Security Analysis and Portfolio Management
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Lecture No. # 35
Bond portfolio Management Strategies - I

In the previous class, we discussed about the bond pricing as well as the bond price volatility and the factors which affect the bond price volatility; that means, what we can say that. Now, we are very much sure that the bond pricing or the return from the bond basically fluctuated because of change in interest rates and also there are certain other factors like term to maturity or the (( )) etcetera. Looking into these things, whenever we discuss certain concepts like duration convexity etc., we can say that how this particular concepts or the concept of duration convexity etc., will be helpful for managing the bond portfolio and also you should know how this bond portfolio strategy is basically worked out by the investor in the market.

So, today, we will be discussing about bond portfolio strategy; that means, how this investors or the fund managers manage the bond portfolio in the market to maximize the return.

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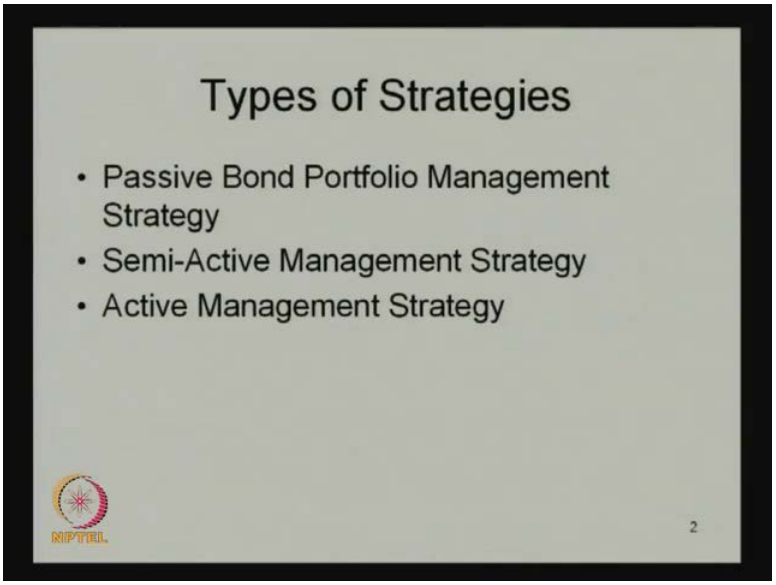

In this context, if you observe here, there are different types of strategies the portfolio manager uses. One is your passive strategy. It is just like the equity portfolio management that we discussed in the previous sessions.

And also, we have we name it Semi-Active Management Strategy. But, it is basically this matching strategy later on we will see and third one is the active management strategy where the bond portfolio manager or the investor is actively involved in managing the bond portfolio in the market. So, today we will be discussing about the first two which talks about the Passive Bond Portfolio Management Strategy and the Semi-Active Management Strategy.

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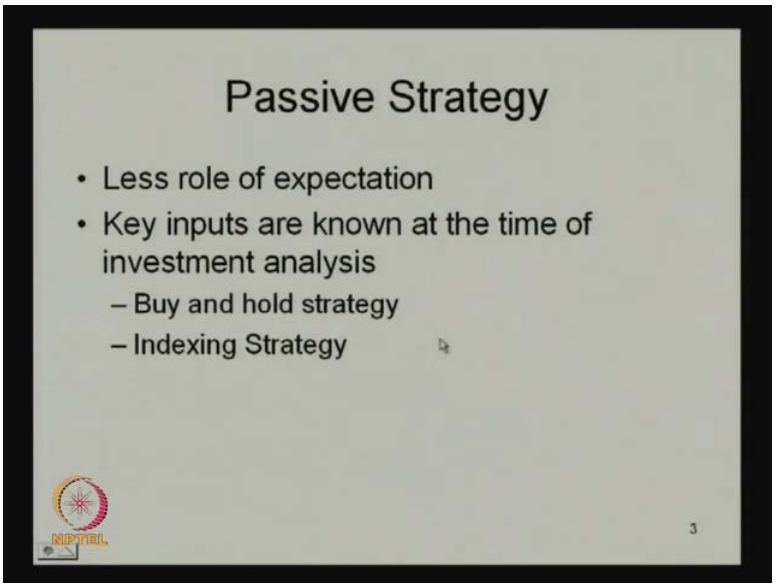

So, first let us see what exactly the Passive Strategy means. Whenever, the investor uses the Passive Strategy, the Passive Strategy is basically nothing, but it is here the investor has no expectations because this change in interest rate, basically, the expectation of the investors should change. But here, whenever the investor basically talks about the passive strategy, he does not bother about the expectation levels or how the movement of the interest rate is happening in the market in a particular point of time.

So, the key inputs and basically, what it happens is that before this investment takes place or before the investor decides where he should invest, his objective is very much known that whatever return he wanted to get or how his objective can be maximized and

which kind of bond can fulfill the requirement of the investor. Therefore, what we can say is, the key puts are known at the time of investment analysis. So, if it is very much clear from the beginning, what are the things the investor is trying to take into account or in the bond investment then, the role of the expectations are basically little bit less.

We use two types of strategies, which comes under the passive strategy of the bond portfolio. one is Buy and hold strategy and second one is Indexing Strategy. These are the two major strategies used by the fund manager or used by the investor whenever they manage the bonds possibly.

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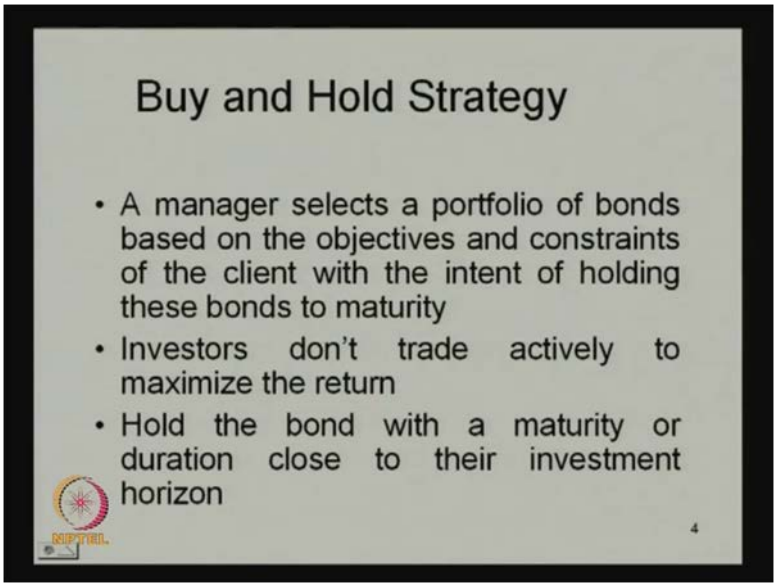

What exactly this passive strategy means or within this passive strategy, how this Buy and Hold Strategy is defined is, in the buy and hold strategy, a manager basically selects a portfolio of bonds based on the objective and constants of the clients with the intent of holding this bonds to maturity.

That means, for example, you say that certain people or certain investors in the market are very much sure or whatever amount of the return or whatever amount of the yield or whatever amount of the liability they will have in the future,

Let an investor wants 10,00,000 rupees after five years. He should invest in such a bond where he can get at least 5,00,000 rupees or more than that from the bond investment.

His objective is very much clear. So, what he should do or what he does is, he buys a bond which can face at least 5,00,000 rupees after five years.

So, from the beginning, his objective is defined that how much return he wants and what is the exact amount of the liability we will have.

So, therefore, what he does is, he takes the position in the market today in such a way that or he should decide a bond portfolio in such a way that it can fetch at least 5,00,000 rupees at the end of the five years.

Therefore, the role of the expectation in that case, will be less and it is it is assumed or it is always intended that this particular client or the investor holds the bond up to the maturity because he has decided this particular maturity period from the beginning with certain objectives.

Another thing is, the investors do not trade actively to maximize the return. the investor does not take any kind of expectation levels into the consideration and once the expectation level is not taken into consideration, then they do not have to change the position frequently in the market and they do not have to trade in the market actively to maximize the return.

Because their liability or their requirement is already fixed, to get that fixed amount of the requirement, they basically invest in a bond or invest in a portfolio of the bond in such a way that the total return of this particular bond can be maximized. Therefore, there is no need to take the position actively in the market to maximize the return.

So, what these investors do here is, they hold the bond with a maturity or the duration close to their investment horizon.

In the beginning, what I told, if you need 5,00,000 rupees after 5 years, what he does is, he decides the bond where the term to maturity is five years or a duration will be five years and accordingly, if you take the position in the market, then this 5,00,000 rupees investment or 5,00,000 rupees requirement what he wants from the market in this span of the five years can be realized.

So, therefore, what we can say is that, always the investor has the opinion that he should buy the bond and hold it after certain period and that certain period is basically turn to maturity or the duration and; that means, the investment horizon period of this particular investor on the basis of the requirement should be matched with this bond's turn to maturity or the duration in that particular time.

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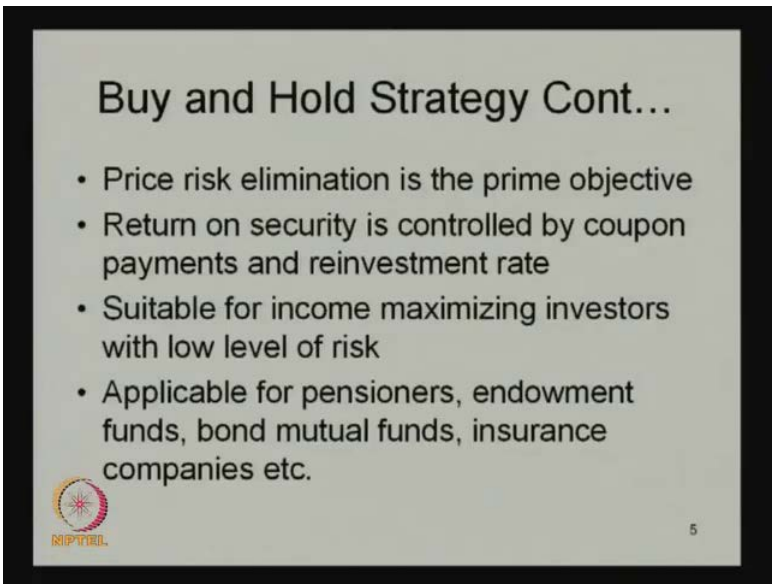

Another characteristics in the buy and hold strategy is the measures risk that the investors want to eliminate from this price risk

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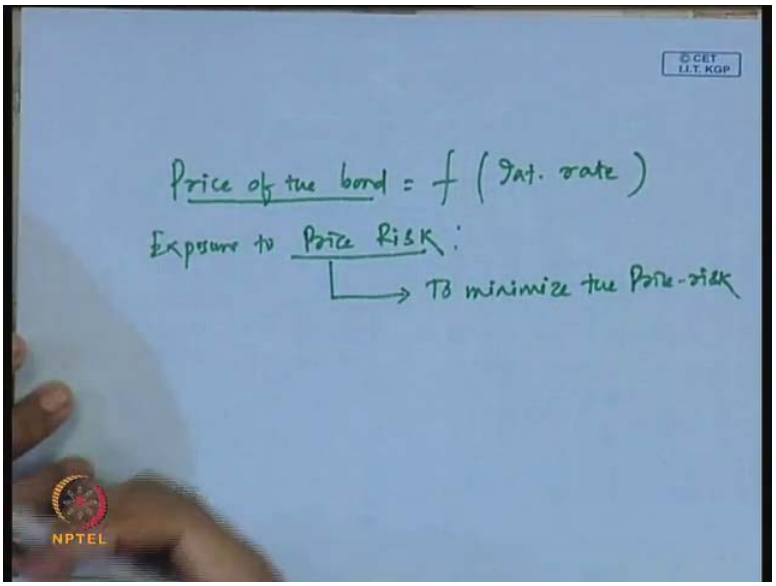

What do you mean by the price risk is, whenever you know that the price of a bond or the price fluctuation of a bond is determined by the interest rate and the other variables, due to the interest rate, the price changes that means, whenever the price change, we are exposed to price risk.

So, if there is a price change, we are exposed to the price risk. So, the basic objective of the investor is to minimize the price risk.

So, here, what happens is that, investor takes the position in such a way that he can face 5,00,000 rupees after five years. But, he is also exposed to price risk because this interest rate in the market may change on the basis of the certain factors which, basically is not observed by the investor from the beginning.

That is why this exposure to price risk or the fluctuation of the price which increases the price risk should be eliminated on the basis of the objective of the investor. Therefore, the basic objective of the investor who follows this concept of buy and hold strategy is to eliminate the price risk. Another characteristics of the buy and hold strategy is that the return on security is controlled by coupon payments and reinvestment rates.

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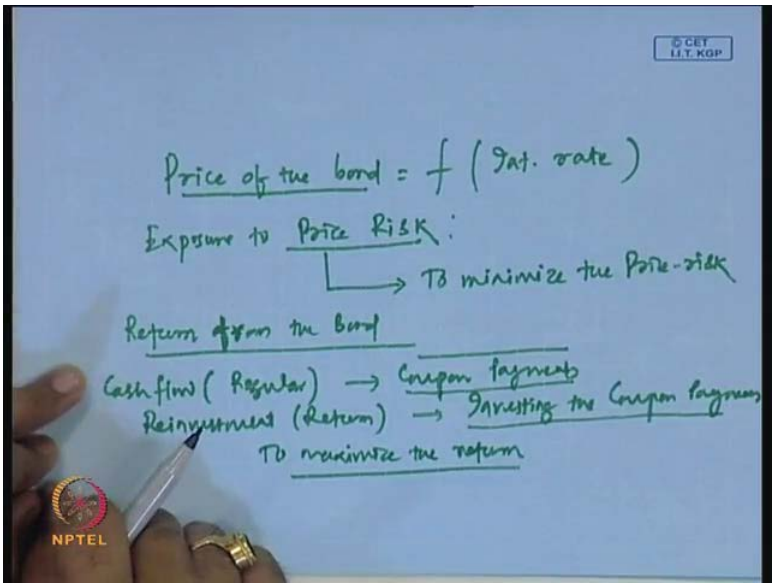

That means, if you observe how this return can be achieved from the bond return,

What this investor does here is, he has two things, one is the regular cash flow which is nothing, but your coupon and another thing is that he gets the reinvestment return, what he gets from the investment from investing the coupon payments.

So, here, what we have seen is that return on security is totally driven by the coupon payments and as well as the reinvestment rate or reinvestment of the coupons in the market at a certain period; that means, whenever the investor is waiting for this particular bond, it should be realized after the term to maturity. So, if this intermediary cash flows, what he gets in terms of the coupon payments and again the coupon payments are reinvested in the market. So, these are the two components that the investor always expect to get in the entering period to maximize the return.

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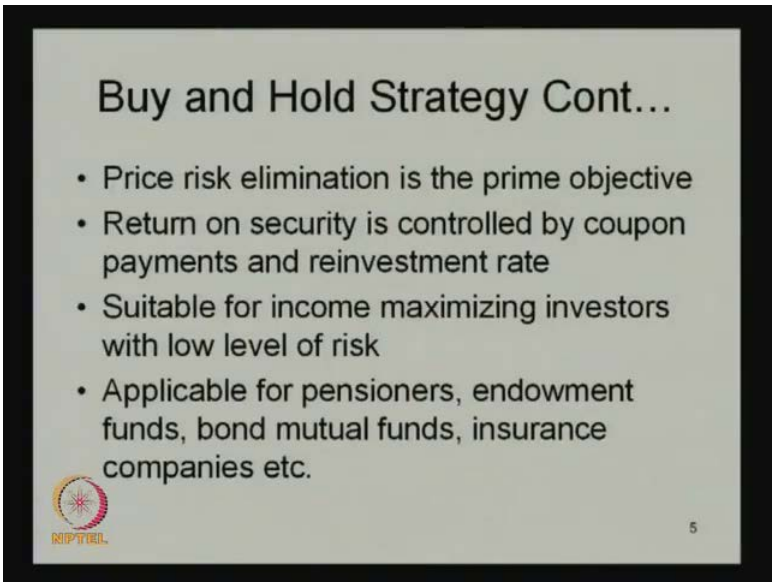

So, the return from the security comes from these two sources. T Who basically uses this strategy in the market? It is more suitable for income maximizing investors with low level risk, you will find certain investors where they do not want high return, but at least their income should be protected or the income should be maximized for a certain period of time and they do not want to take more risk to maximize their income.. Who are those? If you observe, it is more applicable for the pensioners, endowment funds, bond mutual funds and insurance companies. If you observe, the pensioners always want to play the safe game. They always want to take less risk and they want to maximize the

return at a particular time. Then, another way if you observe, we have this particular insurance companies and their their liability is very much known from the beginning.

So, that is why they want to play the safe game and even if they know how much liability they will have using a probabilistic function, So, that is why they should go for a strategy like buy and hold which can face them in the certain amount, which they require after certain years.

So, particular agencies or particular persons who are basically a believer of the philosophy of income maximization, always use this buy and hold strategy to maximize their income in the market.

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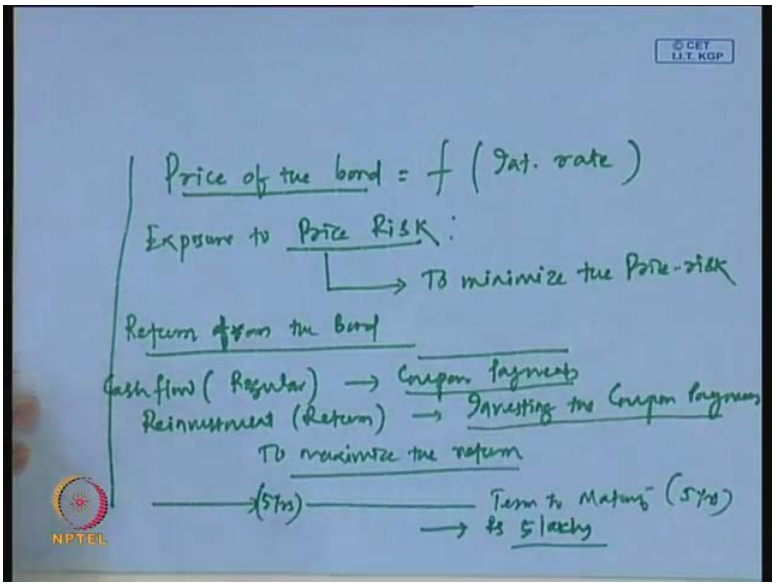

Here, what we have seen is that the investor should hold a bond if their investment horizon period is 5 years, then, he should hold hold a bond where the term to maturity is 5 years and after 5 years, he expects that he will get a return of 5 lakhs.

So, here what we have observed is that from the beginning, we are only concentrating on certain securities where the term to maturity is perfectly matching with the the investment horizon period of this particular bond holder.

And as well as this certain amount of the liability what he is expecting after five years that is materialized or what do we have seen sometimes, because of the interest rate

fluctuations, because of certain other macroeconomic variables, this exact amount of the liability cannot be realized after certain amount of years.

If this exact amount of the liability cannot be realized or there is a fluctuation of this particular interest rate, there is another way of this buy and hold strategies, some of the investors use that is called the bond laddering.

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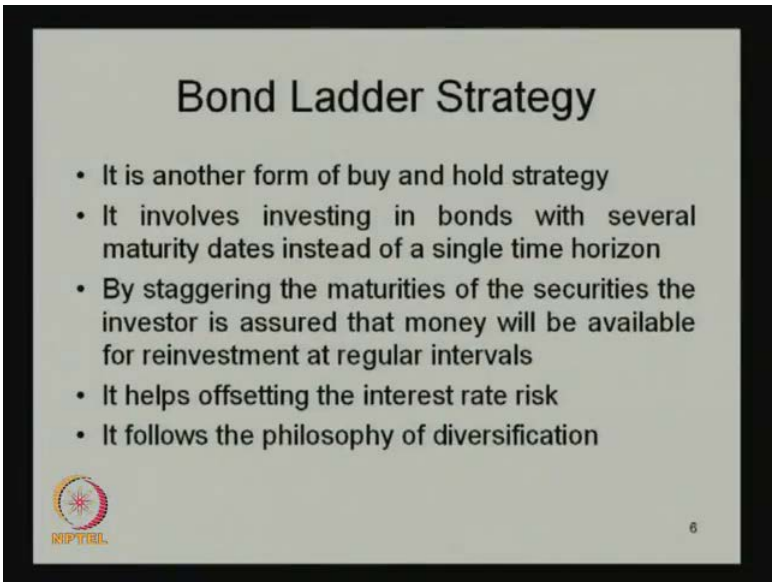

What do you mean by bond laddering? I This bond laddering case, already I told you, it is another form of a buy and hold strategy

But instead of using only one term to maturity and all the money should be spend in one term to maturity period bond, it involves the investment in bonds with several maturity dates instead of a single time horizon.

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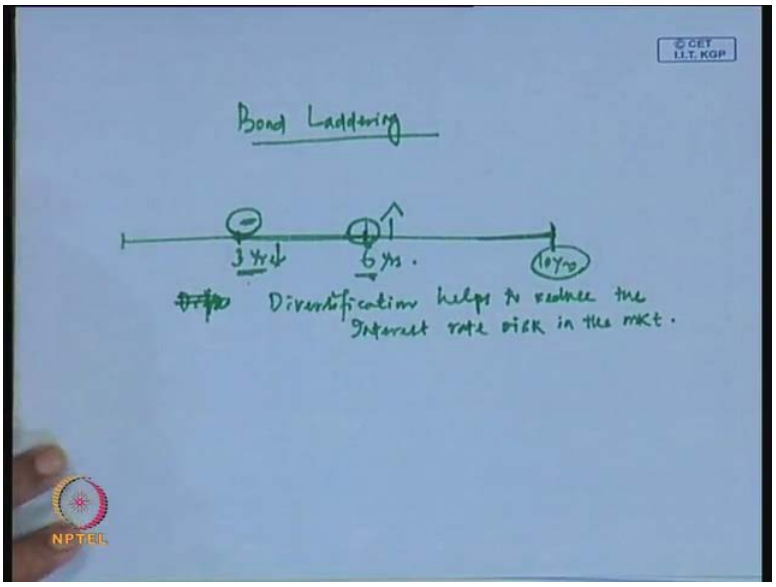

That means, if your investment horizon period is let 10 years, then, certain amount of the money should be kept where the term to maturity or investor should be invested on bonds where the term to maturity 3 years, certain amount of the bonds should be 6 years and and finally, certain amount should be 10 years.

What is this philosophy? Why basically the investor should do that? The investor should do that because by staggering the maturities of the securities, the investor is assured that money will be available for reinvestment at regular intervals.

That means, what you have observed for example, they said this this interest rate has gone down, the price of the bond will go up, but here, he will get some more return. But after certain time, they will realize the 6 year interest rate has gone up, then, what will happen is that the price risk will increase.

So, in that case, the return that they have realized here, extra return can be neutralized here. But, if all the bonds are 10 years maturity, then, what happens is, if there is a fluctuation between the interim periods, in terms of interest rates, then, the exact amount of the liability may not be materialized after the 10 years period.

Now, another thing the investor is also assured of certain amount of regular income. They will have certain amount of the money in this span of 3 years and 6 years which can be reinvested on the basis of the investor's objective.

Once there is increase and decrease of the interest ratecan be offset to each other within this interim period, it helps offsetting the interest rate risk. It helps offsetting the interest rate risk because because of change in interest rates. When the price level or the price of the bond changes, then, we are more exposed to the price risk or the other type of risk. But once we have the different position in the market on the basis of the different term to maturity, the interest rate risk can be reduced or it can be offset by taking that different position on the basis of the term to maturity and it also follows the philosophy of diversification.

What do you mean by the philosophy of diversification? We have the bonds not only on the basis of the different characteristics in terms of the other category, like in the beginning case what we have seen that there is no such kind of diversification we are holding the bond where the term to maturity and other things or coupons etc., are same throughout the period to materialize or to get certain amount of the return after certain years which can perfectly match to our requirements.

But here, what basically we do is, we take the position in such way that we have the different bonds in our portfolio on the basis of their term to maturity. So, that is why the diversification can be taken place and this interest rate risk diversification helps to reduce the interest rate risk in the market. So, that is the way the bond laddering strategy works in the market.

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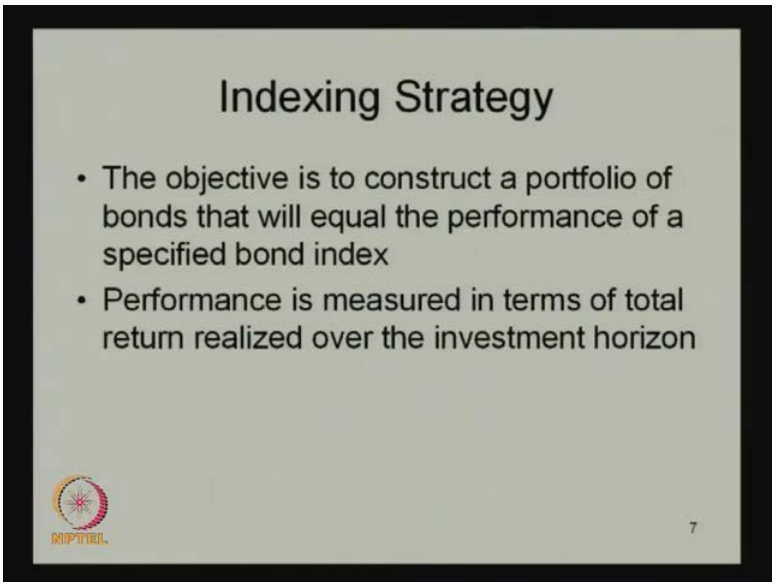

Then another type of strategy we have is called the indexing strategy. What do you mean by this indexing strategy? The basic objective is to construct a portfolio of bonds that will equal the performance of the specified bond index.

You go back to the previous session when we discussed about the indexing strategy in terms of equity portfolio management. It is the same philosophy that is used in the bond portfolio.

There, what we are doing is, we are replicating one equity index and what we have observed there is that the portfolio manager or the investor always wants to get the maximum return what this particular index is giving.

So, therefore, what we can sayt in that case is, we are replicating one particular index which is our benchmark index and the return what this benchmark index is giving this much return we are trying to get from the market at a particular time period.

In this case also, in the bond portfolio strategy, we are following the same strategy. We are again replicating or we are again targeting a particular bond where the portfolio should give as much as return what this particular benchmark index is giving and performance of this particular index is measured in terms of total return realized over the investment horizon.

What is the total return this index is giving and what is the total return this particular bond portfolio which has been constructed on the basis of or by replicating this particular index has been compared and accordingly you can say how this particular index is performing.

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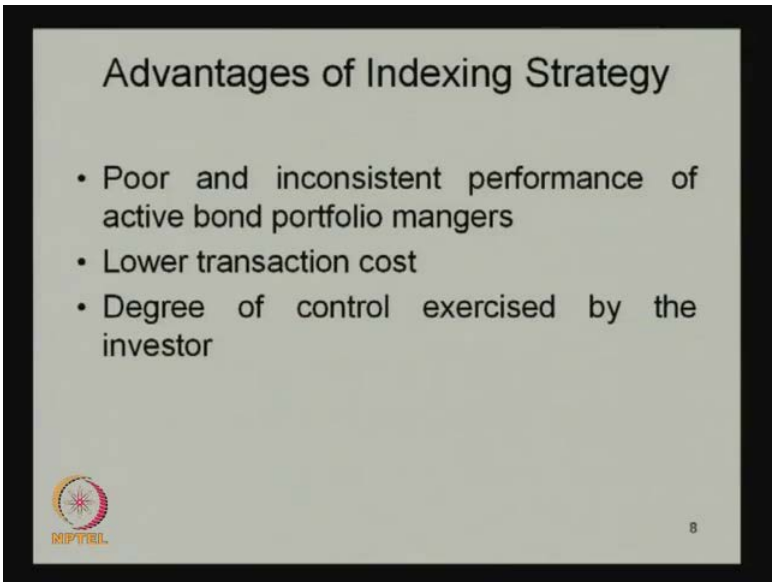

What are the different Advantages of Indexing Strategy? Sometimes, even if we actively trade in the market, we take the different positions in the market. Sometimes, there is an inconsistent performance of the bond manager, portfolio manager. It is because of some of the macro economic factors or sometimes the individual manager's performance.

It involves high transaction cost. But in the indexing strategy, we can minimize that thing because we do not have to change the position frequently and the degree of control exercised by the investor; that means, the particular manager takes his own decision to change the portfolio asset allocation in the particular bond portfolio.

But here, some control has been given to this investor also. He can decide that how this particular portfolio allocation can be made on the basis of his requirement by which the return or the yield of this particular bond portfolio can be maximized.

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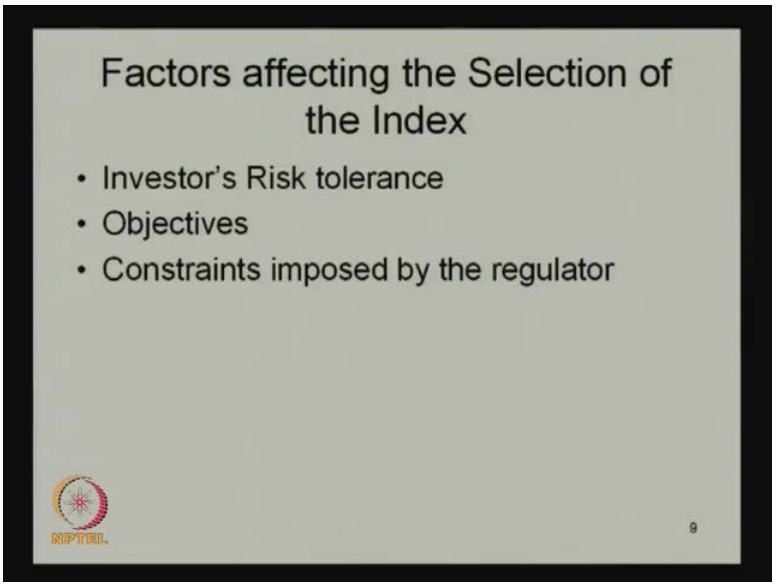

Therefore, there are certain advantages involved in this. What is the basic objective of this? The basic objective of this thing is to minimize the errors that we can get from this particular return expectations and as well as the maximization of the income.

So, what are the factors? Whenever we talk about the Index benchmark, or we can say that we construct our own index by looking into a benchmark index, which are the factors which play the significant role for selection of the index or how this index can be prepared?

The major factor is investor's risk tolerance; that means, if investors risk tolerance level is very low; we can make a Index by taking only the government securities.

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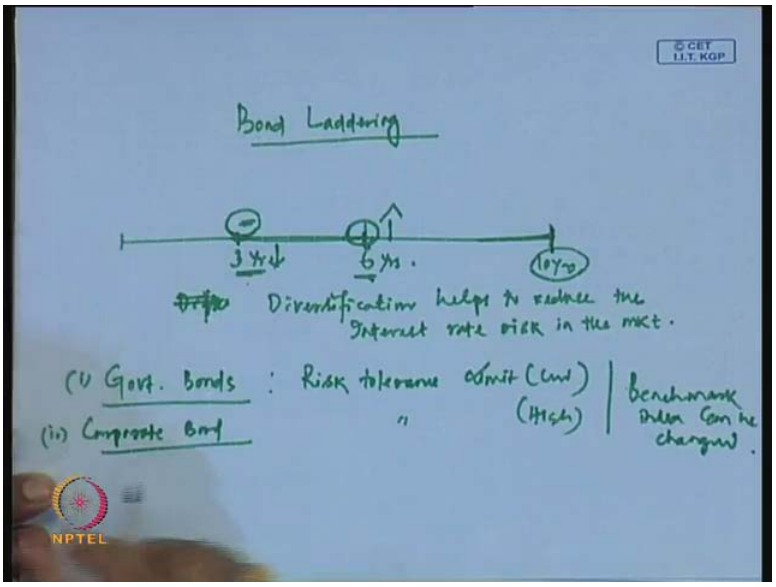

Or we can say that government bonds which are issued by the or government securities issued by the government; have a very low Risk tolerance limit.

But, if the risk tolerance limit is little bit high, then what we can do is, we can go for some risky corporate bonds to make our portfolio or we can make a index and accordingly, the benchmark index can be changedbecause the investment philosophy in these two cases are different. Another factor we have is objectives.

What do mean by the objectives? The objective talks about what this investor wants, in the sense whether the investor really wants to maximize the income. In that case they want to get certain amount or they want to haze their certain amount of the risk because of change in the interest rate in the market.

Therefore, from the beginning, if it is clear what the basic objective of the investor is, what he is trying to do, then what happens is that we should take the position in such a way by which the certain objectives can be fulfilled. Then also; obviously, we will have always this constraints imposed by the regulator because we have certain regulations on which we can say that certain portfolio can should not consist of more than this type of bond or that type of bond and some bonds are basically tax free, some bonds are not tax free. So, those factors will be taken into consideration because of the constraints imposed by the regulators.

So, this is also another factor which basically affects the construction of the index whenever we follow this index and strategy.

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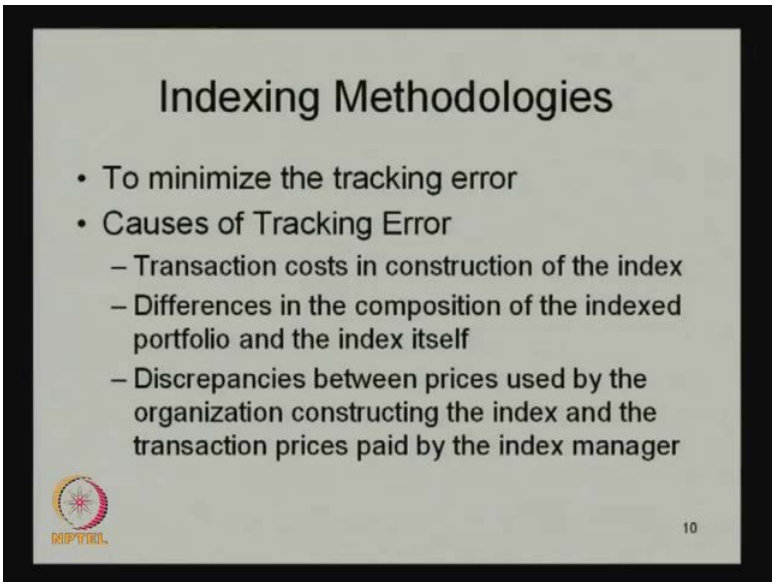

How does this indexing methodologies works? I already told you that the basic objective is the tracking error. The basic objective is minimizing the tracking error.

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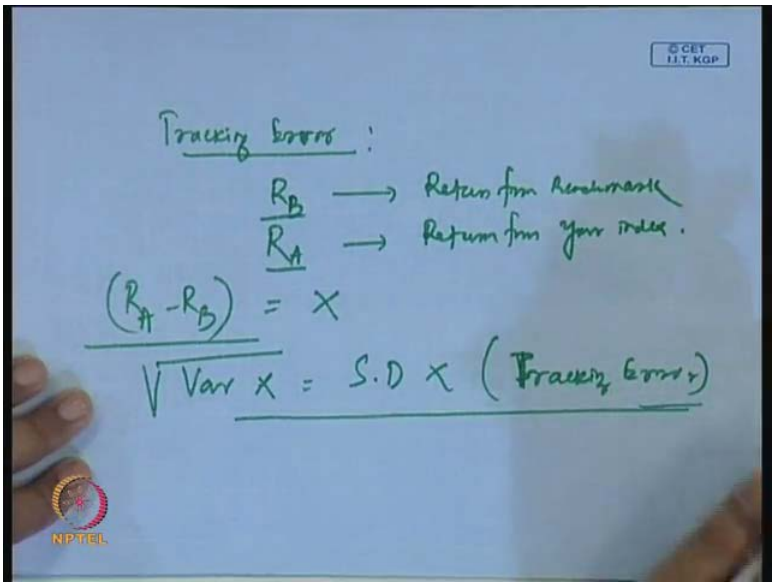

What do you mean by this tracking error? You know it is basically the minimization of the variance of the fluctuation of the returns between this particular index and the benchmark index.

Let R 1 is return from the benchmark. R B return from the benchmark index and let R A which is a return from your actual index. Then, if you calculate this variance of this return; that means, you have R A minus R B. We have the fluctuation on the basis of the different periods. Let this is X, then, this variance of X or if you take the root of this, it will be the standard deviation of the X, the tracking error.

Already we have explained this thing thoroughly in your equity return case. In the same way, this particular function works. The basic objective of the particular investor who follows this indexing strategy is to minimize the tracking error. So, they always try to minimize the tracking error.

Then, why does this tracking error come? What are the different causes of the tracking error? Tracking error is occurred because of transaction costs whenever we measure the construction of a index which may not be available to the benchmark.

Differences in the composition of the index portfolio and the index itself, there is another way we can change the composition. We can also take a very customized index instead of only indexing the same way, whatever way the index actual benchmark, index has been prepared.

So, in that case what happens is that it also affects the return of this particular portfolio by which the tracking error also increases or tracking error may decreases and that is why there is a change in the return between the benchmark portfolio and the actual portfolio what you have constructed. Then, we also have the discrepancies between the prices used by the organization constructing the index and the transaction prices paid by the index manager.

So, if that particular difference is there, that also affects the tracking; that means, in overall we can say the transaction cost or the adjustment cost which basically play the significant role for for the tracking error in this case.

And another way is the portfolio allocation. Whatever allocation has been given to this particular benchmark portfolio, the same allocation may not be maintained in terms of the index what we are preparing or what the investor prepares himself and because of that the tracking error comes into the picture.

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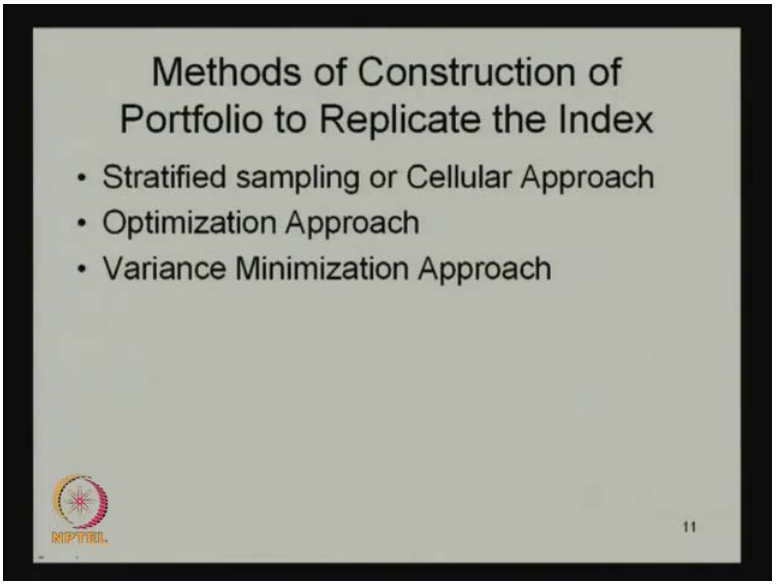

Then, like your equity indexing portfolio, we follow the methods of the construction of the portfolio to replicate the index, we have a stratified sampling approach or the Cellular Approach. Then, we have another approach called Optimization Approach. Then, another thing is the Variance Minimization Approach.

The optimization approach or the variance minimization approach is more or less same. Here, we are optimizing the return, second case, we are minimizing the variance or the risk that we are facing from this.

What does this cellular approach mean? If you observe, here the cellular approach means your index, let you have the difference cells, you can construct on the basis of that certain category, you can observe that this certain category consist of

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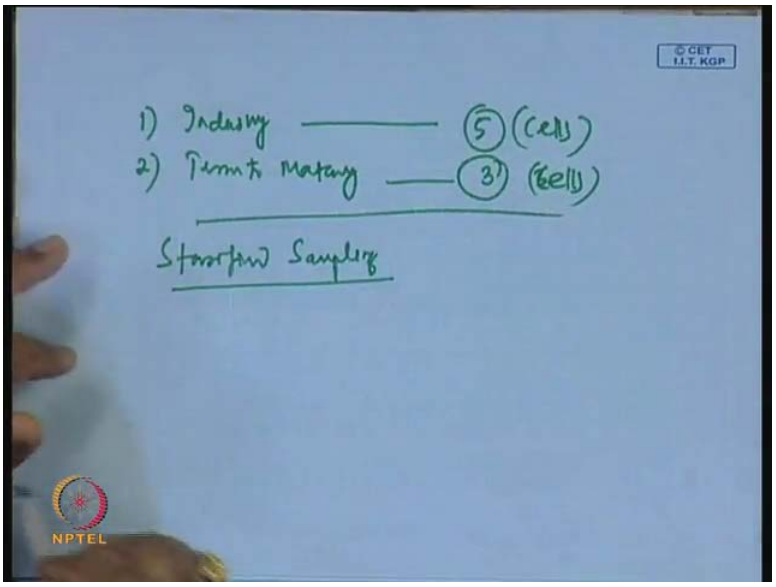

Let you are preparing an index. Let Industry is one of the categories on which you are preferring. Number 2 is your term to maturity.

You have the different cells you can make. Let there are 5 industries available. Then, there are 5 cells and term to maturity let we have 3 alternatives available, there are 3 cells.

On the basis of that, the number of cells will increase and your construction of the index should be based on this and you can decide the number of bonds from each category in the stratified way.

So, we are using the stratified sampling approach to construct this particular particular index in a particular time period. Then, optimization approach already I told you that we have certain objectives and we have certain constraints. Then, either you want to minimize this particular return or income you are going to get from this particular index

or you want to maximize the return what you going to get or you want to minimize the risk or the variance that you are observing between this benchmark portfolio or the actual portfolio that you have constructed.

So, these are the different ways this particular construction of this particular portfolio is made or the index has been made.

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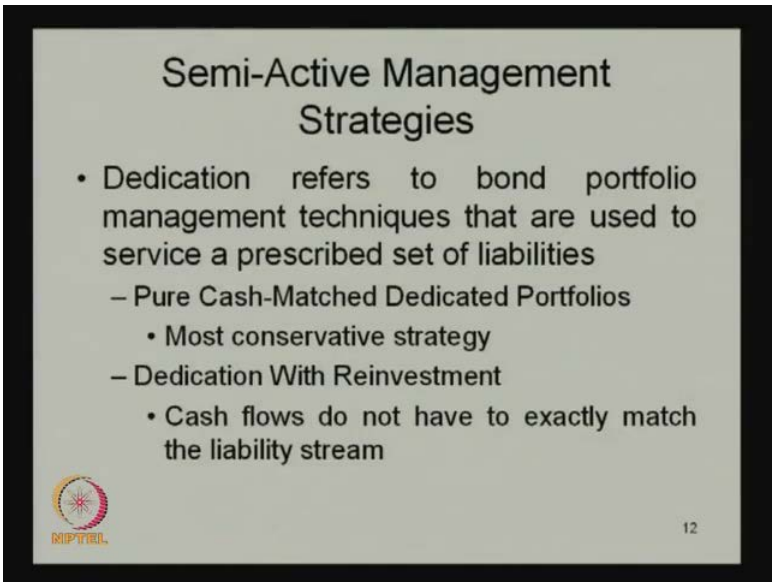

Then, we have another type of strategy called Semi-Active Management Strategy. But, different books have used a different connotation for this. Semi-Active management strategy means there are basically two -three approaches.

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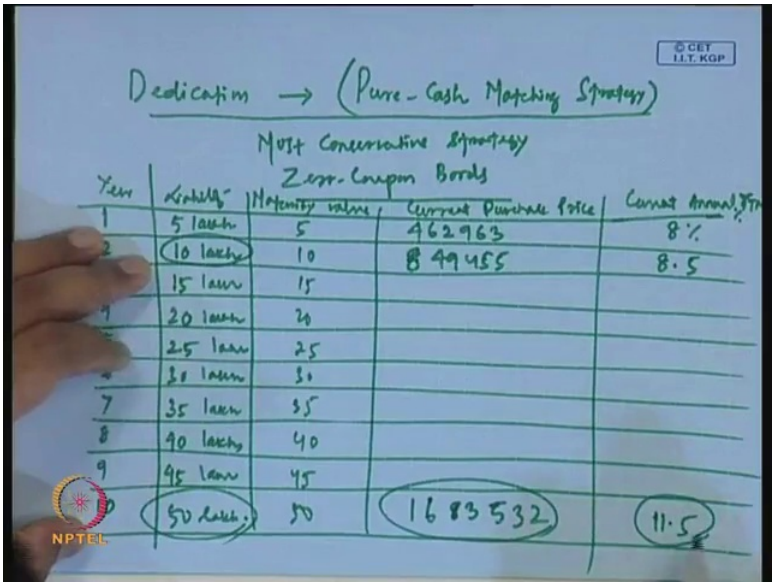

One is your dedication or the cash matching strategy or the Pure-cash Matching Strategy. In this case, what happens is that, whatever way it is defined, that dedication refers to bond portfolio management technique that are used to service a prescribed set of liabilities.

It is the most conservative strategy. How does it work? For example, the best instrument of following this dedication strategy is zero-coupon bonds. zero-coupon bonds.

So, what happens in zero-coupon bonds, suppose a liability of a particular investor has been given for ten years, let the liability of the investor for the ten years has been given. So, this is your year. This is your liability. This is your maturity value. This is your current purchase price. This is your current annual yield to maturity in the percentage.

How does this particular function work? If you observe, if you are investing only on the zero-coupon bonds which has no regular flow of income like your coupon payments,

how does this dedication strategy works; that means, perfectly your income after certain years will be perfectly matched to the liability. That is the perfect matching with liability which with these assets that we can talk about. This 5 lakhs is your liability through 1 year. This is let 10 lakhs, 15 lakh, 20 lakh, this is 25 lakh, 30 lakh, then, you have 35 lakhs, 40 lakhs, 45 lakhs and 50 lakhs.

This is the case. We already know that the maturity value after 1 year is the same amount. It is same like your liability like your 5, 10, 15, 20 25, 30, 35, 40, 45, 50 because this is a zero-coupon bond.

Then, what should be the current purchase price? Then, in this case, at the end of the 1 year if you wants 5 lakhs rupees, then, how much he should invest now?

Let your current yield is 8 percent. If it is 8 percent of 1 year maturity bond, then, he should invest 4,62,963 rupees, to get this 5 lakh rupees after 1 year and to meet the liability whatever you would have then in this way, what generally the individual can do, the individual can finance the liability stream by investing in the zero-coupon bonds.

The current yield to maturity and the required current investment are nothing but, on the basis of the current yield to maturity, he invest certain money in the market in certain period.

Let let your current yield to maturity in the second period be 8.5 percent. So, like that, he should invest 8,49,455 rupees to get this 10 lakh rupees after 2 years.

What he should invest in the beginning? So, like that if you see, the zero-coupon bonds has basically redeemed at the same time when the liability falls due.

So, finally, whenever he will invest, let yield be 11.5 percent, but here he should invest 16,83,532 from the beginning current current period and after 10 years, if the yield to maturity be 11.5 percent, then perfectly it will be matched to this 50 lakh rupees whatever the liability this particular investor has.

So, therefore, here there is no regular income flow whatever we are expecting from a bond and all the money should be invested in the zero-coupon bond which will be redeemed at the par in a exactly amount of the liability whatever he will have, he will be getting it in the end of the period. We have another way of dedication with reinvestment; that means, we can also assume that there is regular flow of income; that means, there is coupon involved.

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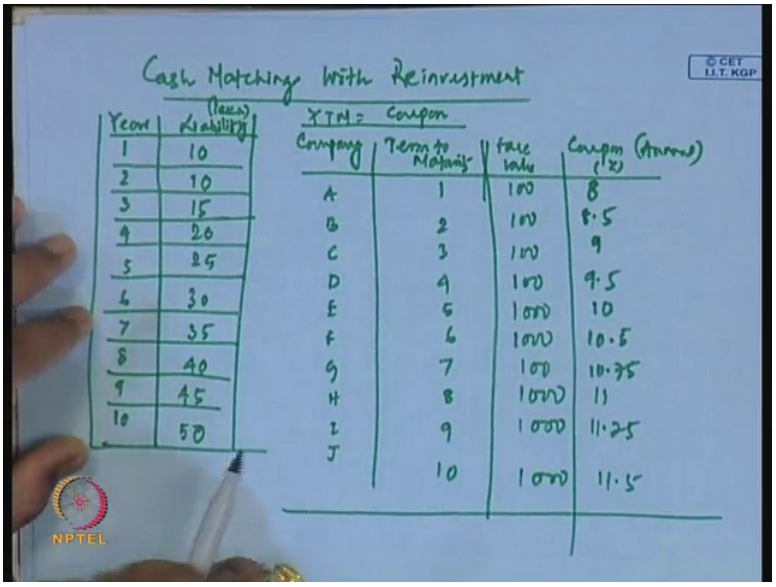

Then, how this particular particular strategy works? Let if cash matching with a reinvestment, we name it cash matching with reinvestment or a dedication with reinvestment, whatever name you can tell, reinvestment opportunities are available here. Let the particular particular pension fund if you take the example of a pension fund, the following liabilities they will have for the next 10 years.

Let this is your year 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. This is your liability. Then, what we have observed is that let the liability of this particular pension fund in these ten years is 10 lakhs. It is in terms of lakhs. Let again for second year, it is again 10 lakhs. This is 15, this is 20, this is 25, this is 30, this is 35, 40, then, this is 45 and let this is 50.

This is the way this particular liability of the fund manager will have. Let for simplicity, we assume that all the bonds are currently trading at on their face values and therefore, the Y T M is equal to your coupon because they are traded at their face value in that particular time period.

So, if you observe that we have certain bonds which are available to him and here the term to maturity, let this is your company which basically switch the bond. Credit rating is same for all the companies. This is your term to maturity and this is your face value and this is your coupon. This is your annual coupon rate, then let this is your company A B C D E F G H I J these are your different companies.

Then, we have term to maturity 1 2 3 4 5 6 7 8 9 10. Then, we have the face values of this particular bond rate 100 rupees. This is you have 100 rupees, 100 rupees, 100 rupees, let this is 1000, this is also 1000, this is 100 rupees, this is 1000, this is 1000, this is also 1000.

And coupon we have taken the annual coupon rate annual. So, this is let 8 percent, this is 8.5, this is 9, 9.5, this is 10, let 10.5, this is 10.75, let this is 11, this is 11.25 and this is 11.5. These are the different coupons that are available.

Let what the fund manager has assumed that they would like to invest in the bonds where the Y T M is not less than 9 percent; that means, he wants to decide that he would invest from the C, because this is your threshold limit, where he has decided he will invest only the bonds where at least this yield to maturity will be 9 percent. Then, how this this particular matching can be taken place in this case. If you observe here,

what basically they have done, let they have invested certain money in this particular bonds.

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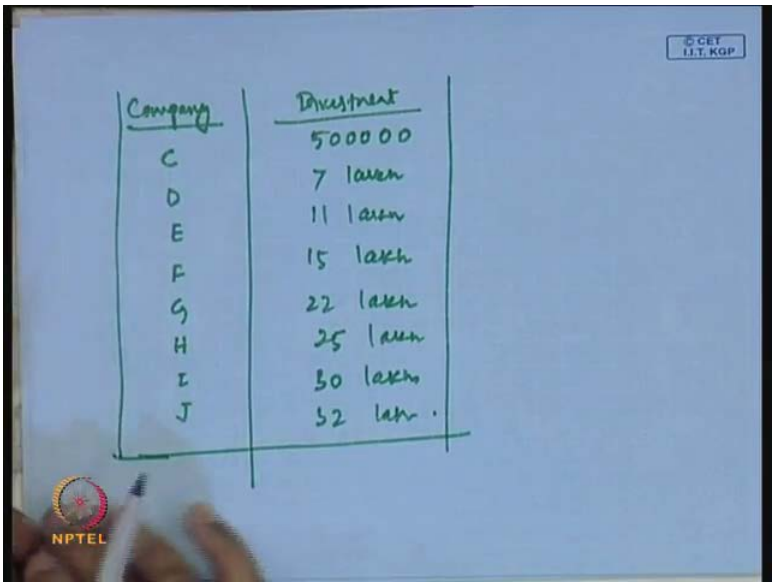

Let now, they have chosen this company. According to their rule, they have chosen the company C D E F G H I J. This is the company what they have chosen and the investment what they have made.

In The company C they have invested 5,00,000. Like that they have invested 7 lakh here, they have 11 lakh in E, 15 lakh in F, then, 22 lakh in G, 25 lakh in H, 30 lakhs in I, then, 32 lakhs in J. So, this is the way they have invested this particular bond.

Now, our objective is that we have to see that exactly this liability in asset after certain years, it will be perfectly matched. There should not be any surplus. In the end of the period, there should not be any kind of deficit according to our hypothesis what you are talking about.

By looking into, but using this data, if you observe, what is the liability that has already given to you?

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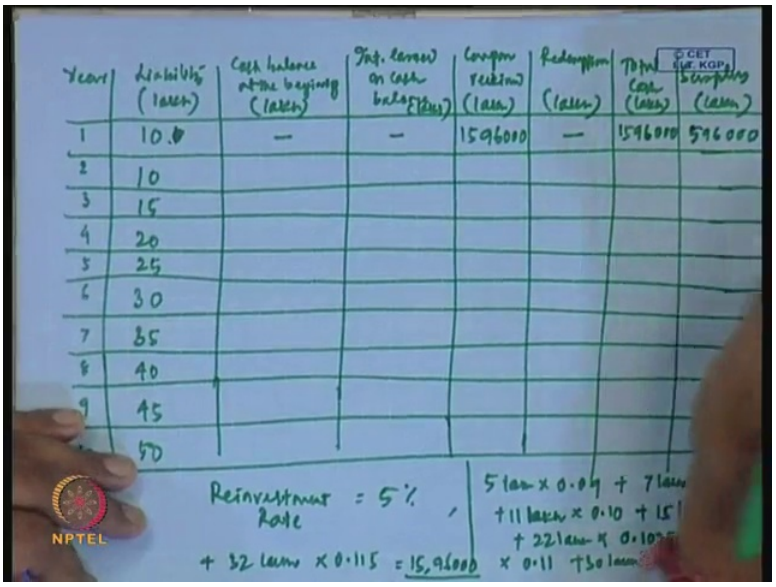

That means, you have the the year. Let this is your year. This is your liability. This is your cash balance at the beginning, then interest rate, and on the cash balance, then your coupon received, then you have redemption, then, you have the total cash available with you, then you have the surplus or the deficit in the end.

If this is the way you are going to study and this is particular wants, then we can see that how this particular matching is taken place 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. Already you know what is the liability we will have for the different years, on the basis of the term to maturity.

So, if already this thing is given to us, then we have to measure this how this works. Let this is 10 lakhs all are in lakhs. We can assume how this particular thing works. Let one of their assumptions, we can take the reinvestment rate is let 5 percent interest available for is always the 5 percent on the basis of this investment. Redemption is nothing but the reinvestment rate is 5 percent. The redemption is the maturity value of the investment.

Then, the total cash available for year is sum of the cash balance at the beginning plus the interest and plus the coupon payments whatever they have and the redemptions.

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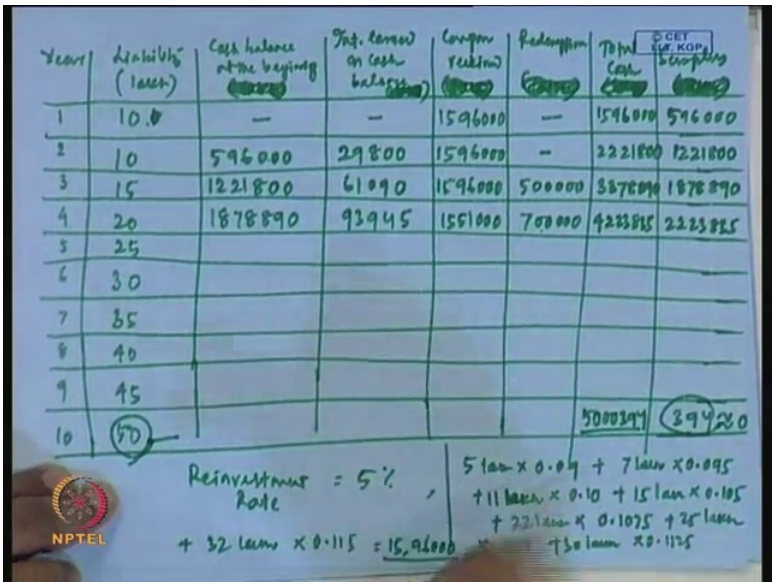

Surplus in the end is the cash available for the year less the liabilities of the particular year. This is the assumption what we have taken. This is 10 lakhs, this is 10 lakhs, this is 15, this is 20, this is 25, this is 30, this is 35, this is 40, this is 45, this is 50. Then, cash balance at the beginning of the first year is nothing. Then, your interest hand is nothing, then coupon, you have to calculate the coupon in the first year, the coupon in the end of the first year you can calculate that is you have invested this 5 lakhs in C bond. That is why the 5 lakhs is multiplied by 0.09 plus 7 lakhs multiplied by 0.095, plus 11 lakhs multiplied by 0.10, plus 15 lakhs multiplied by 0.105, plus 22 lakh multiplied by 0.1075, plus 25 lakh multiplied by 0.11, plus 30 lakhs multiplied by 0.1125, plus plus 32 lakhs multiplied by 0.115. That will give you 15,96,000.

So, the first year this coupon received will be 15,96,000 and that will be your coupon payment receipt redemption is nothing. total cash available is also the 15,96,000. Surplus is this minus this. That will be 5,96,000.

And your total figure you can write is 5,96,000 .Then, in the second year, you will have cash at the beginning is 5,96,000. Then, you will have this interest and this multiplied by 0.05. This will have 29,800. Then coupon payment received is same redemption 96,000. No redemption, that is why it is zero.

Then this total value this plus this plus this this will be 22,21,800 and the value will be this minus this. That will be 12,21,800. it will be twelve twenty one eight zero zero. So, then, what we can do, after 3 years, you have cash balance at the beginning is 12,21,800, interest this multiplied by 0.505, that will give you 61,090, coupon payment received is 15,96,000, then redemption is after term to maturity is a company c ,they have invested 5 lakhs, the term to maturity 3 years.

So, now they have redemption value 5 lakhs. So, that will be 33,78,890, then,990, then we have 18,78,890. Like that, if you see, again this will be used as 18,78,890, then you have 93,945, then 15,51,000. Then we have 7,00,000 again redemption, then we have here 42,23,835, then we have here 22,23,835.

If you go on in the end, you will find this particular surplus value will come 394 will be approximately equal to 0 what we can make. So, therefore, if you go on increasing these things, if you observe, the liability of the 50 lakhs will be perfectly matching with this amount will come to 5,00,394.

So, therefore, what we can say is that the basic objective of the investor always is to match with this value this and therefore, he should go for the perfect matching strategy in that case.

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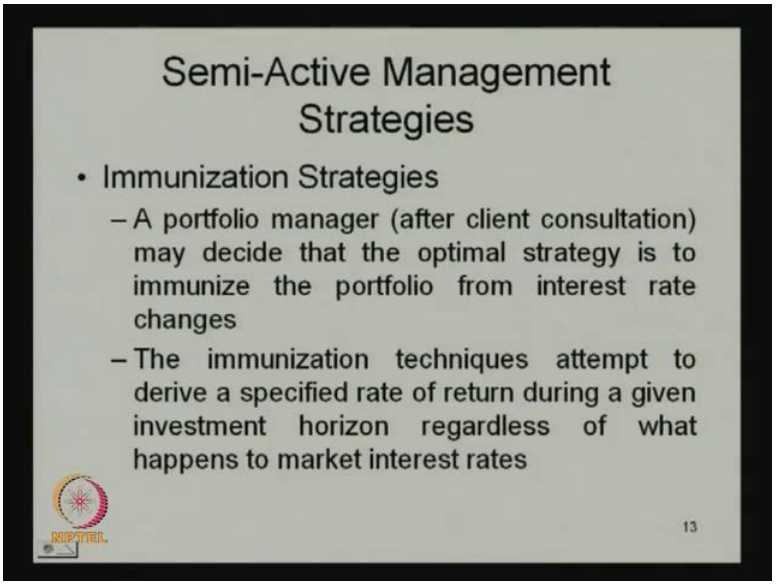

But here, what we have observed is that we have not taken into account the yield. In this context, if you want to talk about the yield, we have certain techniques. We have the immunization strategy. They decide the optimal strategy to immunize the portfolio from interested changes and the immunization technique attempts to derive a specified rate of return during given investment horizon regardless of what happens to the market interest rate.

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How does immunization strategy works? It practically works on the basis of the two ways because they offsetting the price risk with the reinvestment risk; that means, if you know the interest rate gone up, the value of the bond goes down.

But the reinvestment opportunity will be more. The return from the reinvestment of the coupons will be higher. That is why we should the position in such a way that the price risk and the reinvestment risk should be perfectly off set to each other. So, that is the concept how the immunization strategy works.

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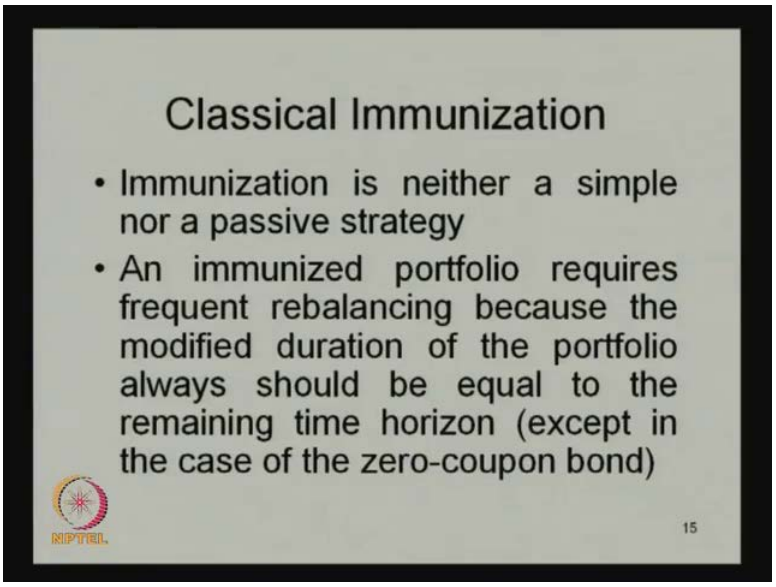

And, we have the classical immunization. It requires this frequent rebalancing because the modified deviation of the portfolio always should be the equal to the remaining time horizon except in the case of the zero-coupon bonds.

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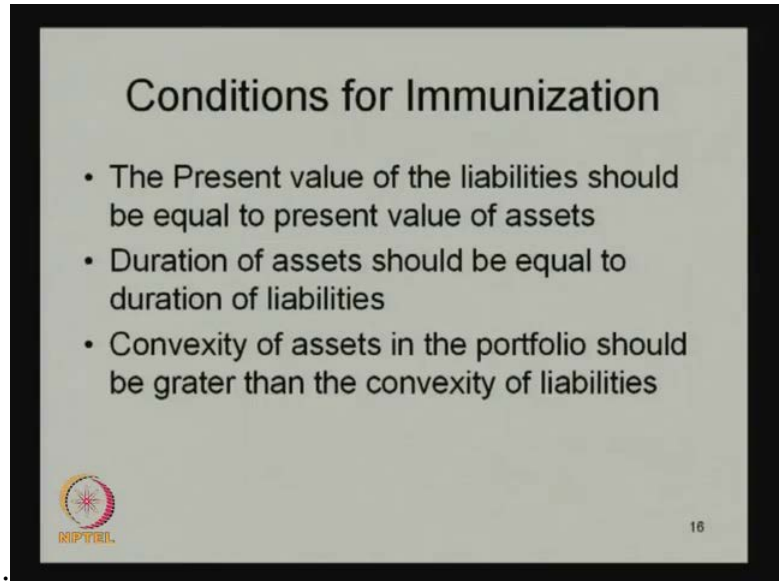

We have certain conditions for immunization. The present value of the liability should be equal to the present value of the assets.

The duration of assets should be equal to the duration of liabilities. Convexity of assets in the portfolio should be greater than the convexity of liabilities. These are the three conditions we should always take into account whenever the immunization strategy works.

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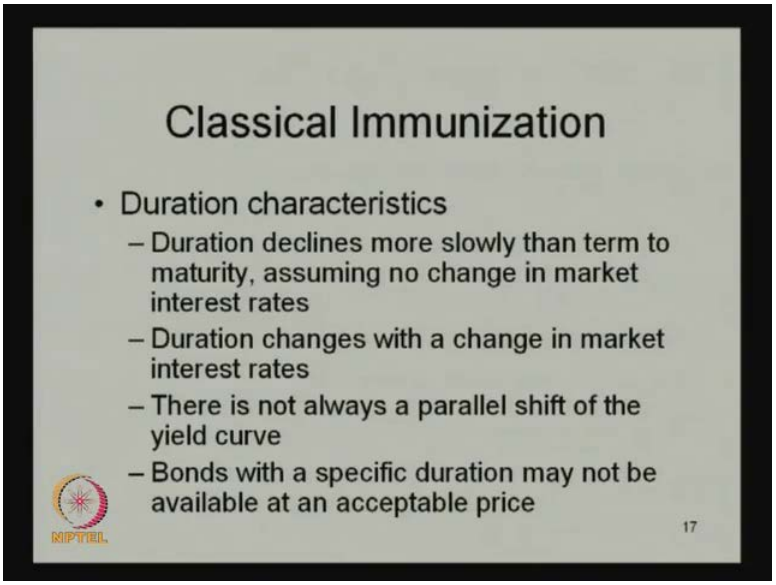

And, if you see the characteristics of the duration, it declines more slowly than term to maturity assuming no change in the market interest rate.

Duration changes, with the change in market interest rates. There is not always parallel shift of the yield curve bonds with the specific duration may not be available at an acceptable price.

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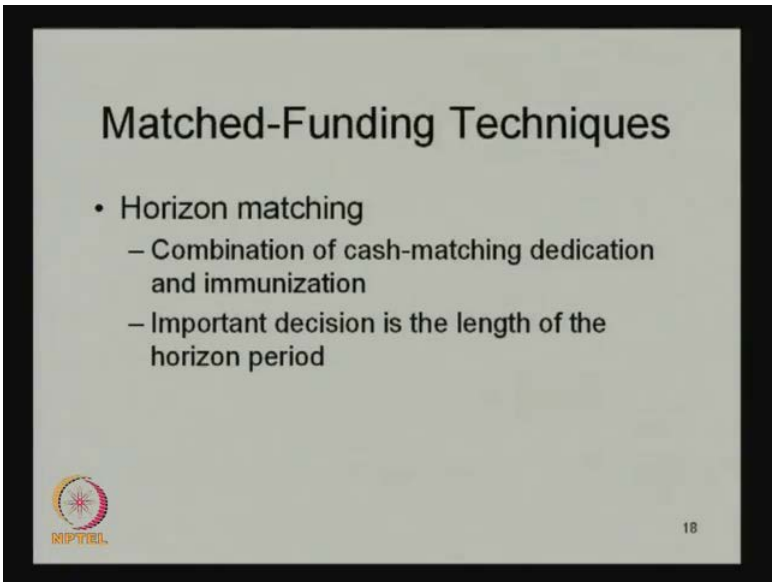

We have a horizon matching where the combination of cash matching dedication immunization will be worked out. It is an important decision in the length of the horizon period of the investor. So, this is the way the immunization strategy works, but how exactly the immunization strategy works and what the basic theme of the immunization strategy and how basically this immunization strategy is very much helpful for managing the risk in the financial market, in the bond investment and there are also other techniques of active portfolio management strategy which will be used in the bond case to get to maximize the return in the market.

We will be discussing that in the next class. Thank you.