Security Analysis and Portfolio Management
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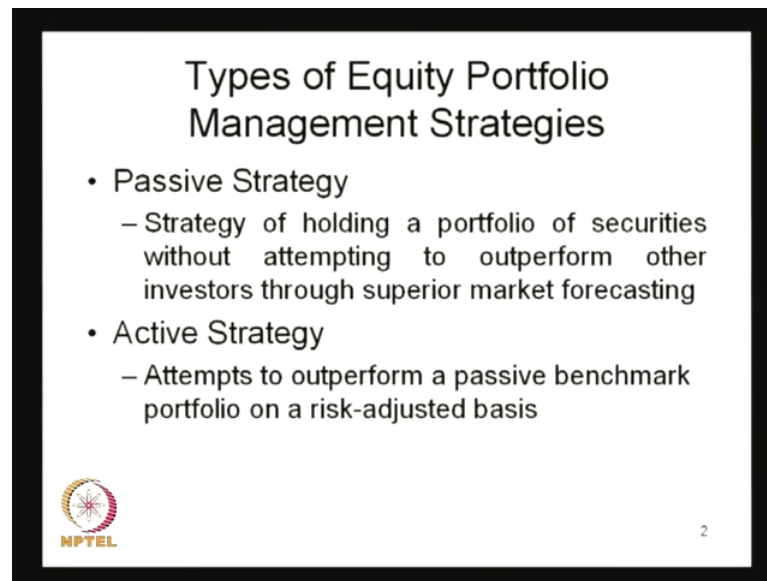
Module No. # 01

Lecture No. # 29

Equity Portfolio Management Strategies – I

In the previous class, we discussed about the different techniques through which we can make or we can construct the optimal portfolios, and also we discussed the different factors which could have the impact on the expected return of the stocks or the different assets. So, after discussing these two important aspects of portfolio management, we will be now discussing specifically how we can make the portfolios, and what are those different strategies, different steps, the investor always follows to construct their portfolios.

And how, on the basis of their objectives, the portfolio management strategy differs from investor to investor. All this questions basically answered by the discussion on the portfolio management strategy. And here, whenever we talk about the portfolio management strategies, the portfolio management strategy is, basically varies on the basis of their assets or varies on the basis of the investors objectives.

And here specifically, first we will be discussing about the portfolio management strategy with respect to the equity assets or the assets related to equity market. Then, gradually in the further sessions, we will be discussing the other assets like bonds and derivatives, and how those assets can be used for their optimization of the portfolio.

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So, let us discuss today about the equity portfolio management strategy and what basically this equity portfolio management strategy is, and what are the different types of equity portfolio management strategy. And in broadly, whether it is equity portfolio management or it is bond portfolio or any other assets. Always this different strategies basically, has been categorized the different management strategy portfolio management strategy has been categorized into two ways; one is your passive strategy or passive portfolio management strategy, another one is your active portfolio management strategy.

And whenever we talk about the two types of strategy what exactly this passive portfolio management strategy is, in a passive portfolio management, strategy always is the strategy of holding a portfolio of securities without attempting to outperform other investors through superior market forecasting. What it basically means, whenever the investor, any of the investors, follow the portfolio management strategy with respect to the passive portfolio management strategy, then what generally they do? They do not want to outperform the other fellow investors. Their basic objective is always to track the market portfolio or the maximum return they should earn from the market is basically the return what market portfolio is giving.

In this context what we are trying to say, always the investors who follows this passive portfolio management strategy, they always want to get certain amount of the return and

they do not want to outperform in the market or they do not want to maximize their return from the market by investing in various assets or by forecasting the possibilities or the opportunities which are available in the market in that particular time. So, therefore, what we can say that the passive investors or the investor who uses this passive portfolio management strategy, they always want to track a market portfolio and always want to get the return for maximum return what the market is giving. But in the case of active strategy or active portfolio management strategy, what the investors do, the investor attempts to outperform a passive bench mark portfolio on a risk adjusted basis.

And in the active case, if the investor is following this active management strategy in that case, they always want to outperform in the market, they always want to get some extra return what the other fellow investors are getting; that means, he wants to always maximize his return with a given amount of is the risk. And they always follow certain kind of strategies which will help them to bid the market at any point of time.

So, therefore, this is the basic two differences, and today we will be focusing on the passive strategy, and in the further session we will be discussing on active strategy. So, let us see how this passive strategy works and what is the basic concept or the basic philosophy behind this passive portfolio management strategy. In the passive portfolio management strategy always in general, we follow or we use this long term buy and hold strategy.

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Passive Equity Portfolio Management

- Long-term buy-and-hold strategy
- Usually tracks an index over time
- Designed to match market performance
- Manager is judged on how well they track the target index

That means, always the investor buys the assets and he will hold the asset for a certain period of time or basically for a long period of time to get the certain amount of the return which will replicate the market portfolio. As you know that whenever we take the position in the equity market, always we feel that the market portfolio is the best optimum portfolio which gives the maximum available returns.

And the passive investor believes in that philosophy, and his objective is, he will hold the portfolio in such a way that in a longer period of time the portfolio will give you certain amount of the return what the market is giving in that particular time. Second point is, basically it talks about or it then it discusses about a index over the time; that means, it tracks an index over the time, because here we mean index means we mean the market portfolio, in the case of India you just take the example of Bombay stock exchange, you take the example of NSE, and we have different indexes whatever we have; that means, we have BSE sensex, we have N S E nifty.

So, those indexes what this investor takes and always investor wants to get the return what these particular indexes are giving considering that the indexes are basically the replication of the market portfolio. Therefore, always this passive investment strategy tracks this index, the return of the index and always the investor who follows this particular strategy they always want to maximize their return in such a way, that the return what he is going to get from the market in that particular time, it should be equal to or the deviation from the market index from the return what I mean the portfolio should not be varied much.
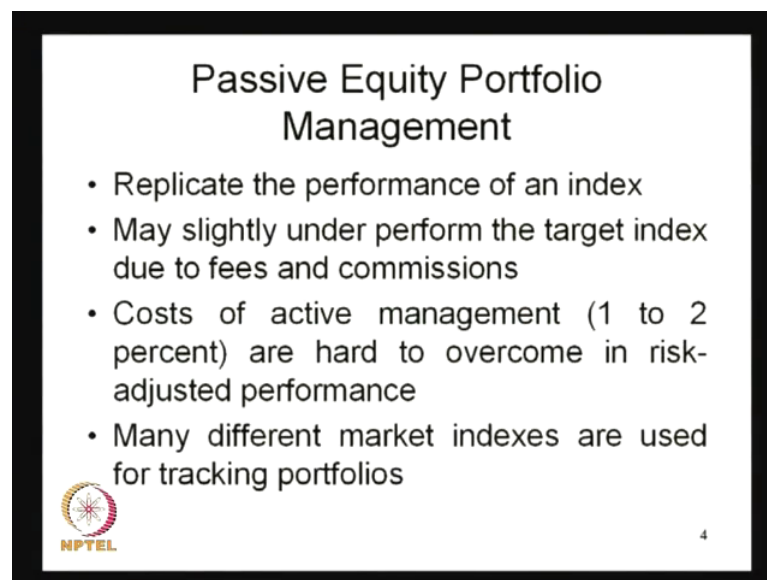
So, that is the basic objective of the investor who believes or follows the passive portfolio management strategy in the market. Third point that is why we have designed to match market performance and the manager is judged on how well they track the target index; that means basically, this particular portfolio management strategy is design to match the market performance. How the market is performing, this particular portfolio what this manager is making or the investor is making that should exactly perform in the same direction in whatever direction your market is moving.

Therefore, it is basically nothing but tracking or replicating this particular index, what this particular investor believes it is the best index which are available in that particular time. And second one is, always this manager is a good performer, or the investor who

believes or who follows this passive investment strategy whether they are a good investment strategist or not, that basically always we track on the basis of the deviation of the return from the portfolio what he is getting, from his own portfolio as well as the return what your marker index is giving.

So, accordingly we can say that how this particular or how we can judge, we can judge that how this particular investor is performing in a particular time. So, that is basically the main concepts which are related or main philosophy of the passive equity portfolio management strategy.

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Already I told you it replicate the performance of an index may slightly under perform the target index due to fees and commissions, cost of active management are hard to overcome in risk adjusted performance. Many different market indexes are used for tracking the portfolios. If you see these things, sometimes what we have observed in general, the index which is basically targeting or which is tracking this market portfolio, sometimes this return is little bit less than the market index, why it is so, it is because of the transaction cost of the fees and commissions, what this particular portfolio manager faces whenever they invest in that particular portfolio.

But most of the cases or in general in the theoretical point of view what we can argue always the investor wants to track that particular market index and they always want to

out to get this particular return what this market is giving. They are not interested to outperform in the market or they are not interested that how this particular return we can get more then the market is giving.

Because in the beginning, the basic objective of the investor is to get the maximum return what the market is giving in that particular time or the market index is giving in that particular time. So, that is why, what generally, sometimes we see, the costs of active management are hard to overcome in risk adjusted performance, because if you manage these particular funds actively, then your cost also will be higher because, the transaction cost will be higher because of the changing positions in the frequently changing position frequently in the market.

Because, the accordingly this based on the timing of the market, on the basis of the cost of the funds of the market, we basically change our position. And if you change your position, then obviously the transaction cost also will be more, if the transaction cost will be more then, that time what will happen that, we will be bearing more cost for that, so that is the part of the active management strategy, but whenever we talk about the passive management strategy, here what generally we see little bit the cost will be less, because we have a strategy of holding this particular asset for a long period of time.

If you are holding this particular assets in a long period of time, then the frequent changing positions in the market is not possible in this case, if you are not changing your position frequently in the market then what will happen? Obviously, the cost will be reduced or the transaction cost will be reduced, if the transaction cost will be reduced then obviously, we can say that the risk adjusted return also will be more in that particular time or basically, which is possible to replicate the market at a perfect time.

And another thing is there are various indexes which are available or various indexes which are available in the market, which can be used for the market portfolio or which can be tracked into, but which particular indexes we should track or which particular index should be use as a market portfolio at a particular time that is the question always comes to the investor or for the fund manager.

And that basically depends on the objective or the depends on the particular investor and where this investor is investing or in what kind of situation the investor is trying to get

this return, what this market is giving and where the investor is interested, whether they invested in a particular sector or they want to invest in wholesome, the diversified portfolio which includes all the sector, or the investor is interested to invest in a particular asset or particular portfolio which consists of or the characteristics of those portfolios are more or less same.

So, depending upon that we have find out certain indexes, which can be used a benchmark index for that particular portfolio, and always the portfolio manager may be interested to track that index in that particular time. So, that basically, we have to look into, we have to see how that particular thing works in the market.

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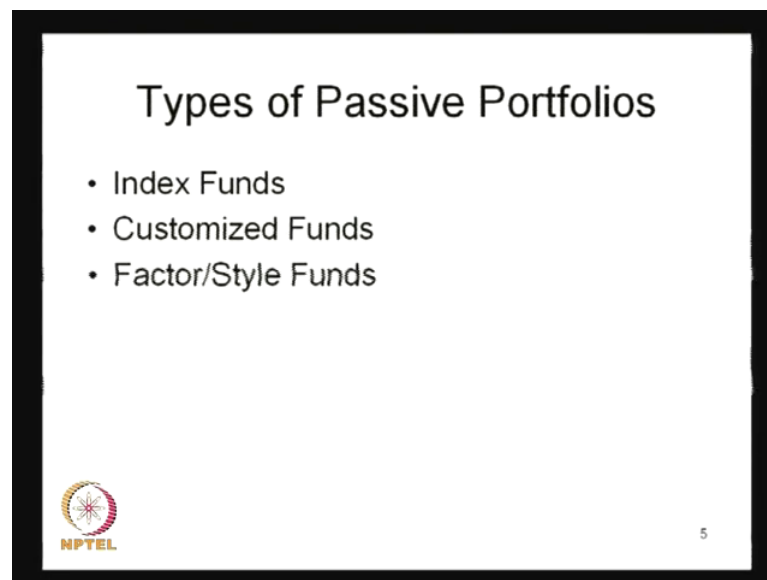
Then we have different types of passive portfolios, what generally are the fund managers or investors make in the market, one is your index funds, second one is your customized funds, and third one is factor or the style funds. These are basically the broad types of the passive portfolios, what in all the markets regularly, the investors who believe or follows this passive portfolios, they use this particular funds or use this particular portfolios to get or to track this market portfolio or market return from time to time.

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And what exactly this index fund is, the index fund basically, attempts to design a portfolio to replicate the performance of a specific index that is your benchmark index, and the difference arises between the benchmark index and the portfolio because of cash flow, company merges and the bankruptcies. If you see that for example, any investor wants to make an index fund, let you talk about the example of the BSE 30.

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BSE 30 or the BSE sensex whatever we have, if we have the BSE sensex and any investor or the manager who wants to follow the BSE sensex. There are 30 stocks which

are different weightage, the 30 stocks let A, B, C, D like that, and once we have the different stocks which are included in the 30 stocks what the investor does or the fund manager does. So, they generally take those 30 stocks into their consideration, same ABC like or D, and they also invest the same weightage, investment also the weightage is same, what the fund manager is or the stock exchange is giving in the different assets, and they want to get the return what this BSE sensex is giving.

The return from the portfolio should be equal to return from the market, this is their objective. And why generally sometimes we raise if we are investing the same weightage, and as well as we are also investing this particular same stock where this particular index is consisting of, then why the return varies? The return varies because, sometimes because of some characteristics the cash flow of the company <mark>may be changes</mark> may be changing in nature, company may be going for bankruptcy.

So, that means, what in general we are trying the <mark>individual behavior of the company</mark> individual behavior of the company changes from time to time. So, once the individual behavior of the company changes from the time to time, whether it is because of the financial reason or the non financial reason, like your intellectual capital etcetera.

Then, what will happen for these, then there is a deviation, the deviation is because of the deviation is arising between the market portfolio the return on the BSE 30, and the return from the portfolio what the particular investor or the fund manager constraints, by taking or by tracking this particular sensex at this particular index. So, therefore, this is basically is your index fund, we generally use in the market.

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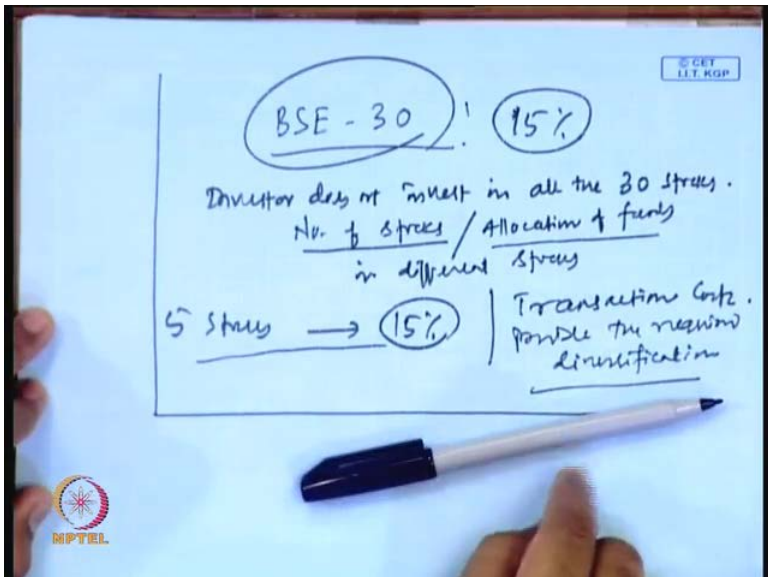Another fund is basically your customized fund, in this case, whenever we talk about the customized fund, in this case the benchmark index is a customized rather than a published index. This has been made because of two reasons, constraints on allowable securities and to provide this adequate diversification. What it basically means, the customized fund, for example, if the same case what basically we take, let we have the BSE 30.

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If you have a BSE 30, in this case, let your BSE 30 is giving around 15 percent return. So, in this case what the investor does, the investor does not invest in all the 30 stocks. What he does? He tries to find out the number of stocks and the allocation of the funds in different stocks, allocation of funds in different stocks. In such a way, he chooses this number of stock, he makes the allocation in such a way, that let instead of investing in this 30 stocks, he invest in 5 stocks, but the return will be as much as same what this particular 30 stocks are giving or the portfolio of 30 stocks, will return of the portfolio, which consist of 30 stock and the return of the portfolio will consist of the 5 stock is almost same.

So, why generally they do it, there are certain constraints and they wanted to avoid this transaction cost, they want to avoid the transaction cost and as well as also they what generally they do, they provide also the required diversification. So, both require diversification and the transaction cost, both can be minimized in such a way that is why, instead of investing all those funds in that 30 stock, the investor may be interested to invest in certain customized funds or customized assets through which the return can be maximized and the return will be same as this particular market is giving. And also, we can get the same amount of the return and we can track this particular market return perfectly, and also the proper diversification can be made.

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Style Fund

- This type of fund replicates a benchmark geared to mimic the performance of a given stock factor such as growth, small capitalization or high yield.
- It can also be specialized or titled towards specific sector or industries such as the energy sector.

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The next one is your style fund; the style fund is basically, this type of fund basically replicates a benchmark geared to mimic the performance of a given stock, the factors - stock factors - such as growth, small capitalization or the high yield. It can also be specialized or titled towards specific sector or industry such as the energy sector. Why generally, how we talk about the style funds? The style fund means, instead of investing in BSE sensex some of the fund manager or some of the investor what they do? They invest in a particular type of fund, which this particular fund is based on the certain characteristics or the characteristics of those stocks which are included in this particular portfolio are same.

What does it mean, you take the example of a particular stock or particular bond, sorry, particular portfolio, which is consisting of 30 stocks or the 40 stocks, and all the 40 stocks are the small cap stocks. So, we have the different benchmark portfolios or benchmark indexes which are available in the market which is based on only on the small cap stocks or only on the growth stocks or only on the value stocks or only on the high yield stocks or only on the low yield stocks.

So, what this investor does, instead of following this total benchmark portfolio or the market portfolio which is available, they typically follow a particular portfolio, which satisfies certain characteristics of those assets or the characteristics of those assets which are included in that portfolio are same. The uniformity is maintained across this particular asset, and once the uniformity is maintained a certain style has been followed to construct that portfolio, then the investor also will be ready to invest in those particular assets, which also follows the certain criteria or the particular characteristics of those are assets are uniform across this individual or across this assets.

So, therefore, the asset already I told you the portfolio may be based on the value stock, the portfolio may be on the basis of the growth stock, the portfolio may be on the basis of the small cap stock, it may be on the basis of mid cap stock, on the basis of the a large cap stock, and also, typically sometimes also you can find this particular portfolio may be also sector specific or the index specific. I can take a portfolio, which is only confined to a particular sector, may be in energy sector, may be also it is in health sector, maybe it is in any of the sectors, may be manufacturing sectors and may be any of the IT or the services sector. So, all the assets what I am going to incorporate at my portfolio, that basically follows certain criteria, this satisfies certain criteria and if certain criteria has

been satisfied then only those assets can be incorporated into our portfolio. And that can maximize or that can mimic our industry return or the index return or the market return at a particular point of time.

So, that generally we call it the style funds, so here in the case of style funds, we do not mimic this market index like BSE sensex and NSE nifty or nasdaq stock exchange index or anything (( )) like that. We basically follow a particular fund or particular index which is based on the certain characteristics and it is based on the uniform criteria like either on the basis of the growth fund, on the basis of the value fund, on the basis of the small cap, large cap, medium cap stocks like that.
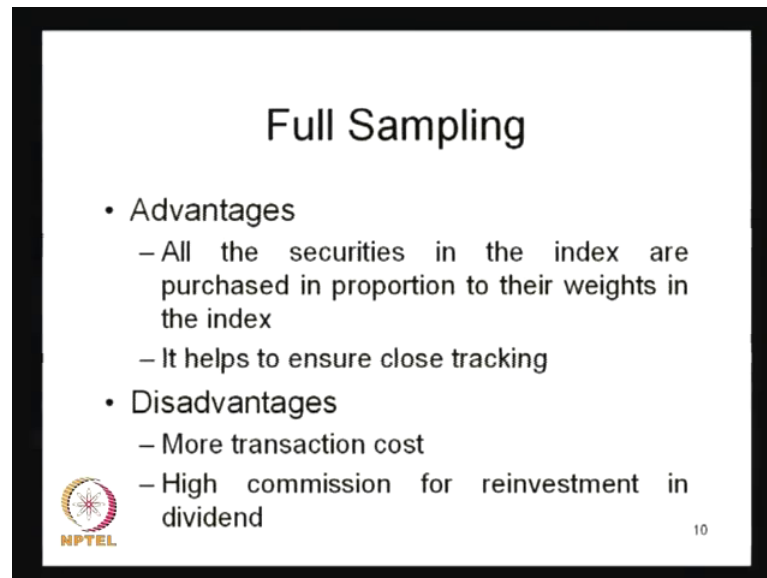
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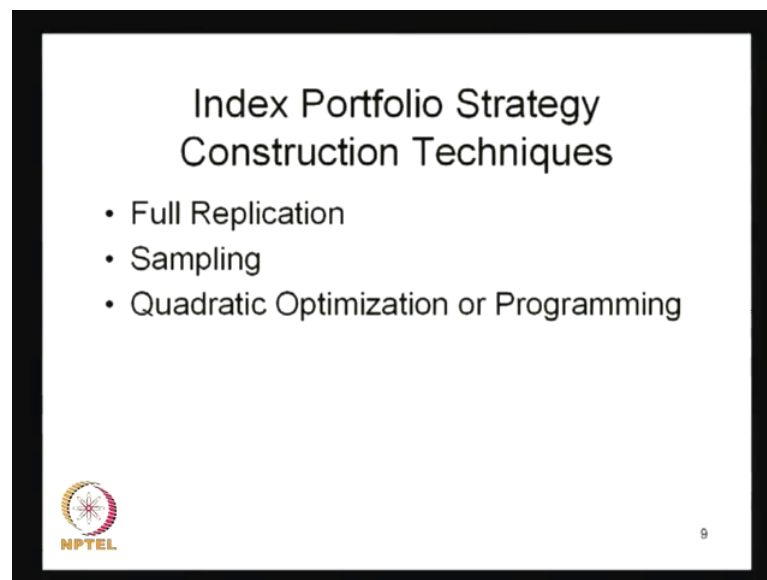
So, this is also one of the ways through which the passive portfolio construction has been made. So, what are those techniques, we talked about the different types of the portfolio which is categorized as the passive portfolios, but how these portfolios are made, and what is this ways or different techniques to which the fund manager or the investor generally constructs these portfolios. The construction of the portfolio may be on the basis of detecting first technique is full sampling; second one is only sampling, and third one is the quadratic optimization or the programming techniques.

There are three ways through which the construction of the passive portfolios are met, then how this particular techniques are worked out and how this particular techniques

help us to construct the portfolios, if you observe one by one what basically the full sampling means.

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The full sampling means, we have to take care of all the stocks, which are incorporated in the and in this particular index. The full sampling basically, what basically it talks about all the securities all the security to see this, it basically talks about all the securities in the index are purchased in proportion to their weights in the index.

Basically, all the securities means, if you talk about the BSE 30 in that particular time, whoever the company, whoever the stocks are included or whichever the stocks are included in this particular index, all the stocks should be purchased in the same proportion whatever way it is invested in the index. And the weightage also will be given to the same and that helps to ensure the close tracking; that means the close tracking in the sense, it helps, it basically once we take into account all the stocks incorporated in this index. What generally we believe that how this particular index will perform, the deviation from the return from the index and the deviation from the return from the index to the return from the portfolio will be very, very, small or it will be closely tracking this index. Because all the assets which are there, all the stocks which are incorporated in this particular asset, these are all also incorporated in this particular portfolio.
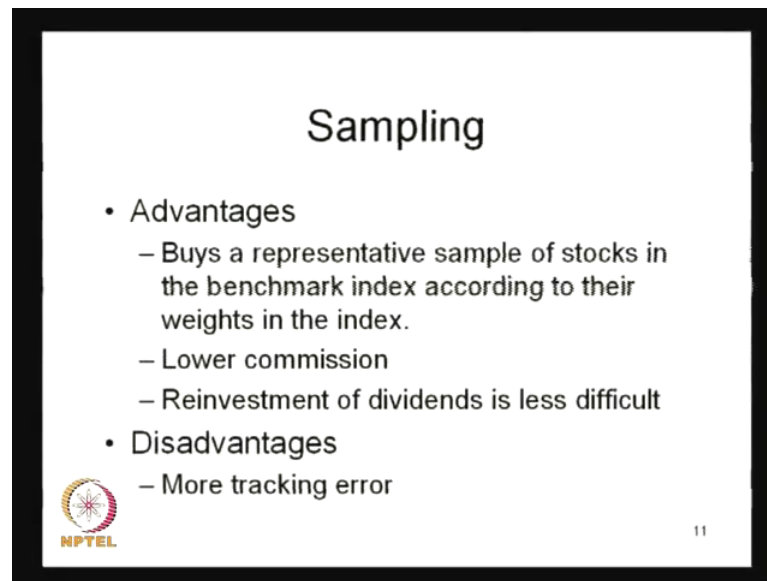
So, therefore, it is basically closely tracking this index, and what are the disadvantages? The disadvantages are, once you take care of all the stocks which are there in the index, it incurs more transaction cost and also the high commission for reinvestment in the dividends. If you have more asset or more stocks, then as much as stock will include in your portfolio then automatically the transaction cost also will increase, because the commissions, the fees, the brokerage charges etcetera, etcetera, everything all the costs which are included in the transaction cost, that will be increasing - number one.

Number two - you have also the reinvestment cost, basically, will be more, because for each stock generally this reinvestment in dividends also the commission for the reinvestment in dividend also will be more; in terms of dividends you have to also bear some cost. For that, because more number of stocks are included in that, but if you have the less number of stocks then obviously, in that way also you can minimize certain cost in the market.

So, therefore, what we have seen, the full replication has the certain advantage because it basically close down this errors which we get from this deviation between the index and this portfolio of what this particular manager is making. But in other way, it also incurs more cost because the transaction cost will be more, as you are adding more number of assets in that particular portfolio. So, that is the pros and cons or the advantages and disadvantages of making this or taking this full sampling into or a consideration as a technique of the full sampling or the total stocks which are there in the index and as well as the or all the assets whatever there in the index will be included in that particular portfolios.

So, that basically is one of the disadvantage whatever we have, but we have also advantages which has it basically reduces the error what we usually face, because of the deviation between this index and the market index and as well as the portfolio what we are trying to make. So, in this context what basically we are trying to say, that once we have the full sampling method we are using, we should also be very careful about the transaction cost, because it is one of the biggest costs, what always the investor faces in the market, and once the transaction cost will be taken care then obviously, the total return can be maximized in the market.

Then, another method is basically sampling, what basically the sampling method is, the sampling method basically talks about the instead of taking the full samples in the market or the full samples from the index, which are there in this particular stocks, its better we should take or we should buy the representative samples of stocks in the benchmark index according to their weights in the index, and it will have always the lower commission and the reinvestment of dividends is less difficult, because less number of assets has been included, but the disadvantages are it has more tracking error.

What it basically means or what it basically talks about? It basically talks about, instead of talking about or instead of taking all the assets into our analysis or all the assets into our portfolio, already in the previous case I also told you that do not take into account all the 30 stocks, all the 35 stocks which are included in the portfolio, you have to identify certain stocks which is basically replicated, the total return what this particular index can give.

So, if you can identify those stocks which can replicate this particular return, what this whole index is giving, then better we should incorporate those stocks and accordingly devoted also will be assigned in such manner and by that we can make a better sampling and once less number of stocks will be included in that particular portfolio, then what will happen? Automatically the transaction cost will go down.
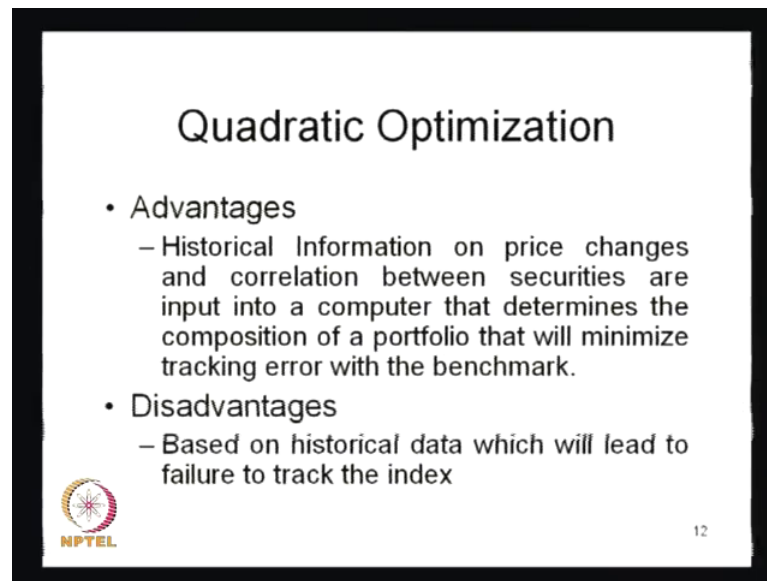
If the transaction cost will go down, then we can maximize the return, because the total cost will be going down, if the cost will be going down the return can be maximized. But only thing is, the skill of the investor is or the basic objective of the investor is to identify those stocks and to identify those number of stocks which can be considered in that particular portfolio through which the return can be maximized or the same amount of the return what the index is giving. We are only getting this much return if you invest only this much number of stocks, and the weightage will be the different on the basis of their type.

So, like that what here we are trying to say that the sampling method is little bit difficult, but here one advantage is, we are minimizing certain transaction cost, if you are choosing this number of assets or the number of stocks which are there, which can replicate to the market index and the return what the market index is giving the same amount of the return we can get. But the biggest problem is instead in the case of sampling is, that it have high tracking error, it may have the high tracking error, what do you mean by this, because sometimes if you observe that once we have this sampling method and we have to decide certain asset which can replicate this funds or the particular market index.

Then, what here we can see that sometimes if you are choosing methods or the particular sampling technique whatever you have use to find out this particular return or to find out this particular portfolio of which can give the amount of the return what your market is giving. Sometimes it is misleaded by investors; sometimes because of certain faults or certain kind of biasness what we have observed that the tracking or the deviation of the market index and the deviation between deviation of the returns from the market index and return of the portfolio will be more. If the deviation from the market index, if the portfolio will be more then obviously, the error will be more.

So, even if you are reducing certain amount of the cost by choosing the samples, here in this case what we have observed, but otherwise we are facing also more errors of choosing this particular sample because of some biasness or because of some errors of this chosen methodology. Therefore, this is one of the problems we face in terms of sampling.

Then another technique we use that is a quadratic optimization, so here what we do? In this method, we historically use this information; the historical information on price changes and the correlation between securities are input into a computer that determines the composition of the portfolio that will minimize the tracking error with the benchmark.

You see previous sessions, we will be discussing about these different techniques through which we can made this or, sorry, we can construct the different optimal portfolios. So, in this case, what here the quadratic optimization technique is trying to, say, you go back to your Lagrange multiplier technique, what basically we do there, let your benchmark index is giving 10 percent return.

So, the objective of the investor is 10 percent and on the basis of let you are using this sharpe method to choosing this to choose this particular assets or you can use this markowitz method to choose this particular asset, what generally we do here, we choose this assets and once we choose this assets, let we have 5 number of assets should be included may be on the basis of the cutoff rate, what your sharpe has explained, or we have the Markowitz method on the basis of the number of stocks on the basis of the risk return profile of the portfolio.

And your objective is, to get the 10 percent return, then in this case, what generally basically we do; we specify the objective is minimization of the risk on the basis of the 5 number of stocks whatever we have included in our portfolio.

Then, your objective is your constant is you have to… there in the 10 percent return what your market index is giving. So, then what generally we do if you put it and make a particular equation using a composite make a composite equation using this Lagrange multiplier method. If you use this lagranges multiplier method to use this particular equation then what will happen then finally, you can calculate the weightage.

So, in this quadratic optimization method we basically find out the weightage and after choosing this number of stock on the basis of the different theories, on the basis of either on the basis of Markowitz theory or the Sharpe theory. Then, we assign this weightage on the basis of this programming method randomly it chooses, then what will happen in this case, this is the advantage because, we technically have certain kind of factors which are responsible or which are determining this particular return, and here the objective is to minimize the striking error or we basically always follow what this return your market index is giving.

But the problem here is, based on the historical data which lead to failure to track the index, because here basically, all the analysis is based on the historical simulation of the data; that means, historically something has happened to the company, and we are using those data to forecast. What should be the value of this return of the portfolio and how this return of the portfolio can track this return of the index.

So, that is one of the limitations what this particular method has, and why we call it as a limitation? We call it a limitation, sometimes if you believe in the efficiency of the market concept, if you say, that your market is not efficient, the market is basically not inefficient, it is basically efficient; that means, we believe in that philosophy that history does not repeat or the stock price by trending or by analyzing the historical data we cannot predict the stock price, this in the future.

Then, the forecasting or the methodology what we are using that is sometimes wrong, because if only historical data why is it to assign this weightage, then that weightage may not work in the future because, because of certain other external factors this particular

behavior of the different stock what we have already incorporated into our analysis and whatever weightage you have also put to them, then they will be changed.

And if we will return with the same kind of methods or same kind of weightage for those assets which are considered in our portfolio and which was because of their performance in the historical in the history, then what we can see that if the same behavior, the stocks will not show in the future, then the return cannot be maximized or the return of this index what it is giving, because of the market fluctuation that we cannot track.

If we cannot track that then, the basic investment philosophy of the passive portfolio management will be gone. If the basic investment philosophy of the passive portfolio management will be gone, and the return cannot be maximized in that particular time, then the benefit of the investor using this passive portfolio investment strategy will be gone. So, therefore, we have a probability of high tracking error, if you choose this on the basis of the market, on the basis of the linear programming method or any quadratic optimization method to track this particular index. So, tracking the index is using this, sometimes is misleaded, sometimes it creates the difficulty, and the disadvantage it is because of the historical data of what we are using to assign this weightage to different stocks.

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Tracking Error and Index Portfolio Construction

- Goal of the manager is to reduce the tracking error.
- Tracking error can be defined as the extent to which return fluctuations in the managed portfolios are not correlated with return fluctuations in the benchmark.

This is another method, so here what generally always we have seen that always we believe in this philosophy of minimizing the deviation between the tracking, I mean, in the deviation between the index and this portfolio return what we are getting. So, what we call it the tracking error and here the goal of the manager is to reduce the tracking error. And tracking error is nothing but, it is basically the extent to which the return fluctuations in the managed portfolios are not correlated with return fluctuations in the benchmark.

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How generally the tracking error can be calculated, if you observe this thing and already we have seen that the basic objective of the investor is to reduce this tracking error. Then, already we know that your return from the portfolio is basically the summation of the return of the individual assets multiplied by the weightage. So, what basically here we can write, then your W I is basically, the investment weightage - investment weight - what we give asset I in a managed portfolio and R I basically a return to asset i in period T.

Then, we have the… and n is equal to your number of assets in your portfolio. Then, here what basically our objective in the basis of the passive portfolio is, we want to reduce where delta RT will be return, what we are getting from these W i R i minus R b t; R b t is basically the return to the benchmark index or benchmark portfolio in period T. So, this is your Rbt, so this is basically nothing but your… this is basically your R b t

minus Rbt, this is the deviation of are turn between the market portfolio and return of the portfolio whatever we getting.

So, then we can calculate the variance of this deviation, it is basically R delta T that is basically, here if you write down where T is equal to 1 to T then, your delta RT minus delta RT bar divided by the T minus 1. So, this is basically the variance of the deviation between the variation returns between the portfolio of yours as well as the tracked portfolio. Then, your standard deviation will be the root of the variance of t, which we call it the periodic tracking error.

So, it is basically the standard error, sorry, it is basically the standard deviation of the return deviation between the market portfolio and the index which is basically defined as the periodic tracking error. And the basic objective of the investor is always to minimize this strucking error, whenever the construct their index portfolio market.

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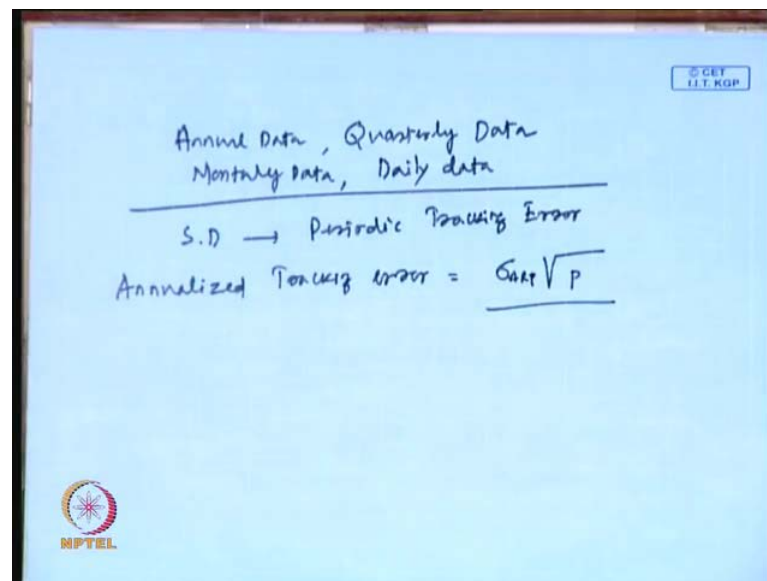
So, this is your periodic tracking error; that means, whatever data you have taken, if you have annual data - you can annual data, you can use also monthly data; you can also use the quarterly data. So, on the basis of that - or you can also use daily data - so on the basis of this whatever standard deviation you can calculate that is your periodic tracking error, and if you want to convert this periodic tracking error in to the annualized tracking error, basically the annualized tracking error is defined as your standard deviation of this

deviation into the period what you have taken, if you see this one, in the case <mark>of…</mark> if you take the example of a particular case like this.

<mark>Let we have a series of</mark> we have a quarterly data whatever we have from two years.

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We have quarterly data of one portfolio and as well as the index what we are tracking in that, this is your period, this is your managed portfolio return, this is your index return, and this is your difference, then from here we are going to calculate the tracking error of this portfolio. There are 2 years data; that means, you have an 8 quarterly data 3, 4, 5,6,7,8, we have this much, then later in the first quarter your managed portfolio is given 2.3 percent where index return is giving 2.7 percent the tracking error is here difference is 0.4. Then, in the second year - second quarter - it is giving 3.6 percent, it is minus 0.46 percent, then it will be, index is this minus this then this will be 1.

Then, here it is 11.3 quarter, it is 11.2, it is 10.1, then it is 1.1, if it is 1.2, this is 2.2, it is giving also minus 1 difference is minus 1. This is let 1.5, this is your 0.4, and this is also 1.1, this is your 3.2, this is your 2.8, then it will be 0.5, and it is your 8.9, it is your 8.1, this will be 0.8, this will be minus 0.8, this will be 0.6, finally, minus 1.6. And if you see that the average deviation - the average difference - is 0. 1875, and from here if you can calculate the standard deviation of this series - the standard deviation of the series will be 1.0521.

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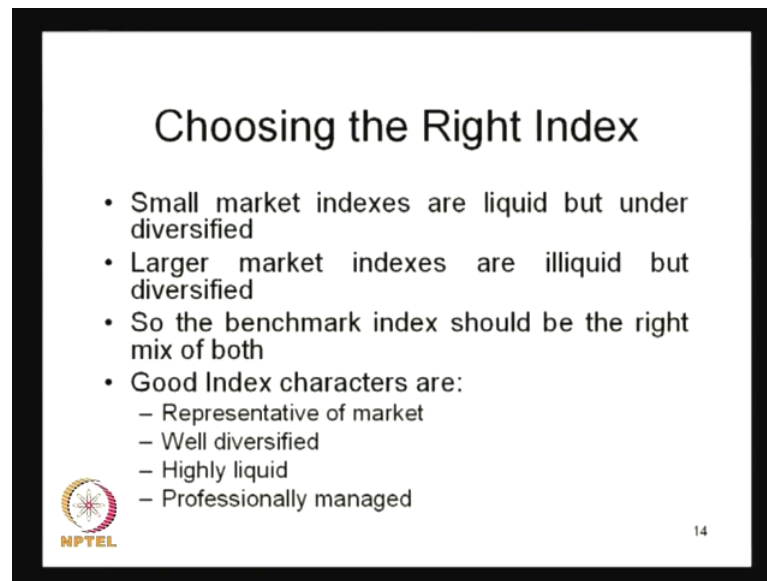
If your standard deviation of the series will be 1.0521, then your tracking error there quarterly - quarterly tracking - error is 1.0521. If your quarterly tracking error is 1.0521, then how we can calculate the annualized tracking error, so your annualized tracking error will be we have your tracking error is 1.0521 into root of 4, because we have 4 is the quarterly, because one year you have 4 quarters, then it will be 2.1042. So, your annualized tracking error will be 2.1042, so that is why in these case, the investor is facing an annualized tracking error of 2.1042.

So, therefore, this is the way through which the tracking error is calculated, and every time the investor or the fund manager wanted to reduce this tracking error as much as possible.

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Here, the one biggest problem always in practice we face choosing the right index which can be used as a benchmark index, so therefore, we should also be much more concerned about this thing. And this right index is basically, in this way we always choose small market indexes are liquid, but under diversified, they are not diversified because the less number of assets are have been included there. Larger market indexes are illiquid, but diversified because they are lot of illiquidity will be available, but they are diversified.

So, the bench we have the confusion whether we should go for a small market index or the large market larger index, so the bench mark index should be in a right mix of both. And whenever we talk about this two then what are those things we should look into, it should be good representative of the market, it should be well diversified, it should be highly liquid and it should be professionally managed. If all these four criteria have been fulfilled by any of the indexes, so that can be used as a benchmark index for the investor, or for the fund manager for their analysis.

In India if you talk about we have, sometimes people argue or the researchers argue that S and P CNX nifty is the one of the most scientific benchmark index in India, that is because, it is basically a market capitalization weighted index. Base year is November 03 1995, base value is 1000 and all companies to be included in the index should have a market capitalization of 5 million or more. Company entering the index should have double the market capitalization of the leaving company; it basically talks about the size of the company or the visibility of the company in the market.

And all the securities should fully satisfy the required execution on 90 percent of the trading days which talks about the liquidity. So, if the liquidity and as well as the diversification part has been taken care for a particular index, then we can consider that index is basically one of the best indexes what we can use as a benchmark portfolio or the benchmark index. So, the basic objective what now we have seen, that the basic objective of the investor is to minimize the tracking error, and tracking error is basically the volatility or the standard deviation of the return difference between the benchmark portfolio and the portfolio what we are constructing.

And once this tracking error will minimize either through a stylish, using any of the techniques like your full sampling or sampling or the quadratic optimization, then we can say the actual objective of the investor has been fulfilled. But here, one thing always basic thing you should remember, we should always remember that if any investor or the

fund manager follows this passive portfolio management strategy, then they always concentrate or they always want to only track the market or the market index, they do not want to outperform in the market, they do not want to change their position in the market frequently to get high return.

Because they always want to diversify their asset in such a way, that this asset can give you the return what your market is giving; that means, they are little bit less risky in nature. And as well as they wait in the market for a long period of time to get this particular return, but in the active investor or the active investment strategy this particular part will be little bit different and how this particular thing will be different and what are the different investment strategies I have used in this active investment part, that we will be discussing in the next class, thank you.