Security Analysis and Portfolio Management

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Module No. # 01

Lecture No. # 08

Testing Market Efficiency

Good morning. In the previous class, we talked about different forms of market efficiency as well as also we talked about how these different forms can be defined and what exactly the market efficient market hypothesis is. And if your market is not efficient, then what could be the problem the investors or the people may face in the financial market. So, after discussing those things and now the question is that, how would you know that whether your market is efficient or not.

Whether we can say that, whether your market is weakly efficient or it is semi strongly efficient or strongly efficient. So, that is the question generally comes to the mind of the people or the researcher or the investors, who generally deals with financial market and day to day life.

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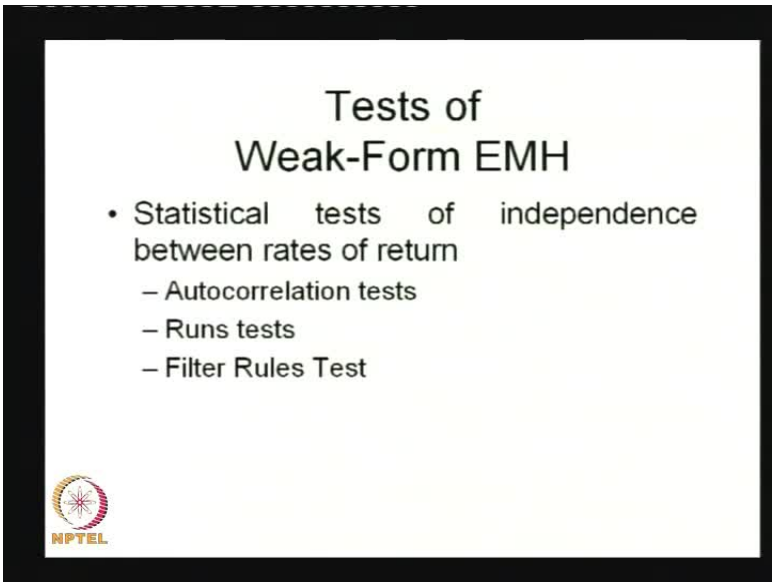

So, today, we will going to discuss about the different tests which are available to know whether or to test whether your market is efficient or not. So, if we recall that in the previous class, we talked about that your market can be efficient in terms of weak-form or market can be in terms of semi strong form or the market can be efficient in terms of strong-form.

So, here one by one we can test or we can see that, how these different forms of efficiency can be tested. So here, first if we start with this, weak form of efficient market hypothesis, here there are three tests we always use, one test is defined as the autocorrelation test and second one is the runs test and third one is the filter rules test. So, one by one we will see how these particular tests works.

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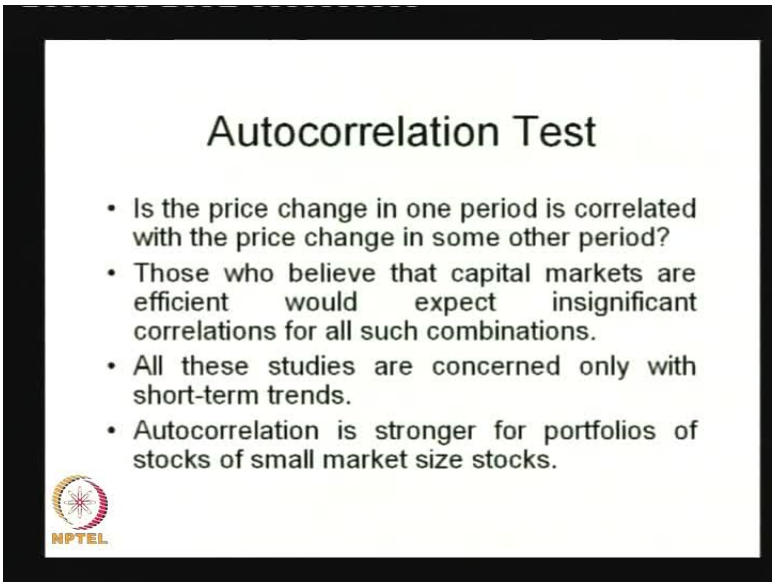

If we start with autocorrelation test, what exactly the autocorrelation test means? Autocorrelation test is the price since in one period or we can say that whenever we go for autocorrelation test, what basically we test there, we test whether the price change in one period is correlated with the price change in some other period.

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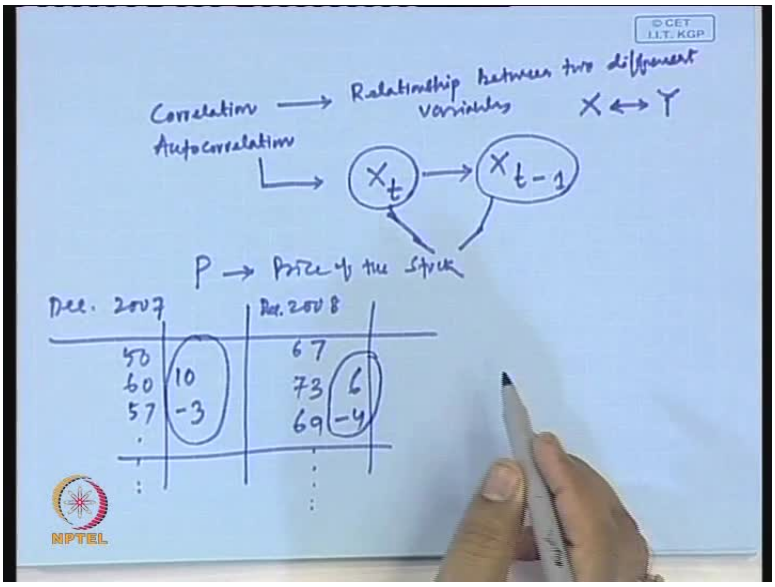

Here there are two things comes to our mind, in literature whenever we use this different word, we have talking about either correlation and another thing is we talk about the autocorrelation. But whenever we talk about the correlation, it is basically talks about the relationship between the two different variables, relationship between two different variables what it means? That if you say one variable is X, another variable is Y whether Y is related to X or Y or X is related to y that basically has been tested using the correlation test.

But, whenever we talk about the autocorrelation, what basically we test? We test whether X in a period of t is related to the Lact value of that same variable which can be denoted as X t minus 1. That means, we test whether the X t is related to X t minus 1 or we can say, is there any relationship between the Lact value and the current value of that particular variable. So if that kind of relationship can be established, then what we can say that from these we can conclude, whether your market is or market can be forecasted for the future or not.

So, here that is why what generally we do? Whenever we talk about the stock market, we can we generally get this price of the stock, so what we do. For example, you have two different periods, let in 2007 and 2008 of a particular period, late end December 2007 and December 2008.

Let the price of the different stocks will be given to you let 50, 60, then let 57, like that and in the December 2008 in the different days you will find this is let 67or 73 and like that you can go for 69 like that. Then what basically we do, we first step in this autocorrelation test we generally calculate the return of the stock. So, this is basically the price of the stock in the different days in the month of December. So, we calculate the return from this let this change in price is here is 10, here it is minus 3, like that here also we can say it is 6 and it is let we can say that minus 4.

So, then from these data, we try to establish the relationship between the price change of this month with the price change in another month of the different year. So, if you find that there is a proper relationship between the two then, we can say accordingly we can say whether your market is weakly efficient or not.

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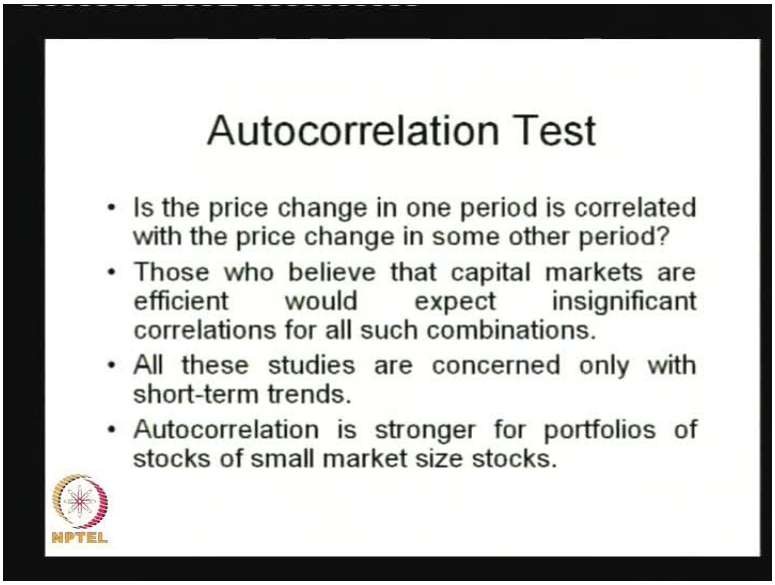

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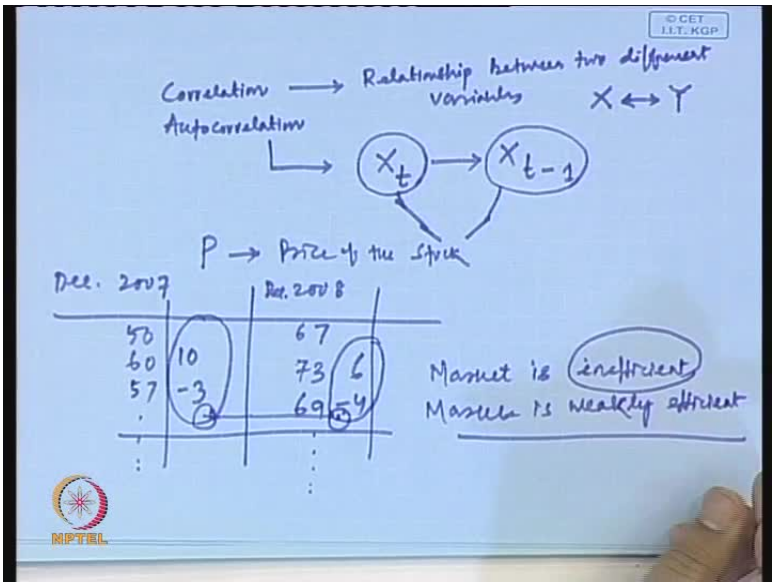

So, those who believe that the capital markets are efficient would expect insignificant correlations for all such combinations. What does it mean? If we found that there is a significant correlation between the price change of this period with the price change of another period, then we can conclude that market is if there is a significant correlation between them, so definitely we can say this market is inefficient.

If the correlation between them is highly insignificant in a statistical manner, then we can say that market is weakly efficient. So what basically we do here, we test the relationship between a particular stock return of a particular period with the another period and from these data the co-relationship data, we can say whether your market is efficient or market is inefficient. So, all these studies are concerned only with short-term trends. So, from these, we can only test this market efficiency in the short-term. So what generally we found that autocorrelation is stronger for portfolios of stocks of small market size stocks.

Basically, those kind of autocorrelation test which are very much stronger, the evidence as shown that these are very much stronger, where we talk about the small market size stocks. It may not be that much efficient or that much applicable for the large market size stocks.

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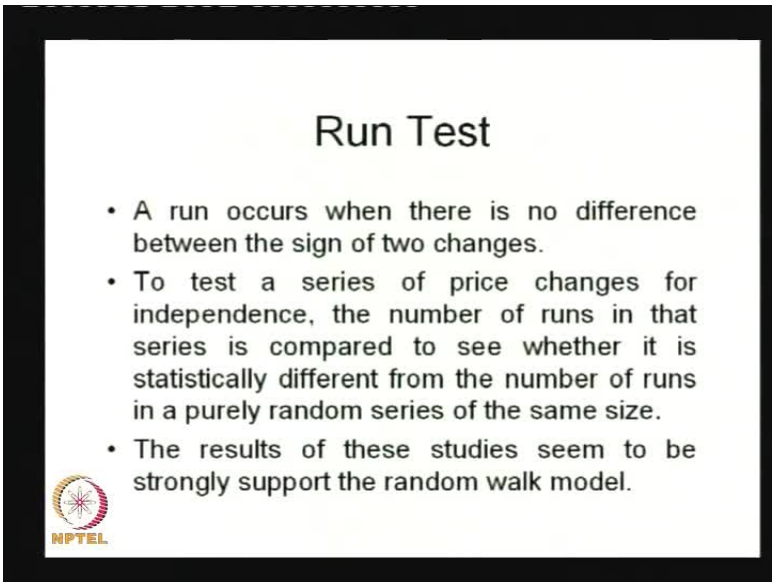

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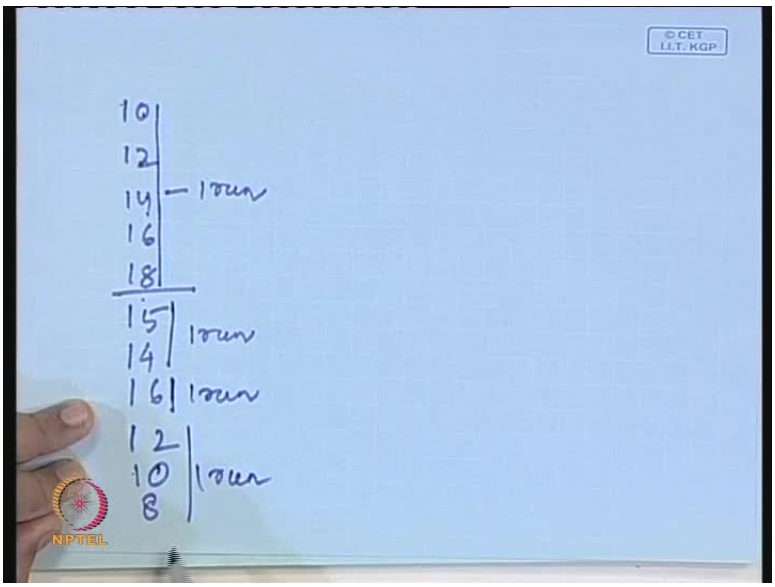

Then another test is we defined that the run test. What basically the run test means? A run occurs when there is no difference between the sign of two changes. So, what basically here we do? If you see for example, the price data will be given to you for the stock, let it is 10, 12, 14, 16, 18, then 15, then we have14, let then again 16 like that.

Then what generally we say, one run is once this increasing because if you see that, it is increase you know 10 to 12, 12 to 14, 14 to 16, 16 to 18. So, once the increasing trend is goes is going on, so this is one run, one the situation change is now the market is going

down, it is going down for these 2 data 15 and 14, so this is another run. Then again it has started increasing, so for example, it has started increasing to 16, then again it has gone down 12. So, this is again one run and like that if you again goes on decreasing 12 to 10, 10 to 8 like that, then it is one run and again if it is increasing, we can go for another run.

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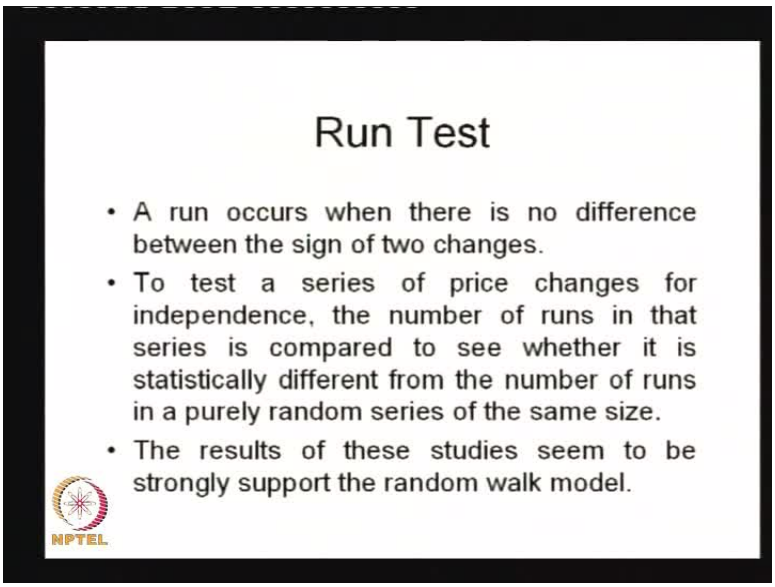

So, basically a run occurs when there is no difference between the sign of two changes. It is goes on increasing then, you can say that the same run is going on for that particular time, if it is in between there is a break whether the particular return or difference between the price different, then we can say that is different run will start from there.

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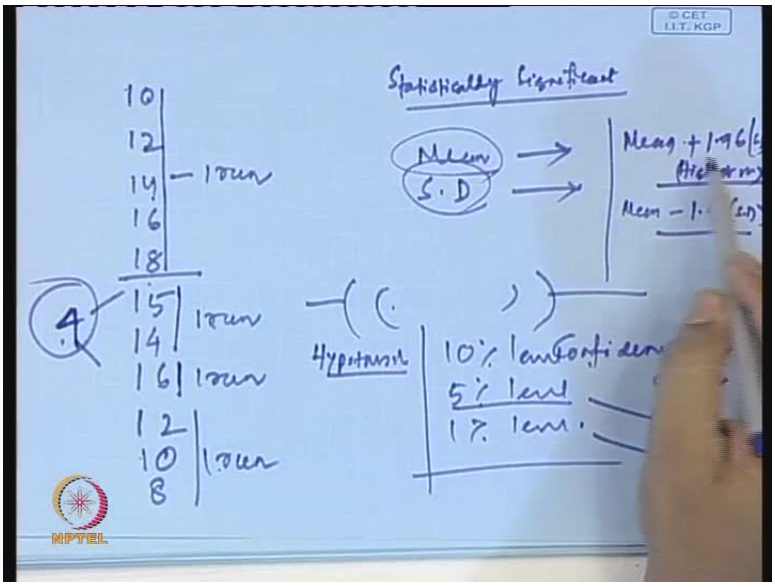

So, once we get this number of runs for a particular period, what we can do? To test series of price changes for independence, the number of runs in that series is compared to see whether it is statistically different from the number of runs in a purely random series of the same size. What does it mean? If you are compared to some of the statistical significance level, what basically we say that statistically significant, what does it mean? For example, we have now 1, 2, 3, 4 runs in this series, we have the 4 runs.

So, we have to test that whether these 4 runs are statistically significant or not. What does it mean? What do it mean by the statistical significant level? It means that, once you have to calculate the mean of that particular series, then you have to calculate the standard deviation of that particular series. For example, you have how many plus and how many minus signs you got from these particular series and from these you can calculate your mean, once you have calculated the mean, you can calculate also your standard deviation.

So, basically you calculate out of these mean and standard deviation, you can find out your range. You can find out the range means, we are talking about the confidence level. The confidence level what does it mean? For example, you say whether your this number 4 is statistically significant at 5 percent level or 1 percent level.

Generally in statistics, we can go up to maximum 10 percent level. So, the level that means, here variable is significant at 10 percent level means the confidence index, the confidence level will be 90 percent. That means, in the 90 percent probability that this particular variable or particular figure 4 is correct, we can rely on this particular figure.

Like that we can say it is 95 percent, then it is 99 percent confidence level they are significant, but here what generally we do? If that particular figure comes under this particular range, we can say that, the hypothesis is accepted. What is the hypothesis here? The hypothesis is that the number 4 runs whatever we have these are statistically significant or we can say that the number of runs what we have taken, the 4 is quite relevant for our analysis.

So, if it does not come under this range, then we can say that the hypothesis is rejected. So, here what generally we do? We make this range, how this range is decided, already if you know in the standard normal distribution, if you take the 5 percent level then generally, we calculate this range like this mean plus 1.96 into the standard deviation value. That will give you the higher range and lower range will be mean minus 1.96 into the standard deviation that will give you the lower figure (Refer Slide Time: 13:50).

So, this is your highest value, this is your lowest value, if this 4 comes under this between this mean plus 1.96 in standard deviation and mean minus 1.96 into standard deviation, then your hypothesis is accepted and if does not come under within that region, then your hypothesis is rejected.

So, here that is why we say that whether it is statistically different from the number of runs in a purely random series of the same size or not, if it is not then, we can say your hypothesis of statistical or we can say the null hypothesis has been rejected and if it is statistically not different, the null hypothesis is accepted.

The results of these studies seem to be strongly support the random walk model; that means, in the beginning we discuss that the stock market follows the random walk model or we cannot predict about the market by looking in the past data. So, in the run test we can test that whether your market follows a random path or we can say the market can be predicted by analyzing the past data. So, basically in the run test whenever we test the weak form of efficient market hypothesis, what generally we see there? That most of the

cases, it strongly support the random walk model that means, we can say that market is weakly efficient.

In the Indian context also, we have carried out some of the studies and this studies what the people have carried out the over the period of time, they found that the Indian capital market also weakly efficient by using the run test or by using the autocorrelation test.

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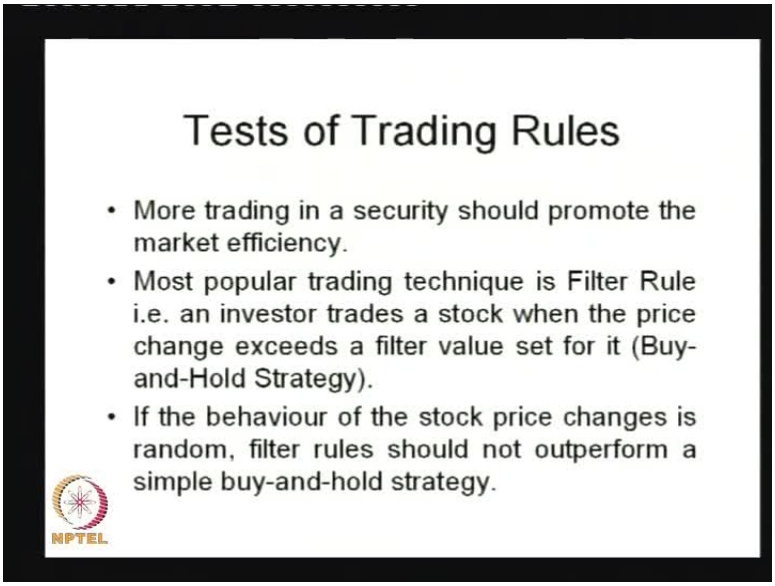

So, run test is also one of the powerful test we use, you should know whether your market is weakly efficient or not. Then we go back to test of trading rules or we can say the filter rules. So, what we have talked about or we have first shown that thing there is another test also we are using, that is the filter rules test that we can say whether your market is weakly efficient or not.

So, here generally what we do? More trading in a security should promote the market efficiency that means, if you go on trading everyday or the price discovery of that particular security is happening in a strong manner in everyday basis, then we can say that it will promote the market efficiency in that particular scenario. So, like that if you see that most popular trading technique is filter rule, that is an investor trades a stock when the price change exceeds a filter value set for it; that means, what generally they do.

Most of the investors goes for trading in the market, whenever they see that the price of that is particular security is exceeding the particular value or we call it the filter value which is set for that individual security, that is why the filter value is always different from security to security. If that security which comes under a certain industry which comes under a certain company, which comes under a certain business, so if that particular security exceeds this value of the filter value set for that security, then maybe investors will be inclined to invest in that particular stock or they are interested to trade in that particular stock.

If that particular security does not exceed this filter value may be the interested investors who are before, it means previously interested for that security may not be interested, once the filter value changes or we can say this value does not exceed this filter value.

So, what generally we say here that whenever we go by the filter rules, the filter rules basically or we can say this filter value is decided on the basis of the buy-and-hold strategy of the investor. What exactly this buy-and hold strategy means, we will discuss extensively whenever we talk about this passive investment strategy of the investor or we can say talk about the investment strategy, equity investment strategy in the market in the further lesson.

But here, I should give you just hint what buy-and-hold strategy means, the investor invest in that particular stock and wait for that particular time period; that means, he holds that particular stock after a certain period to realize his expected return, what he was expected to get from that particular security.

So, he does not take the position in the market every day, he does not change the position in the market every day or sometimes in particular day he takes a buying position next day, he takes the selling position, those kind of situation never prevails if the investor follows this buy-and-hold strategy; that part we will be extensively discussing in the future sessions.

So, if the behavior of the stock price changes is random, filter rules should not outperform a simple buy-and-hold strategy; that means, if we say that the stock price does not follow any pattern, if this stock price changes is very much random in nature;

that means, you cannot predict anything by analyzing the past value of this particular stock.

Then the filter rule should not outperform a simple buy-and-hold strategy; that means, if you go by the filter rule also, most of the investors cannot get maximum return or cannot get more return, what the other investors were getting from this buy-and-hold strategy. Basically buy-and-hold strategy is a strategy which is used by the passive investor, who does not want to take risk everyday or they always want to minimize the transaction cost in the market.

Because they are aggressive, they want more return that is why they change their position in the everyday market, but here what generally happens if your market is behaving very randomly or we can say market is weakly efficient, then we cannot predict anything about the market. So, that is why if you cannot predict anything about the market, so even if you go by the filter rule, it cannot outperform in the market or the investor cannot outperform in the market, the investor cannot achieve more return from market, what the other investors are getting simply out of this buy-and-hold strategy.

So, in that case we can say that, if certain investors even if they are following the filter rule, still they are not getting higher return from the market, then we can say your market is weakly efficient. If they can get then, his market is inefficient. So, this is the way generally the we can test that whether your market is weakly efficient or not. So, basically three popular tests - statistical tests always we use one is your autocorrelation test, second one is your run test and third one is your filter rule. So, these three tests are quite popular in the market, where we get the to that we can through that we can test the weak form of efficiency.

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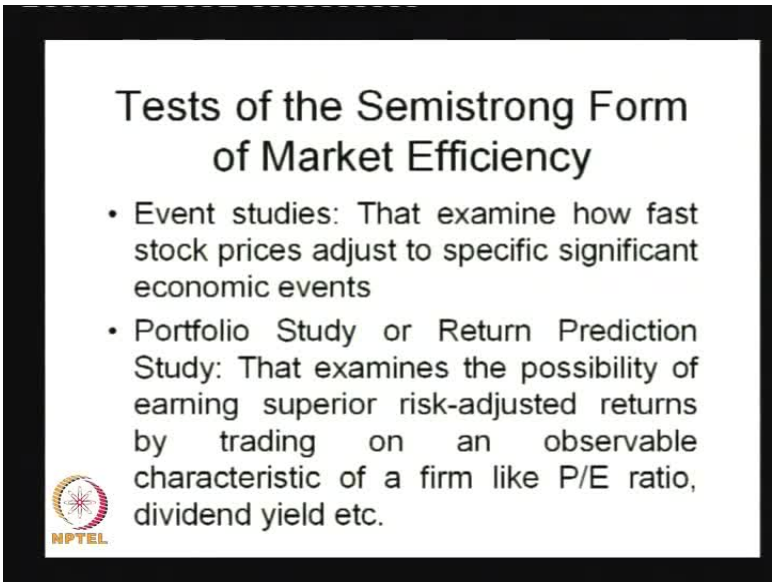

Then the other form of market efficiency that is defined as the Semi-strong form, there are various tests available various types of tests available to test this Semi-strong form of market efficiency; and from then, if you see the popular test is the event studies and the portfolio study or the return prediction study.

What this event study means? The event study means or the even study examine, how fast stock prices adjust to specific significant economic events? What do mean by this events? The events can be anything: the events can be dividend announcement, event can be a stock split, event can be a particular buy backing the share, this particular event can be we can say that any kind of a drastic changes in the economy or about this particular stock.

So, these are basically the different or bonus announcement. So, these are the different events generally we talk about for a typical company. So, what here we will see that once this particular event has been announced, so in and around at the time of dividend announcement or at the time of stock split or the particular event when it has occurred, before that event or after that event. And the event whenever the event has occurred, the average return from that particular stock should not be very high or the cumulative excess return what you are getting between these three periods, if you take the cumulative average of that, it should be excess return, the average of the excess return if you take, then it should be 0.

So that means, we can say even if there is one announcement, even if there was one event, so it is publicly available. So, with all the investors are using that particular information uniformly in the market. So, nobody should get the high return in a particular time or over the period of time, the total cumulative average excess return should be 0. So if it is 0, then we can say your market is Semi-strongly efficient, if it is not 0, then your market is not your market is inefficient.

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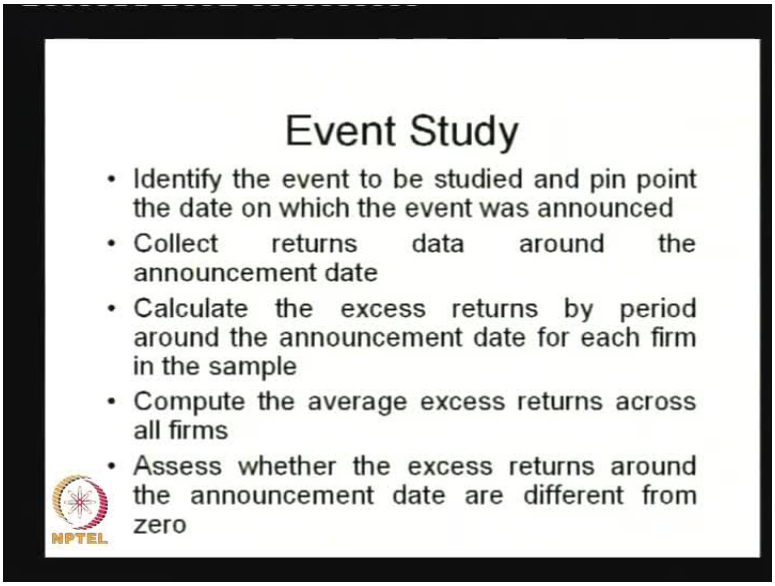

The portfolio study what here we see or we do in the portfolio study, which examines the possibility of earning superior risk-adjusted returns by trading on an observable characteristic of a firm like price-earnings ratio, dividend yield etcetera. What here happens in general? I will just give you the hint in the further slides, what basically the event study means? Already I told you that, what are the different steps of the event study? In the different stage, what generally we do, identify the event to be studied and pinpoint the date on which the event was announced.

Collect returns data around the announcement date, calculate the excess returns by period around the announcement date for each firm in the sample. Identify the event whether it is stock split, whether it is a dividend announcement, whether it is a bonus announcement or anything else or share by banking etcetera.

Pinpoint the date on which the event was announced, when the event was announced you just try to figure out that particular date then, collect returns data around the announcement date; before the announcement date, at the particular time whenever the announcement was happening and after the announcement date, so around the announcement date you calculate or collect the returns data.

Calculate the excess returns by period around the announcement date for each form in the sample, whatever excess return this particular form got which is what do you mean by the excess return what was the expected return and how much return he got. So, that basically talks about the expected return, the expected return is basically calculated as the actual return minus the expected return.

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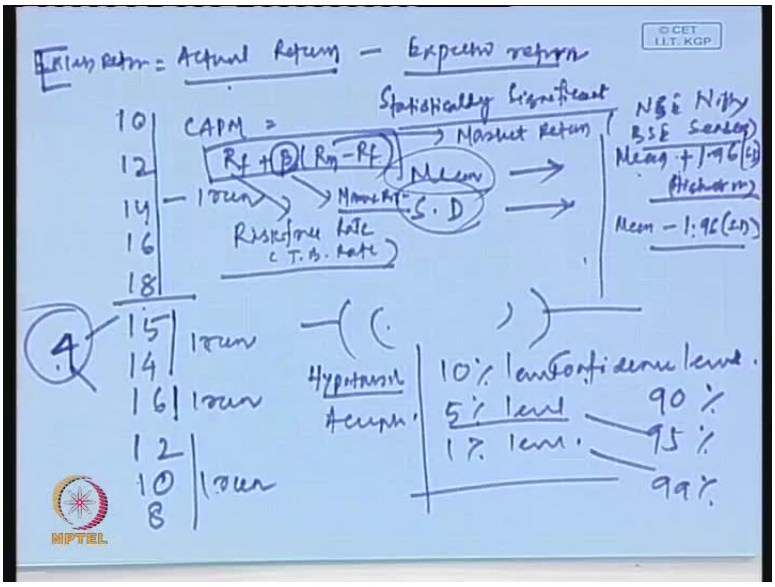

So, actual return is what it is the realized return what he got and the expected return is basically defined as what we got it from the CAPM model, what it is that we will discuss further in elaborate manner. So what generally in the CAPM model we say, the expected return of a stock is calculated as R f plus beta into R m minus R f. What it basically means, the R f defines the risk free rate. The risk free rate means, without any risk if you once you have started the investment, the return is assured may be the we can say the treasury bill rate.

Then we have data already know that, this is the market risk and your R m basically shows the market return. So this market return means this basically the we can say that in the context of India the BSE Sensex or NSE Nifty which are generally called as the market portfolio. So, if they are the market portfolio, the return what we get from those index, we call it the market index.

So, this is may be NSE Nifty, the proxy for market portfolio or BSE Sensex. So, these are basically taken has the market return. So, once you have the market return and you have the risk free rate and you have the systematic risk or the market risk, then you can calculate your expected return what you are getting out of this.

So, the excess return is the excess return is your actual return minus expected return. So here, once generally we what we do for each stock for each stock around the announcement date in that particular period, you calculate the excess return. So, once the excess return is calculated, then you can calculate the compute the average excess return across the all firms. Once this you can calculate the average excess return across all firms, you assess whether the excess returns around the announcement date are different from 0 or not.

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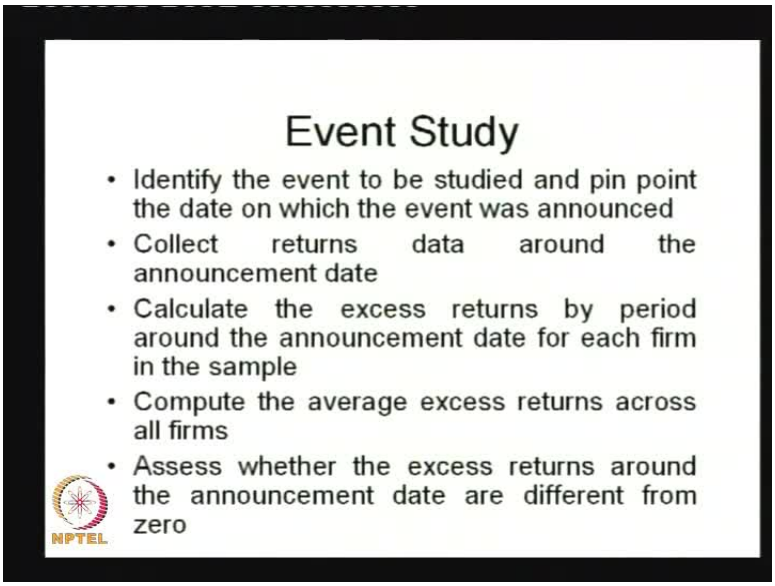

So, from this you can say that whether is there any kind of public announcement which has which was happening and some of the investors which are investing in some of the stocks, they got excess return over the other investor.

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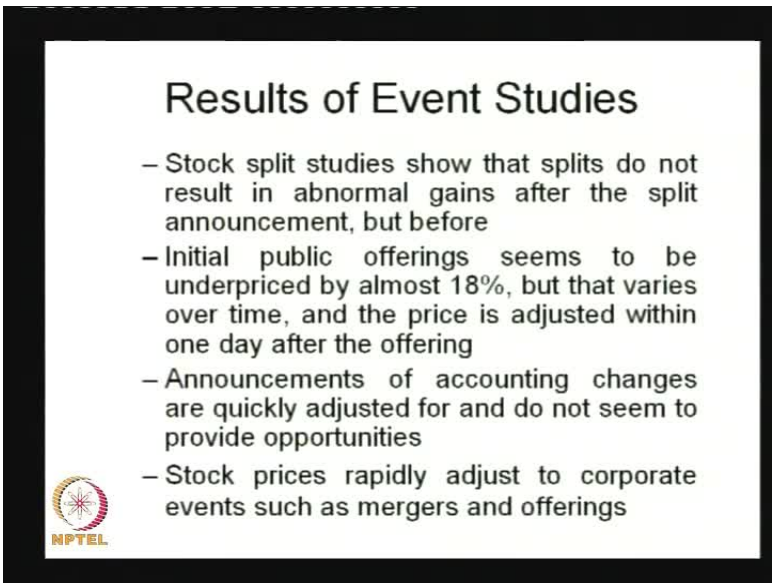

So, what kind of result we found from the event studies. In the various countries, the research has been carried out and what we found that, if you say that stock split is an event and some of the people have taken stock split as an event and they try to find out what is happening to this particular market, if you takes stock split as a event; using the event study, what they found? They found that these splits, the stock splits do not result in abnormal gains after the split announcement, but before what does it mean?

That after those split announcement, the abnormal gains were not there, but before the stock split announcement, there was some gain people are getting out of this. Then initial public offerings, this is another event which generally happens with the company and this studies seems to be underpriced by almost 18 percent, but that varies over time and the price is adjusted within one day after the offering.

So that means, what you can say the market is more or less Semi-strongly efficient, in that case and the announcement of accounting changes are quickly adjusted for and do not seem to provide opportunities to get the abnormal return, that is why we can say that

your market is Semi-strongly efficient and the stock prices rapidly adjust to the corporate events such as mergers and offerings.

So, more or less the most of the studies and basically I will just quote you that most of the event studies in the larger form is carried out in the developed countries. So, in the developed countries case, in the context of USA, UK, Australia, Canada, so in those countries, if you find that most of the cases this public announcement or the events which was occurring to the company and it is available to the public because of their system their efficient system, this particular information generally research to all the investors very quickly.

So, that is why one group of investor or some of the investor may not use that information to get some abnormal return from the market. So, that is why the average excess return over this announcement or over this events is always generally significantly 0. So, they cannot get any excess return out of these, that is why those markets are basically Semi-strongly efficient.

But, in the developing countries like India, we have seen that most of the time the certain group of investor basically earns high return by using the publicly available announcements or publicly available event, which were occurring in the company, it is because of the inefficient system we have.

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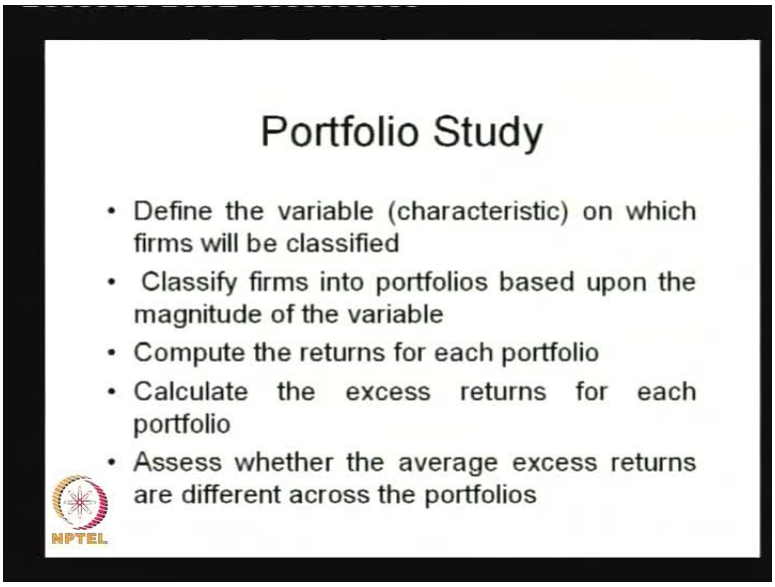

So, then the another study is the portfolio study. So, in this portfolio study what generally we see that, in this we define the variable on which the firms will be classified. Classify firms into portfolios based upon the magnitude of the variable, compute the returns for each portfolio, calculate the excess returns for each portfolio, assess whether the average excess returns are different across the portfolios, I will just explain what it exactly means.

Whenever we invest in the stock market, the different investors generally makes the different portfolio. So, how generally they make the portfolio? If you are ((comparing)) to some of the words like value stocks like a growth stocks or like certain indicators whatever we have, some of the companies are paying high dividend, some of the companies are paying low dividends. So, accordingly the investors make the different portfolios on the basis of certain characteristics; certain characteristics in the sense, whether you can make the portfolio on the basis of the high price-earning ratio or on the basis of low price-earning ratio.

You make a separate portfolio, which consisting of different stocks which are this is a price-earning ratio which were high and you make another portfolio, where all the stocks which all the stocks where the price-earning ratio is low.

So, there after making this different portfolio portfolios on the basis of the different parameters, what generally you can do, you calculate the return from that particular portfolio in each category. Once for the different portfolios, you have calculate the calculated the return, what generally you can do? You have see that how this particular return, what you have calculated that is different from your expected return.

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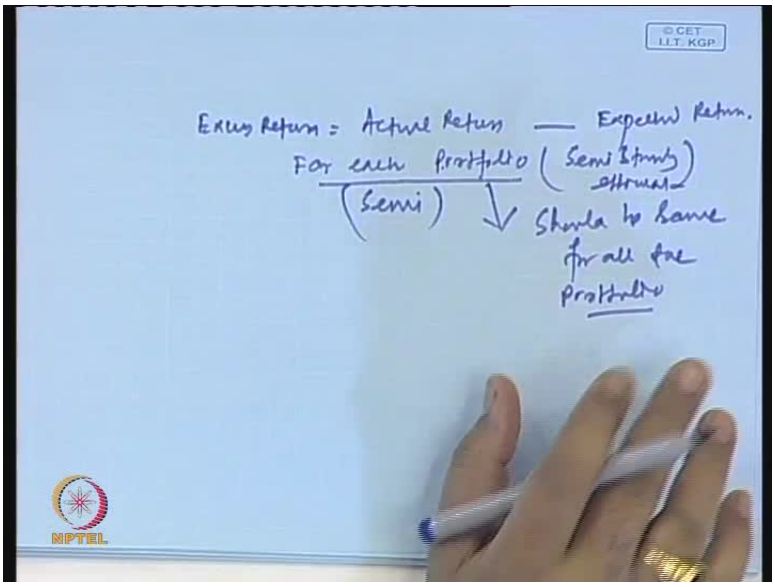

Because once you have made the portfolio, you must have calculated the expected return what you are deriving using the same formula, but the for the portfolio calculation it is little bit different, it basically consist of the different stocks. So, what generally you can do? Once you have your expected return and once you calculate your expected return of the portfolio. So, what generally you can do? The excess return can be calculated in this way, the actual return what you got from this portfolio minus the expected return.

The expected return what you have calculated from this particular stock. So, once the expected return, a excess return is calculated for each type of portfolio, for each portfolio whether it is consist of high price-earning ratio stocks whether it is consist of the low price-earning ratio stocks.

So, once this return of the excess return of the portfolio is calculated, you test whether the excess returns or a different across the portfolios or not. If the excess return is different across the portfolio, then we cannot say that your market is Semi-strongly efficient.

But across this portfolio, if you find this excess returns are not different and we find more or less same excess return out of this, then you can say your market is Semi-strongly efficient. So, the excess return of the portfolio should be same for all the portfolio; that means, one investor should not get any kind of excess return or abnormal

return by using certain philosophy. So, this is way generally we can test your Semi-strong form of efficient market hypothesis.

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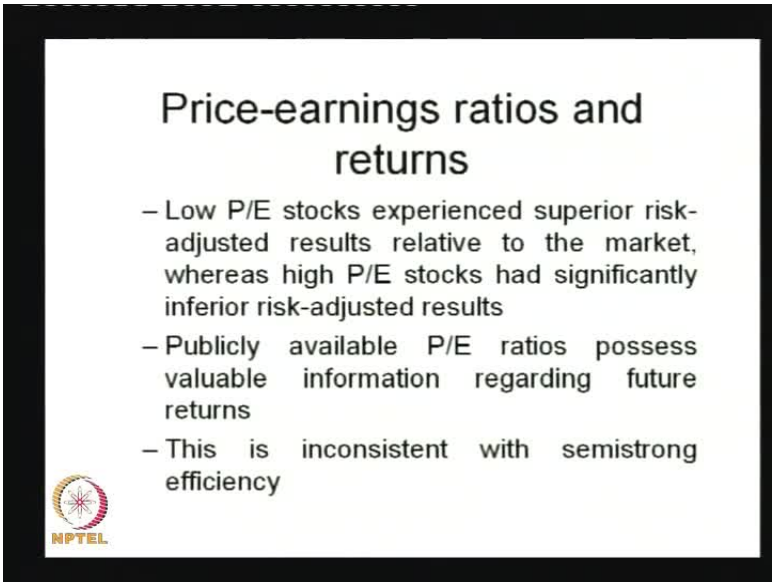

So, what generally the results we found that in the different cases, low price-earning ratio stocks experienced superior risk adjusted results relative to the market whereas, high price-earning ratio stocks at significantly inferior risk adjusted results. That means, in the previous literatures or previous studies what we found?

The low price-earning ratio stocks, in generally we call them the value stocks experienced very superior return risk adjusted return relative to the market, whereas the high price-earning ratio stocks, we generally call it the growth stocks that significantly gets lower return than the market. The risk adjusted returns are lower for the high price-earning ratio stocks, but for the low price-earning ratio stocks, the returns are higher.

Then publicly available price-earning ratios posses valuable information regarding the future return. So, that what it concludes, if we find this kind of trend that low price-earning ratio stocks are performing better than the high price-earning ratio stocks or the portfolio what you have made out of the low price-earning ratio stocks is outperforming the particular portfolio, which consist of the high price-earning ratio stocks, then what we can say, that the publicly available price-earning ratios possess valuable information regarding future return.

Some of the people are able to use that information in such a manner that, they can get some abnormal return from the market or the investor gets outperformance of market in that way, but the people who does not have that kind of information which is involved in that particular securities or particular stocks, they cannot get more return from the market or they cannot out from the market. So, this is inconsistent with the Semi-strong form of efficiency.

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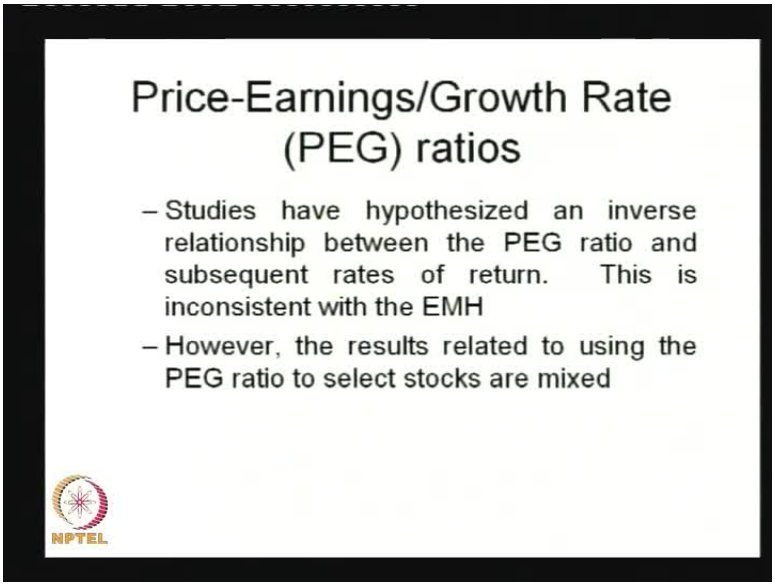

So, that is why what you can say? That most of the cases, if you take this portfolio studies, we found that this market is not Semi-strongly efficient. Then another way also we also defined this portfolio studies on the basis of the price-earnings to growth rate or we divided by growth rate, we call it the PEG ratio. And the here what we found, that the studies have hypothesized on inverse relationship between the PEG ratio and the subsequent rates of return.

If this kind of results its quite relevant or people or the investor can use that information to outperform the market, then this is very much inconsistent with the efficient market hypothesis. However, the results what the other people have got using the PEG ratio is to select stocks are very mixed kinds of results, what they found from the various markets.

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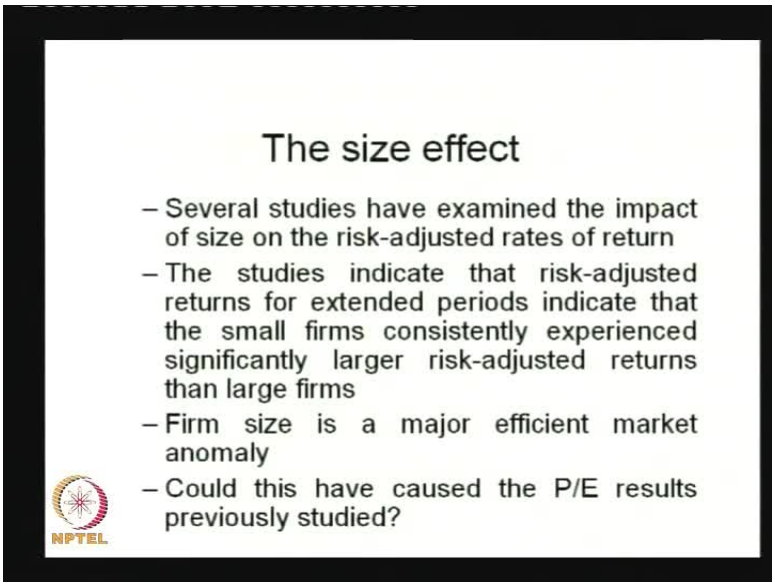

So, that is why any of the categories, any of the characteristics what we take and we make the portfolio accordingly; we found that most of the cases these are very much inconsistent with the efficient market hypothesis in the Semi-strong firm. Another studies which is very popular, people are extensively use this particular study that we call it the size effect; that means, they make the portfolio on the basis of the size of the companies.

So, here generally what they do, that the studies indicate that the risk adjusted returns for extended periods, indicate that the small firms consistently experienced significantly larger returns than large firms. That means, this a small firms always outperforms the large firms; that means, if your make portfolio which consist of the basically the small firms, they have the better potential to perform in the market, but here one point I am trying to say that, this kind of study the one study in other famous study which are available on the basis of the size effect of the portfolio. So, there what generally happens that in the context of USA, this particular result is quite relevant.

So, in the US market, the investors always outperforming the market if they will investing the small size stocks or the value stocks what we talk about the low price-earning ratio stocks etcetera, but in Indian market, it is little bit the scenario is different.

Some of the studies have found that, small size stocks never outperform in the market, the large size stocks outperform in the market and as well as also we found that, sometimes it may not be the value stocks, it may be the growth stocks which always performs better in the market in the context of India.

But still, again there is the anomaly is there that we can say that, there is some information available to size of the company, category or we can say that price-earning ratio category etcetera. So, that is why the people can use that they can outperform it, whether it is the small size performs better or the large size performs better, that does not matter, but across this portfolio, this performance should not be very much different if you make your portfolio on the basis of size or on the basis of the different parameters like price-earning ratio or the dividend yield etcetera.

Then what we can say that in overall, we can say the size effect also the or the portfolio study itself concludes that the market is not Semi-strongly efficient or we can say market is inefficient. So this some of the people also ask this questions, may be this quote have cause the price-earning ratio also we previously studies.

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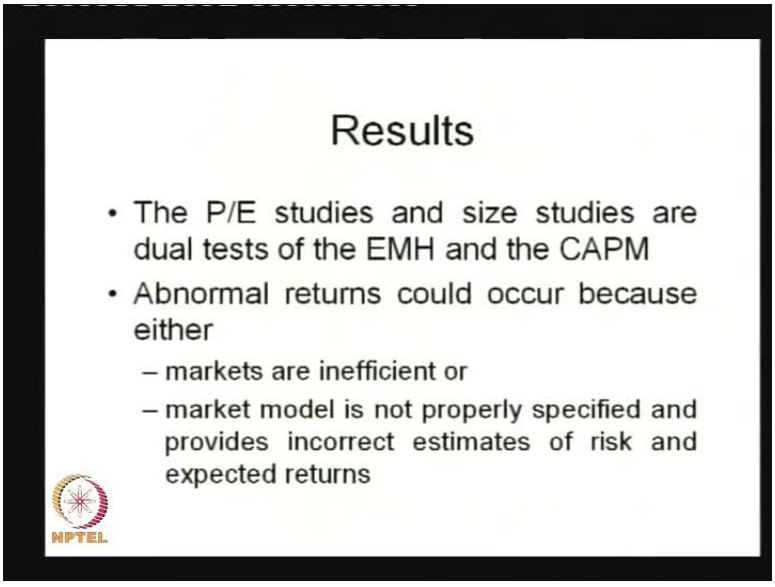

But, basically this is very much unexplored areas what generally we can say. So, the results what basically people found that, the price-earning ratio studies and the size

studies are dual test of efficient market hypothesis and the capital asset pricing model what I already told you.

The abnormal returns could occur sometimes because, the markets are inefficient or the market model is not properly specified and provides incorrect estimates of the risk and expected returns. So, definitely if you want to blame the model itself, what we have specified, either in terms of the capital asset pricing model or in terms of the other models, what we discussed in a very extensive manner in the further sessions.

But here, if you see that most of the researches have argued, whenever you calculate the expected return of a particular portfolio of a particular stock, may be your model is not correctly specified, that is how we sometimes we say, we are getting some excess return out of this.

But here, that sometimes also we can say that if your model is correctly specified, but still your getting excess return, that may be because of your market is inefficient. So, here what we can say that, either it is in terms of inefficiency of the market or it is in terms of the incorrect specification of the model, but still the results are found in most of the cases, we get some abnormal return from the market or some of the investors get abnormal return from the market by using certain investment philosophy or by making their portfolios by specializing their investment strategy in the different ways on the basis of the different parameters what are available publicly available to them.

So, in that context what you can say, it is very difficult to say that whether your market is efficient or not, but most of the cases, what we can conclude that the publicly available information is not adequate to everybody or it is not reaching to everybody by who is most of them can get the same return like the other investors is are investors are getting.

But like one other ways also, the researchers most of the cases are found that, the model what we have specified to calculate the expected return out of this is not correct and it is true also, that is why the various models have been developed to overcome that particular problem. And this is still a warning you, so in the capital market to know which is the correct model, which can measure the expected return of an equity or expected return of the portfolio.

So, here if you see that like that the capital asset pricing model, we have developed the arbitrage pricing model, then we have the multifactor model etcetera, what we will discuss further, but still what we can say this is also one of the very big reason. We cannot blame only the market that because of these actually we are not getting excess return or the market is not efficient, that is why we are saying that some of them are getting abnormal return and some of them are not getting.

But most the cases also, the investor who specifies the model or the analyst to specify the model, they have not incorporated all variables which can have the impact on this return of the stock. So, in that case what happens, whatever expected return we calculated out of this, that may not be the actual return what or expected return what we could have expected to get it, if you invest in that particular stock.

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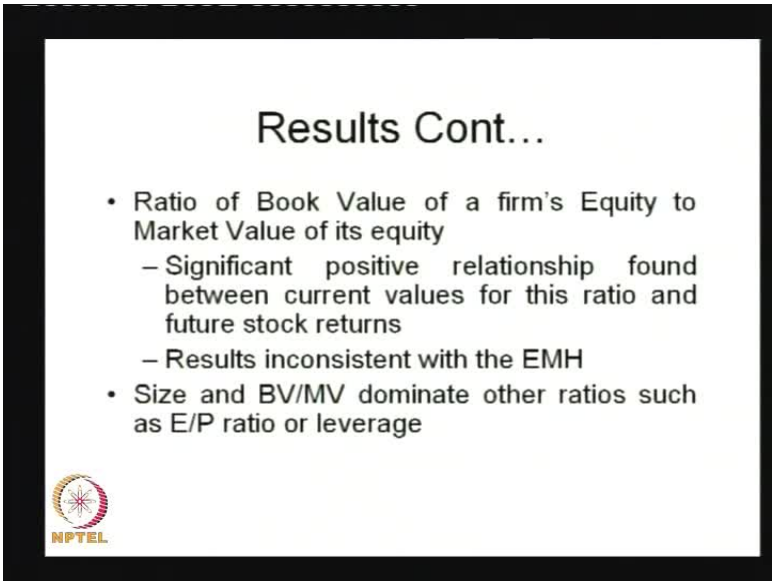

So, that is why there are both the reasons are quite relevant in this context that, whether it is because of your market is inefficient or whether the model is not correctly specified. Like that we can also see that the ratio of book value of a firm's equity to market value of its equity, we have seen that the significant positive relationship found between current values for this ratio and the future stock returns.

So, this result also is again inconsistent with the efficient market hypothesis, size and book value to the market value dominate other ratios such as price-earning ratio or the

leverage. What generally here the book value to the market value? So, it basically shows the growth opportunity of the company.

This is a proxy which is used to measure the growth opportunity of the company or the growth potential of the company, half of the company can grow. So, if the growth potential will be there and there is a probability that, the company can perform better in the market, obviously we can expect most return in the future.

May be return is today what you are getting from the company is less, but still there is chance that the company can grow further and there is still huge potential about that company which can perform in the market better. So, in that case what we can see, that always we can use also that is one of the very big parameter which can affect your shock return.

So, that should be incorporated in your model whenever you are calculating your expected return, if you do not say that or do not include that particular variable because in the CFA model, we do not include that one, we only include the beta or the systematic risk or we can argue that or the systematic risk or the market risk if the sole factor which affects the expect return of the stock.

Where that is not say so, always we can say that the there are certain other factors like you are already have seen the size of the company is a factor, market to book reserve is a factor or we can say the price-earning ratio is a factor, which can have the larger impact which can affect the stock return.

So, if you specify your model by incorporating all the variables which can or which can have the probable impact on this particular stock return, may be your model will be correctly specified. Then if you compare with your actual return with the expected return, then maybe we can conclude somewhere that, whether we are getting some excess return out of this or not. If you do not incorporate those variables to calculate your expected return, then it is quite difficult to say whether you are getting some high return out of these or not.

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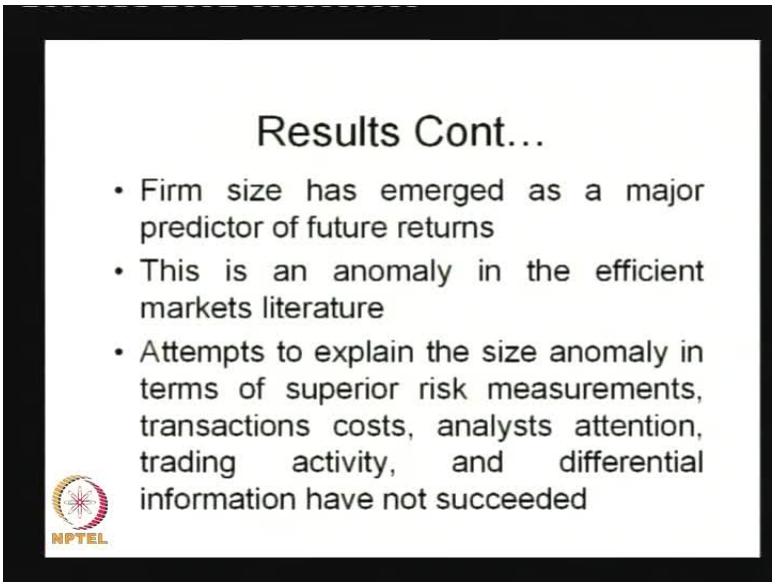

So, the firm size has emerged as a major predictor of the future returns what already I told you. So, this is an anomaly in the efficient market literature, which attempts to explain the size anomaly in terms of superior risk measurement, transaction cost, analyst attention, trading activity and differential information are not succeeded.

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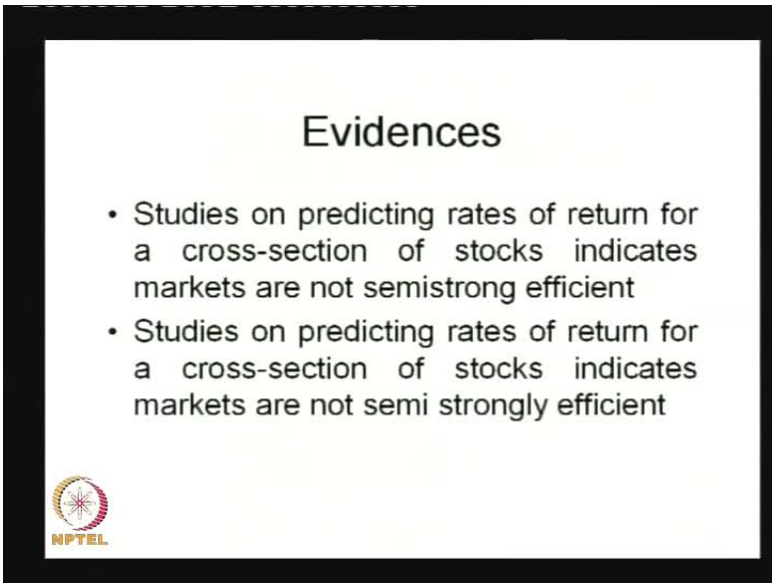

Studies on predictive returns for a cross-section of stocks indicate markets are not Semi-strongly efficient and studies on predicting rates of return for a cross-section of stocks indicate markets are not semi strongly efficient. That means, this was basically a

bubbling of this line, but basically what we can say that, then the evidences what we found that the studies have shown that most of the cases, if you study the cross-section of the stocks we found that the markets are not Semi-strongly efficient.

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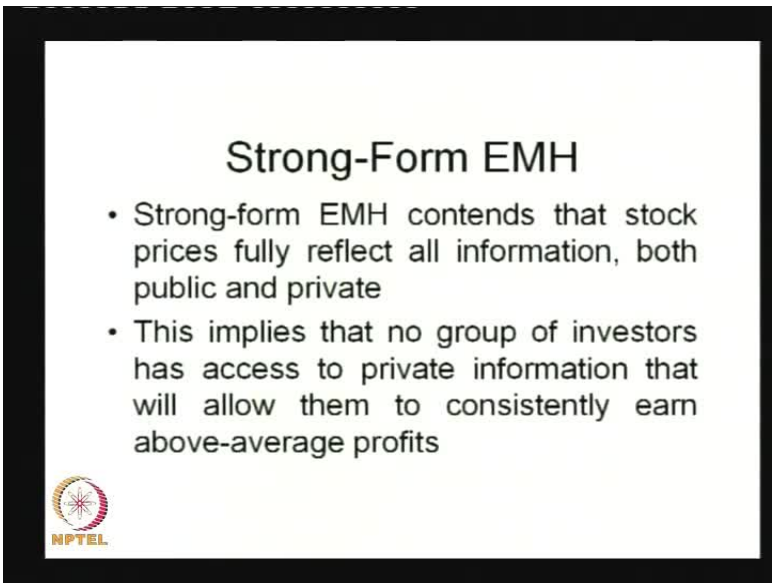

Then coming back to the strong-form of efficient market hypothesis. So, here what happens that the in the strong-form of efficient market hypothesis, it contains that the stock prices fully reflect all information both public and private, those part we have discussed very elaborately in the previous class or previous discussion.

So, here what it implies, it implies that no group of investors has access to private information that will allow them to consistently earn above average profits; that means, that should not be any kind of investor, any type of people who will there we can get excess return out of this particular investment, it is because that they have the larger or better access or private access to the company.

So, if any of the group of the investor or any group of the people can access to the market or can access to the information, which is not available to the public, then they can get some superior return out of this. So, that is why what you can say that, most of the cases what we find that, they should not get any excess return out of this or we can say that, the above average return, what if they will get some above average profits or

above average return from their investment, then we can say this market is not strongly efficient or we can say it is inefficient.

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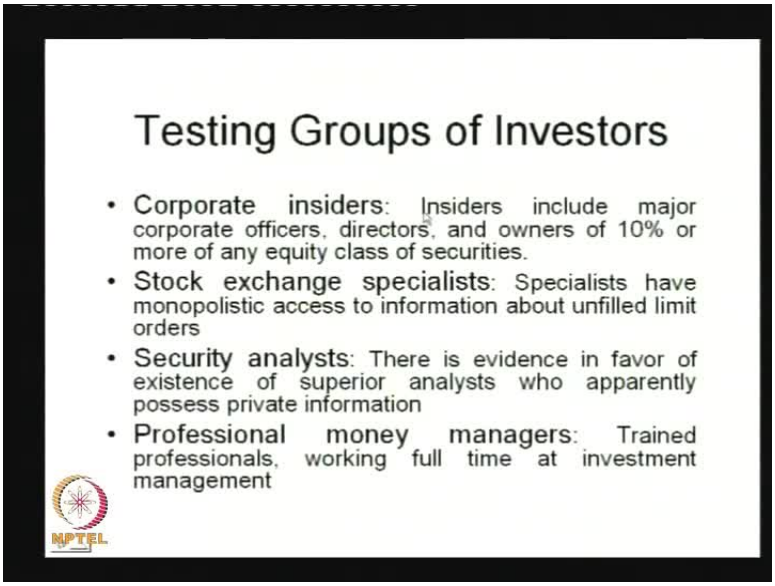

So, how we can test it? We can test it in the different ways: one way is basically we define the different specific groups of the investor, they are either they are the corporate insiders or they are the stock exchange specialists or they are the security analysts or the professional money managers. So, what generally we do? The corporate insiders include basically the major corporate officers, directors and owners of 10 percent or more of any equity class of securities.

Stock exchange specialist basically have the monopolistic access to information about unfilled limit orders and the security analyst, there is evidence in favor of existence of superior analysts, who apparently possess private information from the stock exchangers. Then the professional money managers, they are trained professionals working full time as the investment management. So, if you can categorize those type of groups, those type of investors who are coming under this category, then what generally we can do.

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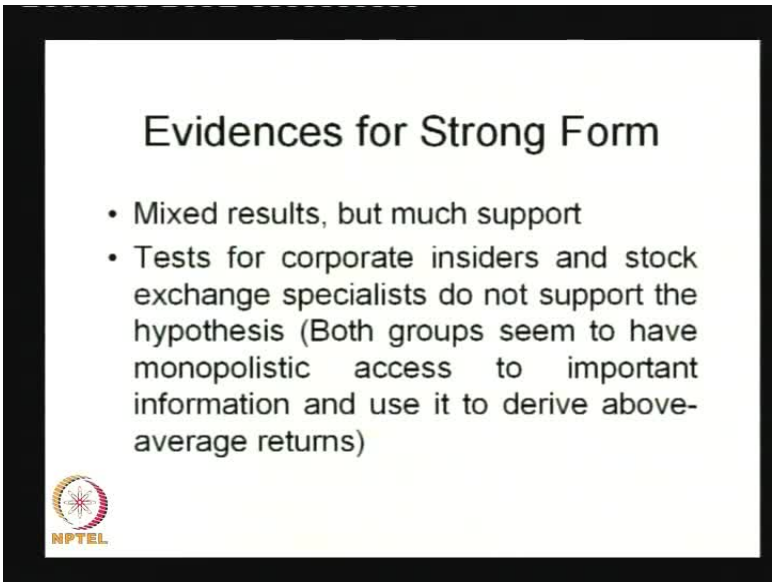

We just check that what is the return this type of people, either it is the money manager or the stock exchange specialist or it is the corporate insiders, how they are getting over the period of time? What is the excess return they are getting? So, if their excess returns what they are getting from the investment are quite high, what the other investors are getting, other investors are getting and they are getting back particular return very consistently, then what you can say that the market is not strongly efficient.

That means what you can say? All the information should not be categorized as public means, one of the information is public available, some of information is privately available and that is why they have the more information available to about the company, that is why they can get more return. So, if those people are consistently outperforming in the market, then we can say that the market is not Semi-strongly efficient or we can say it is inefficient.

What we found that mixed result, but much support; that means, we can say that the corporate insiders and stock exchange specialist do not support the hypothesis. So, that is why both groups seems to seem to be have monopolistic access to important information and that is why they use it to derive the above average returns, the no market in the world which is strongly efficient.

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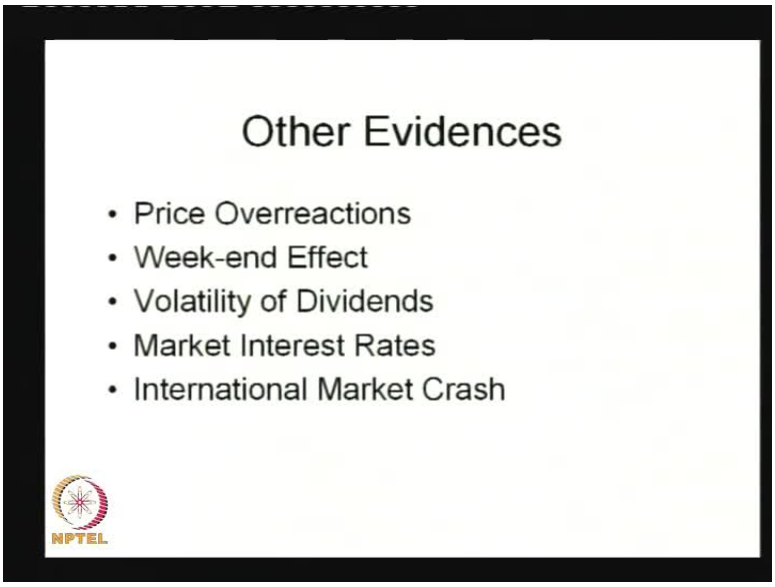

So, other evidences also or the other figures also, the other parameters also sometimes we take like your price overreactions sometimes we find in the market, some of the stocks are highly overpriced or the lower priced and they shows sometimes the overreaction in the market.

We can in fact, sometimes we see that the whatever price level was there in the Friday and once the Saturday, Sunday this trading will be closed in the Monday whenever it will be open, the price will be different and most of the people have seen that trend and if that trend can be utilized and can be used in the trading philosophy or the trading strategy. So, most of the investors can get high return out of this.

Then the volatility of dividends, sometimes we find that some of the companies pay very consistent dividends every year and some of the companies do not pay the dividends every year or there is no consistent growth rate of the dividends available for those companies. So, from there also the investors can predict about the potential of the company or the probability probably return from that particular company. So, if that kind of information will be used in or not used in a very uniform manner to everybody, then sometimes you can get some abnormal return from this dividend volatility or the growth rate of the divided volatility.

But those kind of thing never prevails in the today scenario, but basically these are also the one of the factors which can also play the role to determine the efficiency of the market. And the market interested because, the interested scenario today is this is a most of the interest rates are market determined.

So, sometimes what is the analyst do? They see that how the interest rate is behaving and if you can predict about the interest rate in what direction it is going to change, then from there also you can predict about some of the information and in that case also, some investors can get high return than the other investors. So, that case also, we can say that is we can say this is also another anomaly what or other evident is through which you can test whether your market is efficient or not.

Another thing is your international market cross like your south east Asian crisis or it is today's financial crises, you from there also you can find out or you can extract some of the information by which you can say that whether your market can perform better or the particular stock can be perform better or not.

So, here what generally we can say? Basically, we can say that there are certain parameters, what generally we use always to test or to predict about the market and once we can predict about the market better than the other investors, then we can get some of abnormal return out of these and if that kind of thing prevails then obviously, your market cannot be efficient.

So, in general we can say if your market will be efficient, then most of the investors or the people who participate in the financial market or particularly in the capital market, they should get the some kind of average same average excess return. So, that is why at least, we cannot say that somebody has the better information that is why they are out performing in the market, then somebody has not that information that is why they are not able to outperform in the market.

So, in this context what we can say, that it is basically talks about the testing of the different form of efficiency, where we incorporate a largely the information has a sole parameter, which says that whether your market is efficient or not.

So, once we know is your market is efficient or not, then the other approaches or other techniques what we use to test our or to know whether you go for trading or not and which stocks should be sold which stocks should be bought. So, those analysis basically is the part of the security analysis what we will be discussing in further sessions, thank you.