Investment Management
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Lecture - 38
Portfolio Evaluation

Hello there. Having discussed about different financial assets, their characteristics and how to evaluate them and also learnt about behavioral factors that might affect our decision making. It is time to understand how to evaluate the performance of a portfolio that includes different types of assets.

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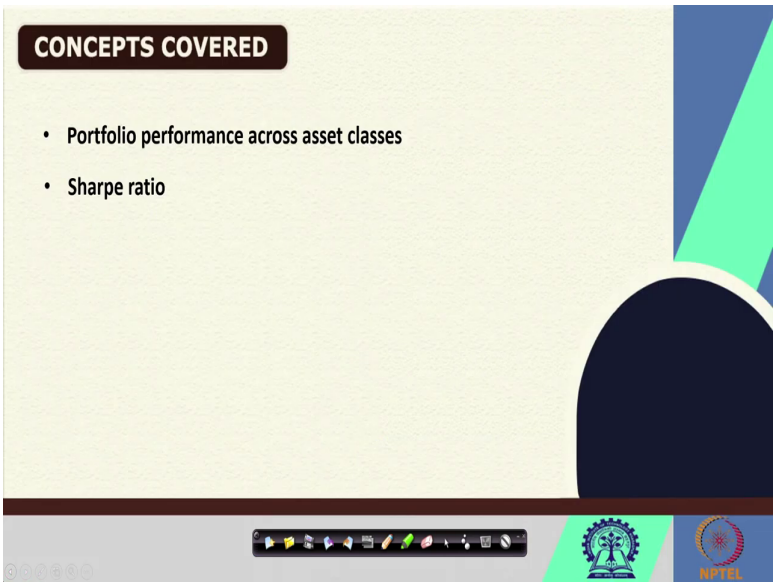

In this session we will talk about portfolio evaluation. And particularly we are going to talk about portfolio performance measurement across asset classes and tools that might be

required to understand the evaluation of portfolio performance. To start with we will talk about Sharpe ratio and other indicators will be discuss subsequently.

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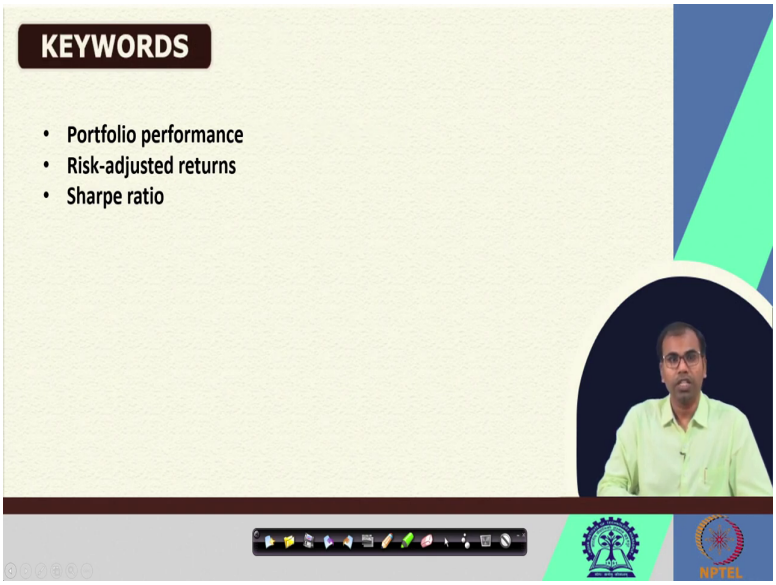

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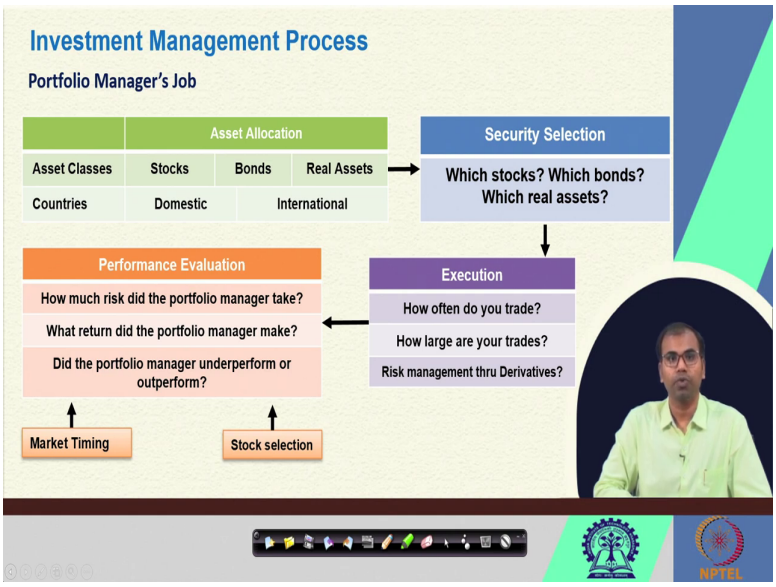

When it comes to investment decision making, we know that the job of a portfolio manager starts with asset allocation and subsequently security selection is carried out and then the trade execution happens and finally, performance evaluation is done. We know that when as a portfolio manager working on behalf of a client or as an investor, we need to decide what kind of assets do we want for our portfolio.

These assets can be stocks or bonds, mutual funds or any other assets. We can also want to diversify our portfolio within domestic markets or we can go international. Once we decide on the asset class that we want only equity or only bonds or a combination of equity and bonds or a mutual funds or real asset in our portfolio. We need to decide on the security selection part.

When it comes to security selection, we need to decide which stocks, which bonds, which real asset, which mutual fund and these things are carried out on the basis of the valuation? Where we learned about the value of any financial security typically depends on the expected cash flow or expected return that the security is supposed to be generating.

Based on future dividends or future coupons or future returns we decide the value of a financial security and if we realize that the price of financial security today is worth less than the present value of future cash flows that we are expected to receive from that financial security then we go ahead and buy that security for inclusion in our portfolio and so on.

Buying a security also depends on how quickly you want to buy, how often you want to buy, in what quantity you want to buy and whether we need to do certain risk management practices by investing in derivatives or any other risk management tools. Having done all these we need to decide whether our portfolio is doing well. We need to start with understanding how much risk did we take as an investor or as a portfolio manager, whether the risk that we have assumed is commensurate for the return that we are going to receive.

Whether the return that we are generating from the portfolio is sufficient for the risk that we are taking particularly when it comes to comparing the portfolio with another portfolio or for a benchmark index; after we do this then only, we realize whether as a portfolio manager or as an investor we have underperformed or outperformed.

Well, it goes without saying that all these questions have varying answers and it depends on market timing, stock selection abilities, the overall market movement and then only we realize and understand whether we have outperformed or underperformed. When we see that the portfolio that we have invested in has generated more returns than an average portfolio in the market for example, the benchmark index or benchmark portfolio then we can qualify ourselves as an outperforming manager.

And if the portfolio that we have invested in has generated a return less than the benchmark market portfolio or benchmark index then we can call ourselves as underperforming manager.

There is no brain argument in saying that everyone want to invest in a fund or in an investment managed by an outperforming manager, which implies that when you do appropriate asset allocation and identify securities that are most valuable particularly for your portfolio.

And investment goal then only you can expect your portfolio to be performing better than other portfolios.

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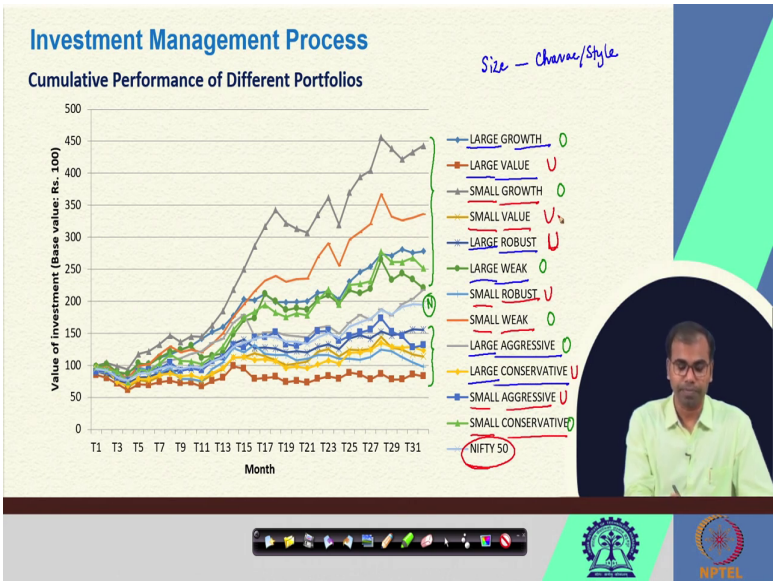

If we look at this graph, we observe that this graph has a trend of different types of portfolios showing their value over a period of time. If we look at this graph this graph essentially is based on last three years data where, if we had invested 100 rupees of some money in T0 which is at the beginning of the period, what would have been the value of that 100 rupees investment at the end of the sample period of almost 3 years.

If you look at the comparable performance of different types of portfolio here we have portfolios that belong to asset classes. Particularly in case of large cap stocks we have let us assume that these portfolios are some proxy mutual funds, which have investment in large cap stocks or large cap growth stocks, large cap value stocks, large cap robust stocks, large cap weak stocks, large cap aggressive stocks and large cap conservative stocks.

So, we have two dimension one is size of the stocks where the fund has been invested in and characteristics or style. Similarly, we have other portfolios or funds which belong to small growth, small value, small robust, small weak and small aggressive and small conservative. And in order to compare their performance with the benchmark index we have Nifty 50 acting as the benchmark portfolio.

If you look at the outperforming and underperforming portfolio Nifty 50 is based here and some six portfolios have underperformed and other six portfolios have outperformed. If you look at the portfolios that have outperformed, we see that they belong to certain types of categories and there are other portfolios, which are under performing which have not performed as well as the Nifty index.

For example, we see that large aggressive portfolio the top performing portfolio is small growth portfolio then we have small weak portfolio, then we have a portfolio which is based on large cap and growth stocks. Then we have a portfolio which is small and conservative then we have a portfolio which is large and weak and finally, we have a portfolio.

So, we have these six portfolios which are outperforming the Nifty index and remaining six portfolios, which belong to large robust underperforming portfolio, small aggressive underperforming portfolio, large conservative underperforming portfolio, small robust underperforming portfolio, large value and small value.

We see that these are six portfolios which are under performing and remaining six are portfolios which are outperforming. Now, that we cannot conclude by saying that these six portfolios are always going to outperform or the other six portfolios are always going to be

under performing. It depends on where we started it also depends on the market moment during this period.

It also depends on the benchmark that we are considering to compare the performance of our portfolio. But in general, typically when we compare the portfolio that we have invested in with any benchmark we see how well or how worse we have been doing.

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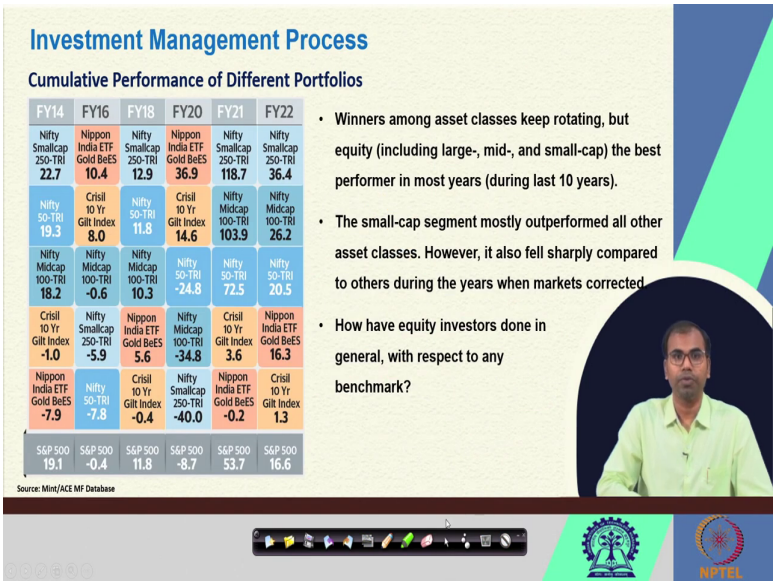

If you look at the historical performance of certain types of assets using certain historical data if you look at this particular graph, this particular diagram shows that there are certain types of assets or certain types of portfolios or proxy portfolios for that matter that have been doing better than other portfolios or other proxy portfolios.

For example, in this particular diagram we see that winners among asset classes keep on rotating, but equity including large cap, mid cap and small cap are the best performers in most years during last 10 years period. For example, if you look at the winners which are common in most of these years, we see that Nifty small cap is one common type of stocks or assets, which have outperformed all other asset classes. In general, particularly here out of 6 years, 4 years Nifty small cap has outperformed.

If we see this these 2 years it also fell sharply compared to others when the market corrected particularly in the year when we had COVID and previously also it had corrected sharply because of market correction. Similarly, if you look at other asset classes for example, gold, gold might have done well in certain number of years for example, if we look at these 2 years when gold had outperformed all other asset classes.

In other cases, we see gold has been doing reasonably well with respect to other asset classes and mid cap has been doing on and off in these years. So, if we want to know how have equity investors done in general with respect to any benchmark as we can see here the benchmark is S and P 500 and in several years S and P 500 done well except these years when S and P 500 has not done so well and with respect to S and P 500 these 5 asset classes have been performed. But in general, if you want to look at the performance of equity investors.

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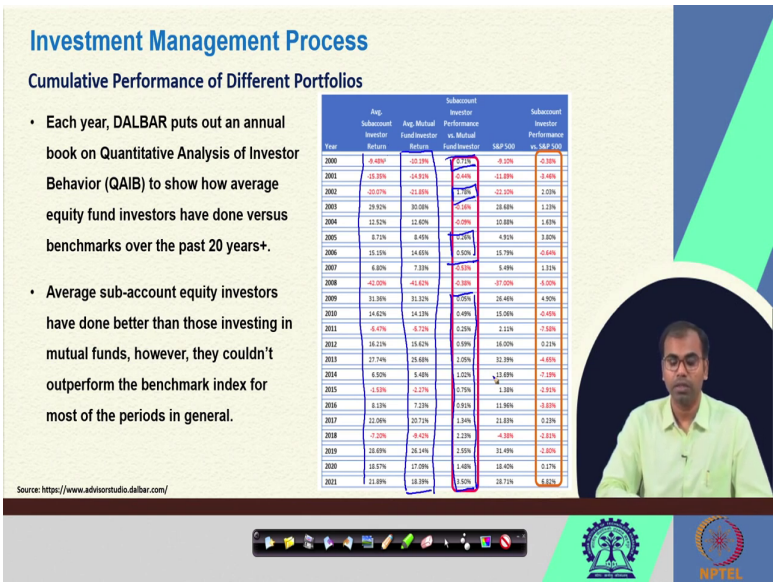

Can we take a look at more broad level? For example, if you look at the cumulative performance of different portfolios this particular data set is based on equity research firm where, the firm puts out an annual book on Quantitative Analysis of Investor Behavior to show how average equity fund investors have done with respect to benchmarks over the past 20 plus years.

If you look at this data set the number shows and tell us a lot of stories about the performance of investors belonging to different asset classes. For example, if you look at the average equity investors, they have done better than those investing in mutual fund, which means those who have been directly investing in equity markets they have done better than those who have been investing in mutual funds indirectly in equity.

However, they have not done so well when it comes to the benchmark index. For example, if you look at the data set this particular column shows the return of average investor in equity market. And the next column shows the average return on for investor who have invested in mutual funds.

If you look at their comparative performance, we see that the performance of average equity investor has been reasonably better than mutual fund manage mutual fund investor on several counts.

Only very few years let us say for example, in year 2000, in year 2002, in year 2005 and 6 and since year 2009 they have been doing much better than the people who have invested in mutual funds. But when it comes to their comparable performance with respect to index or benchmark index that is S and P 500; we see that S and P 500 has been doing better than average equity investors.

Where we note that in year 2000 and 2001, in year 2006, in year 2008, in year 2010 and 11, in year 2013, 14, 15 and 16 in year 2018 and 19 in these years S and P 500 has done better than average equity investors. And other years including 2002, 3, 4, 5 then 2007, 2009, 2012, 2017 and 2020 and 2021, equity investors have done better than even S and P 500.

It goes without saying that these data are based on average values and we can just infer that in under certain situations, certain market situations. Equity investors in general can outperform several other asset classes and this might be one of the motivating factors for any investor to explore equity as an investment strategy.

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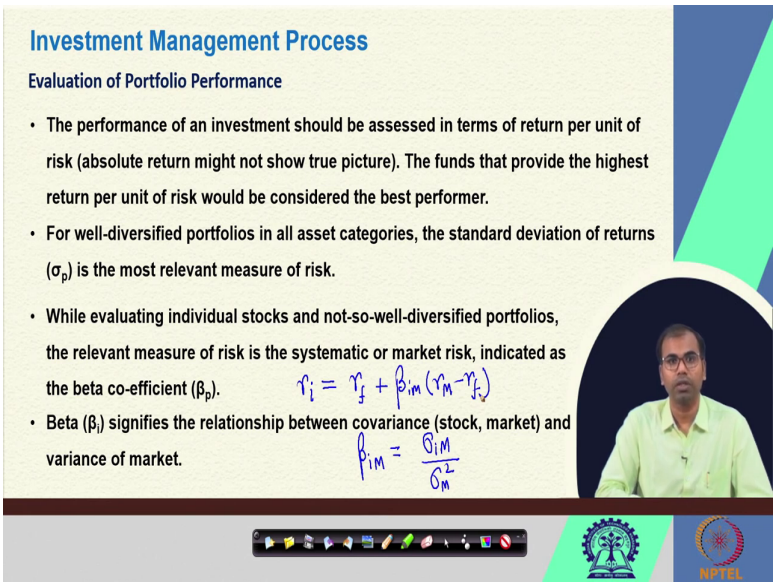

Subsequently if we want to understand the performance of the portfolio that we are investing in. The performance of an investment is typically assessed in terms of return per unit of risk because if we just consider the absolute return of a portfolio, then this might not give a true picture and we might be biased.

For example, if we say that my portfolio has given 20 percent of return, now this might look attractive, but this might not give the true picture, maybe this 20 percent of return is because of very high risk that I might have taken in my portfolio or for the same period, the benchmark index might have given 25 percent of return.

So, in that case my portfolio has underperformed. So, absolute return can cannot give the true picture and that is why risk return per unit of risk is a better measure. The funds or the portfolio that provide the highest return per unit of risk should be considered as the better

performer, the best performer, particularly for well diversified portfolios in all asset categories, the standard deviation of return that is sigma is the most relevant measure of risk.

And when we compare the performance of the portfolio, we need to compare the return for every unit of sigma, every unit of risk associated with that portfolio. Even when we are evaluating individual stocks and not so well diversified portfolios, a better relevant measure of risk is the systematic or market risk that is indicated as the beta coefficient. Earlier we have discussed about beta coefficient and we know that beta signifies the relationship between covariance that is between stock and market and variance of the market.

If we could recall the formula for beta coefficient, we know that beta on any stock i with respect to m is covariance between stock and the market and market covariance. And earlier we had seen that we can also find beta with respect to this formula called capital asset pricing model, where we have return expected on any asset i is a function of risk free rate of return plus beta i m that is beta of asset i with respect to the market r m minus r f where, r m is the rate of return on the market asset or benchmark portfolio and r f is the risk free rate of return.

With these understanding of risk which is systematic risk or market risk or undiversifiable risk denoted as beta coefficient and specific volatility or total risk of the asset indicated as the sigma in case of individual asset and case of portfolio, it is sigma portfolio.

We can use these risk measure to understand the risk adjusted return or return per unit of risk undertaken as part of the portfolio investment. And then only we can compare these returns in order to arrive at a conclusion whether the portfolio is doing better or worse than other portfolios or benchmark portfolios.

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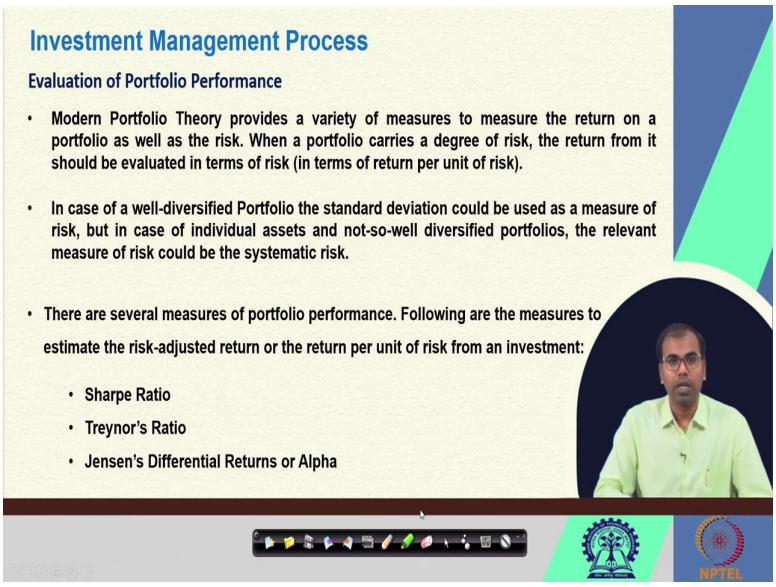

Earlier we have discussed about Markowitz portfolio theory also known as Modern Portfolio Theory. And we know that Modern Portfolio Theory provides a variety of measures to indicate to measure the return on a portfolio as well as the risk. When a portfolio carries a degree of risk the return from the portfolio is typically evaluated in terms of risk.

And more specifically we compare the performance of the portfolio in terms of return per unit of risk particularly in case of well diversified portfolios the standard deviation could be used as a measure of risk. And in case of individual asset and not so well diversified portfolio we could use the beta as an indicator of systematic risk. And when we use the return as well as risk in order to compare the performance of different portfolios.

We can use these three measures particularly that can be used for estimating the risk adjusted return or the return per unit of risk from an investment in case of evaluating a portfolio

performance. These three indicators are Sharpe ratio, Treynors ratio or Jensen's differential return or Jensen's alpha.

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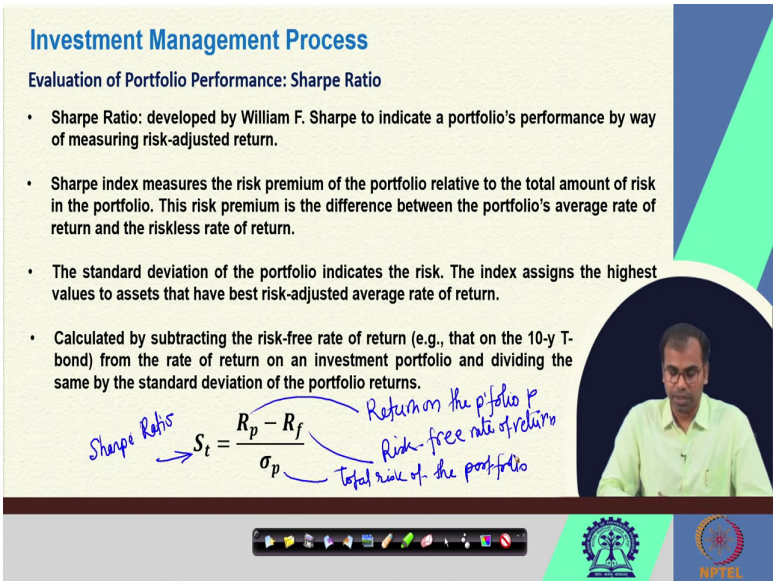

Let us take a look at the Sharpe ratio. We know that Sharpe ratio was proposed by William F. Sharpe was a Noble Laureate in Economics to indicate a portfolio's performance by way of measuring risk-adjusted return. And Sharpe ratio or Sharpe index measures the risk premium of the portfolio relative to the total amount of risk that anyone takes in that portfolio.

This risk premium is typically indicated as the difference between the portfolios average rate of return and the risk free rate of return. So, risk premium is used with respect to every unit of risk associated with that portfolio. And risk here is calculated in terms of standard deviation of the portfolios and this index Sharpe index assign the highest value to assets that have best

risk adjusted average rate of return. So, we can calculate a Sharpe ratio by calculate subtracting the risk free rate of return.

For example, in many cases we can use return on the 10 year treasury bond of the government from the rate of return on an investment portfolio and dividing the total by the standard deviation of the portfolio returns. So, here in this case this particular notation is for Sharpe ratio or Sharpe index. This particular is return on the portfolio that is held by the investor.

This is risk free rate of return, which is rate of return on any government Treasury bill or Treasury bond for example, 10 year Treasury bond of the government. And finally, this sigma p is the total risk of the portfolio.

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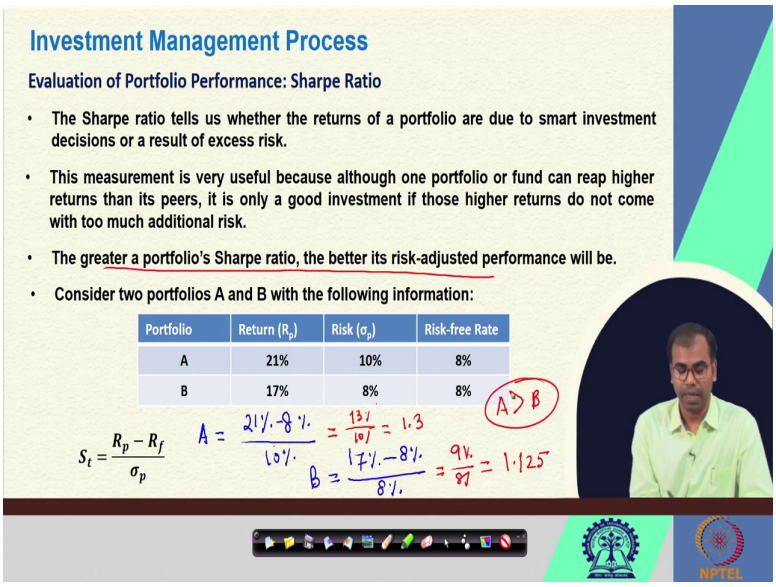

So, we can use this formula to calculate the Sharpe ratio of any portfolio and in order to compare one portfolio with another portfolio or a portfolio with benchmark portfolio. We can see this Sharpe ratio and make a decision. We observe that the greater the Sharpe ratio of the portfolio or the investment is the better it is for the risk adjusted performance.

Typically, Sharpe ratio tells us whether the return of portfolio are due to smart investment strategies or a result of excessive risk because it is an return indicator for every unit of risk. This measurement is very useful because even though one portfolio or fund can be higher return than its peers it is only a good investment if those higher returns do not come because of too much of additional risk.

And that is why we compare this risk adjusted return measure for comparing the performance of a portfolio. So, here in this case for example, let us say we have two portfolios and portfolio A and B have return 21 percent and 17 percent respectively. Their total risk that is sigma p is given as 10 percent and 8 percent and risk free rate for that matter is 8 percent in both cases.

So, if we compare Sharpe ratio, we know that for asset for portfolio A we can compare Sharpe ratio as 21 percent minus 8 percent minus 10 percent. And we can use this 21 percent minus 8 percent divided by 10 percent and for B we can use 17 percent minus risk free rate that is 8 percent divided by 8 percent.

So, if we calculate Sharpe ratio for A, we find the value of 13 percent by 10 percent. So, we get 1.3 here and in case of portfolio B we find 9 percent by 8 percent. So, we get a value of 1.125. So, going by this argument that in case of greater Sharpe ratio we can believe that a particular portfolio with higher Sharpe ratio is better in terms of risk adjusted return or return per unit of risk. So, in this case portfolio A is better than portfolio B.

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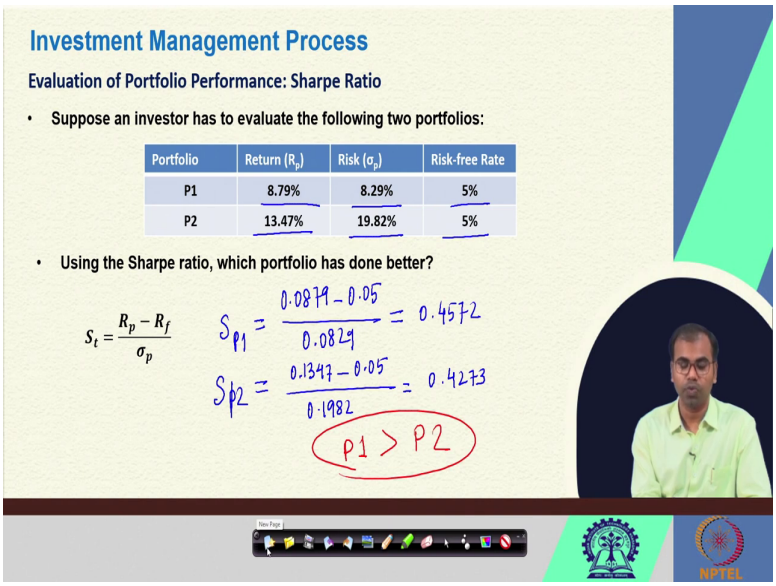

Similarly, if we let us say take a look at another example where we have two portfolios P1 and P2 where, P1 has a return of 8.79 percent risk of 8.29 percent and risk free rate 5 percent. P2 has a return of 13.47 percent risk of 19.82 percent and risk free rate of 5 percent. So, if you look at absolute return, we know that P2 is doing better, but we also see that P2 has much higher risk than P1.

So, we can calculate Sharpe ratio for P1. Here we have rate of return 0.0879 minus 0.05 that is risk free rate of return divided by 0.0829 and we get the value of 0.4572 and in case of Sharpe ratio for P2 that is portfolio 2 we get 0.1347 that is risk of return on the portfolio then we have risk free rate 0.05 and divided by standard deviation that is 0.1982. If we calculate we find a value of 0.4273.

So, we note here that portfolio A has better risk adjusted return or better return per unit of risk. So, portfolio 1 has performed better than portfolio 2 and with measures like Sharpe ratio we can simply calculate the risk adjusted return and figure out, which portfolio has done better compared to other portfolio or any benchmark portfolio.

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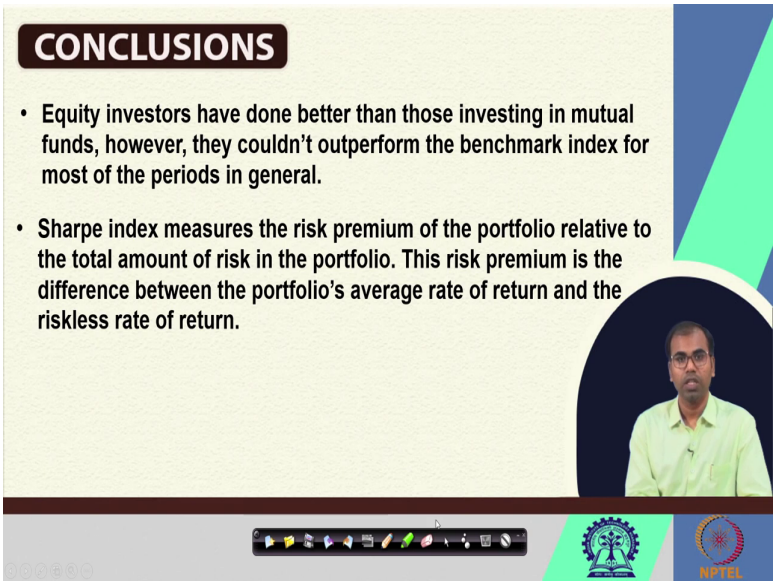

So, to conclude this session we know that in order to arrive at a decision whether our portfolio management or portfolio investment has done better or worse than other portfolio or benchmark portfolio. We need to decide whether it has outperformed the benchmark index or other average portfolios. There are several tools and one of the tools that we most commonly used is Sharpe ratio that measures the risk premium of a portfolio relative to the total amount of risk that we assume in the portfolio.

And this risk premium is the difference between portfolios average rate of return and the risk free rate of return. And using Sharpe ratio as a tool we can compare the performance of different portfolios and figure out whether a portfolio has done better or worse than the other portfolio and accordingly we can continue with our investment decision.

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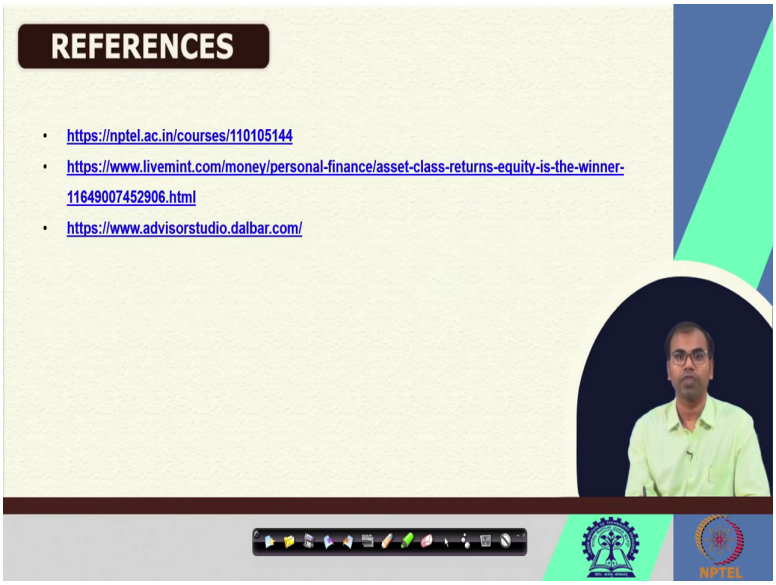

With this I end up this session.

Thank you very much.