Security Analysis & Portfolio Management
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Lecture 57
Efficient Market Hypothesis I

Welcome back, so let us continue from where we left off. In the last lecture, I was talking about the various approaches to the appraisal, or the evaluation of portfolios, in the context of their performance. So, the first and the simplest and the most elementary approach is to have a direct comparison, you identify certain portfolios with similar risk characteristics. And then you compare their respective returns.

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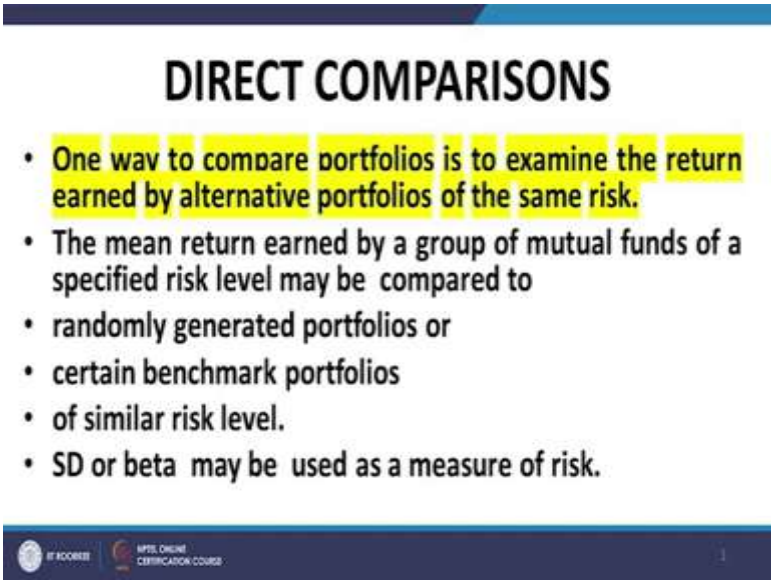

Either you can have randomly generated portfolios for the purposes of comparison, or you could use certain benchmark portfolios. And then you compare the returns that have been achieved on these portfolios, the benchmark, or the random portfolio, as the case may be with the target portfolio, which you are planning to evaluate. So, that is the simplest simplistic and a direct approach.

The other approaches relate on certain parameters. The simplest of these is the one parameter approach, that uses the sharp ratio, or the trainer ratio, or the Jensen's measure, that is the differential return measure. Let us now talk about each of them.

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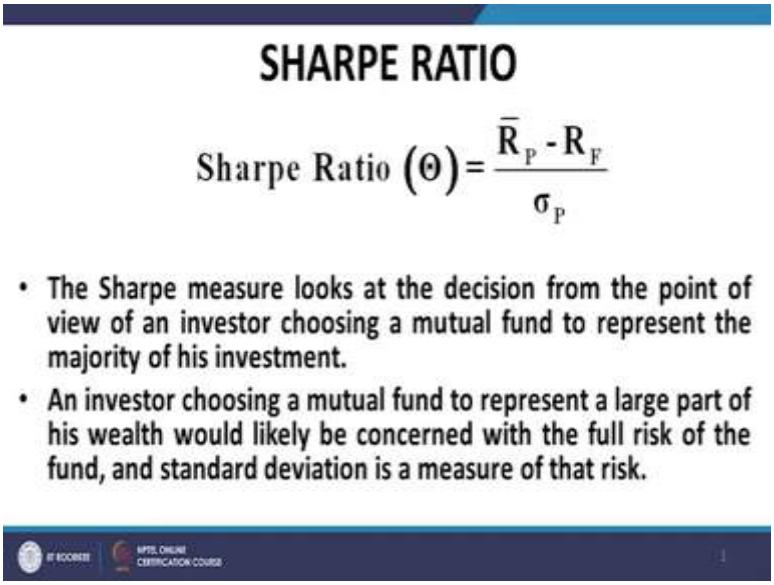

The sharp ratio as we have discussed in several context is simply the excess return on the portfolio, or the set of securities, per unit of the standard deviation, that is it is given by this access return Rp minus RF upon sigma p, this is the sharp ratio.

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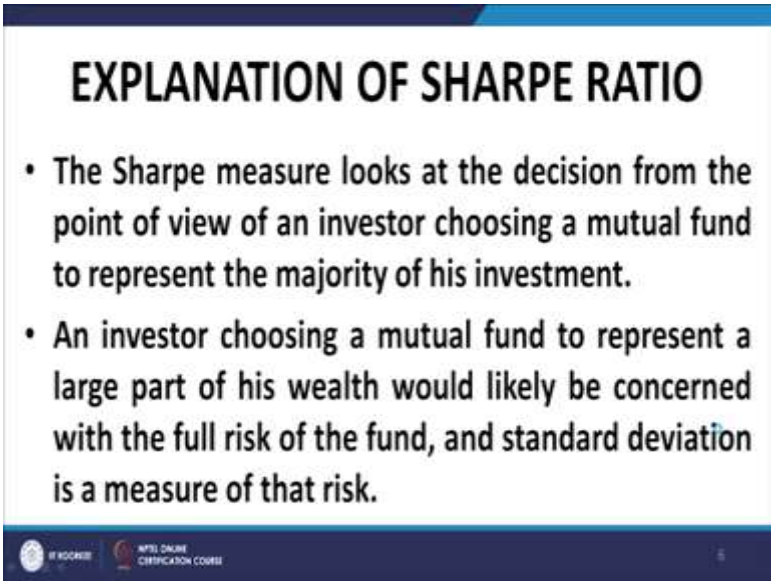

Now, as far as the sharp ratio is concerned, or the sharp measure is concerned, it looks at the decision from the point of view of an investor, who chooses a mutual fund to represent the majority of his investment. An investor who chooses a mutual fund to represent a majority, or a

large part of its wealth would be concerned with the total risk rather than only the systematic risk. And accordingly, would choose the standard deviation as the relevant measure of risk than the beta risk.

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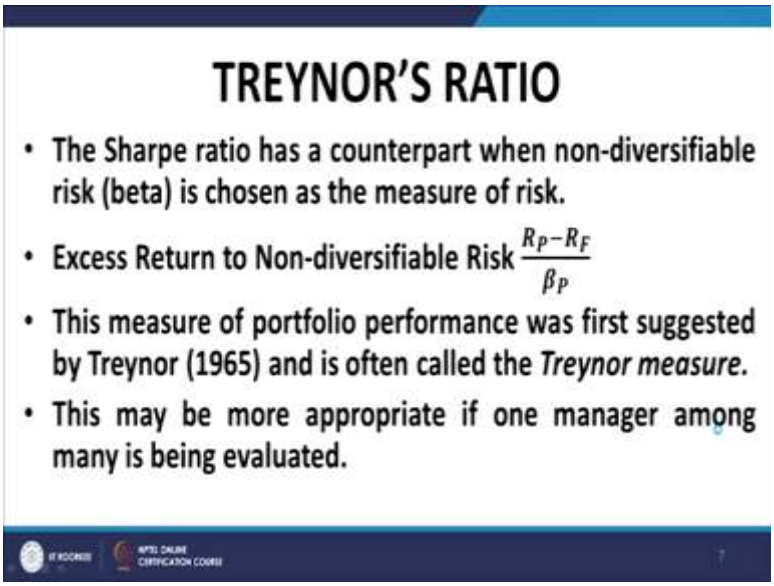

Then the other approach, that I mentioned just now is the Treynor approach, where the measure of risk is taken as the systematic risk, the beta risk and then again we compute the ratio of the excess return per unit of beta risk. So, we define this Treynor measure in terms of the ratio Rp minus Rf divided by beta p, where beta p is the beta of the portfolio, that is to be evaluated and Rp is the return, that has been generated on that portfolio Rf is the risk free rate.

Now, this measure of portfolio performance was first suggested by Treynor, in 1965 and is often called the Treynor measure. And this is more appropriate, when one manager among many are being evaluated.

Now, let us look at this ratio a little bit more closely, let us work in the beta expected return space. Now, all combinations of the risk-free rate and a given portfolio, let us call it a, or a security you may take a security, or a portfolio either way, the linear combinations of the risk free rate and the security, or the portfolio a, would lie along a straight line with joints, these two points let us call this line Fa.

Then the slope of this line is obviously R a minus R f upon beta a, because the beta of the risk free, risk free asset is 0 invariably 0, as is the standard deviation in fact. And the y intercept of

this particular line Fa will be the risk free rate Rf. So, the point is that all the points of combinations of the given asset, or the given portfolio and the risk free rate will lie along the straight line joining the two.

Now, the investor would obviously prefer, that particular portfolio a, for which this particular this straight line has the maximum slope. We have discussed at this point in the context of mean variance portfolio optimization, the same rationale carries on to this particular measure of Treynor's ratio.

And at the end of the day, what we conclude is that, the investor would like to choose that portfolio, which gives you the highest Treynor's ratio, because the Treynor's ratio represents the slope of this particular line, in beta expected return space and you want to maximize, that particular, the slope of that particular line.

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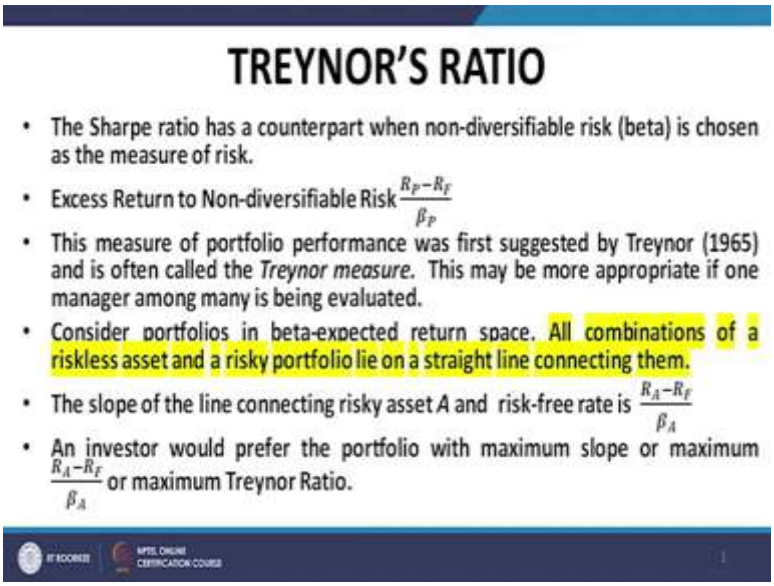

So, that being the case an investor would prefer the portfolio with the maximum slope, or the maximum value of Ra minus Rf, or maximum Treynor's ratio. So, that gives a rational for using this Treynor's ratio as a measure of portfolio performance.

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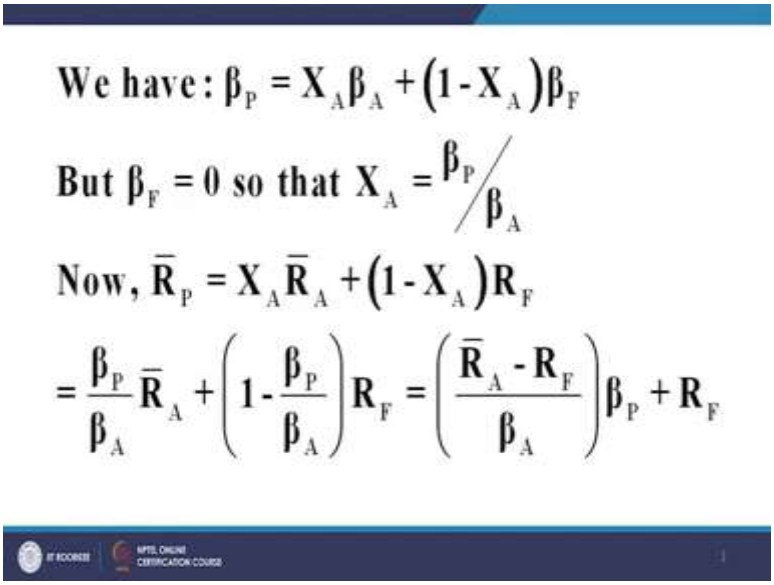

This is the derivation of the equation of that line Fa, as I mentioned the line that joins, the joint the rest free rate with the point that represents the portfolio a in beta expected return space.

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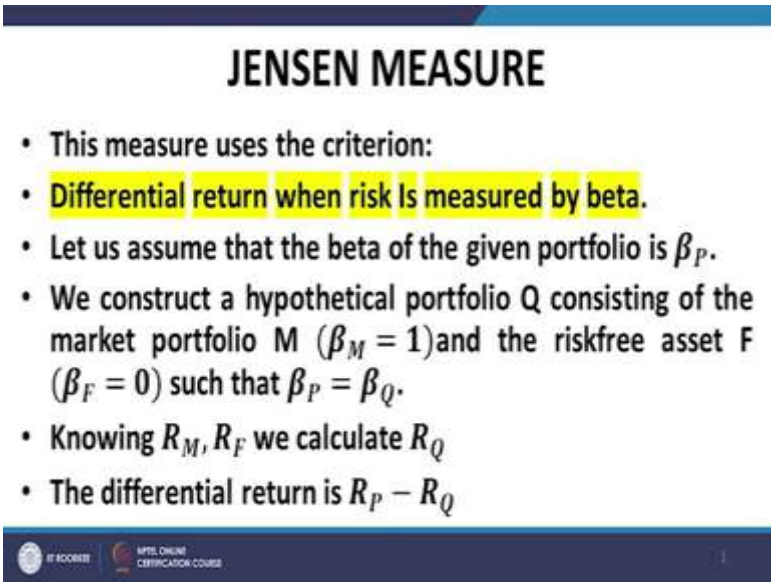

Then we talk about the Jensen measure, the Jensen measure attempts to compare the differential returns. Now, what is differential return? The differential return on a portfolio is the for the purpose of computing the differential return on a portfolio, if we construct a hypothetical portfolio Q, given a portfolio P, we construct a hypothetical portfolio Q. What is the property of Q?

The property of Q is that the beta value of p is equal to the beta value of Q, in other words the systematic risk content of the given portfolio is mimicked, or is represented by the systematic risk of the given portfolio Q. But, the portfolio Q has another property, it comprises of a linear combination of the risk free asset and the market portfolio. And therefore it is an efficient portfolio, the entire risk of this portfolio Q is its systematic risk, it has no unsystematic risk.

So, in other words, what we are doing is we are constructing a portfolio Q, which is efficient and the risk of which comprises only of systematic risk is equal to the risk of p. The systematic risk of p, then we work out the return on the portfolio Q, on the basis of the equation Fp that or Fm, as the case may be, that we have already seen in the previous measure in the Treynor measure in beta expected return space, having obtained the return on the portfolio Q, we simply work out the return Rp minus RQ, this is called the Jensen's differential return.

In other words Jensen's differential return is the excess return, is the excess return of the given portfolio p, over hypothetical portfolio Q which has the same level of systematic risk as the portfolio p, but which is an efficient portfolio, which is a linear combination of the market portfolio and the risk-free asset.

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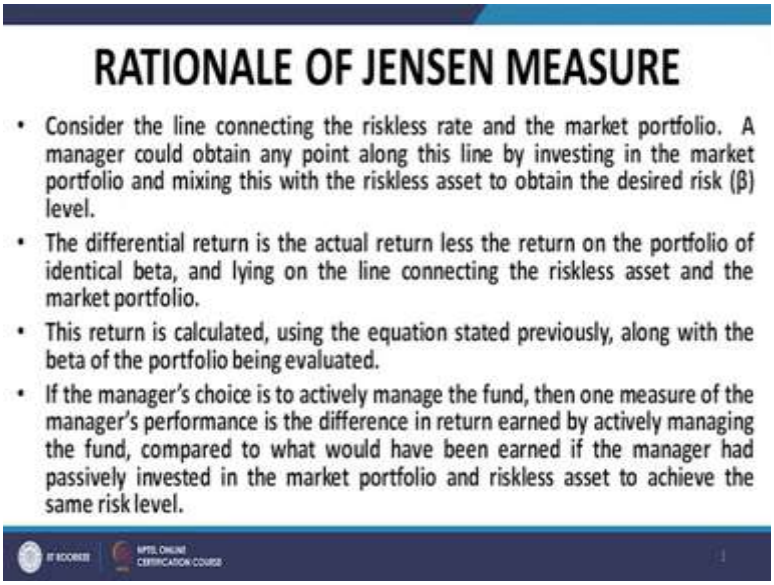

The rationale of the Jensen measure, as I mentioned as I explained just now we suppose, we consider the line joining the riskless asset and the market portfolio, then a manager a portfolio

manager could obtain any point along this line, the line F m by investing in the market portfolio and mixing this with a riskless asset to obtain the desired beta level.

The differential return is the actual return on the portfolio p, that is the given portfolio the target portfolio, the portfolio being evaluated less the return on the portfolio of identical beta, that is the portfolio Q. And lying on the line connecting the riskless asset and the market portfolio, that is the line Fm.

This return is calculated using the equation stated previously, I mentioned that. What is the equation? The equation has a slope of Rm minus Rf divided by beta and beta m beta m is 1 of course and the y intercept is the is the risk free rate. So, this return is calculated using the equation stated previously, along with the bit of the portfolio being evaluated.

If the manager's choice is to actively manage the portfolio, then one measure of the manager's performance, that is the differential return measure, is the difference in return earned by actively managing the portfolio compared to what would have been earned, if the manager are passively invested in the market portfolio and the riskless asset to achieve the same risk level, as represented by beta.

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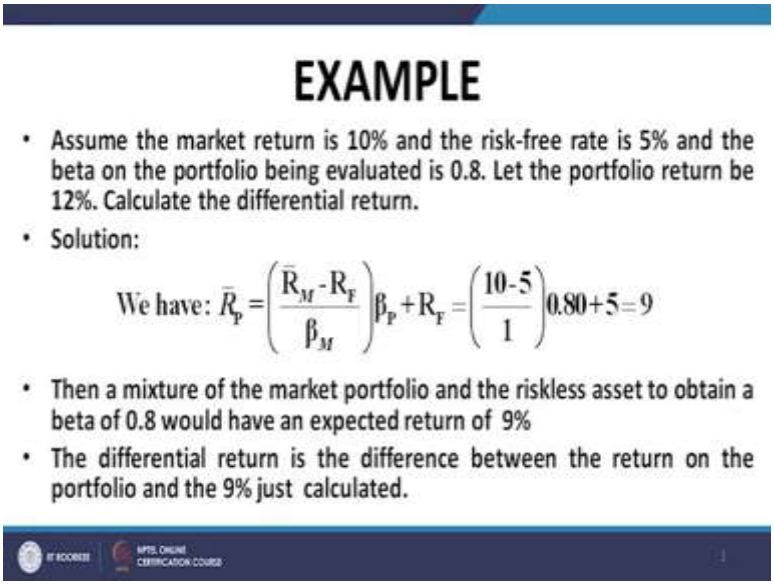

Let us do an example on this. Assume that the market return is 10 percent and the risk free rate of return is 5 percent, the beta of the given portfolio that is being evaluated is 0. 80. Let the

portfolio return be 12 percent. Calculate the differential return. It is quite straightforward we are given the market return and we are given the risk free rate.

So, we can work out the equation of the line F m, we are given the beta of a given portfolio. So, we can work out the return on the given portfolio, on the portfolio of Q, which has the same beta as the given portfolio and lies on this line Fm. Then Rp minus RQ is the differential return.

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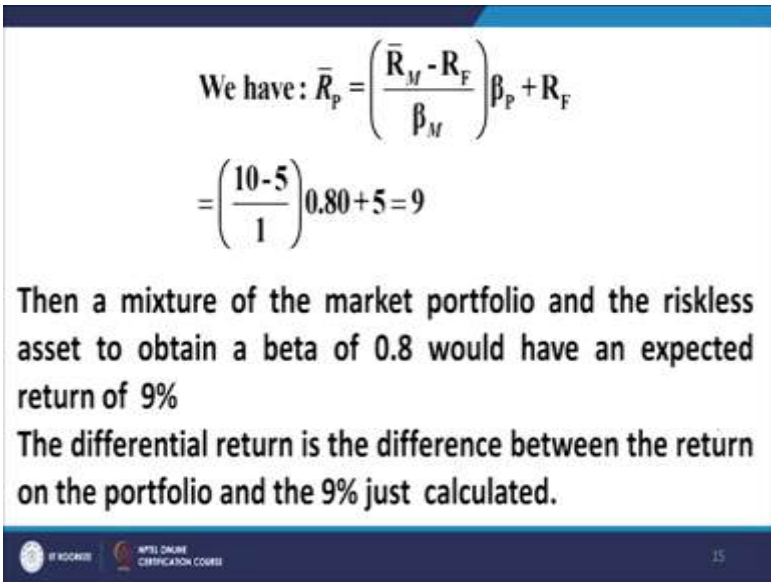

So, the working is given here, the equation of the line that I was talking about is equal to Rp is equal to RM minus RF upon beta M into beta P plus RF beta M is 1. So, we have 10 minus 5 upon 1 into 0.80 plus 5, that is 9 percent. So, in other words, if the portfolio Q, that has a systematic risk content equal to the systematic risk content of our gain portfolio p would have had a return of 9 percent. So, the excess return is 12 percent minus 9 percent that is 3 percent.

So, a mixture of the market portfolio and the riskless asset to obtain a beta of 0.8 would have an expected return of 9 percent as shown in this brief summarized calculation. The differential return is the difference between the return on the portfolio that is 12 percent and the 9 percent that we have just calculated.

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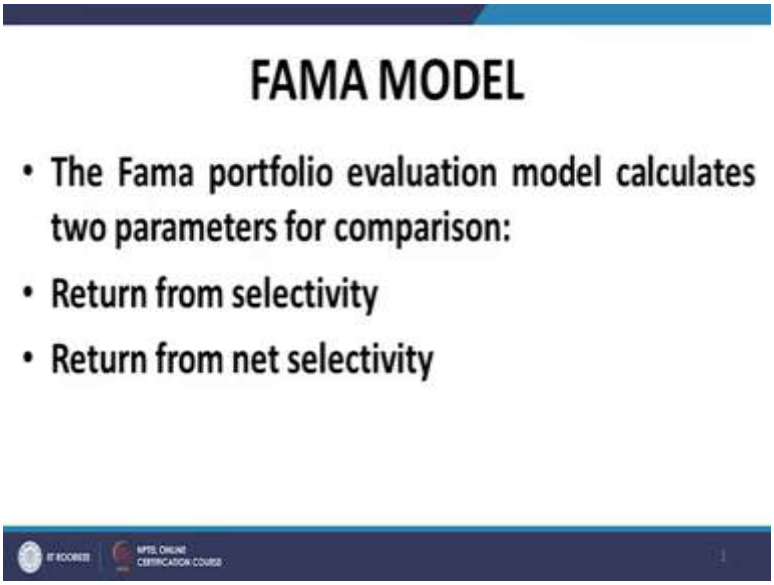

Now, we talk about the Fama model. The Fama model is a two parameters model. So far whatever we have discussed is either the direct approach, or one parameter model. The Fama approach uses two parameters and the two parameters are termed as the return from selectivity and the return from net selectivity.

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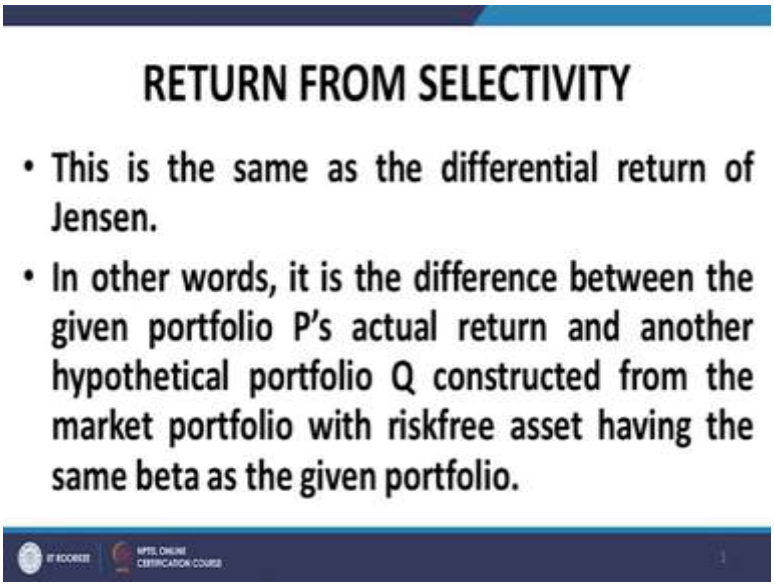

As far as the return from selectivity goes, it is identical to Jensen's differential return, that I have just discussed quite elaborately. So, as far as the return from selectivity is concerned, it is the difference between the given portfolio P's actual return and another hypothetical portfolio Q

constructed from the market portfolio, whether it is free asset having the same beta as the given portfolio, notated lie is on the line Fm, but it has a beta value equal to the value of the beta of the given portfolio P and the difference between the returns RP and RQ and give us the return from selectivity.

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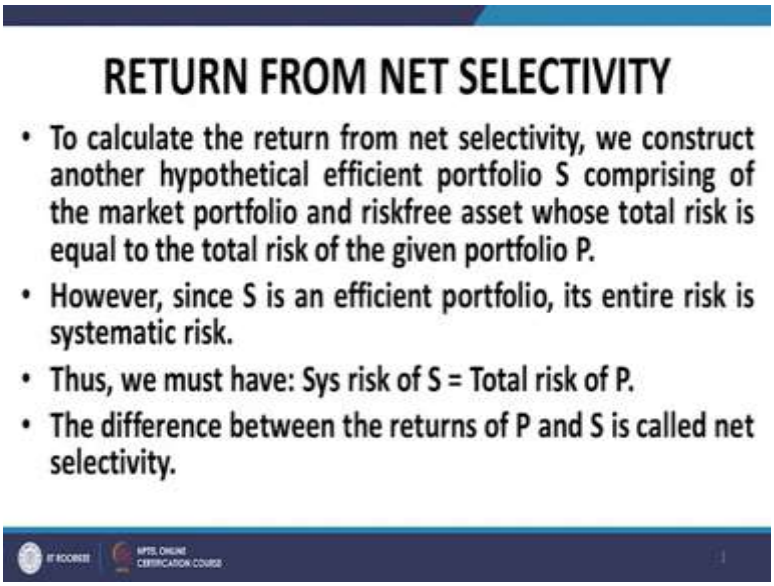

The return from net selectivity is a bit more interesting, the return for net selectivity is calculated as the for the purpose of calculating the return from net selectivity, we construct a new portfolio, as a hypothetically, we construct a new portfolio S. What is the property of the new portfolio S? The property of this new portfolio S is number one, it is an efficient portfolio. So, it lies on the line FM, where M is the market portfolio, F is the rest free rate. So, it is a combination of the market portfolio and the risk-free asset that is one property.

The second property is that, as far as the risk of this portfolio as is concerned, the risk of this portfolio S is equal to the total risk of portfolio P, total risk of the portfolio, that is given to us that is being evaluated that is portfolio P. So, the risk of S is equal to the risk of P, but the risk of S is entirely captured by its systematic risk, it has no unsystematic risk, because it is a efficient portfolio.

Since S is an efficient portfolio, the entire risk is systematic risk and therefore what we obtain is the systematic risk of S is equal to the total risk of P, from this from equating these two, we are able to obtain the beta value of the systematic risk S of the of S. And having obtained the beta

value of S, we are able to obtain the corresponding return on S by locating the point on the straight line FM extended if required.

So, let me repeat the procedure, the fundamental point is that the total risk of the portfolio P is equal to the risk of an efficient portfolio, which comprises only of systematic risk, which is equal which we call the portfolio S. So, because the total risk of portfolio P is equal to the systematic risk of S, we can obtain the beta value of S by equating sigma P square is equal to beta S square sigma M square, that gives us the, or that enables us to obtain the value of beta S, knowing the beta value of S, knowing the equation of the line FM, we can find out the return corresponding to the risk of the portfolio S.

And the difference between P and S, or the returns on P and S, that is RP minus RS is the return from net selectivity.

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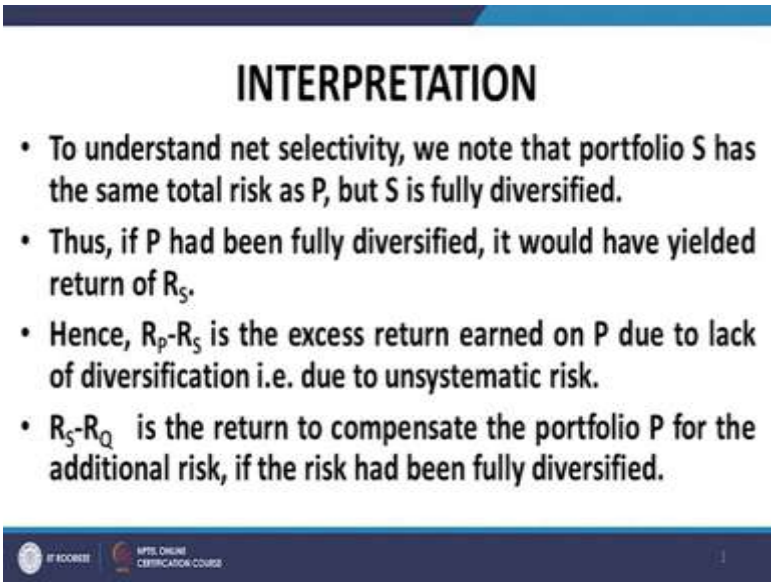

So, what is the interpretation of this net selectivity? To understand net selectivity, we note that the portfolio S has the same total risk as P and is fully diversified. It has no unsystematic risk. Thus a P would have been fully diversified, it would have yielded the return RS. Therefore, RP minus RS is the excess return earned on P due to lack of diversification, that is due to the unsystematic risk.

So, this is the interpretation of the return from net selectivity, in and as far as the figure RS minus RQ is concerned, it is the return to compensate the portfolio P for the additional risk, if the risk had been fully diversified. So, this is as far as the interpretation of the Fama model goes.

Now, we move on to a new topic, that is called the efficient market hypothesis abbreviated as EMH. I had given a brief intro about this particular concept, which is literally all pervasive in the finance literature, a lot of work, a lot of pricing strategies are worked on the basis or on the presumption, that the markets, that are in the financial sector are highly efficient and on that basis we work out the pricing exercises of various financial products. So, let us understand what we mean by essential markets hypothesis?

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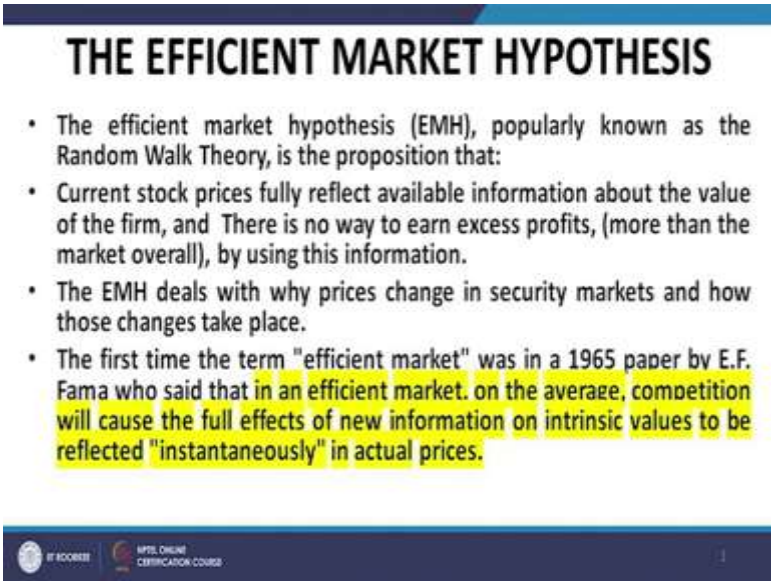

The efficient market hypothesis EMH, I shall briefly use this abbreviated form EMH, popularly known as the Random Walk Theory, as well it is sometimes termed as a random walk theory, although they do not convert exactly the same thing. The difference will come to know in the course of the following discussion is the proposition, that current stock prices fully reflect available information about the value of the firm, current stock prices fully reflect available information about the value of the firm. And there is no way to earn excess profits more than the market overall by using this information.

So, the effective market hypothesis deals with why prices change in security markets and how those changes take place. So, and the first time the EMH was propounded was propounded in

1965, in a paper by professor E F Fama. Fama cited the efficient market hypothesis describing it as, in an efficient market on the average competition will cause the full effects of new information on intrinsic values to be reflected instantaneously in actual prices. So, that is the concept of efficiency, that was propounded by Fama, and which is more or less as it stands as of now.

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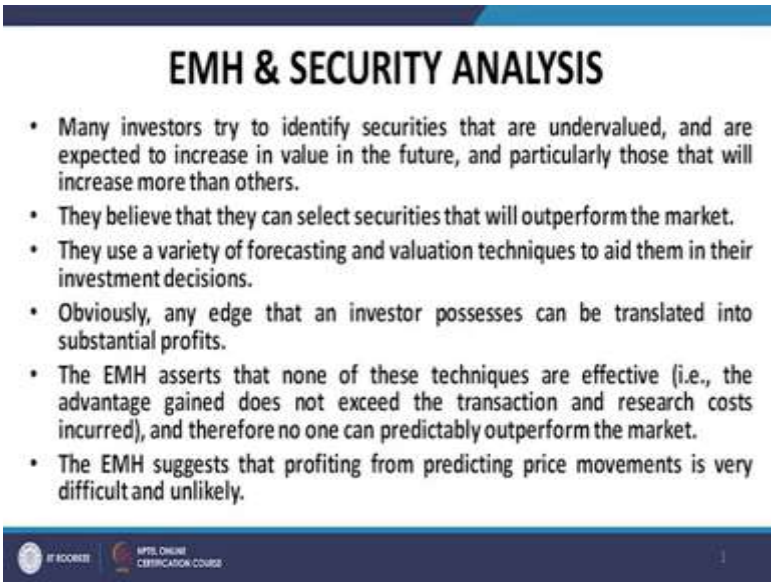

So, the relationship between EMH and security analysis. Many investors try to identify securities that are undervalued and are expected, that they perceive as undervalued and are expected to increase in value in the future, in particularly those, that will increase more than others. They believe that they can select securities that will outperform the market. The use of variety of forecasting and valuation techniques to aid them in their investment decisions. Obviously, any edge that an investor possesses can be translated into substantial profits.

Now, what does the EMH say about this set of propositions? It says that none of these techniques are effective, that is the advantage gained does not exceed, the transaction and research costs incurred, and therefore no one can predictably outperform the market. The effective market hypothesis suggests, that profiting from predicting price movements is very difficult and unlikely. The affected market hypothesis and prices.

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What is the relationship between the current market prices and what the EMH has to say about the current market prices? At any point in time, prices of securities in efficient markets reflect all known information available to investors. The main engine behind price changes is the arrival of new information, this is very important. The main engine behind price changes is the available of new in is the arrival of new information into the market.

A market is said to be efficient, if prices adjust quickly and on average without bias to new information. As a result the current prices of securities reflect all available information at any given point in time. Consequently, there is no reason to believe, that prices are too high, or too low. Security prices adjust before an investor has time to trade on and profit from a new piece of information. Thus, the most crucial implication of the EMH can be put in the form of a slogan, trust market prices, trust market prices.

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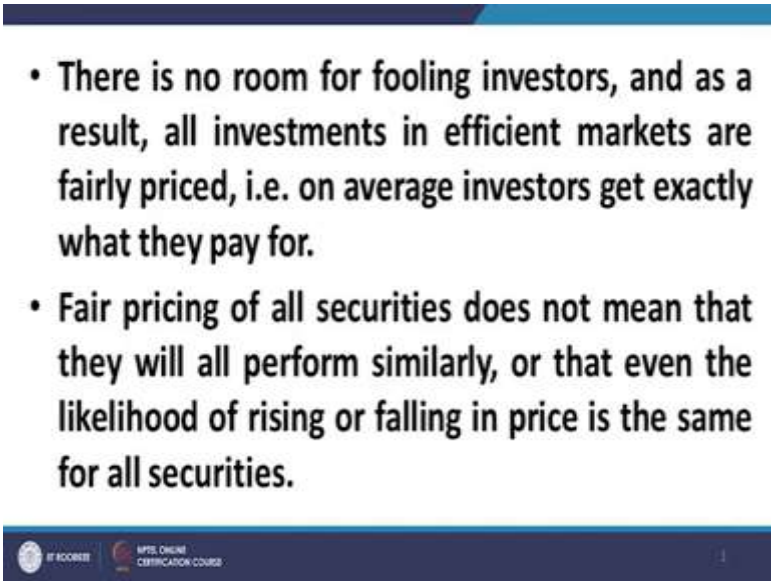

There is no room for fooling investors, and as a result, all investments in efficient markets are fairly priced, on average investors get exactly what they pay for. This is the bottom line of the efficient market hypothesis. Fair pricing of all securities does not mean, however that they will perform similarly, or even that the likelihood of rising, or falling in price is the same for all securities. However, it means that, the average, on the average the investors get exactly what they pay for.

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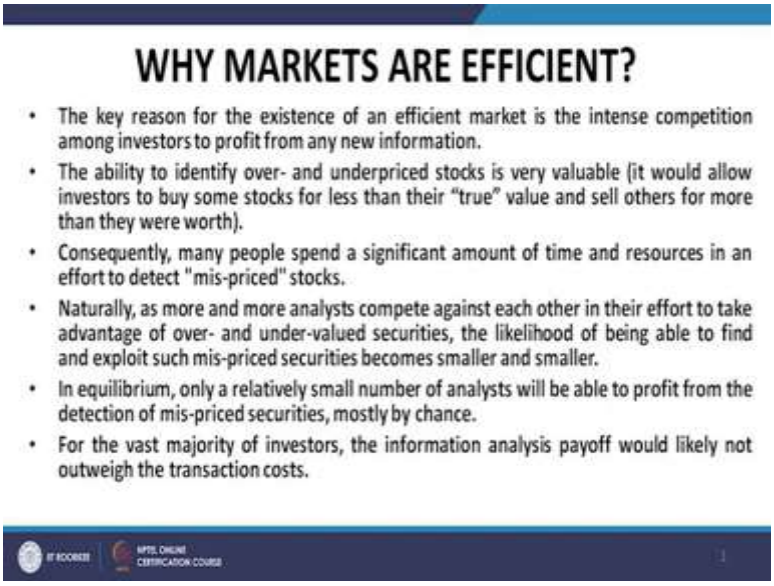

Why markets are efficient, this is a fundamental question that needs to be answered. So, let us answer this question. The key reason for the existence of an efficient market is the intense competition among investors to profit from any new information. The key reason for the existence of an efficient market is the intense competition among investors to profit from any new information.

The ability to identify over an underpriced stocks is very valuable, it would allow investors to buy some stocks for less than their true value, and sell others for more than what they were worth. Consequently, many people spend a significant amount of time and resources in an effort to detect mis-priced stocks. Naturally, as more and more analysts compete against each other in their effort to take advantage of over and under-valued securities, the likelihood of being able to find and exploit these mis-priced securities becomes smaller and smaller.

So, this is the intensity of the competition, which results in the markets being efficient. In equilibrium only a relatively small number of analysts would be able to profit from the detection of mis-priced securities, mostly by chance. For the vast majority of investors, the information analysis payoff would likely not outweigh the transaction cost. EMH and the random walk. What is the relation between EMH and the random walk?

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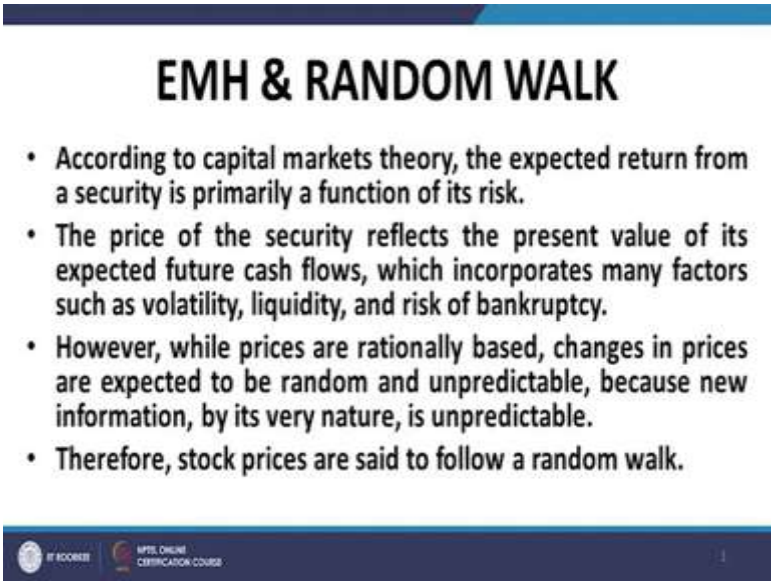

According to capital market theory, the expected return from a security is primarily a function of its risk. The price of a security reflects, the present value of its expected underlying, expected

future cash flows, which incorporates many factors, such as volatility, liquidity, and risk of bankruptcy. However, while prices are rationally based, changes in prices are expected to be random and unpredictable. Why? Because, new information by its very nature is unpredictable.

Now, there are two things here, number one that, the changes in prices arise, or occur in consequence to new information percolating into the market. And number two, this new information is by and large random and consequently the changes in prices are also random. Therefore, stock prices are said to follow a random walk.

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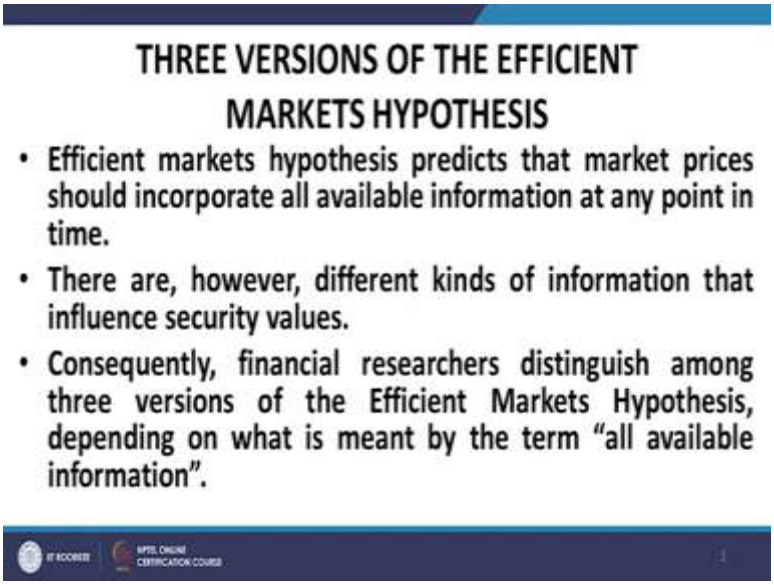

The three versions of the efficient market hypothesis. Now, efficient market hypothesis EMH predicts, that market prices should incorporate all available information at any point in time. So, based on what we exactly mean by available information, there have been the EMH has been classified into three forms, the weak form, the semi strong form, and the strong form. I repeat on the basis of the definition, that we attribute to the term information in this first sentence, leads to the classification of EMH into three forms, the weak form, the semi strong form, and the strong form.

So, there are however different kinds of information, that influence security values. Consequently, financial researchers distinguish among three versions of the efficient market hypothesis, depending on what is meant by the term all available information.

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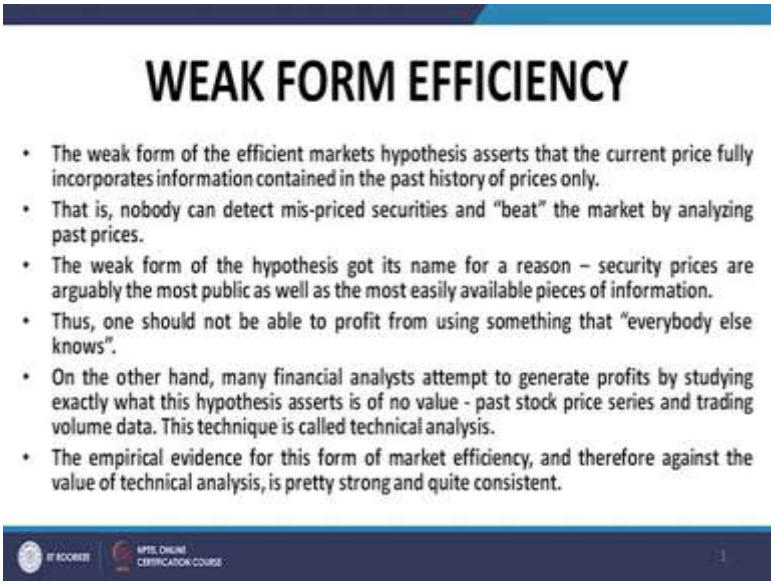

What is weak form efficiency? The weak form of the efficient market hypothesis asserts, that the current price fully incorporates information contained in the past history of prices. I repeat this important sentence, the weak form of the efficient market hypothesis asserts, that the current price fully incorporates information contained in the past history of prices, that is nobody can detect mis-priced securities and beat the market by analyzing past prices.

The weak form of the hypothesis got its name for a reason, what is that reason? Security prices are arguably, the most public as well as the most widely available pieces of information. Thus, one should not be able to profit from using information, or using something, that everybody else knows. This is the philosophy of the weak form of the efficient market hypothesis. On the other hand, however many financial analysts attempt to generate profits by studying exactly, what this hypothesis asserts is of no value, past stock price series and trading volume data.

This technique is called technical analysis, I have referred to it briefly in an earlier lecture. But the EMH goes in contra distinction to this philosophy of profiting from technical analysis, EMH clearly says, that you would you are not likely to profit from technical analysis, at least on a consistent basis. It may be the occasional flutter that you earn profits from technical analysis, but on the overall you will not be able to earn consistent profits from analysis of past price data.

The empirical evidence for this form of market efficiency, and therefore against the value of technical analysis is pretty strong and quite consistent. After taking into account transaction costs

of analyzing and of trading securities, it is very difficult to make money on publicly available information, such as the past sequence of stock prices.

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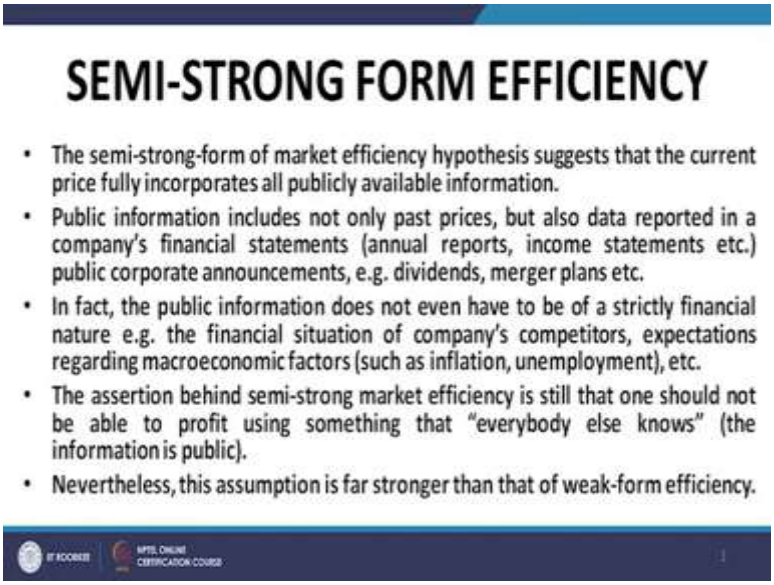

The semi strong form efficiency, the semi-strong form of market efficiency hypothesis, suggests that the current price, fully incorporates, all publicly available information, please note the difference here lies the difference between the weak form and the semi-strong form. In the weak form of the efficient market hypothesis, the focus was in current prices. In the semi-strong form, the focus is on all publicly available information.

Now, this has been expanded in the next sentence. Public information includes not only past prices, but also data reported in a company's financial statements, annual reports, income statements, public corporate announcements, like dividends, bonus issues, merger plans, and so on.

In fact the public information does not even have to be of a strictly financial nature, I repeat the public information does not even have to be of a strictly financial nature, for example the financial situation of a company's competitors, expectations regarding macroeconomic variables, macroeconomic factors, like inflation, unemployment, exchange rate, etcetera.

The assertion behind the semi-strong market efficiency is that one should not be able to profit using something, that everybody else knows. The information is public, please note that, we are

talking about public information. Nevertheless, this assumption is far stronger than that of weak form efficiency, which focuses solely and purely on the past price history.

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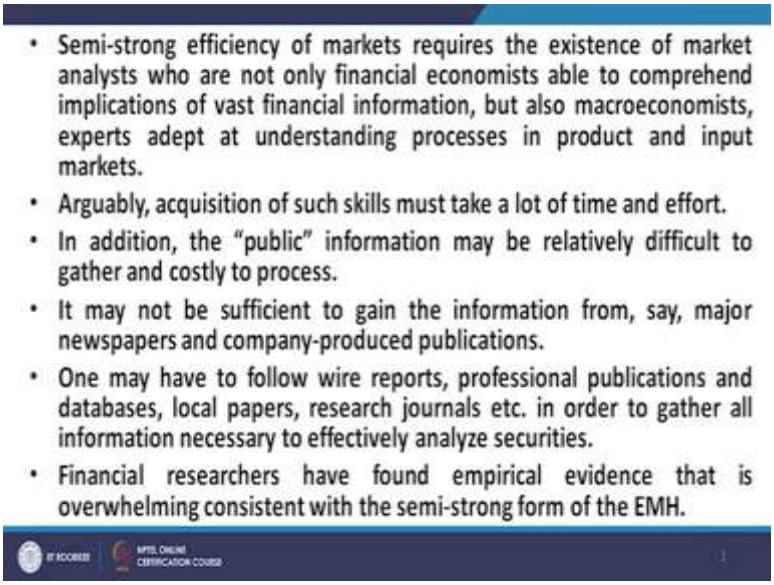

Semi-strong efficiency of markets requires the existence of market analysts, who are not only financial economists able to comprehend implications of vast financial information, but also macroeconomists experts adept at understanding processes in product and input markets.

Arguably, acquisition of such skills must take a lot of time and effort. In addition the public information may not be may be in addition, the public information may be relatively difficult to gather and costly to process.

It may not be sufficient to gain the information, from say major newspapers, and company produce publications. One may have to follow wire reports, professional publications and databases, local papers, research journals, etc. In order to gather all information necessary to effectively analyze securities.

Financial researchers have found empirical evidence, that is overwhelmingly consistent with the semi-strong form of the efficient market hypothesis. Now, we talk about the strong form of the EMH.

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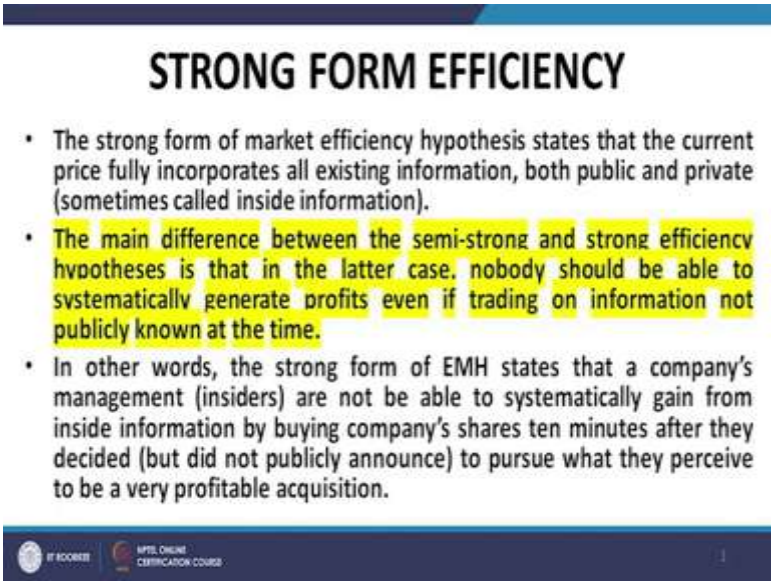

The strong form of market efficiency hypothesis states, that the current price fully incorporates all existing information, both public and private sometimes called inside information. The main difference between the semi-strong and the strong efficiency hypothesis is that the later in the latter case, nobody should be able to systematically generate profits even if trading on information not publicly known at that time.

Let me repeat, this is the fundamental difference between the earlier two versions, that is the weak form and this and the semi-strong form. The main difference between the semi-strong and the strong efficiency of hypothesis is that, the latter case, that is the strong form, nobody should be able to systematically generate profits, even if trading on information, not publicly known, not underlined highlighted emphasized, publicly known at that time.

In other words, the strong form of the EMH states, that a company's management insiders, that is are not able to systematically gain from inside information by buying company shares ten minutes after they decided, but did not publicly announce to pursue, what they perceive to be a very profitable acquisition.

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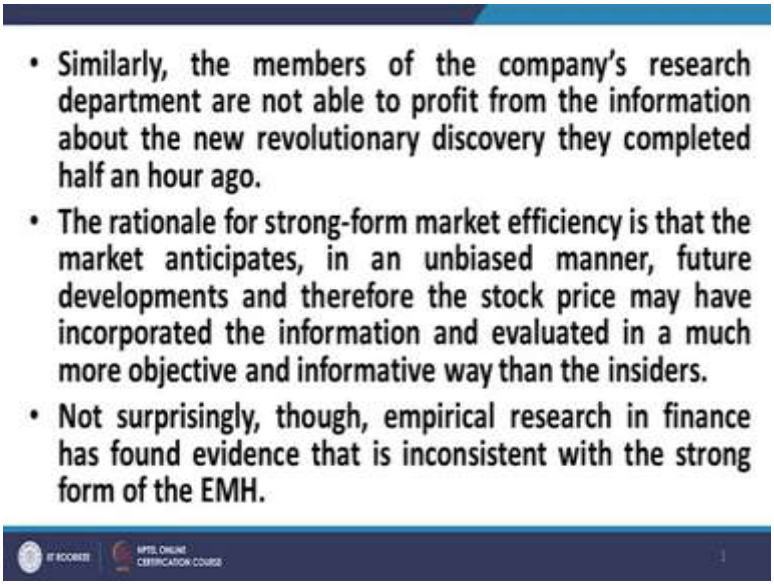

Similarly, the members of a company's research department are not able to profit from the information about a new revolutionary discovery they completed half an hour ago. The rational for the strong form market efficiency is that, the market anticipates in an unbiased manner, future developments and therefore the stock price may have incorporated, the information and evaluated in a much more objective and informative manner than the insiders.

So, this is the rational, this is the fundamental reasoning on the premise of which the strong form of the market hypothesis was propounded. Let us go through it again, the rational for the strong from market efficiency is that, the market anticipates in an unbiased manner, future developments and therefore the stock price may have incorporated, the information and evaluated in a much more objective and informative way than the insiders.

Not surprisingly, though, empirical research in finance has found the evidence, that is inconsistent with the strong form of the EMH. So, from here we take a break and after the break will continue with the discussion. Thank you.