International Finance
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Lecture - 11
Value at Risk for Foreign Exchange Market

Good morning. See, in this session we will be discussing about the value at risk model particularly in the foreign exchange market. As I mentioned in our earlier session, exchange rate fluctuation is a risk for the exporter importer. If the exporter importers are not purchasing any risk management product, their position is open. In open position any fluctuation in exchange rate creates risk. And how much risk they are bearing in their position, you have to estimate that; that estimation generally you do in the finance through value at risk. So, value at risk applicable to foreign exchange market, to bond market, to any position, whenever there where the underlying is asset whose asset value is fluctuating.

Before discussing about the value at risk, you have to understand some amount of little bit statistics, about standard deviation, normal distribution and also the portfolio risk estimation side.

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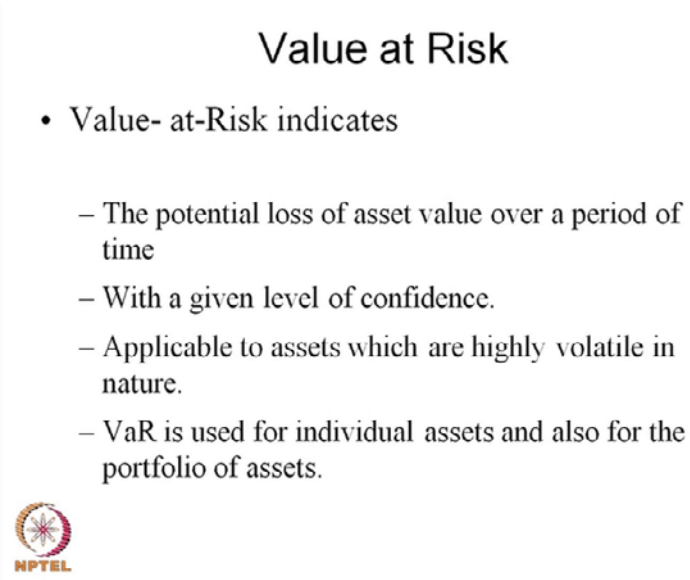

Let us start. Value at risk indicate, what is called value at risk? Value at risk indicates the potential loss of asset value over a period of time. What does it mean - potential loss? There is no loss so far. We are using the historical data and estimating some parameter; through the parameter, we are estimating what will be the potential loss. Actual loss has not taken place for asset, asset value. The asset may be foreign currency, may be a bond, may be any kind of financial asset whose value is fluctuating with a given level of confidence because when you estimate something about the future, you are estimating your potential loss. You are estimating; so we are not confident actual loss will take place. We are confident on certain degree. The degree of confidence is very important here. The degree of confidence we are we will be estimating through the normal distribution.

The value at risk applicable to assets, which are highly volatile in nature, the value of the asset, value at risk is applicable to asset. The asset value is fluctuating, highly volatile. Then there will be foreign currencies highly volatile, equity prices are highly volatile, bond returns are highly volatile. So, they are applicable to such kind of asset whose underlying value is fluctuating.

The value at risk is used for individual asset and also for a portfolio. What does it mean? One single foreign currency you can use or a combination of foreign currency: US Dollar, INR Indian, may be in Yen, French Franc, and Euro - a combination of currencies. And we are designing a portfolio, that also we can use, the value at risk for the portfolio variance, portfolio value at risk.

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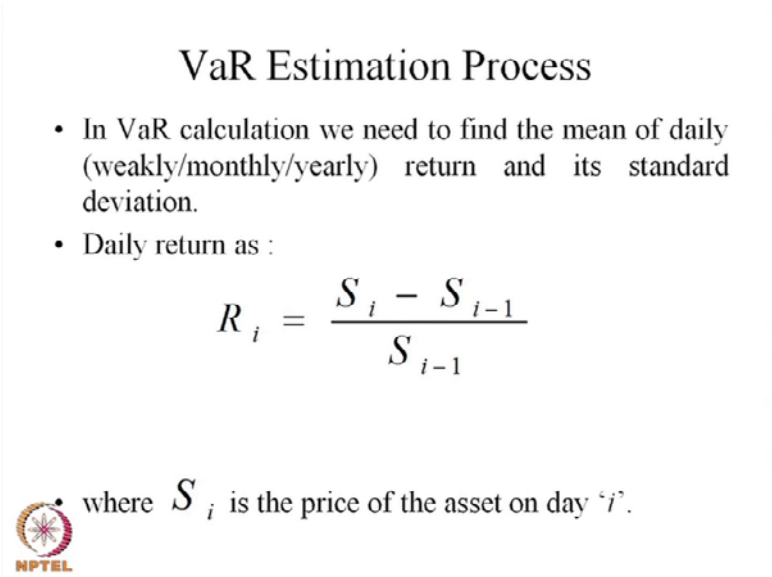

For estimation of value at risk we have to estimate what is the return. Return fluctuation is important here. So, VaR calculation or value at risk calculation we need to find mean of daily return and its standard deviation. The mean of daily return after calculating estimating the mean of daily return, we can convert into weekly, you can convert into monthly, you can convert into yearly also. So, you have to take the daily returns; return is nothing but tomorrow price minus today price divided by today price, you will get the return.

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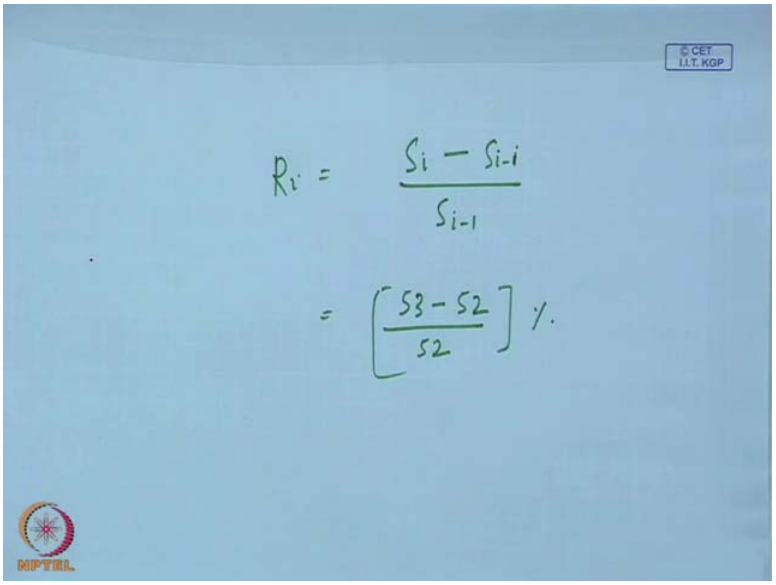

So, here S 1 - price of the asset on day i and S 1 minus 1 - price of the day previous day and S 1 minus I divided by that you will get return. What does it mean? The return is here. When you calculate the return, return is here R iis equal to S 1; S i minus S i minus 1 by S i minus 1. Here what does it mean? Suppose here we are calculating 53 Rupees per dollar today, yesterday 52 Rupee divided by 52 Rupees we will get the return to us. We will get the return to us, return will be in percentage form.

So, return is nothing but today minus yesterday divided by yesterday will give the return. So, this return is daily return because everyday data you are taking. After getting the daily return, we can convert into yearly return, then convert it into monthly return; you can convert it into any other day return over a period of time.

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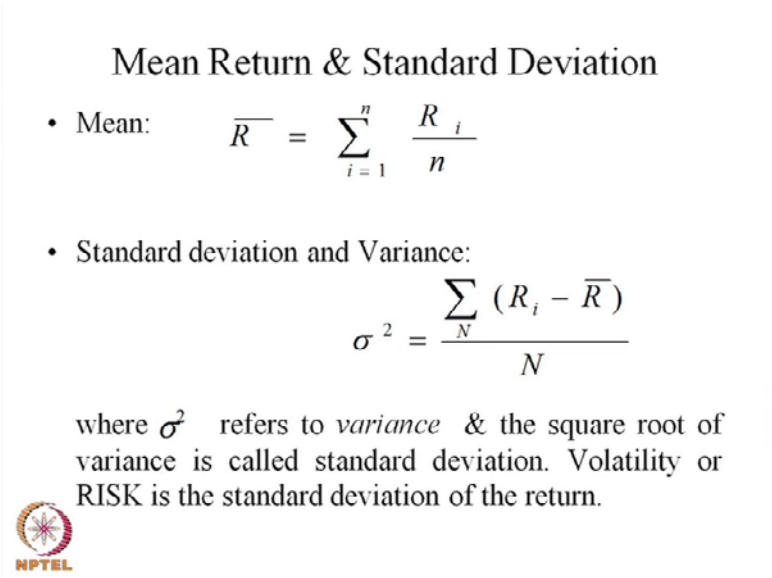

So, in value at risk two things are very important what is called mean return and standard deviation.

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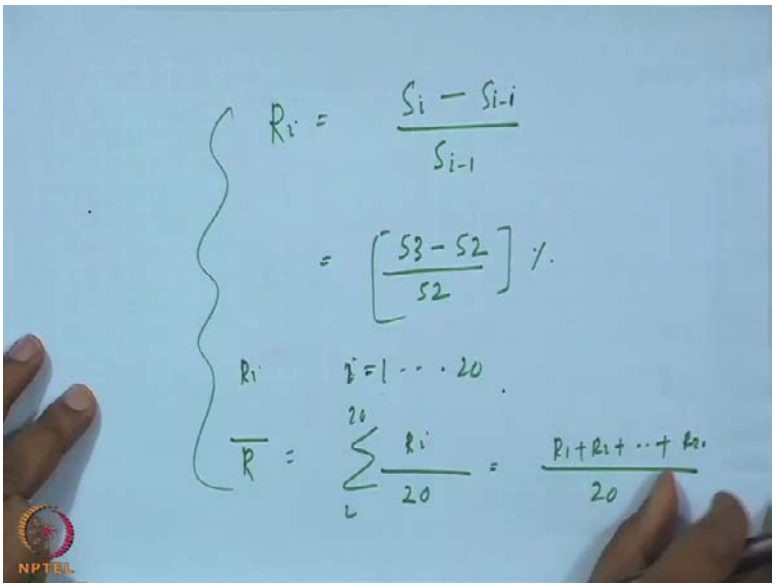

The mean return is nothing but if you calculate daily return for Ri, you have to calculate Ri, i1 i is equal to 1 to 20; means first day, second day, third day, fourth day, all days returns till twentieth day. The mean return will be nothing buti1 to 20 divided by R i, R i divided by N, N is here 20.What we are doing here? We are calculating R 1 plus R 2 plus like this R 20 divided by 20, you will get the mean return; mean return or R bar square. This is a mean return calculation side.

Similarly, in value at risk we also need what is called two more things what is called standard deviation of return; standard deviation of return we are calculating. By after getting the mean return, you have to calculate the standard deviation of return. Standard deviation return is the variance of the series.

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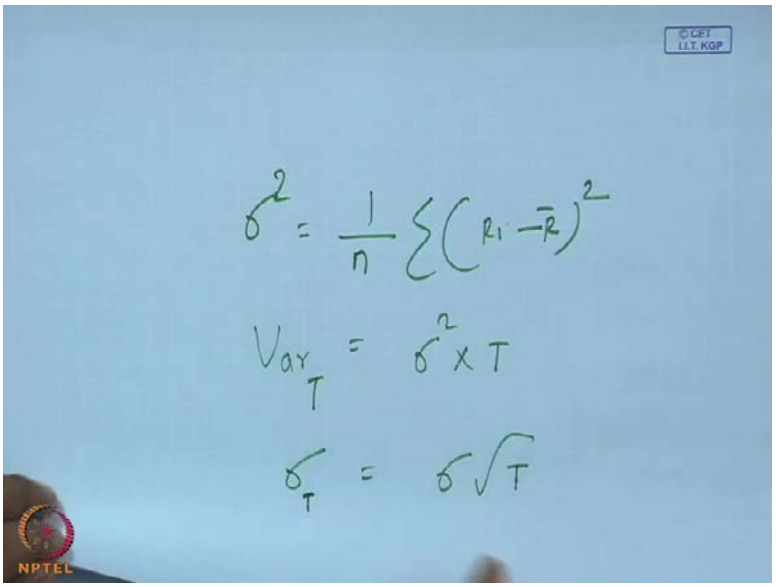

The variance as we know is nothing but 1 by n individual return minus the mean return square mean return square. So, we get the standard deviation of the return; individual return minus the mean return. How much the individual return are deviating from the mean return? That is called the variance or the risk or the volatility of the return. When you call volatility of return, it is nothing but deviation from the mean. Any deviation from the mean is a risk and the risk you were capturing through Ri minus R bar and the risk is standard deviation and standard deviation generally we use for the risk calculation side.

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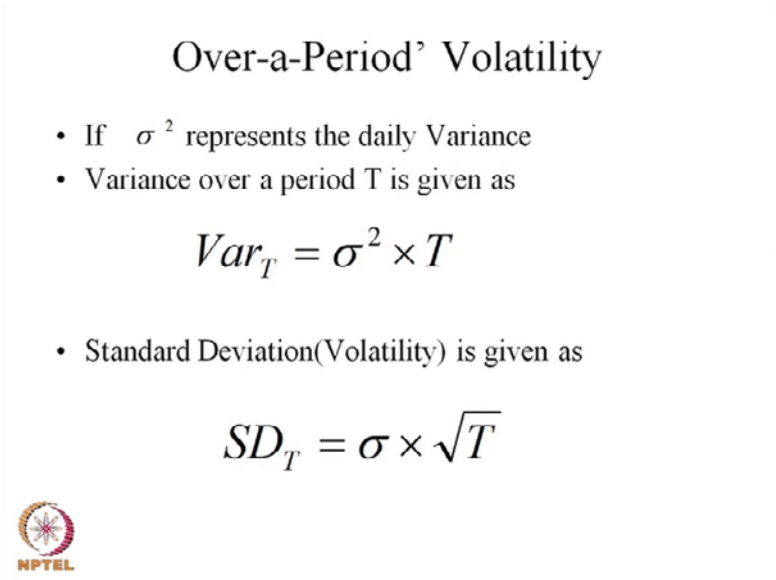

Once because these are value, these returns are daily returns, but we may need for weekly or we may need for monthly return. Then question is how we can calculate value variance for the period over a period of time; variance over a period of time.

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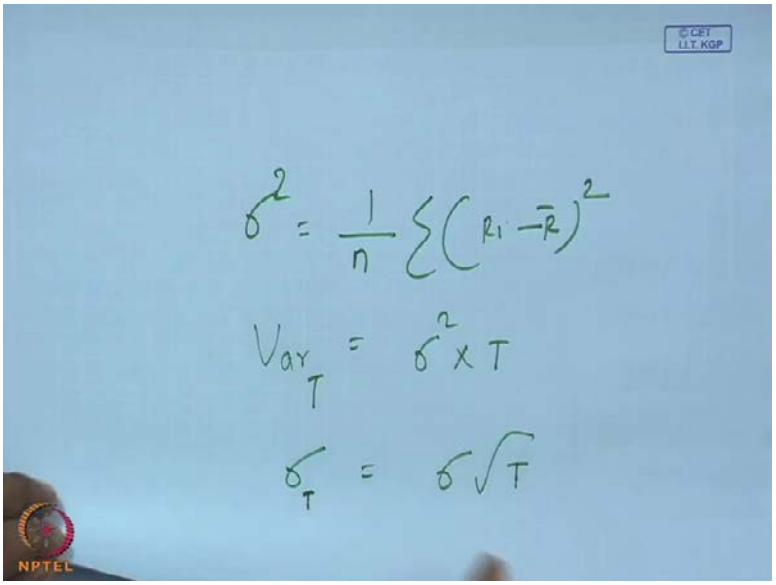

So, we call VaR rate variance at period of time, T T period is nothing but sigma square - the variance and into T into T. Suppose we know this daily returns we know, daily returns we know for seven days return daily return into seven days will be the seven days variance. One month return -suppose you know daily return, you are calculating what will be the variance for the thirty days; you multiply by thirty. So, similarly standard deviation is nothing but the value sigma, sigma into root over T. So, for T period T is suppose 1 day,2 day,3 day,10 days, whatever days it may be, so, if you know the standard deviation of daily return, standard deviation into root over T,T is the time period - number of days, you can calculate the volatility of return for T period; T may be 1 day,2 day,3 day,10 days,15 days, anything. This is called the volatility of return calculation.

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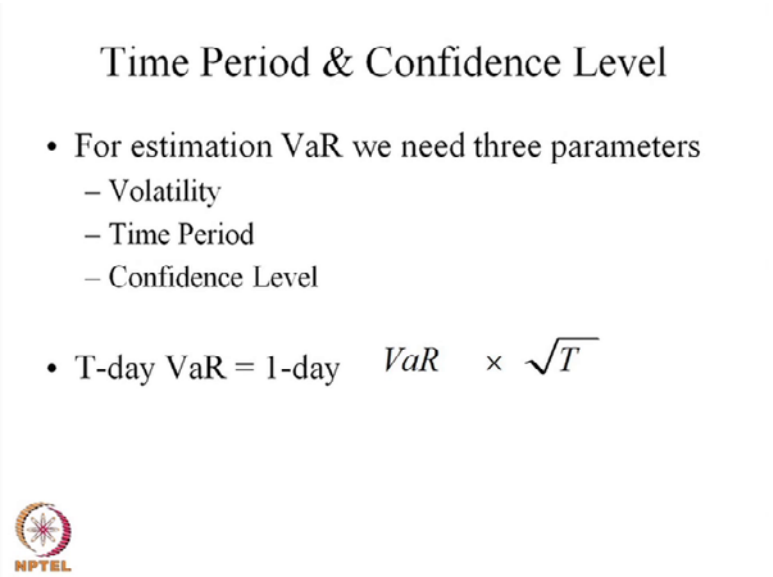

When I mention that in case of value at risk we need three parameters: the first parameter is our volatility, second parameter is here time period, third parameter is confidence level. So, we will be discussing each of these. What is volatility? I know. I mention here volatility is a risk. Risk is coming from where? In case of foreign currency, the exchange rate volatility; exchange rate is changing its value; US Dollar in Indian Rupee is depreciating everyday. So, there is depreciation; appreciation is a risk. The risk you are capturing through the standard deviation and the standard deviation is nothing but volatility.

Then you generally do the value at risk for some time period because when I purchase a foreign currency I may keep it for ten days. So, I am bearing ten days risk. Within those ten days the foreign currency may fluctuate, may be appreciate, may be depreciate and there is a risk and ten days risk I am keeping with me. So, I have to calculate the risk here; the volatility for ten days. I have to take the data for daily data, for 240 day data, one year data. From the one year data, I have to calculate the value that is our ten days variance and ten days variance will give me the ten days risk of keeping the particular foreign currency for ten days. The time period is the number of days because without reference of any period you cannot calculate the values volatility or the risk.

Confidence level - the confidence: here confidence level is nothing but how much confident I am, the volatility remain the same which I have estimated. I have taken a

historical data. The historical data on the basis of historical data, I have accept I have estimated the volatility. What? I am using the historical data volatility for future prediction. What is the confidence that the history may repeat itself in future? So, that is called confidence level. I may I have confidence that same kind of volatility will be there in future also. My confidence, suppose I am 99 percent confident same kind of volatility may occur also in future, that is called confidence level. So, it may not have may not have may not be same kind of volatility because it may happen, history may not repeat itself; it may happen that the volatility may be less than the earlier volatility. So, it depends upon the confidence limit what I have with me. So, T VaR, time value T VaR means number obtained; five days, ten days VaR. T VaR is equal to one day VaR, one day VaR into root over T. What does it mean?

Suppose I am calculating the value at risk variance, value at risk for one day, value at risk for two days, value at risk for ten days, T VaR one day VaR value at risk into root over T -that will give me that value at risk for that many days. For T VaR two days var, so one day VaR I got; so, one day VaR into root over TI will get the VaR for second days, third day, four days, whatever it may be. What does it mean? It means that I am using I am here.

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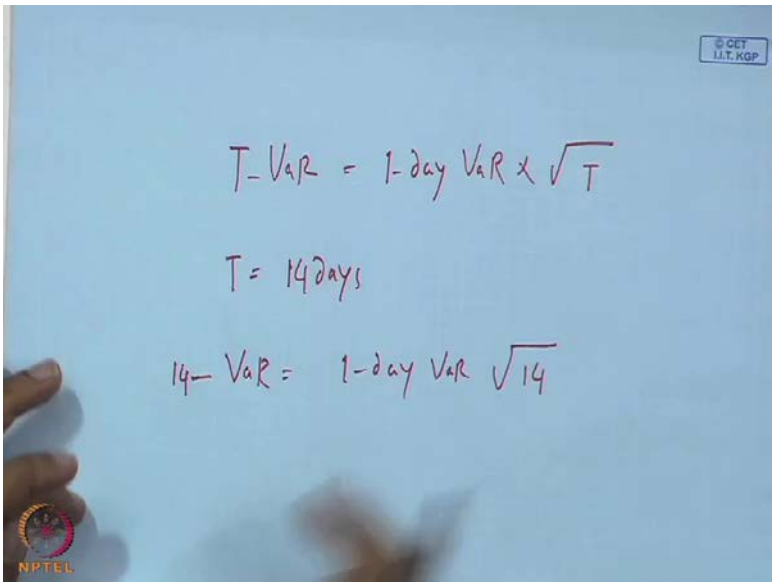

Suppose I got T VaR is nothing but one day VaR into root over T. Here, T is suppose fourteen days,2 weeks. So, T is14 days VaR; 14 days VaR is nothing but one day VaR;

one day VaR I know; one day VaR into root over of 14.So, that will give you the 14 days VaR. One day VaR I have used a yearly data and estimate that every day. Yearly data means each day data and estimate the volatility and estimate their value at risk.

Suppose I want to keep my position for 14 days and what would be the VaR? What is the risk I am caring for 14 days because I use the one day VaR and I convert into 14 days var. So, that is called VaR VaR over the period

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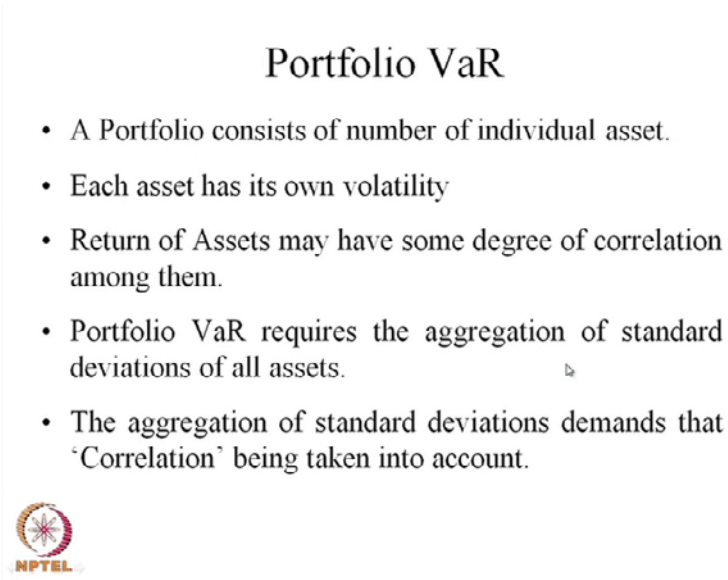

So, another problem is also there what is called portfolio VaR because it may happen in my portfolio where I have number of assets. Number of asset has own weight in the portfolio. Each asset has its own weight; each asset has its own volatility. So, portfolio risk is combination of all these volatility. So, the question is here - how I have to estimate the portfolio risk? So, you have to calculate, you have to understand what is a portfolio first. A portfolio consists of number of individual assets; each asset has its own volatility. Return of asset may have some degree of correlation also.

It may happen that Rupee and Pound Sterling may correlate. When Rupee is depreciating, Pound Sterling may depreciate; when Rupee is appreciating, pound sterling might appreciate. That may be positive or negative correlation among the currency. Similarly, when a asset when a portfolio have four assets, each asset individual asset among them there will may be positive negative correlation. So, suppose the negative correlation may reduce the volatility portfolio VaR, portfolio risk, positive correlation

may increase the portfolio risk. So, I always try to reduce the portfolio risk. The portfolio risk can be reduced by having negative correlated of individual asset. So, returns or returns of asset may have some degree of correlation returns of asset have some degree of correlation.

I have to factor this correlation while estimating the portfolio VaR, the aggregation of standard deviation, but how I am doing this portfolio risk calculation? I have to aggregate the individual asset under deviation and I have to factor the correlation among them. So, I have to estimate what is called a portfolio standard deviation.

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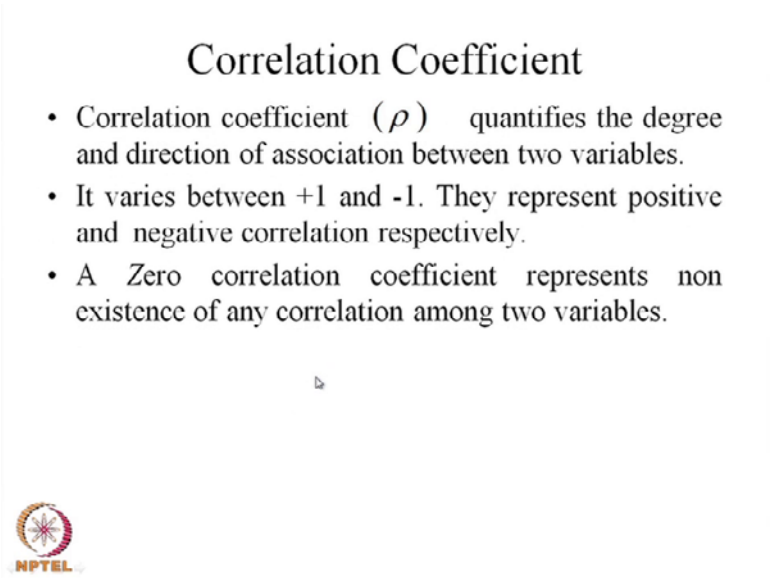

Portfolio standard deviation: As we studied in corporate finance, corporate finance, where the correlation is very important among the asset, individual asset, their own weight, individual asset are own volatility, along with the correlation among them you have to factor to estimate the portfolio VaR. But what is correlation? Correlation as what we discuss what we understand from the statistics? Correlation is a degree of association among assets, among returns. The degree of association may be positive negative. This is how…Hence, correlation varies from plus to minus 1; plus 1 to minus 1.They represent may be positive correlation or negative correlation.

They are highly correlated; so, it is a positive one correlation. There is negatively correlated, may be negative minus one; in between this plus and minus the correlation stands. So, 0 correlation there is no association. Generally, in a portfolio if we want to

minimise their risk, we generally have a negative correlation among assets, individual assets, so as to reduce the portfolio risk. When you discuss about portfolio risk you have combination of standard deviation. It is very important here.

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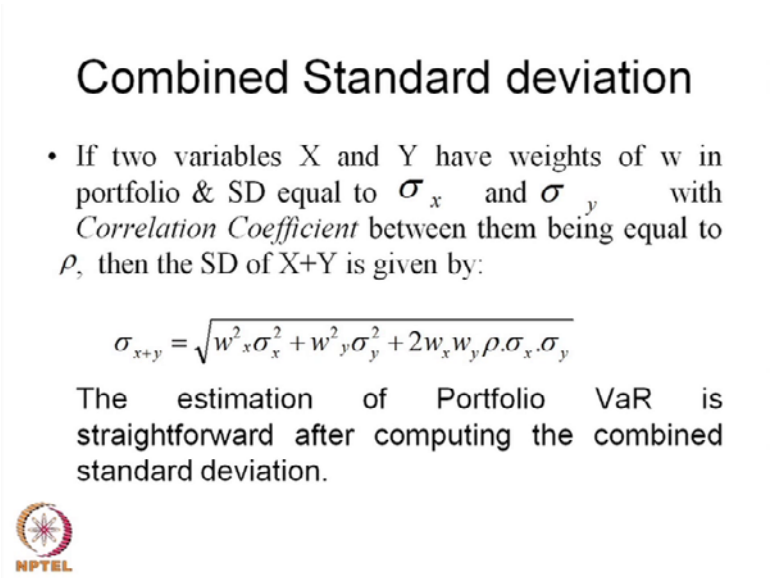

Here, suppose there are two assets here X and Y - two variables, two assets, two individual assets, the portfolio is composed of the portfolio having the portfolio will be having X and Y, two assets.

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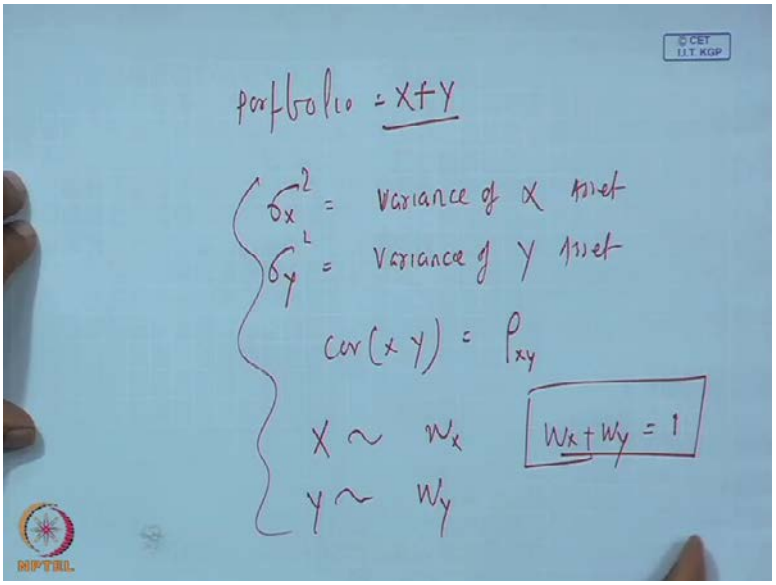

Square is the volatility of the variance of variance of x asset and sigma Y square will be variance of y asset and among these 2 X and Y there is a correlation. Correlation between X and Y,I refer is x and y. Then the portfolio will have some amount of money. I suppose X compose of the X has a weight of w x and y has a weight of w y. So, when w x plus w y if you include it will be 1. w x plus w y is equal to 1.x is the weight of w x y is the w y. Now, once you know these, you have to you have to estimate that portfolio standard deviation; so, portfolio standard deviation.

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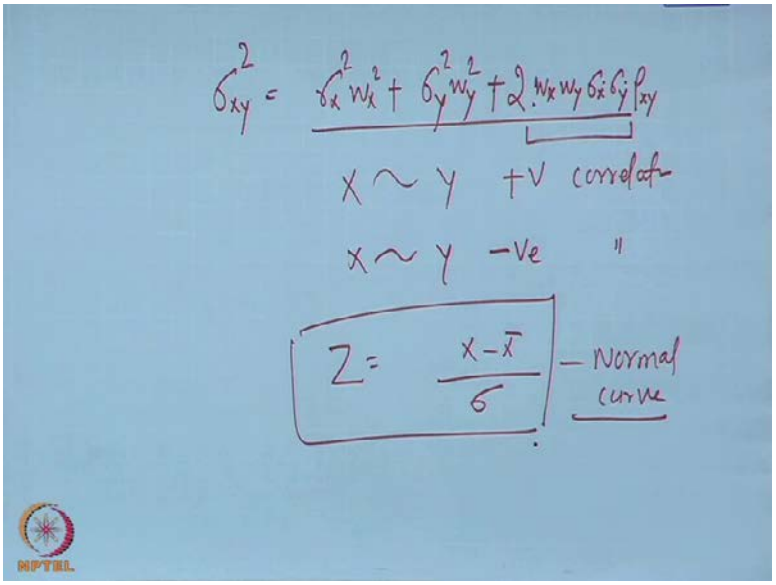

As per the calculation goes, portfolio standard deviation is nothing but sigma xy square is nothing but sigma x square into w x square plus sigma Y square into w y square plus 2 into w xw y and sigma x sigma y and xy the correlation among these two. So, that is this individual asset volatility into weight of the asset; this two has come and correlation among these two that is xy rho xy and standard deviation between two, along with the weight the correlation part will come over here. So, then if the asset x and y,x and y have positive correlation then this part will be positive and this part will be positive and overall standard deviation will be more. If the asset x and y is negative correlation then this part will be negative and overall standard deviation or overall portfolio variance will be less .

So, it depends upon the designing of the portfolio. what kind of have to decide the asset quality or asset return relations. Generally, to minimise the portfolio variance we should

always have such kind of individual asset whose correlation is negative so as to reduce the overall portfolio variance or portfolio risk.

So, in the estimation of value at risk for a portfolio of asset or portfolio of currency, you have to see the individual currency standard deviation, individual currency weight in the portfolio and among this currency what is the relation or correlation among them. Plugging all these all this parameters we can have the portfolio standard deviation or portfolio volatility or portfolio risk that you have to use for calculation of value at risk.

Now, now the set of things we have got. One is what? Time period; time period is our T. we can come Time period is our T which can be one day to one year and you can we know how to adjust it. Then we have volatility. Volatility is nothing but standard deviation which is nothing but deviation from the mean we can calculate for individual asset, we can calculate for the portfolio of asset. Now, third thing we need confidence interval because we have to operate in a normal world. We are estimating that the volatility of an asset or a group of asset have a normal distribution. By assuming the normal distribution only we can proceed further.

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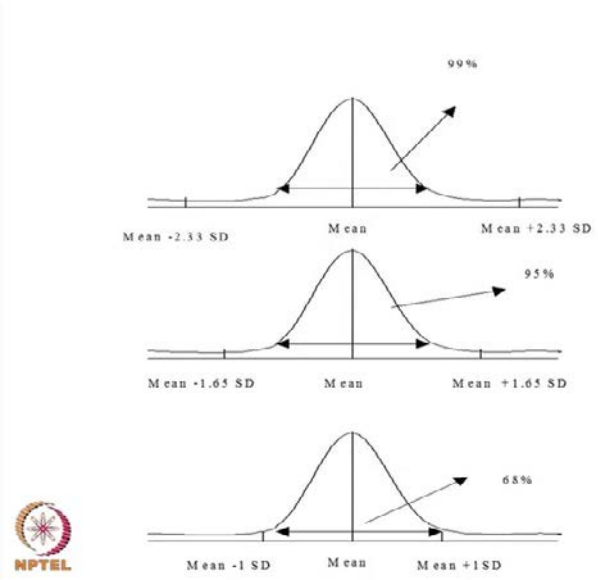

So, what is normal distribution? The normal distribution is nothing but the asset asset volatility spread over asset volatility spread over in such a way the curve will normal shape in nature; the mean, mode, and everything that the asset volatility is spread over the mean. So, mean is the central part here and volatility is spread over mean, spread

over the mean uniformly distributed. There is a bell shape here. It is not extreme volatility or not a volatility which cannot be estimated from here. So, mean of standard deviation and the mean, and standard deviation design what is called the Z score; the Z score is here Z is equal to nothing but X minus X bar by standard deviation. From this basis we design the normal curve and using this curve we will design what is the confidence interval. Because…why we need confidence interval? We are using historical data. Using the historical data, we are predicting for the future that what will be a probability of loss in future on the basis of what? Historical data, historical volatility. We are assuming that historical volatility may repeat in future, but it may not be the hundred percent repetition. Some extent it will be more volatile, future may be more volatile than the past. It may happen that the future will be less volatile than the past, but our underlying assumption is that history repeats itself, but there is a confidence; history may not repeat same way; history may repeat 70, 80, 90 or 99 percent of past.

So, like that on the basis of, since you are using, historical data we are not confident enough or hundred percent confident same kind of volatility will be there in future. So, you have to design a confidence interval. The confidence interval is here through the normal distribution. What is normal distribution here?

The mean and the standard deviation or the volatility is important for the normal distribution. We are assuming that the volatility distributed across them in such a way the curve is a uniform normal curve which is bell shaped in nature. And after that you can design the confidence interval on the basis of volatility mean plus volatility mean plus volatility.

Now, if you see here, if you are 99 percent confident the history may repeat itself in future that we are somewhere mean minus 2.33 standard deviation, that is this point to this point, Mean plus 22.33 standard deviation.99 percent we are sure the mean will, the volatility or historical volatility, will repeat in future. Suppose you are 95 percent sure, then here the distribution of standard deviation is such that it is mean minus 1.65 standard deviation from this point to mean plus 1.65 standard deviation; here 95 percent confidence interval; the history will repeat itself. If the same volatility continues in near future, then here in third sign here; the mean minus one standard deviation and mean plus one standard deviation here 68 percent of the curved area we are capturing.68 percent you are confident the history or same volatility will be there in near future. So,

these are the calculation of confidence interval through mean and standard deviation using the normal curve.

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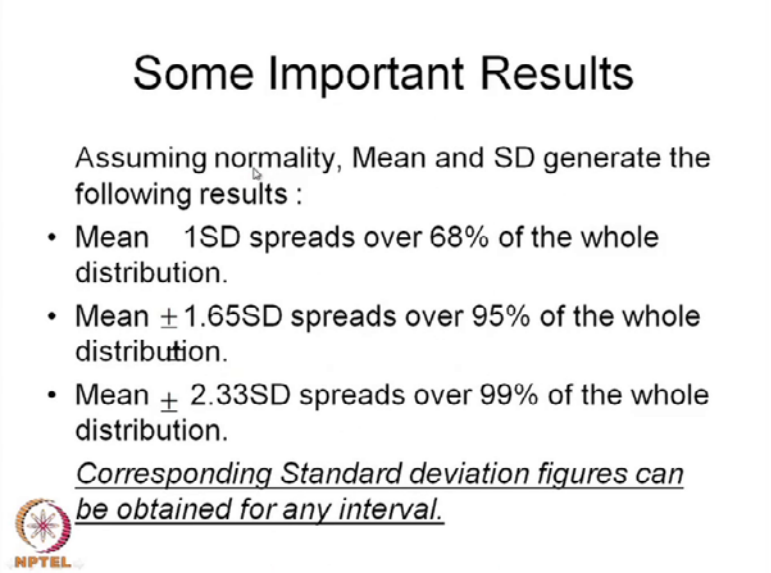

Now, suppose some important result is here assuming the normality mean and standard deviation we can generate the following result. So, mean is one standard deviation spread across two side what is it means we have discussed earlier the mean is spread over one standard deviation the third curve. The curve one standard deviation on left one standard deviation right of mean is cover 68 percent of the curve area, which 60 percent confidence are history may same volatility will continue in the near future and here mean plus minus 6.5 standard deviation its covers 99 percent of the whole distribution. If you see here the second diagram here plus minus mean minus 1.65 standard deviation mean plus 1.65 standard deviation, which cover 95 percent of curve area 95 percent we are confident that history may repeat near future.

Mean plus minus 2.3 standard deviation here the 99 percent curve area we are capturing mean minus 2.33 standard deviation and 2.32 point plus 2.33 standard deviation which cover 99 percent of curve area; that means, 99 percent you are sure how history will repeat same way 1 percent we have a we have a problem.

Now, come to the VaR side value at risk side the first diagram 99 percent sure history repeat itself. So, probability of loss is 1 percent here similarly probability of loss is 5 percent on 5 percent we are not sure, similarly probability of suppose here 60 32 percent

we do not sure we are not sure. So, here same way you can calculate the value at risk model now.

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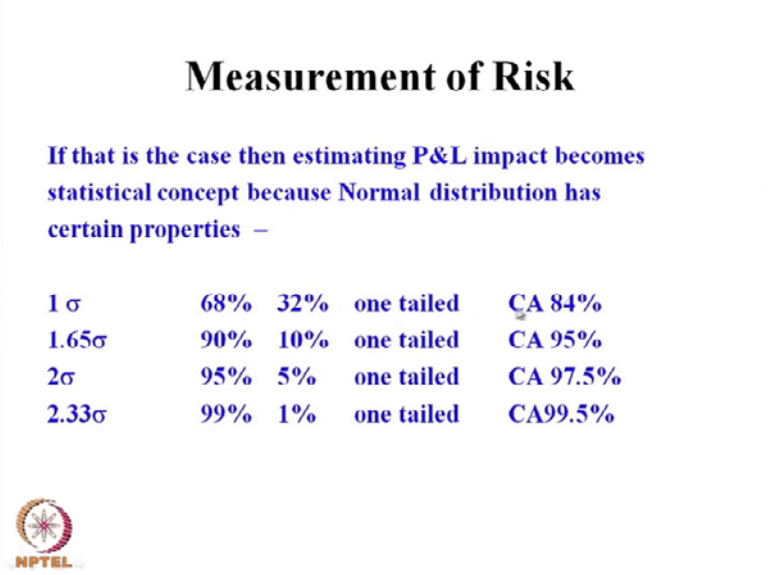

So, what does it mean? It means two things here: first one standard deviation cover 68 percent one tailed; this means 32 percent one tailed 32 percent. So, curve area is confidence interval 84 percent cover area is 95 percent here when 1.65 standard deviation. Similarly, two standard deviation cover 95 percent. Here cover area is 95.7 percent.

Similarly, 2.33 percent we are sure. So, the one tailed your cover area is 95.9.95.99.5 percent standard deviation. When you discuss about when you decided that about the calculation process of volatility, the conversion of day volatility into a period volatility then we discussed about confidence interval. These three things, as I mention from the beginning, you require for the calculation of value at risk. Once we decide about the three things, now we discuss about value at risk calculation.

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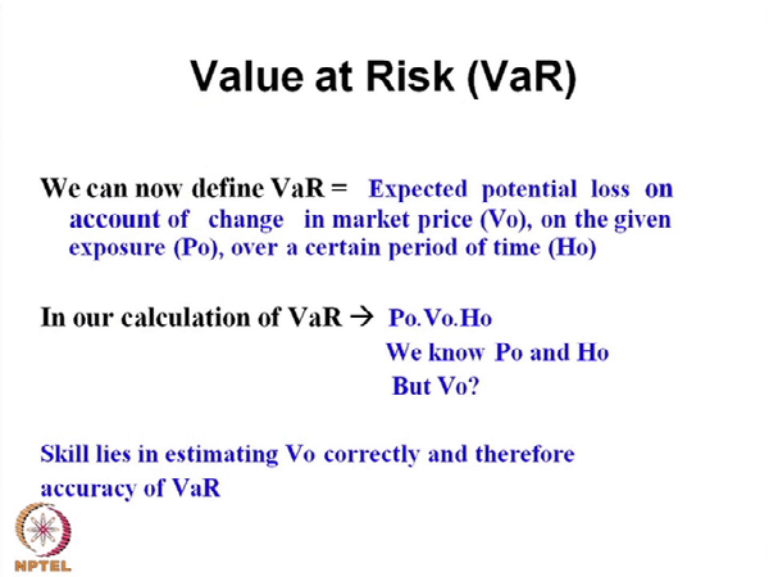

The value at risk is, as I mention from the beginning is, expected potential loss; not the actual loss. We are not discussing any actual loss here. We are discussing potential loss. Why potential? Because we are using the past historical data to predict the future so, we are predicting the future. Future has not arrived to us. All our calculations are expected potential. So, expected potential loss on account of change in market price.

So, your market price: suppose your foreign currency US Dollar, Indian Rupee, the fluctuation of Indian Rupee against the US Dollar. So, change in market price on the given exposure. Our exposure amount is how much?10 Million. On a certain period of time means how many days you are keeping the 10 million; 10 days, 15 days, certain period of time. So, we understood here 3 parameters. Expected potential loss on account of market price volatility, US Dollar Indian Rupee, Indian Rupee is fluctuating; the volatility is coming from the fluctuation side. Exposure amount - how much US Dollar we are keeping? 10 million US Dollar. So, amount is exposure P 0 10 millions US Dollar.

How many days you are keeping? Suppose 10 days, the period of time 10 days here. So, everything has come over here. So, value at risk is nothing but you have to multiply all these things too; all three things. V 0 - V 0 is our exposure 10 million, V 0 is a volatility of a Indian Rupee and US Dollar that is Rupee is fluctuating, V 0 volatility of Rupee and

H 0 holding period that T is coming over here holding period. All these three things if you multiply, you will have a calculation of what is called value at risk.

Now, question is, here we know what? We know P 0. P 0 amount 10 million,20 million,30 million. What is the portfolio? What is the size of our holding? 10 million US Dollar; we know it; we know holding period. How many days you are holding? You know the holding period; H 0 we know. What you do not know? We know the V; you do not know the V 0,the volatility. You have to estimate the volatility using the historical data of Rupee Dollar exchange rate. Here rupee is fluctuating. You take 240 days or one year daily exchange rate of Indian Rupee and estimate its variance or variance of standard deviation we estimate; that will give daily standard deviation or the daily volatility.

So, the calculation of V 0, the volatility only can give you the skills or estimating the V 0 correctly. What way you are estimating V 0? What the process you are adopting for the calculation of V 0? That determines our value at risk calculation because in value at risk calculation, all other things are given, value given. What is this value at risk calculation? We know that value at risk calculation.

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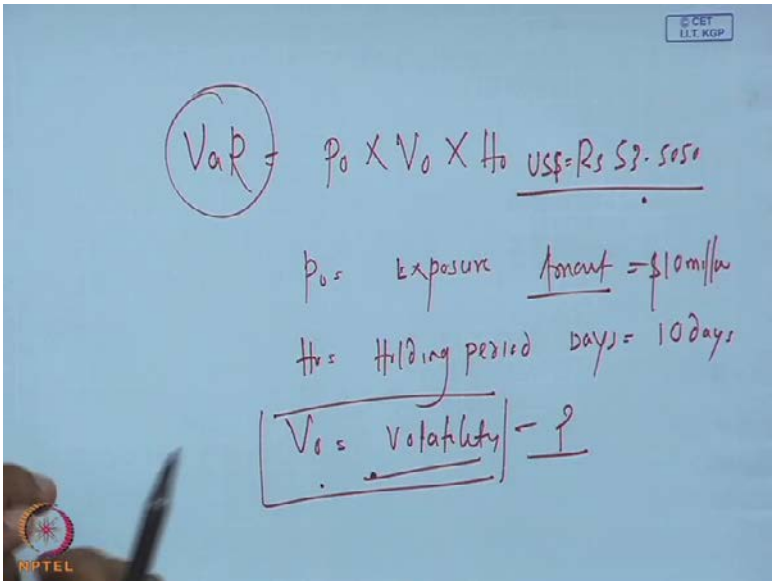

What is our exposure? That is P 0 into V 0; V 0 is volatility and we also know what is called H 0; H naught is the holding period. So, P 0 is our exposure. Exposure is our amount; we know the amount and H 0 is our holding period. Holding period how many

days you are keeping? Suppose amount is 10 million US Dollar.10 million10 million US Dollar.

How many days of holding period? Suppose 10 days. You know this, 10 days. We know this and V 0 is the volatility; this we do not know. We do not know; you have to estimate. So, everything for us is the given value; only this thing is not given to us. We have to estimate how we estimate? You have to take suppose you are handling US Dollar in Indian Rupee, Indian Rupee and US Dollar calculation, then suppose US Dollar 53.5050 is starting rate you take a series of number of days generally may be around 240 days data, everyday data and see what is the fluctuation. Then calculate the exchange rate for 240 days, the historical data and estimate the standard deviation of this; that will give you the volatility calculation.

So, what we are estimating? The volatility, that only gives a good VaR to us. TheVaR is good; the prediction is good; the volatility prediction depends upon how, what way you are predicting or estimating the volatility.

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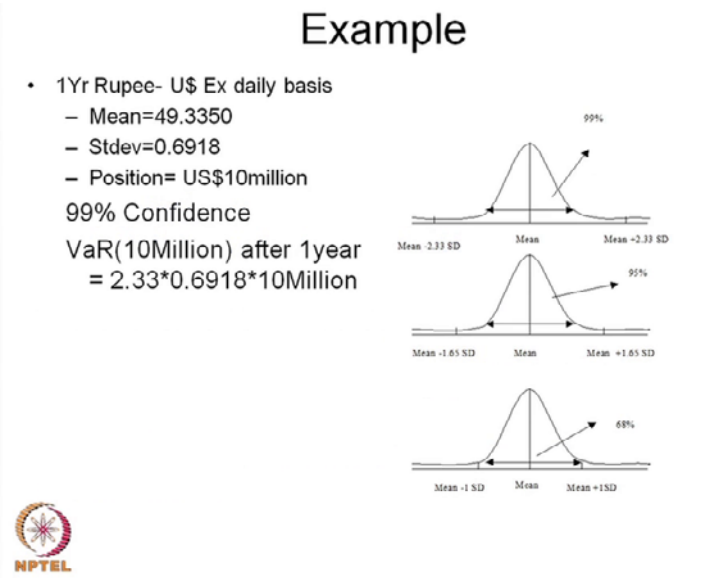

So, suppose here suppose here, one example is here one year Rupee. Suppose you have taken a one year Rupee US Dollar in exchange rate. Suppose, now we are estimating in the VaR what you have to do? The VaR in Indian context Indian context we have the working day.

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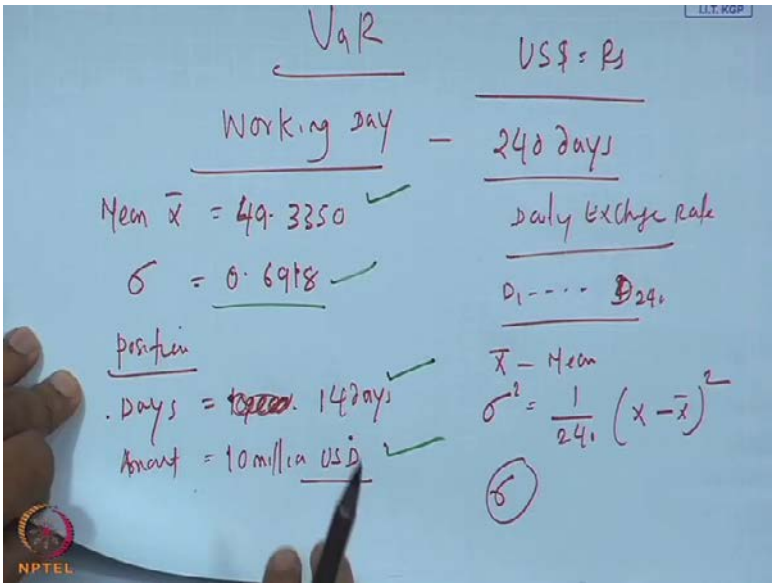

So, suppose you are estimating the US Dollar and Indian Rupee exchange rate volatility calculation. So, you have to take a working day. In India, we have suppose around 240 working days, if you are in a foreign exchange market 240 working day data you will get because Monday to Friday generally exchange rate market in India works; Friday also Saturday also it works, but Saturday the transaction not so much; you may not get the conversion rate, but you can include Saturday also.

Monday to Saturday the data if you see, you remove the holidays. It is 240 working days will get. Take the daily exchange rate; daily exchange rate of US Dollar exchange rate of US Dollar in Indian Rupee. So, that starting from day one, day one you go up to how many days? 240 working days. Then take its mean. Mean calculation will be there; then after that estimate the variance. Variance is nothing but 1 by 240 into X minus X bar square. That will give you variance. After estimating the variance, we got the volatility here.

So, volatility, standard deviation of volatility is here and this will help for our calculation of VaR. Now, suppose the volatility we estimate; the mean is suppose here; we got the mean, mean X bar. If suppose we got the mean of X bar something around 49.3350 and we got the standard deviation of suppose around 0.696918 and the position is here. Our position is a two side; one is days of position; days suppose day our day is suppose we are going for1 year,1 year calculation, our day also we got; this is daily volatility. So,

your daily volatility is one year. So, you have to suppose daily volatility; suppose you got in place of days, we calculate suppose 14 days -2 weeks, nearly 2 weeks.14 days a position 1 is in position 1 is date and another is amount. Amount is suppose our amount is 10 million US Dollar, 10 million USD.

So, we got the 10 million USD. We got the mean calculation; we got the standard deviation calculation; so, standard deviation is here; our mean also we got; standard deviation we got; position we got; the position for 14 days we got an amount for 10 million.

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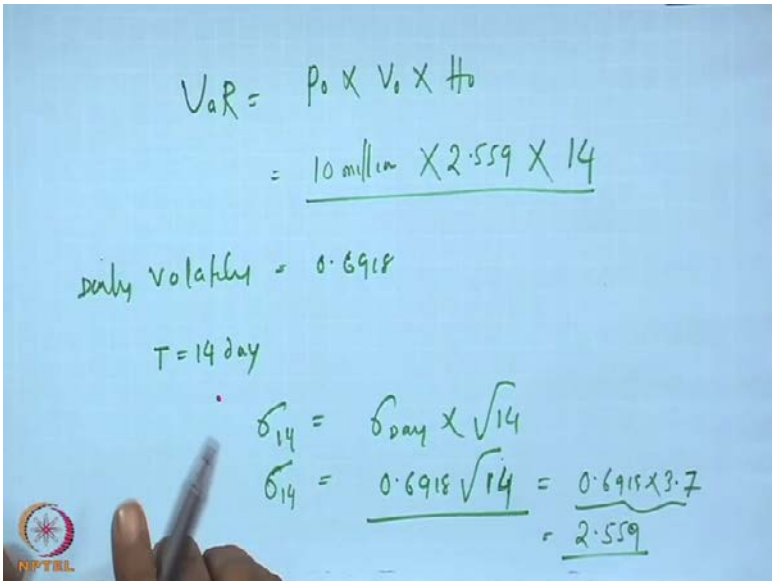

Now you have to calculate theVaR; VaR is here. When you calculate the VaR, what is our requirement? The VaR is, as we discussed earlier class earlier slide, VaR is nothing but P 0 that is position; then V 0 that is volatility. And also you have to calculate what is called holding period H 0.

Now, P 0 is our 10 million volatility. volatility we have estimated the daily volatility; you have done daily volatility is 0.6918. So, you have to calculate 10 days volatility. So, T is equal to 14 days;14 days volatility; T is equal to 14 days. So, the volatility calculation is what?14 days. We already discussed in our earlier example. When you want to convert the yearly volatility into days volatility, what are you supposed to do? You have to calculate here 14 days; volatilitybe14; sigma 14 is nothing but sigma daily into root over 14.

So, sigma daily is our 6.198 root over of 14.If you calculate this it will be something whatever this gave you, this is our sigma for 14 days; sigma for 14 days. So, how you could do is 14 days root over you take.14 days of suppose 14 root over is around3.8 something will come. So, you have to multiply; multiply 0.6918 into it will be around 3.6 will come; something around like that 33963.6 or 7.

Suppose we are assuming 3.7 then multiply this3.7.Then it will give you the 14 days volatility. Let us multiply. Suppose it will be coming around, it will be coming around, if you calculate that actual amount in excel sheet, it will be coming around0.6918 into3.7 it will give around 2.56 2.5592.559.So, 14 days volatility we got 2.559.V 0 is our, V 0 is our 2.559.The question is here what is the confidence limit? When we discuss about this, we have to also discuss about the confidence limit. Confidence limit is what? Confidence…what is our confidence that same volatility continue. So, for confidence limit also you have to factor here. So, confidence limit is you have to go for different kind of confidence limits.

So, here as holding period is fourteen days you have to multiply fourteen days. So, our calculation is here, if you multiply all these three, then you will get the one standard deviation here. So, one standard deviation because we discussed earlier slide that the VaR depends upon the confidence limit.

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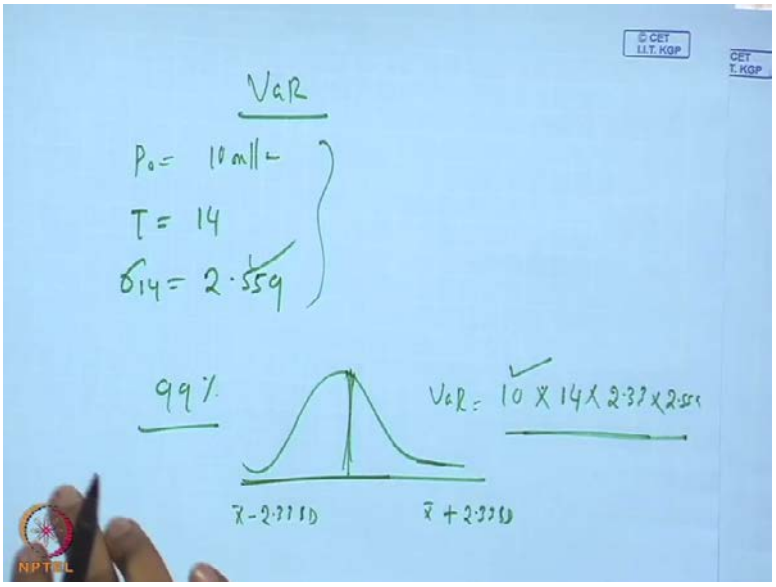

So, our VaR we got that. So, P 0 is 10 million.10 million. Then we also got we also got what is called what is called the T period. T is 14 days as sigma 14, we also got 2.559 and now these three we need for calculation of VaR.

So, suppose you are 99 percent sure, same volatility will continue then 99 percent sure what the we have the positive negative side of the volatility calculation; that is we know that our calculation process will be positive. Our standard is 99 percent sure. Our normal distribution curve will be something around here x bar minus 99 percent sure will be 2.33 standard deviation and positive x bar2.33 standard deviation. So, now, 99 percent sure. So, our value at risk will be 10 million into 14 into your VaR will be 14 days into2.33 into standard deviation is 2.559. This is our standard deviation calculation process. So, the 99 percent sure we have. This is our value at risk. What we will get out of this? Everything. This is the only dollar or others are numbers. So, what is the maximum loss we can have? That we are estimating. Value at risk means the 10 million value, 10 million Dollar. What will be the maximum loss we can have?

So, if you multiply these, we will get that. What is the 10 million I have 10 million with the volatility of 2.59 daily 14 days volatility, what is the maximum loss I can have? I am calculating it.

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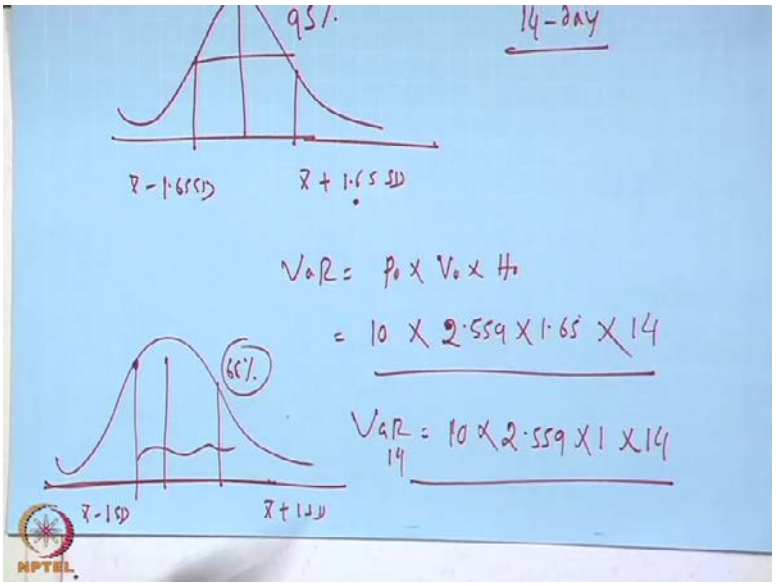

Similarly, if you do if you do for other things, suppose I have confidence of I have confidence of something around 60, something around 95 percent confidence, so,

95percent confidence I have x bar minus 1.65 standard deviation and x bar plus 1.65 standard deviation. So, my area is here. So, my calculation of standard deviation of value at risk will be P 0 into V 0 into H. So, my P 0 is 10 million US Dollar; my V 0 is earlier my V 0,daily my 14 days volatility was I am calculating for 14 days; volatility calculation is for 14 days. So, my daily 14 days volatility of 2.559 into I have confidence of 95 percent into 1.65 into my H 0 holding period is 14 days. So, this will give me the maximum loss when I am sure of 95 confidence. So, that is the calculation process will come over there. So, what we are doing here?

Similarly, you will calculate for one day VaR; that is for one day. Suppose I am confident about only 68 percent, when only 68 percent confidence my standard deviation is one standard deviation here; one standard deviation here; I am confidence about small area. So, here VaR for standard 9068 percent sure 68 percent calculation, 68 percent I am sure. So, VaR for 14 days for 68 percent will be 10 millions into daily volatility 14 days volatility of 559 into 1 into 14 days. So, this will give you the maximum loss when I am sure about only 68 percent; that is one standard deviation I my volatility I am sure. So, this is the process of calculation of VaR.

VaR only give us what is called what is called the probable expected potential loss; it is not giving us any kind of actual loss. The volatility continues in same manner. What is the expected loss I will have in my foreign currency calculation? Foreign currency which is open to me; we have not purchased any kind of any kind of risk management product.

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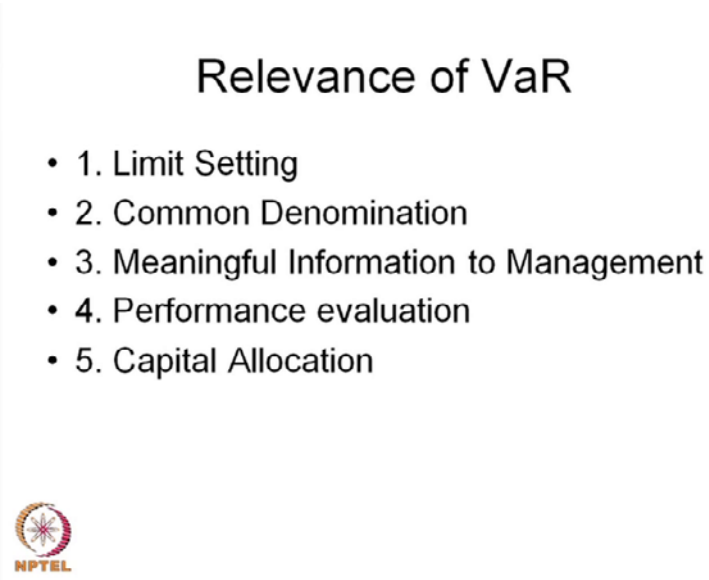

So, what is the relevance of VaR? relevance for VaR is many things. So, when I discuss about relevance of VaR, where I am using this VaR in actual foreign currency market? Foreign currency market limit setting because foreign currency dealers are there. They trade in foreign currency market. So, for how much loss they should have the maximum loss they can have in their foreign currency, the limit setting they will use it.

Similarly, common denomination because for calculation of calculation of loss some kind of information I should have, because I cannot continue with the open position. I have to understand that if there is a volatility how much loss I should have. So, meaningful information to management, meaningful information to the management VaR VaR indicates.

Third thing, performance evaluation: Three, four traders are there. Each trader has some kind of portfolio given to him. How we can evaluate the traders on the basis of value at risk? What is the value at risk? What is the risk they are caring in their position? That is value at risk to avoid some kind of information of performance evaluation about the about the traders.

Similarly, what I am estimating from the value at risk? A risk I am estimating. To minimise the risk or to absorb the risk, I should have capital with me. So, allocation of capital also is important and that will also provide through the value at risk model. And another thing is a foreign exchange dealing; foreign exchange dealing rooms.

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So, front office we have a foreign exchange dealing room that is designed on the basis of the value at risk model. Value at risk model provides some kind of information: how we can design the front office or the mid-office, back office. In front office, dealer with the dealing room they use the value at risk significantly to minimise the loss to avoid the potential loss or to create some kind of risk management product to immune their position. That is very important for the front office dealing of the front office dealers, where value at risk help them significantly.

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So, when I go for something more, the functions of treasury, other things, inter-bank dealings room, so, in functions of treasury forex also that value at risk help in designing what is called operational losses and translational losses, management position of the position of exchange risks. These are some other areas where value at risk model is generally applicable in foreign currency market.

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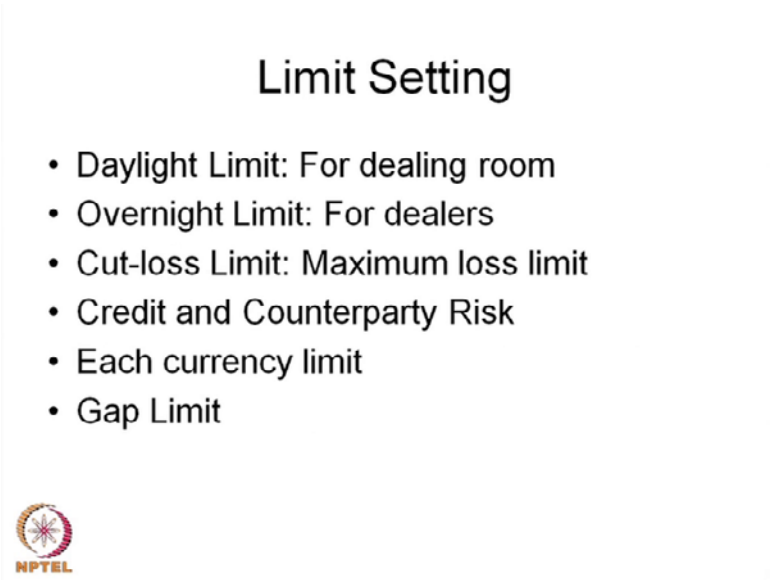

Similarly, in limit setting also, foreign currency day limit because one day how much limit I should have in trading? That day limit trading also you can design from the value at risk. Overnight limit - the next overnight over night within the overnight limit how much loss they should have, maximum loss the balance sheet or the portfolio can absorb, that also can be prepared through the value at risk model.

Cut-loss: Well, cut-loss means when I have to stop my trading, the loss, loss maximum loss I can have, the cut-loss, I have to cut-loss limit also see it through the maximum loss limit set by the value at risk model.

Credit and counterparty risk, because counterparties are there. They also bear risk. Their risk can be analysed through value at risk model also. Credit and counterparty risk also possibilities are there. You can use the value at risk model; each currency limit each way because each currency has own volatility. We can say you can put a limit on the currency, each currency trading pattern, trading side, for the through the value at risk model.

Similarly, gap analysis because when I have export import buying selling are going on, I have to prepare a gap for my foreign currency open, foreign currency closed position, foreign currency foreign currency in inflow outflow. So, on that basis, I can put a gap limit through the value at risk model. Value at risk model is very, very useful, particularly in foreign exchange market because exchange rate is highly volatile. You have to you have to we have to keep constant touch in the movement of exchange rate and this constant touch only possibilities are there when you have value at risk model because in a foreign currency dealing room, we are not trading with the one currency; many currencies are there. Each currency have to have a target limit, each currency I have to have a gap limit, each currency have a limit setting for each currency. These possibilities are there all through the value at risk model.

Thank you.