilities.

Spot trading in the case of commodities happens everywhere. The spot market is there in the friendly neighborhood shop, and you know any wholesale market is the spot market. So, this is one of the very important distinctions between a financial market and a commodity market. In case of a financial market both the spot as well as the futures and option traded in the same platform in market both the spot as well as the futures and option traded in the same platform in case of a commodities spot market is physical market which operates everywhere, and your derivative or futures option market is traded in a derivative exchange. In this context of you know in the spot market, the government of India has brought in a new market called E national agricultural market. So, that particular market is providing a platform for farmers, and you know value chain partners to come to a platform to an online platform to do a spot trading.

So, in the next session we will be discussing more about this in a market and the spot market with respect to commodity in greater detail. I would like to wind up this today's session and I would again urge each of you to go through some of these interesting web links I have given here. And I would like to say a very important you know important thought process which I have is that you should never be restricted by my knowledge. I would encourage each of you to go beyond what we have discussed in this PPT and do some additional study. So, that you understand appreciate the commodity market in a greater detail and these are some of the selected website links which I have provided and very hopeful that each of you will be able to spend some time and be more knowledgeable about the commodity market by visiting each of these websites.

So, thank you all of you. With this we are ending session one I look forward to in interacting with all of you in the next session that is the second session. Thank you all of you.