Security Analysis and Portfolio Management

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Module No. # 01
Lecture No. # 23
Capital Market Theory - I

Good morning. So, in the previous class, we talked about the Markowitz portfolio theory, which is the basic foundation stone of the concept of the portfolio management process. And then, the next thing is, whenever we do the practical investment in the market, some of the basic issues always we should look into how the market is and what are those different characteristics or the different factors, which basically play the role in our investment process or in our portfolio conception process.

So, these are the different questions basically comes to the mind of the investor. And when the investor feels that, where to invest and where not to invest and whether we should take a single asset or we should invest in combination of the different assets, what we talk about or we define it as portfolio.

So, in this context, there are other theories have been developed to analyze all those factors which basically play a significant role in the portfolio management process. In this context, our first and foremost theory after the Markowitz portfolio theory, basically we have that is the capital market theory. And what exactly capital market theory is and how this theory basically, helps us to take the decision in the investment process in the market, that we will be discussing today.

So, if you see what exactly the capital market theory is, capital market theory is nothing but, it is basically an extension of the portfolio theory what already told you. And the previous class, we discussed about the Markowitz theory, so capital market theory is the extension of that and it basically develops a model, it basically specifies the function for pricing of all risky assets.

Because whenever we invest in the market, we have the various assets to be invested and where should we invest and where we should not invest, that basically is decided by the risk capitate of the investor. And the risk capitate of the investor varies from investor to investor and therefore, the various investors basically decide the different assets to invest on the basis of their risk profile. And whenever we talk about the different assets of different type of risk profile, then how we can say that what kind of expected return and what kind of expected benefit we are going to get, if we invest in that particular stock. So, those particular questions or that particular issue has been addressed by the capital market theory.

So, basically capital market theory develops a model, it specifies a function which will help us to calculate the expected return from the various assets. In this context, I hope you must be aware about or you must hear about this model, we define that capital asset pricing model. So, it is the foundation stone or we can say that finding theory of capital market. So, here if you see that, capital asset pricing model will allow you to determine the required rate of return for any risky asset.

So, capital market theory basically starts with the capital asset pricing model and in this capital asset pricing model, what we do? The basic objective of the capital asset pricing model is to calculate the required rate of return or the expected rate of return on the basis of the risk profile of that particular asset.

So, what we can see, the investor uses the capital asset pricing model to calculate, how was it is expected return he is going to draw, if he will invest in a particular asset or in a particular stock. Therefore, in this context, what we can say? It helps us the capital asset pricing model helps us to take any decision in the market, whether to invest in that particular stock on the basis of the risk profile or the risk capitate of the investor.

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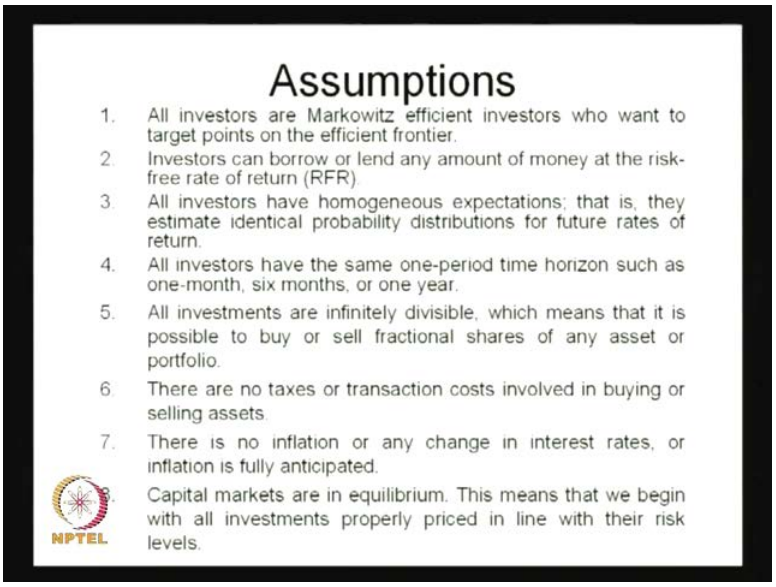

Before going to the different mechanism or different concepts related to these, different logics involved in this particular model, let us see that before developing this model, we have certain assumptions, what the people basically they who (( )) the capital asset pricing model. To develop this capital asset pricing model, certain has taken certain assumptions, what are those assumptions? And the first assumption is, all the investors are Markowitz efficient investor, who wants to target points on the efficient frontier.

If you recall the previous class what we have seen that, Markowitz has talked about the efficient frontier. In efficient frontier we have the different portfolios, which give you the best alternative return with a given amount of the risk or best alternative or minimizes of the risk with a given amount of return.

So, basically, when this either of this two criteria will be fulfilled, we define that portfolio is defined as the efficient portfolio. And here what basically this Markowitz assumption or Markowitz theory was talking about. And we with this particular assumption or particular explanation what Markowitz has talked about, the capital asset pricing model basically, always feels or always assumes that, all the investor are on the efficient frontier only.

That means everybody wants to fulfill one of this condition of the efficient portfolio. Then second one is investors can borrow or lend any amount of the money at a risk free

rate of return. We will discuss extensively what basically exactly this risk free return is; then all investors have homogeneous expectations, that are they estimate identical probability distribution of future rates of return. That means, the expectation of all the investors are almost homogeneous in nature.

And there expecting that from the distribution point of view or if you see the risk return profile point of view, all the stocks or all the investor who want to invest in this particular stocks or particular assets, there probability distribution the expected return what they are going to draw from this particular assets, these are homogeneous. The probably distribution functions of the expected return will be homogeneous; that means, there is no such kind of diversions between the expectation level of the investor for a particular stock.

So, everybody assumes that the probability distribution is same for all types of stock what they are going to invest. Then all investors of the same one period time horizon such as one month, six months or one year. So, but here this is the very serious assumption what the capital asset pricing model takes because, the investors profile if you see, the investor always invest in the market on the basis of is hard requirement.

So, if you assume that, all the investors time horizon or the requirement of the return of a particular time period is same for all the people, then it is very difficult or we can say it is one of the serious assumption, what deduct classification model takes because on the basis of the requirement, the investors time horizon for investment changes.

Somebody wanted may be, some investor wants the money after six months, may be some investor wants after one year and some investor want the realization of the money after five years depending upon the requirements, depending upon their position financial position in the market.

But here, what the capital asset pricing model assumes? It assumes that all the investors' time horizon is almost equal. So, therefore, we can say that, this is one of the very major assumptions, but it is a very serious flaw in this particular theory in the beginning what we can say.

All investments are infinitely divisible, which means that it is possible to buy or sell fractional shares of any asset or the portfolio. It is very clear, basically what we can say that, so any kind of any number of shares can be bought from the portfolio, but the fractional shares of assets or portfolio can be bought or can be invested in a particular market. There are no taxes or transaction costs involved in buying or and selling assets. What generally we have seen that, already we know in the practical world, there are huge amount of invest transaction cost we face, whenever we practically do investment in the market.

We have the different fees, we have the different type of cost which is involved in this particular investment process, but here what the capital asset pricing model assumes, there is no such kind of cost, there is no such transaction cost, which are involved in this investment process.

So, therefore, what we can say? The investor only feels that how much risk he is going to face, where is no such kind of transaction cost or quotation cost involved in this case. So, which is basically a theoretical concept in nature, it is very difficult to or it is not possible to raise the money or it is not possible to invest in a particular asset or it is not possible to buy or sell a particular asset without any kind of adjustment cost.

But, this is the assumption from the beginning the capital asset pricing model market takes. Then, there is no inflation or any change in interest rates or inflation is fully anticipated, which is again is a very serious assumption what the capital asset pricing model takes.

It is said that, there is no inflation, the price level will almost stagnant or we can say it is almost stable, there is a no chance of increasing or decreasing inflation or we can say there is no chance of increasing, decreasing the interest rates, which is basically a serious assumption what the capital asset pricing model takes. Because what we have seen that day to day life, the interest rate everyday fluctuates and depending upon the demand supply situation, that is in your control of the regulative authority, there is no control of the monitory authority or the government to, may be they have certain majors they have certain policies through which they can reduce this.

But, it is not possible to make this inflation stagnant for a particular period of time, but here, what the capital asset pricing model assumes that, the inflation rate is almost stable or there is no change in inflation rate and as well as even, if it is changing then it is fully anticipated.

What do you mean by this? That means, the investor can realize that, whether this particular inflation will increase or decrease. If it will increase and decrease, then how much it will be increased and how much it will decrease? So, that is the basic assumption or basic things, what the investors were trying to explain, whenever they want to use this capital asset pricing model theory.

And another variable which is very important variable from all investor prospective and as well as common man's perspective that is interest rate. And if you observe that, interest rate also is a market driven instruments, the interest rate determined on the basis of the demand for and supply for certain variables.

But here, what we have seen, that the capital asset pricing model again assumes that interest rate is also not going to be changed. And again that is why what we can say that in our strategy or in our investment process, what we have observed from the basic theoretical background?

All that we assume that, the interest rates cannot be stabled and the most dangerous or most we can say that unpredictable way of predicting this unpredictable way of making the strategy for investment in the market is to predict the interest rate. Because interest rate cannot be predicted fully, it when if it can be predicted then, the direction also sometimes not go with the expectation of the people; if this investors expectation will not go with this market sentiments or the demand supply of certain variables, who generally determines the interest rates, then it is very difficult to say that, whether the interest rate will be stable in a particular period or not so.

That is also a very important assumption what is a very serious assumption what the survey and other people have taken, whenever they derive this capital asset pricing model theory. Then finally, what we have seen that, the capital markets are in equilibrium this means that, we begin with all investment properly priced and lined with their risk levels.

Again you see that, it is not it is very difficult to say that always the capital market is in equilibrium and always all the assets are being priced fairly because of may be certain there are certain peripheral variables, which play the significant role; but, those variables has have not been taken care by the people who has or vacated the capital asset pricing model.

Therefore, again what here to explain this capital asset pricing model and which is the foundation theory or we can say the basic theory, where the investment theory starts with or the capital market theory starts with, in this context what you can say. So, you have to take that assumption to derive that particular thing. So, therefore, what we can say there are certain assumptions which is viable or a certain assumptions which are not viable in a practical sense in today's world.

But, to explain this capital asset pricing model theory, these are the assumptions what (( )) people have taken, whenever they derive this concept of capital market theory or we can say, capital asset pricing model in a particular investment context.

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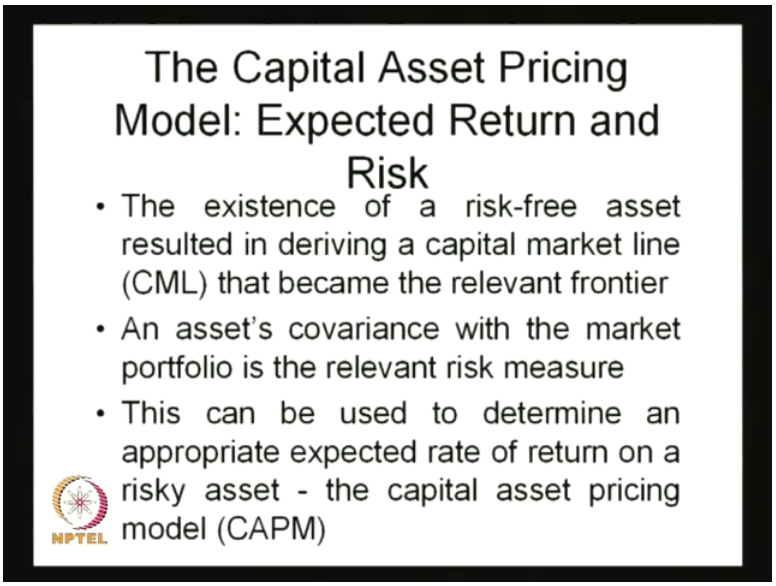

Then if you see that, how this particular thing works or how the what is the explanation of the capital asset pricing model. Already I told that, the capital asset person model is nothing but, it is basically a model which explains or which keeps or which helps us to derive the required of rate of return from a particular asset or a particular portfolio.

So, that is why what we have seen, that it is basically nothing but, there is a trade off this particular model is trying to make between expected return and the risk. So, whenever we have taken into account the risk free rate of return, quite basically we have seen that, the existence of a risk free asset result in driving capital market line that became the relevant frontier of the investor.

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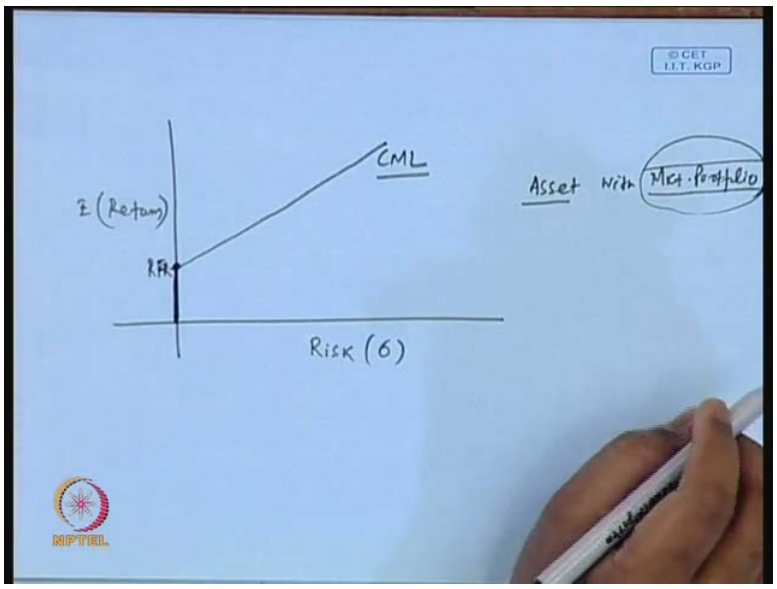

So, what we have seen here that, what we can we all can trying to say that in the previous case, you must have observed that we have risk and return. And whenever in our portfolio we are taking a risk free asset, basically here the return and risk involved to involve in the various assets, what we are trying to take to make our portfolio.

But here, if you observe that, once we take that there is a risk free rate of return involved in this, then obviously, without any risk we are getting some return which is the basic characteristics of the risk free rate of return. So, that is why what generally we say, that whenever we saw this tradeoff between the risk and the expected return, the expected return and risk, it basically gives you a line like this, which we can say the capital market line and which is the basically the frontier of that particular investor in that period (Refer Slide Time:16:60).

So, what we can see here that, once we have seen that there is a risk free return in your portfolio and there are other risky assets in the portfolio. So, in this context your line

basically looks like this, an asset's covariance with the market portfolio is the relevant risk measure. Basically what it talks about that, if you want to make a relationship between asset, one particular asset either in an individual stock or anything else with the market portfolio.

Already we have seen that, the market portfolio is a concept where the maximum it is basically optimal portfolio, where your utility curve or utility will be, curve will be tangent to the efficient frontier; that means, this is the best possible combination of the different assets.

So, what we have seen here that, the risk which is affecting the expected return of stock, that is basically the covariance between the assets and the market portfolio in that case. That is why this can be used to determine an appropriate expected return on a risky asset and which is defined as the capital asset pricing model, which is defined as the capital asset pricing model.

Capital asset pricing model basically tries to answer the questions like what should be the expected return of a particular stock or particular risky asset, by assuming the portfolio consists of another risk free asset or the portfolio has risk free asset and the portfolio is a combination of risk free asset with other risky assets.

So, CAPM already I told you that, it indicates what should be the expected or required rate of return on the risky asset. This also helps us to value an asset by providing an appropriate discount rate to use the dividend valuation models, which will help in further; almost we talking we have already talked about everything in the equity evaluation models.

We you can compare the estimated rates of return to the required rate of return to know which particular asset is overvalued or undervalued, that we will see in the further slide in the detailed manner.

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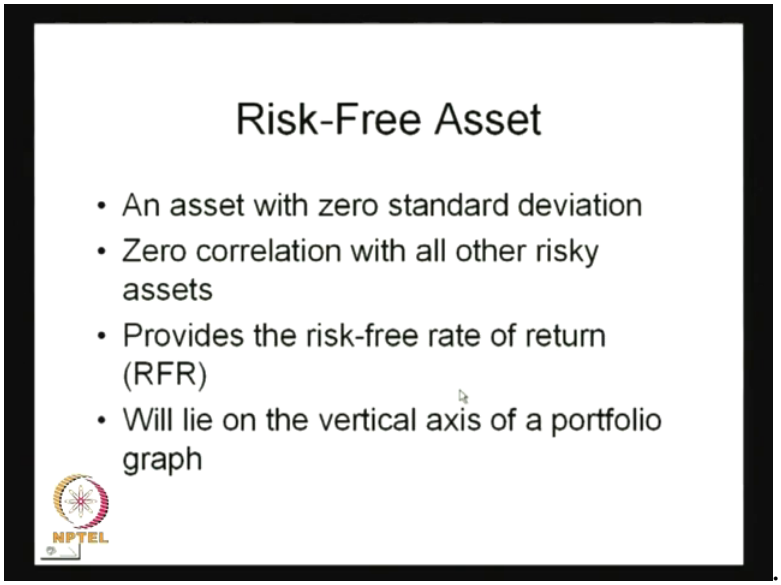

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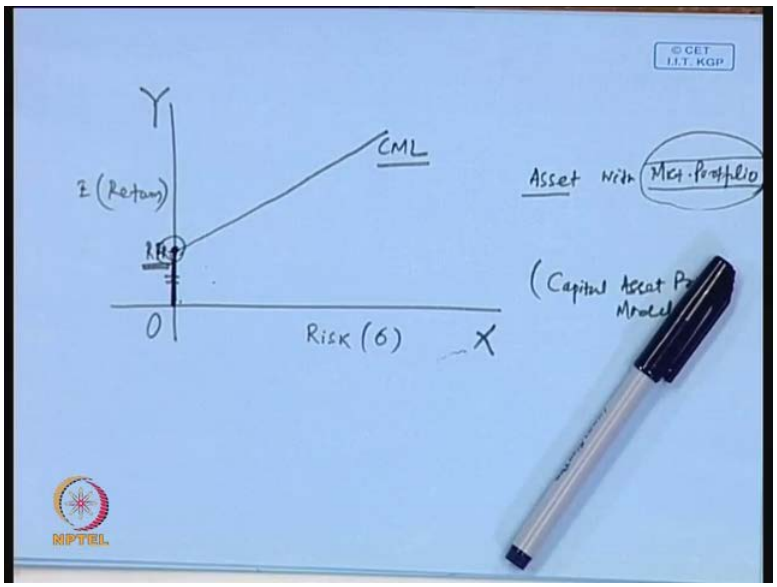

Then we are coming back to certain things of what basically the risk free asset is. Already we have I have shown you that, this part in the y axis, this is basically your x axis and this is your y axis. So, what here we have seen, this part, particularly this vertical part, this is basically the risk free rate. So, in this case already I told you that, the risk free rate means from the name itself you can predict the particular asset, which gives you the return without any risk.

So, if the particular asset which gives any return without any risk, that particular asset is defined as the risk free asset. So, that is why this asset has zero standard deviation and it has zero correlation with other risky assets, because there is no relationship of this asset with the other kind of risky asset, because whether this particular asset will have any impact of any in return on other assets. It is basically whether we should invest in a risk free asset or we should invest in a risky asset, there is no such kind of linkage, there is no such kind of relations between these two.

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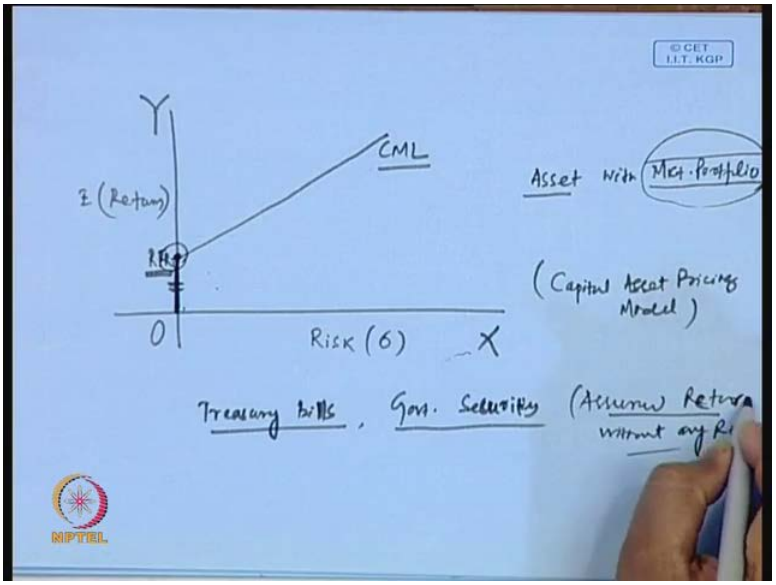

Always lie on the vertical axis of the portfolio graph, already what I have shown it to you. What generally we can see it here that, if you observe certain things that, the risk free asset whatever we have and always what you have seen that this is always on the vertical axis. If you stick the real example, it is basically the treasury bills in India, treasury bills or government security, any of the other government securities. Why we call it because these kinds of assets gives you the assured return, the assured return without any risk; these are the asset which gives you the assured return without any risk.

These are the asset which gives you the assured return without any risk, that is why what we call it these are the these are the assets which is defined as the risk free assets.

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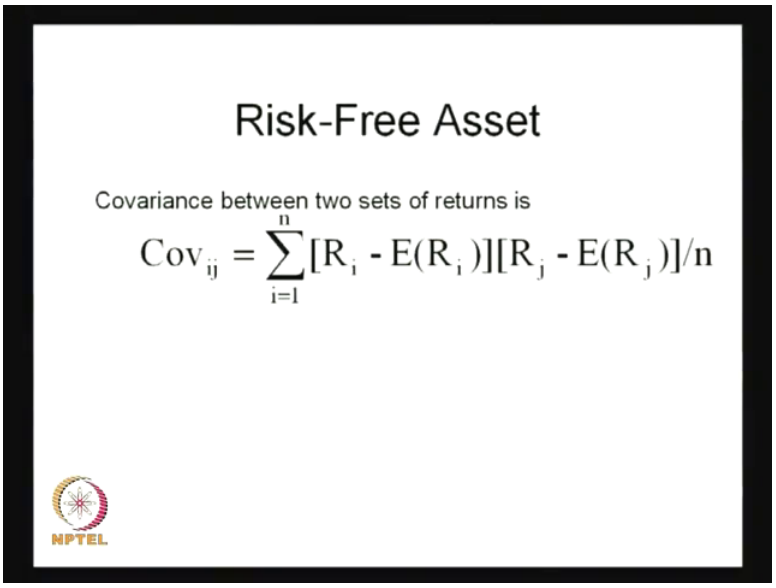

Already I told you that, this is which you talk about the risk free asset, and any risk free asset is nothing but, it is the covariance between two sets of return; that is the already you know that the covariance is nothing but, the r i minus expected r i and into the r j minus expected r j divided by n. Because the returns for risk free asset are ascertained, then the standard deviation of the risk free asset will be zero. Therefore, the actual return or the return is equal to the expected return and there is no difference there's no difference between expected return and the realized return or the actual return whatever we have.

Therefore, the covariance of the risk free assets with any risky asset or portfolio will always equal to 0. Therefore, the covariance of the risk free asset, correct remember, the covariance of the risk free asset with any risky assets or portfolio is always equal to 0. And similarly the correlation between any risky asset and the risk free asset would be zero, that already we have explained.

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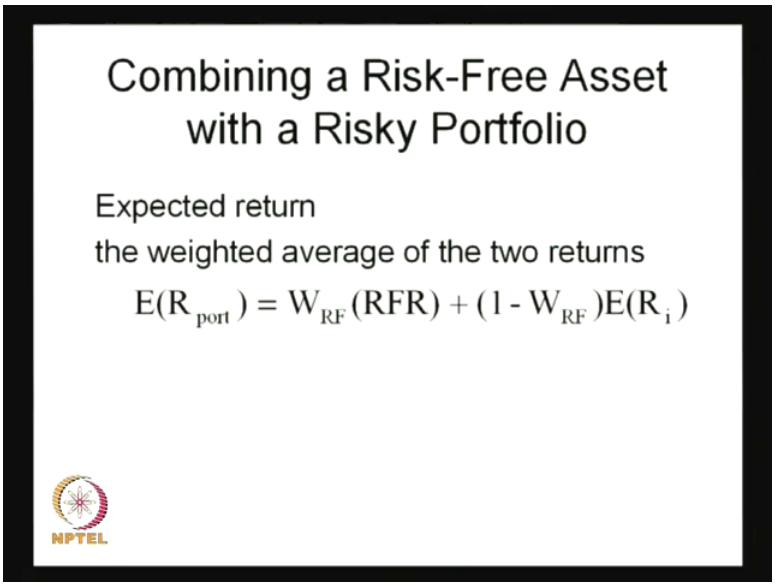

Then if you combine, what we have seen that whenever we invest in a particular portfolio, if the portfolio combination is basically the combination of the different assets and already if you if you see that, we have taking a portfolio which is a combination of the risk free asset which have the risky assets, then how you can calculate the return?

The return is basically calculated in this way, already you know that, the expected return is the weightage what we have gain in. For example, 50 percent we have been invested in risk free asset and 50 percent we have invested in risky asset.

So, here what you can see, that the expected return of the portfolio is equal to 50 percent into your R f r, how much return you are getting plus 1 minus w, what percentage you have invested already here that is your 50 percent. So, that is 1 minus R f is also a 50 percent multiplied by the expected return of the particular stock. So, then what you can calculate? You can calculate, the total expected return of that particular portfolio in that situation and this is a linear relationship always existing between these two.

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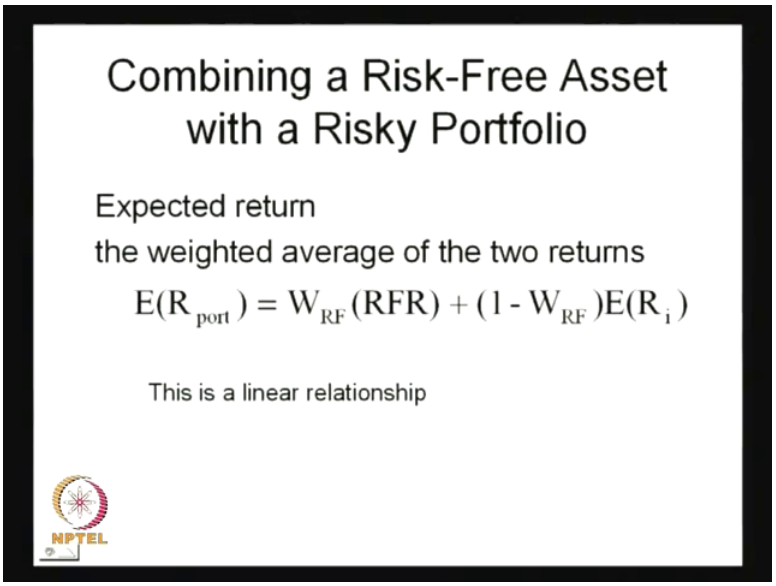

But, if you see this combining risk free asset with a risky portfolio, already what we have seen in the previous class, when we talked about the expected return of assets and as well as the expected return of the portfolio and also the risk of the asset and the risk of the portfolio.

So, here what we have seen, we have seen certain things that we should see that, already we know that expected variance of the portfolio is nothing but, it is the w 1 square the variance of the first asset and w 2 square the variance of second asset plus 2 w 1 w 2 the covariance of the this two. But, basically it is standard deviation of 1 standard deviation of 2 and are 1, because the covariance of 1 and 2 is nothing but, it is the correlation between these two and 2 r 1 to standard deviation of 1 into standard deviation of 2.

But here, if you already what we have seen that, one asset is your risk free asset. So, if one asset is your risk free asset then obviously, what will happen? Then this part will be 0, because this variance would be 0, then this part will be 0, then it will be w 2 square then the variance of the return of the second asset plus the here also this term also is equal to 0.

It is because this term will be zero, if this term will be zero, then automatically this will be zero, then the expected variance of this particular portfolio will be w 2 square and this variance of the risky asset for your taking.

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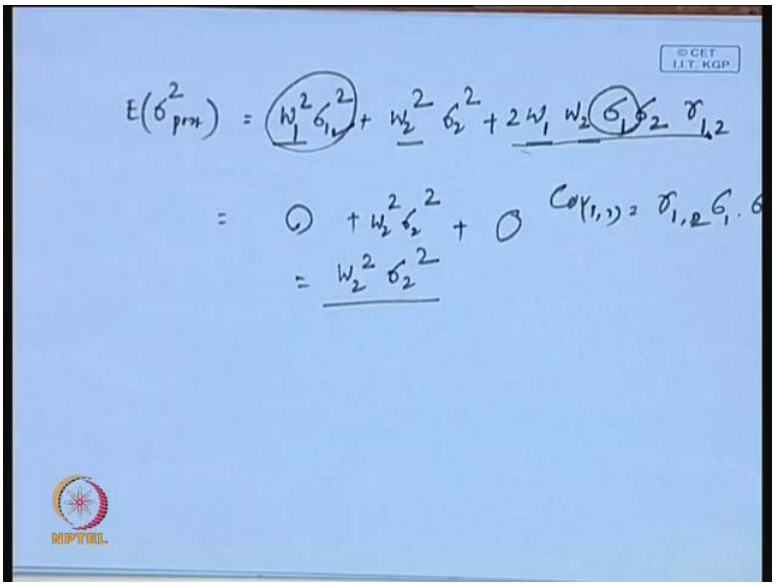

So, that is why this is the thing what we are trying to say, since we know that the variance of the risk free asset is 0 and the correlation between the risk free asset and any risky asset also 0, we can adjust this formula in this way and finally, we can arrive here the w 2 square into the variance of the second asset.

So, what we have seen that, whenever we have seen that this formula is expected portfolio is nothing but, this 1 minus w r f which is your w 2.

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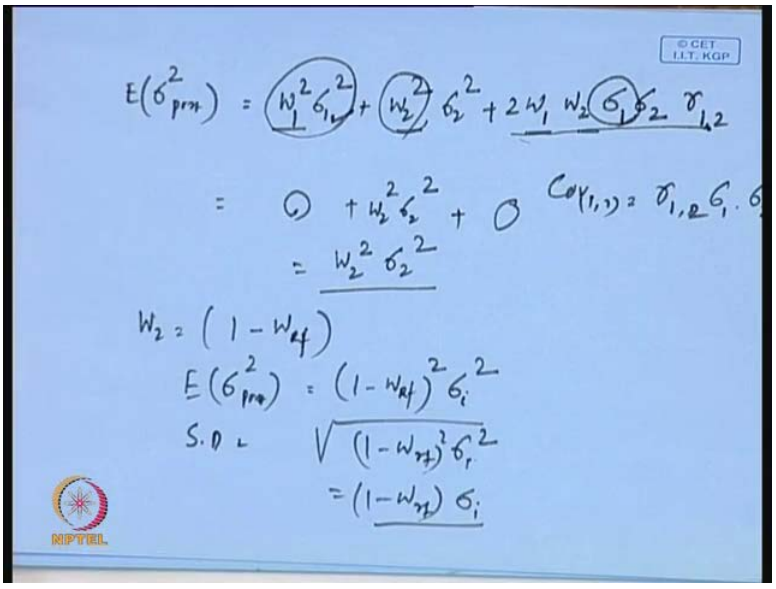

W is equal to 1 minus w r f, but we have named this as w 2. So, this was basically what we have finally arrived, the expected variance of the portfolio is equal to 1 minus w r f into the square into the variance of this particular asset. Then, obviously, the standard deviation will be the s d will be the square root of this w r f square into variance of this particular asset.

So, finally, it will be 1 minus w r f into the standard deviation of this asset. Therefore, the standard deviation of a portfolio that combines the risk free asset with risky asset is the linear combination or the linear proportion of standard deviation of the risky asset portfolio.

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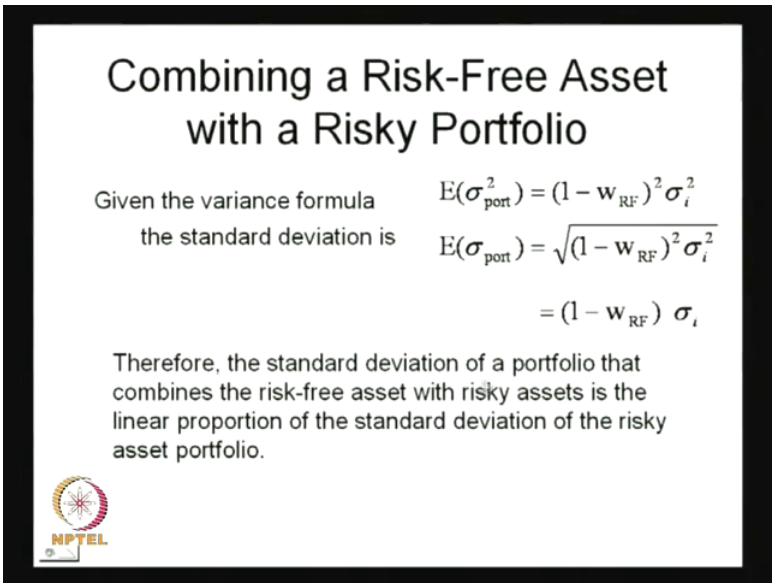

Therefore, the standard deviation of a portfolio that combines the risk free asset with risky assets is the linear proportional of the standard deviation of the risky asset portfolio. Therefore, if you combine this risky asset with another risk free asset, then basically the risk what we are going to in terms of the risky asset that, basically tells the risk level of that particular portfolio than the other assets.

So, since both the expected return and the standard deviation of return for such a portfolio are linear combinations, a graph of possible portfolio returns and risks looks like a straight line between the two assets, already I have shown it to you.

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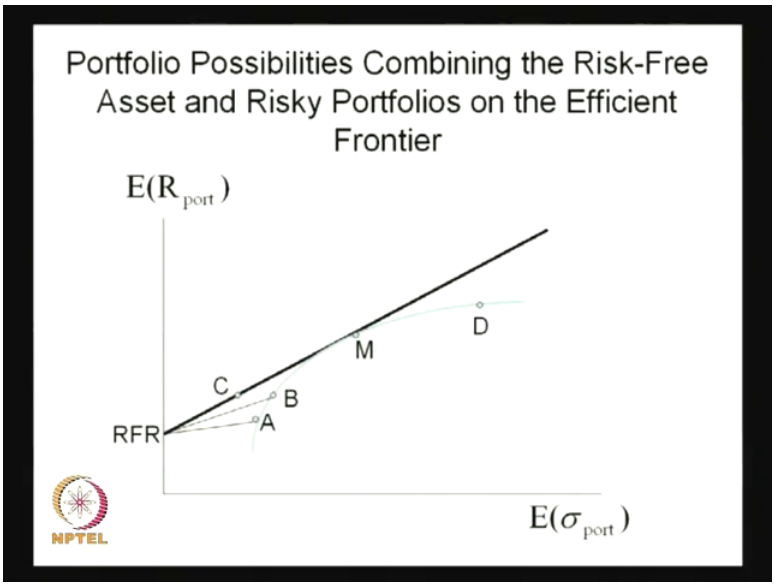

So, this is basically what we have seen that, this is your expected return of the portfolio, this is your sorry this is the expected risk of the portfolio, this is the expected return of portfolio (Refer Slide Time: 28:30). This part will be your risk free rate and if you see these are the combination of the different this is your a b m, these are the different efficient portfolios or whatever we have. And that is why this is your capital market line, which is talking about the inclusion of the risk free rate in this particular portfolio, which gives you the linear combination of risk free asset and the other assets.

Then what we have seen that, if the different portfolio, this portfolio gives you the best or the optimum portfolio, it is because that, this particular capital market line or this line basically it is derived from this line that is efficient portfolio. From here, you derived this line and if you observe here, this is here and instead of these, we have risk free asset with other assets, that is why the this is the linear combination of this, one risk free asset, one risky asset. This is another linear combination like that and this is the best portfolio whatever we have and because of this linear combination, the tradeoff line is a straight line in this case.

But, another observations if you see that, what is the risk return possibilities with the leverage what does it mean? It basically to attain a higher expected return that is available at point m in exchange for accepting higher risk, because in the previous slide

what we have seen that, the m is basically which is defined as the optimal portfolio or optimum portfolio or the market portfolio.

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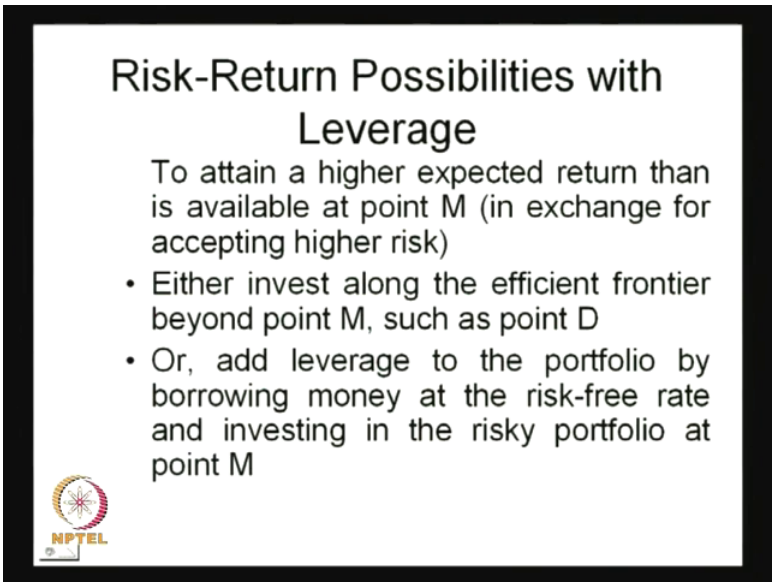

And here what we have seen that, this particular m if you want to get higher return than that, then what you have to do? Either you invest along the efficient frontier beyond point m such as point d, in the previous slides whatever we have seen. And this is your point d, either you invest here or you can if you observe here, we have the this is your capital market line, then this is your efficient frontier and this is your d, what we have seen and this is your b and this is your a.

So, if you want to get your expected risk and this is your expected return of the portfolio, this is your risk free rate, what you have seen? If you want to get the more return than this m, then what we have to do?

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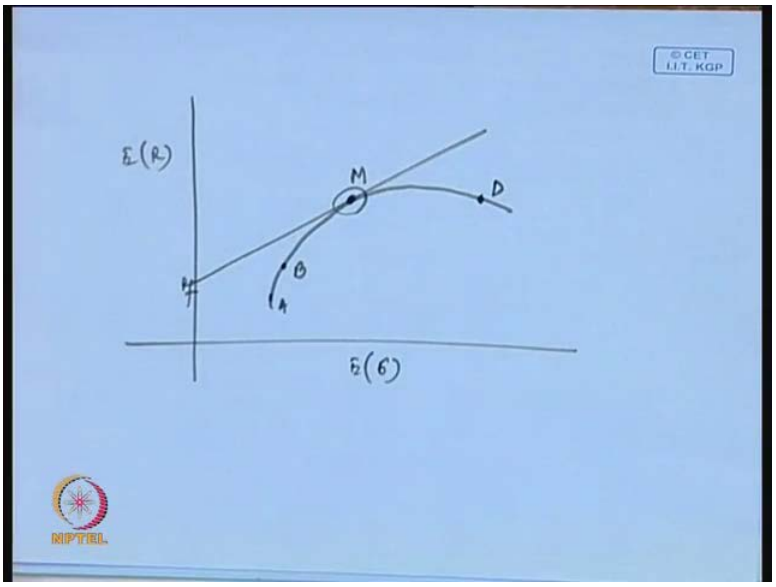

We have to do only, either you invest in the d which is beyond this m and in this case, what you have to do, you have to be taken more risk or leverage to the portfolio by borrowing money at the risk free rate in investing in the risky portfolio at point m. So, what generally other options you have, you borrow the money at a risk free rate, without any risk and invest it at m, which gives you the more return than the risk free rate.

So, if the m basically it is a combination of the risk free rate and as well as the other assets, you borrow the money at a risk free rate, invest it at m then what will happen? For example, your risk free rate is 6 percent because of high risk; your market may be giving you this 10 percent return.

So, you borrow at a 6 percent rate, invest it in a market portfolio, get a 10 percent return, then 6 percent even if you pay here, then another 4 percent extra return what you can get it. That is why what you can call it, that this is the concept of adding the leverage and the risk return possibilities. So, that is why add the leverage to the portfolio by borrowing money at a risk free rate and investing in a risky portfolio at the point m.

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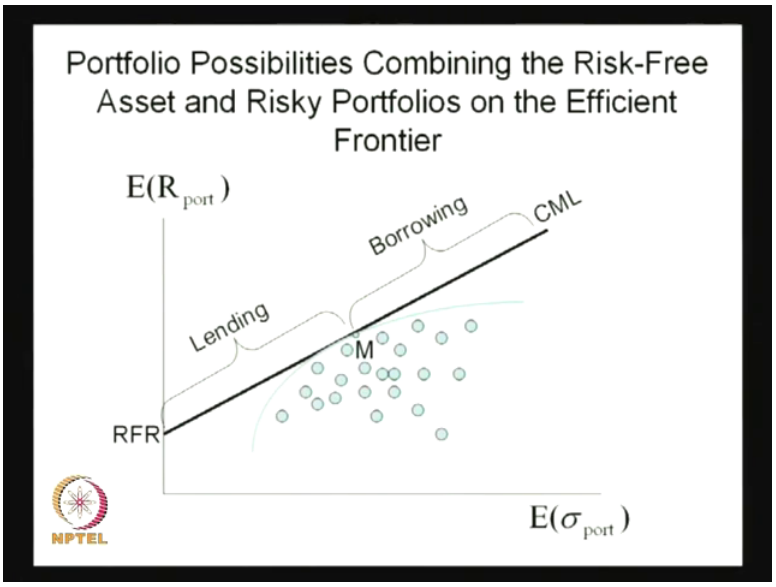

So, this is basically the lending and borrowing situation of what we just now talked about. So, here you can lend it a business rate and borrow it in a other rate and sometimes what you can see that, you find a different combinations of risk free rate of return which are the risky assets, which is on the efficient frontier line.

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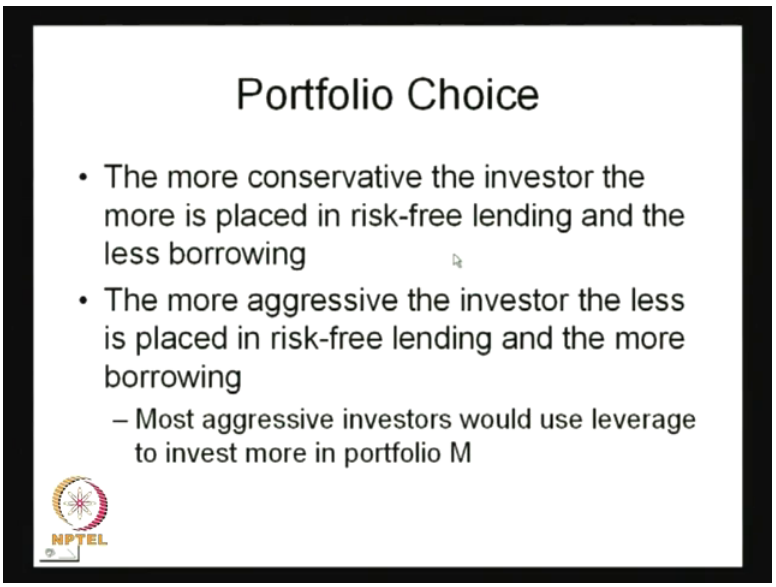

Then, how generally the portfolio choice is made on the basis of the risk free or the capital asset pricing model? And the more the conservative investor, the more is placed in risk free lending and the less borrowing.

It is also already reflected, in practical also it is possible, if the investor is so conservative, they always put place in the risk free lending and the less borrowing the more aggressive the investor, the less is placed in risk free lending and more borrowing less is placed in the risk free lending and more the borrowing and most aggressive investors would use leverage to invest more in portfolio m.

Just now what we talked about here, they always get the money lend the money at a risk free rate and try to invest in the m, which is the market portfolio or the optimal portfolio, which gives you the best maximum alternative return than the other portfolio as whatever we have.

That is why all the aggressive investor, who always wants to get to the market in any moment, they always try to extract that benefit because they borrow the money at a risk free rate and invest it in a market portfolio and they get higher return than the risk free rate. And finally, they always try to enhance or to maximize their return in that particular situation.

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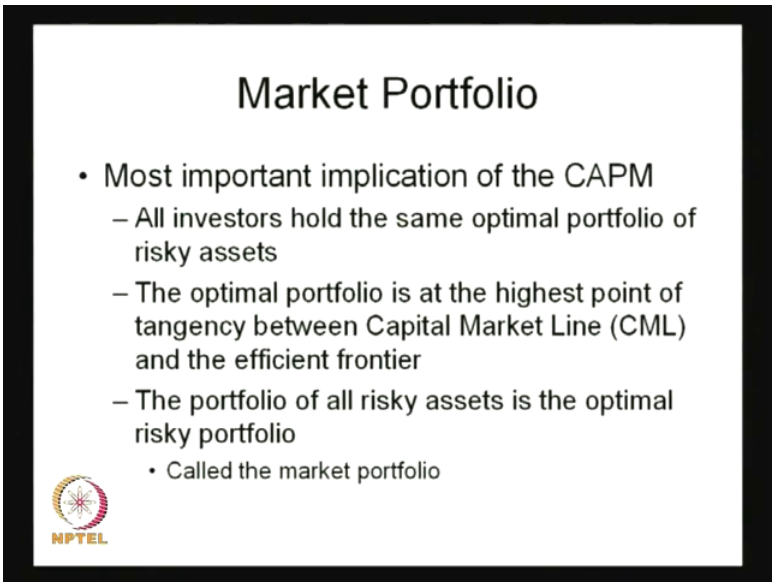

Already, I talked about little bit on market portfolio, but in enhance if you see or in a extensive manner you want to know, what exactly the market portfolio is, it is the most important factor, which helps to use the capital asset pricing model and how it will be helpful and how the capital asset pricing model is a tested or measure that we see further.

But here, if you observe minutely, what exactly the market portfolio is that, here the all investors hold the same optimal portfolio of the risky asset. And the optimal portfolio is the highest point of the tangency between the capital market line and the efficient frontier. And the portfolio of all risky assets is the optimal risk portfolio which is defined as the market portfolio.

That is why the market portfolio is basically risky portfolio and it is the combination of the different risky assets in the market and if you have this particular portfolio, you want to construct this, then this should be the tangential point between the capital asset, the capital market line and the efficient frontier. Capital market line is nothing but, it shows the research and tradeoff of the portfolio that various portfolios and the basis of their expected risk and the expected return. It is at the different combination of this and finally you can arrive at the market portfolio, where this line will be tangent to the efficient frontier.

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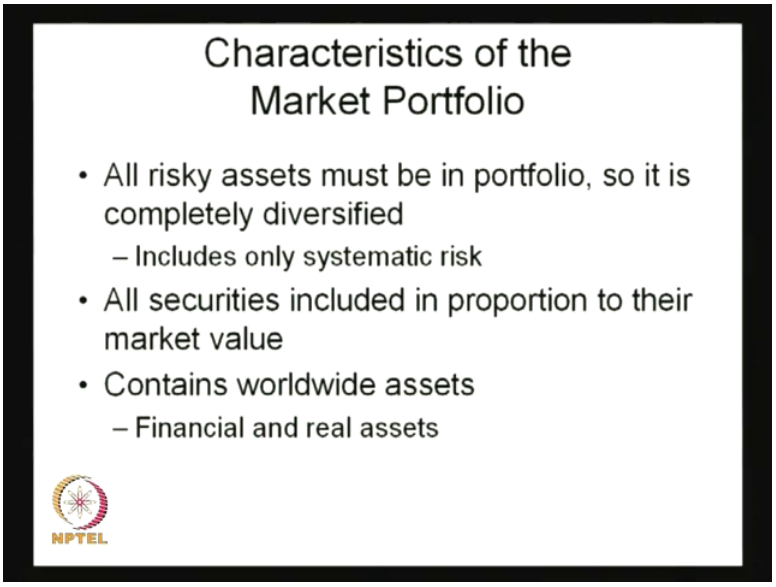

What are those characteristics of a market portfolio? The characteristic of a market portfolio is all the risky assets must be in the portfolio in the market portfolio case. So, it is completely diversified, what does it mean, already I we talked a large in the previous class about the diversification.

That is basically the market portfolio tries to minimize the unsystematic risk to the highest level because there should not be any unsystematic risk in the market portfolio case.

So, that is why we say that, it includes only the systematic risk, which is the market risk because we cannot afford the systematic risk which is basically affecting or which the risk, which is basically involved in all the assets in the market in a particular time. So, all securities included in proportion to their market value, it contains worldwide asset basically, either it is a financial assets, real assets or any other assets whatever we have.

That is why the market portfolio is the best optimum portfolio, where the return maximization can takes place; the return maximization can takes place with a given amount of the risk level.

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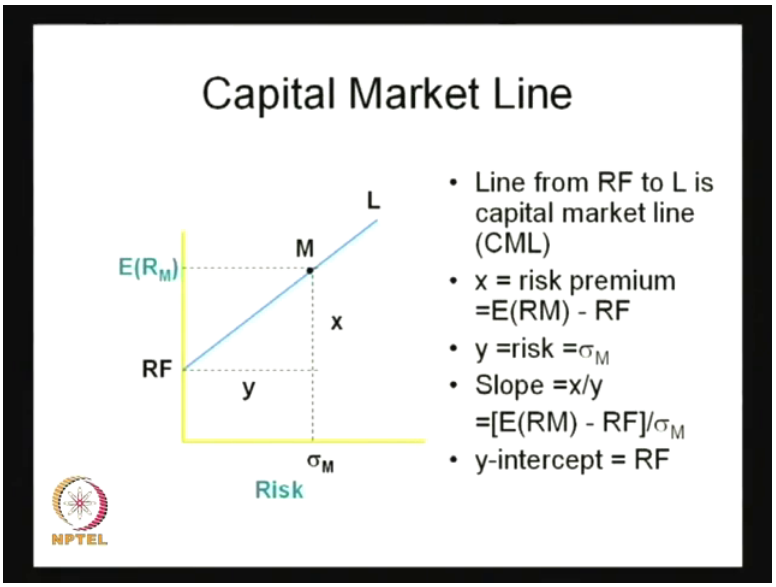

Then if you see exactly how the capital market line look like, already I told you the capital market line is nothing but, it shows the relationship between or the (( )) between the expected return and risk of the different portfolios which are basically the efficient portfolios.

So, the line from r f to l is the capital market line already what we have seen here this is the line and x is the risk premium, which is nothing but, the return from the market minus r f and y is equal to your risk and slope is equal to your x by y, which basically

talks about the expected return from the market minus r f divided by the standard deviation of the m.

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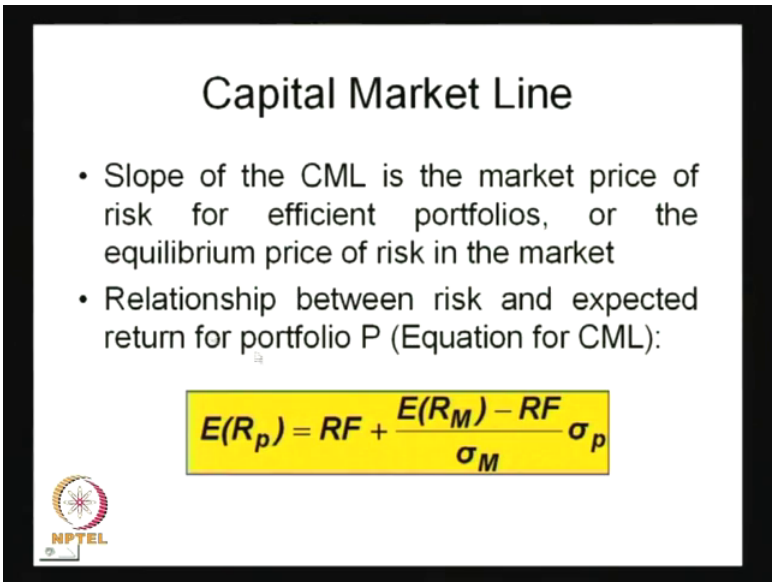

Then y intercept is the r f, this is basically the r f already what we have seen. Then, if you see that, if you want to convert in the equational form, then how this equation will look like for a capital market line. The slope of the CML or capital market line is for market price of the risk for efficient portfolios or the equilibrium price of risk in the market. The slope of Remember the slope of the capital market line is the market price of the risk of efficient portfolios or it is the equilibrium price of risk in the market.

So, the relationship between the risk and the expected return of the portfolio what basically, already you can observe here this is basically your expected return from the portfolio is basically nothing but, the r f plus already we have seen their expected r m minus r f divided by the standard deviation m into the standard deviation of the p or we can say, this is the r f into r f plus beta into r m minus r f. This is basically nothing but, the systematic risk; systematic risk in the market then there is the different theorems have been derived in this capital market line case.

What are those theorems are basically? What we call it? We call it the separation theorem, the capital market line and the separation theorem, he talks about so many

important applications, it gives lot of important insights to the investor, it basically the CML leads all the investor to invest in the market portfolio.

The individual investor should differ in position and the CML depending upon their risk preferences or risk capitate and how on investor gets into a point on the CML is based on his financing decisions, on the basis of their risk level.

Risk adverse investor will lend part of the portfolio or the risk free rate and invest the remainder in the market portfolio. Investors prefer in more risky, more risk might borrow funds at the risk free rate and invest everything in the market portfolio, that already we have seen. The decision of both investors is to invest in portfolio m along the C M L because this is the best optimal portfolio, whatever we have which is the tangential point between the efficient frontier and the capital market line.

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The decision to borrow or to lend, basically if you option a point in the CML with a separate decision based on the risk preferences. So, CML and the separation theorem, basically gives importance to risk capitate of the investor or the risk profile of the investor. How the investor prefers, how the investor is deciding to the different assets on the capital asset pricing model of the capital market line case. Therefore, the Tobin basically the famous economist, refer to the separation of the investment decision from the financing decision, which is defined as the separation theorem.

Because the financing decision of the investor basically gives the risk level, how the investor wants to finance this investment. However, the investor wants to invest the money that basically measures the risk level of the particular investor depending upon the risk capitate because, the financing decision again depends upon the risk capitate of the investor.

So, if the risk capitate of the investors is more, say accordingly they decide where to invest where not to invest, that is why we call it the separation theorem. Then another concept which largely used in the portfolio literature is that the security market line.

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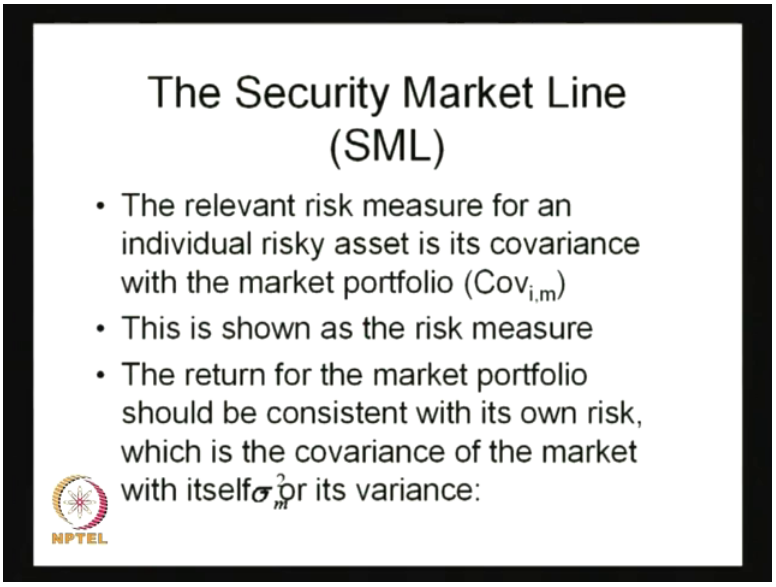

Here, if you observe one thing that, I have derived this model in this case. Here what we have seen in the capital market line case. The capital market line basically talks about the risk return tradeoff of the portfolio, efficient portfolios but, the security market line basically talks about the risk return tradeoff of the individual assets.

It is basically the individual assets and where to invest, these particular these are the combination of the individual asset (Refer Slide Time: 40:22). This is your risk free rate; this is your SML, here how this SML is derived in this case? That the relevant risk measure, for an individual risky asset is its covariance with the market portfolio that already we know that, how much risk is involved for a particular asset, that basically is measured by the covariance between the market portfolio and the individual risk.

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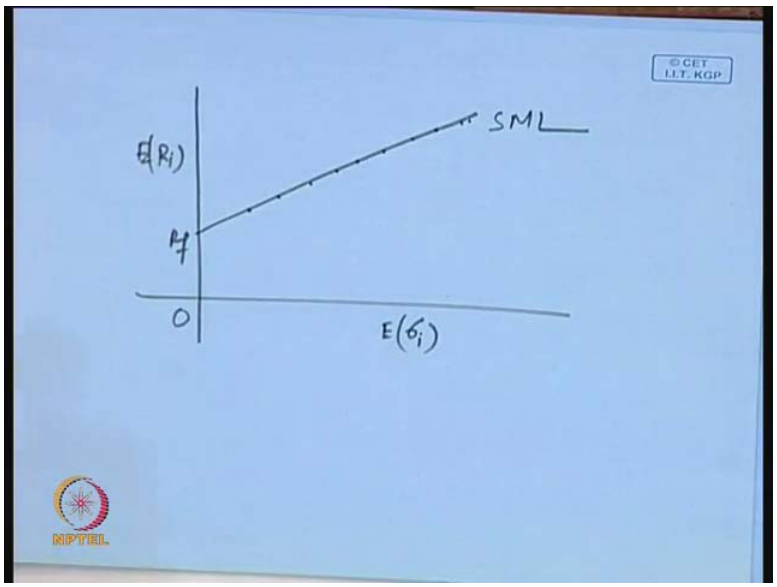

The return from the market portfolio should be consistent with its own risk, which is the covariance of the market with itself that is already we know.

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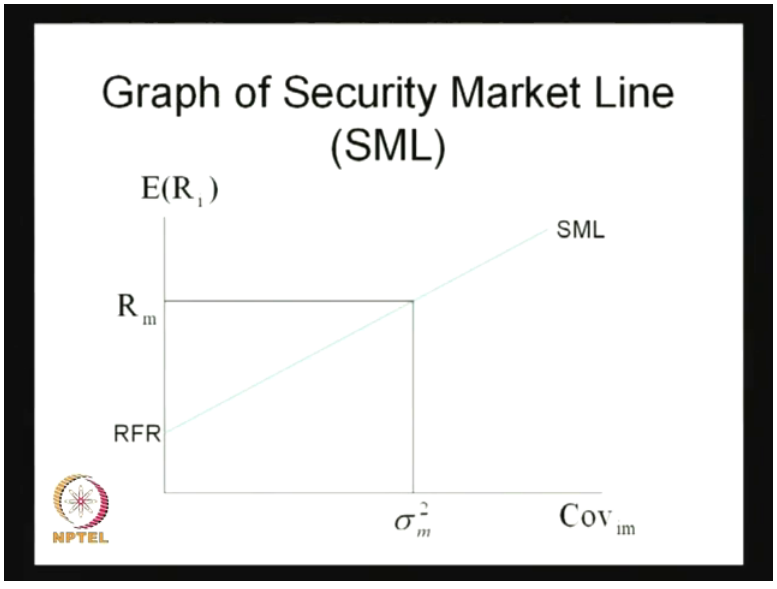

So, that is why already what you have seen that, this is your SML, this is basically the risk level this is the respected return from the individual assets. So, it talks about the SML.

So, let this is your market portfolio here, then this is your market portfolio then, this is it should be your r m, this should be your standard deviation of the m, what are thing we are talking about. So, this basically talks about, the SML line and how this SML line is derived. Here if you observe, the SML line is derived already, I told you the expected return is basically your risk free rate.

R f plus already we have seen r m minus r f divided by the variance of m, the covariance I m. So, this is basically r f plus covariance I m, if you rearrange it standard variance of m into r m minus r f, so this covariance I m similarly standard deviation m, this basically nothing but the beta. So, therefore, it is equal to r f plus beta into r m minus r f r m is equal to market return, r f is equal to the risk free rate of return, beta is equal to systematic risk and r f is equal to already explained that is the risk free rate of return.

So, this is basically the derivation of the security market line. So, the expected return of a risky asset is basically determined by the risk free rate of return plus a risk premium for the individual asset. The risk premium is determined by the systematic risk of the asset, which is beta and the prevailing market risk premium in a larger way we will explain it in the further sessions.

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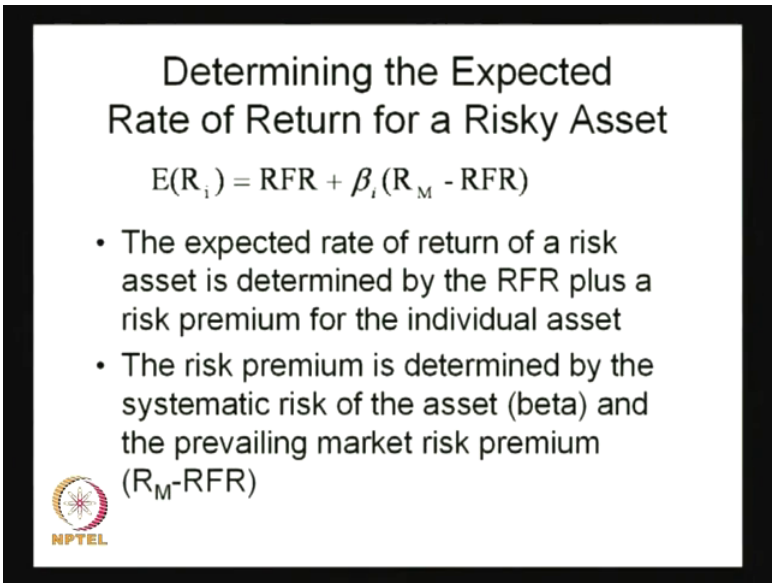

So, in equilibrium if you observe, what generally we can see? All assets in the portfolio of assets should plot on the SML, any security with an estimated return that plots above

the SML is under priced and any security with an estimated return that plots below the SML is overpriced, that you can imply from this. A superior investor must derive the value estimates for assets that are consistently superior to the consensus market evaluation, to earn better risk adjusted rates of return than the average investor.

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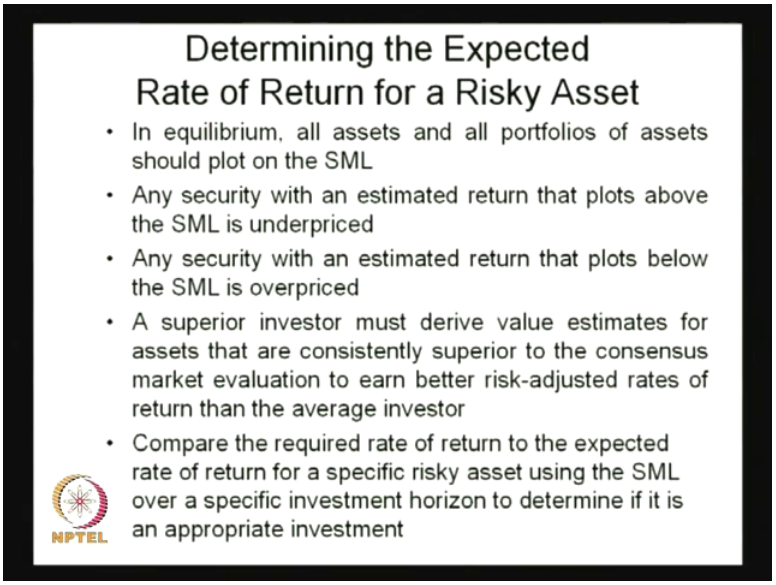

If we ask you one question here, how this SML and CML are different? Why the SML and CML are different? We can make a statement here, basically CML is a special case of SML special case of SML because, why it is a special case of SML? Because here what we have seen that the market portfolio, what we are taking in the CML case, this is basically efficient portfolio and whenever we calculate efficient portfolio already, that means, this particular portfolio what we are taking in the CML case, that is totally highly correlated with the market portfolio.

So, if it the highly correlated with the market portfolio, let us assume that is totally resembles this market portfolio, then how this market portfolio work? It is basically your expected return is equal to your r m minus r f is equal to r f plus r m minus r f into covariance I m through variance of the m.

But, here the covariance between the individual securities, which market is nothing that it is the correlation between the market and the individual securities and the standard

deviation of the I and standard deviation individual security, then standard deviation of the market.

But here, if you observe in case of the CML, if you assume that the correlation between the market and the individual security is almost close to 1, then what we can say, in this case what will happen? It will be expected return will be equal to r f plus where the standard deviation I and the standard deviation m divide by the variance of the m, because the this term will be equal to 1.

Then it into r m minus r f, but again what we have seen this is again you can cancel it then expected return is equal to r f plus standard deviation of I divide by the standard deviation m into r m minus r f in the case of CML.

But in the case of the SML, basically this is the in the generalization of this particular equation. So, therefore, sometimes we call the capital asset pricing model or we can the capital market line is a special case of the security market line. So, superior investor must derive value estimates for asset, that are consistently superior to the consensus market evaluation to earn better risk adjusted rates of return than the average investor.

So, compare the required rate of return to the expected rate of return, for a specific risky asset using the SML over a specific environment horizon to determine if it is an appropriate investment or not. So, that is the way generally this capital market theory helps us to our investment process. So, here if you see the certain things, what generally we are trying to explain that, capital market theory or the CML helps us to calculate this is your r f plus this helps us to know that how much return we required, how much return we required to invest.

This is your risk and this is your expected return. So, this is basically helps us to know how much expected return we need to invest certain securities, so what it basically, what we have seen from the beginning? There are certain limitations of this assumption whatever we have, even if there are certain limitations whatever we have, still the capital asset pricing model holds or capital asset pricing model talks about certain issues related to the investment or it is very much required to use to calculate the expected return or required rate of return.

How much required rate of return should this particular asset give or how much return this particular asset can give to the investor or how much expectation, we should have on that particular investment to maximize the return.

But, the another question here is that, there are certain variables which used in the capital asset pricing model to derive this expected return and those variables whatever we use in the capital asset pricing model are determined by certain external factors. And if you talk about the certain external factors, it basically helps us or it basically gives you the more dynamism, the more dynamic concept of the use of capital asset pricing model to derive the expected return for an particular risky asset.

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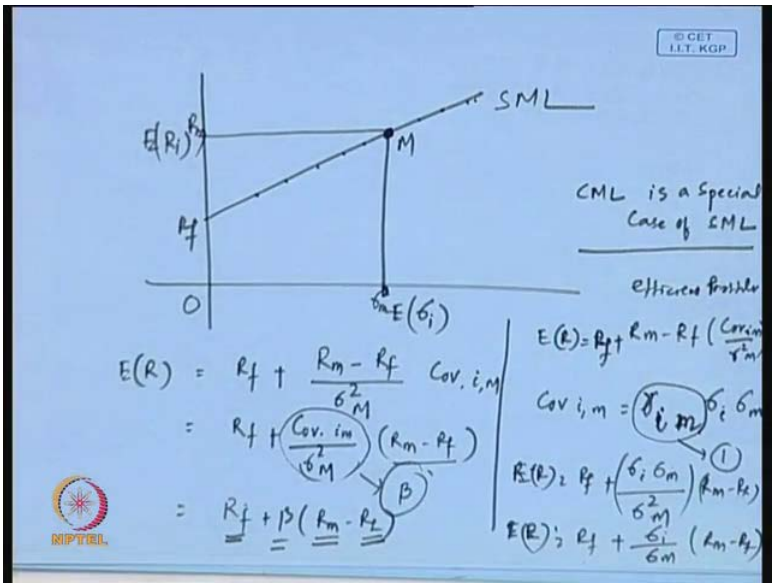

Therefore, what we can say? We should know more about the inputs or about the requirements of this particular use of the capital asset pricing model and if you assume or if you relax certain assumptions, whatever the capital asset pricing model takes, then what is going to happen in this model? That is basically the more enhanced objective of the investor to know that, because once we calculate the expected return of the particular asset, it basically talks about the cost of this particular asset, because we are taking certain risk and once we taken risk, it is basically the opportunity cost what we talk about the second best alternative whatever we have, we are forgiving that cost and we are investing in this particular asset.

So, therefore, there are certain cost we are incurring for this and whereas, this cost what you are incurring, the expected return from that particular asset should be more than that, that is the basic intuition the basic assumption always investor takes.

So, therefore, well what is the basic objective of the investor is now, the basic objective of the investor is to know the factors which affect this equity return or the factors which affects or which helps to formulate the capital asset pricing model and how those factors can be determined. So, that we will see in the next class, thank you.