**Behavioral and Personal Finance**
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Module – 01
Behavioral Economics and Finance
Lecture - 21
Portfolio Return and Risk

Welcome back to the course Behavioral And Personal Finance. Having discussed the basics of behavioral economics and finance concepts, let us move towards personal finance domain, where we will try to understand, how these behavioral factors influence our financial decision making? But, before we move on to personal finance topics, let us try to understand how the different theories of finance can influence the understanding of investments and personal finance decisions.

In this session we will discuss the methods and concepts of understanding the risk and return associated with an investment.

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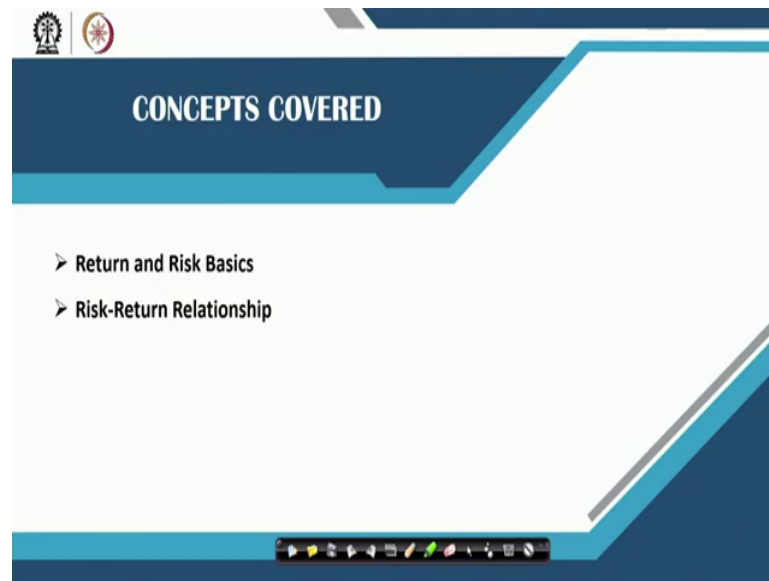
The topics that we are going to discuss here are the basics of risk and return, what it implies for financial decision making and what are the quantitative relationship between risk and return associated with a financial asset or investment? When we try to understand the relationship between different factors associated with a financial decision.

Mainly we talk about two aspects; one return which is basically the income or the revenue that we generate from the investment and another is the uncertainty associated with that return. Basically, what it implies is the risk part of the return. Essentially, it means that if we are expecting to get some return out of an investment and there is an uncertainty associated with it of which we know, the possibility of that uncertainty we call it as risk associated with that investment.

There is a structured way to explain how the return and risk could be related in a broad framework. To begin with I present an example, which is associated with a business idea or a business project and how risk and return can be related with different other factors associated with a financial decision making.

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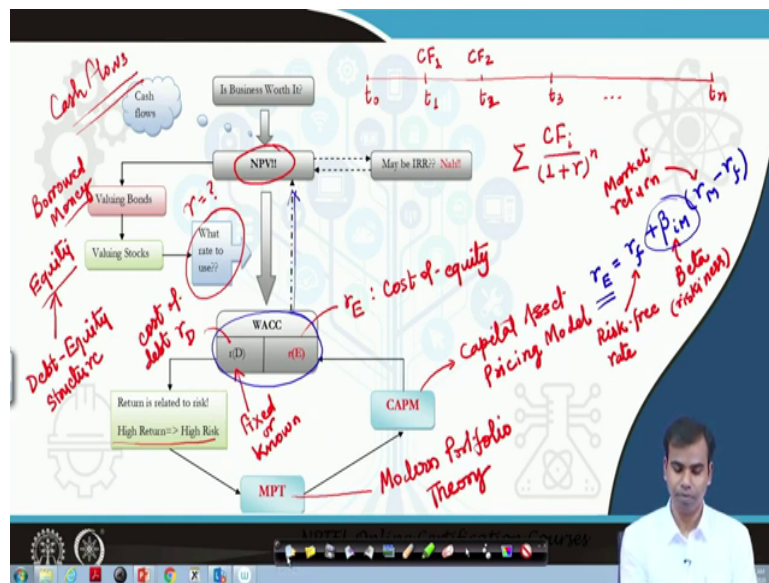
The idea that I am going to discuss briefly here starts with the proposal to set up a business in terms of making an investment of substantial amount. Suppose, you have to make an investment in a business idea or a project or for that matter any investment avenues, such as stocks, bonds or any other factors. The business idea typically has a series of cash flows that we have already discussed, in previous sessions, that an investment or a project having certain cash flows associated with it might be evaluated for the feasibility.

So, how we start with the feasibility of a business idea or an investment choice? Typically, we try to understand what are the cash flows that are associated with the business project or the investment avenues? And, if those cash flows can be brought back to the present time to understand, what is the present value of those future cash flows? Basically, in previous session we learned that there is the method of net present value, where we try to understand the present value of future cash flows in comparison with the initial investment that we are making.

And, if the net present value is positive we understand that the project or the investment is worth taking up. So, for calculating net present value we need to understand, how do we discount those future cash flows to discount those future cash flows, we need to find cash flows and the discounting rate? And, if there is any growth rate that we have already discussed that can also be included.

To find that discounting rate we need to understand, how we are proposing to invest in that business for the proposal or the investment venue, whether we are going to use our own money or we are going to borrow these factors also determine how we are going to evaluate the business proposal or the investment project? If you try to look at the graph we start with the cash flow that we have here, that is basically coming from different investment choices and these cash flows could be presented in a timeline.

So, if you remember we had discussed earlier that there could be different points of time where cash flows might be generated and then based on those cash flows; we calculate the present value of those cash flows to understand the worth of that business project or investment idea. So, basically we know that the cash flows could be discounted using a method called net present value and that was a cash flow discounted by a rate that we use.

So, this is the way we use cash flows and discounting rate to calculate the net present value. Here, the net present value is the final outcome, but to calculate the net present value we need to find two major factors; one is what rate to use basically it implies what should be the r for discounting and how the cash flows are coming.

So, cash flow we can calculate, but r need to be understood using the financing structure of that business. Suppose, you are investing that business idea or the investment proposal using borrowed money, which is basically a sort of loan. This borrowed money will have certain cost of the fund, which will be basically the interest rate that you are going to pay to the institution from where you have borrowed the money.

Similarly, if you want to use your own money which is basically in the form of equity or your own money you can invest that money as well in the business idea. So, the structure of financing in terms of borrowed money and equity would determine how the rate of discounting are calculated?.

Once you have the financing structure basically also known as debt equity ratio. So, basically this particular part is technically known as debt equity ratio implying that the money of the investment is funded by a combination of debt equity structure, which is basically a combination of borrowed money and your own money. Then you come to calculate the total cost of funds. And, total cost of fund can be calculated by using the cost of borrowed money and the cost of equity.

Since, cost of borrowed money is mostly fixed, because it is a loan where you have to pay a fixed rate of interest, we know that this could be indicated as cost of debt which is r D. And, if it is funded by a component of equity we can say that this is r E, which is basically cost of equity. And, this is cost of debt; a combination of these two would make the total cost of fund.

And, we know that the cost of debt which is indicated as r D is fixed mostly or known beforehand for r E; we do not know what is going to be the expected rate of cost in terms of cost of equity. And, that is basically a function of the riskiness that the project carries or the riskiness of the business idea that we are pursuing.

So, that is where we say that if the business is highly risky we should give high return to the equity holders or the owners, because they are taking up too much of risk. And, that

technically is expressed as higher the risk higher should be the return. So, higher risk lead to higher return and that is where the cost of equity or r E as indicated here would go up, if the total risk of the business proposal or the investment idea is high.

This particular thing can be derived using a framework known as modern portfolio theory that is known as MPT, which we have touched upon in the very beginning of this course. And, modern portfolio theory gives us what should be the return for the level of risk that an investor or an individual is taking up. And, this tells us the higher risks should lead towards higher return.

Once, we understand the cost of equity in terms of r E, we can also use another alternative framework known as capital asset pricing model, which tells us the rate of return that investors would be expecting given that the risk of the project. So, if we touch upon the capital asset pricing model theory, it says that rate of return expected by the equity investors is given by, the rate of return that an investor can earn for sure that is risk free rate plus the riskiness of the project and the market with premium that the market is paying for the investor.

So, if we try to break up this formula this tells us the risk free rate, which is basically the this is known as beta or we also call it riskiness of the project this indicates the market return. So, when we talk about capital asset pricing model, it suggests that given the beta here given that the we have the beta value or the riskiness of the project, and the return on the market along with the return on risk free securities, we can calculate how much an investor should expect for his or her investment.

So, now that we have models which can help us to determine the rate of return expected by equity investors, we know that these two components would be clubbed together in the proportion of the funding structure and can be used to calculate the net present value of an investment. So, this graph particularly explains how the risk and return of any investment or any business project can be functionally related with each other, and can be determined using market return and the financing structure of the investment.

So, basically to summarize we can say that this graph shows the relationship between the present value calculation approach with financing structure and the risk return relationship in financial projects. These things are related to showcase how return of an investment can be related to the risk associated with that investment.

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Speaking of return and risk we know that higher return should be a function of higher risk or alternatively, if we carry higher risk we should be expecting higher return. And, when we talk about higher return it basically means higher expected return whereas, higher risk essentially means in terms of mathematical function the standard deviation of returns. We know that standard deviation basically is the deviation from the average of any data series or any observations.

So, when we talk about the risk return relationship, basically we try to understand the relationship between the return in terms of expected return from an investment and the risk in terms of standard deviation of the expected return. When, we talk about return it can also indicate the return on bank deposit, or return on equity, or return on any other investment, but essentially what it implies is the change of prices fall from one period to another period.

Essentially, when we talk about return in financial context, it is the rate of return or rate of change at which the security prices vary from one period to another period, we can also indicate in very simple terms. So, return this particular return, this particular return can be calculated as the price at time 0 or rather price at time 1 minus price at time 0 with respect to price at time 0.

What it shows that the change in price from time 0 to time 1? So, for example, if we purchase our security or an asset at time 0 for 100 rupees and we hold it for one period and at time 1 we sell it for 110 rupees. Essentially, the return that we are making here is 110 minus 100 divided by 100 which is basically 10 percent of return. So, this is how we calculate return associated with financial assets or financial investment.

And, when we talk about risk essentially it is the standard deviation of returns, which means the deviation of observations or deviation of returns from the average return that we have generated over a period of time.

If we try to illustrate this through a numerical example, we can see here that the return is basically a function of price over period or over time and a risk is essentially the standard deviation. So, if we take a numerical example here, if you look at the graph the first column has time period from 1 to 10. So, these are time periods you can call it number of days, or number of months, or number of years, as per the convenience. And, in second column we have the average rate of return.

Basically, the change in price from 0 period to one period and one period to two period and so on. Third column has the deviations, basically the deviation from the mean and mean has been calculated using the values given in second column. So, we know that the mean is calculated using this divided by. So, this is the total and total divided by number of observation gives us the mean.

So, this is our average return for the period that we are holding the investment the deviations are calculated using. The deviation from the mean for each of the observation or each of the return on those 10 respective days, and square deviation has been calculated using the squared value of the deviations. And, this gives us a value of this particularly for square deviation, which is also known as the variance and the standard deviation is calculated using this square root of the variance, and this is basically the risk that we are talking about here.

So, this is how we calculate the return and risk for a security or an asset given that we have some observed returns or observed prices, which we can use to calculate the return and risk.

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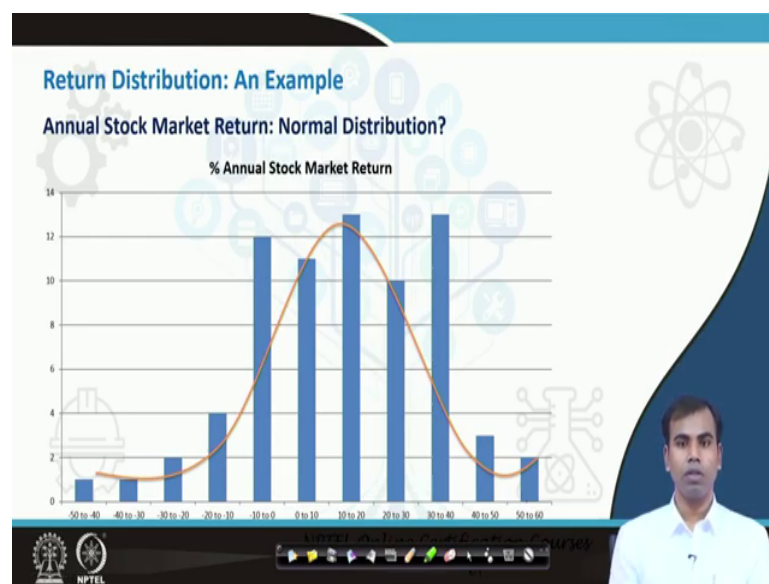
If we have a long observations of prices and it is subsequent returns. And, we try to plot it in a distribution framework, and we try to know what kind of distribution the returns would look like, this is how the returns distribution typically look like particularly in financial market

context. So, the graph here shows that the return distribution of stock market return index, basically the change in value of stock market index, over a long period of time has exhibited a distribution that looks like a bell-shaped curve, which is basically a normal distribution.

And, that is where that is the basic assumption of all financial investment models, where we try to understand how the returns on different securities or different financial assets might behave will depend on what kind of distribution it follows. So, typically the stock market returns follow a normal distribution as shown in the graph, it might be skewed towards positive or negative side, but typically it looks like a normal distribution curve.

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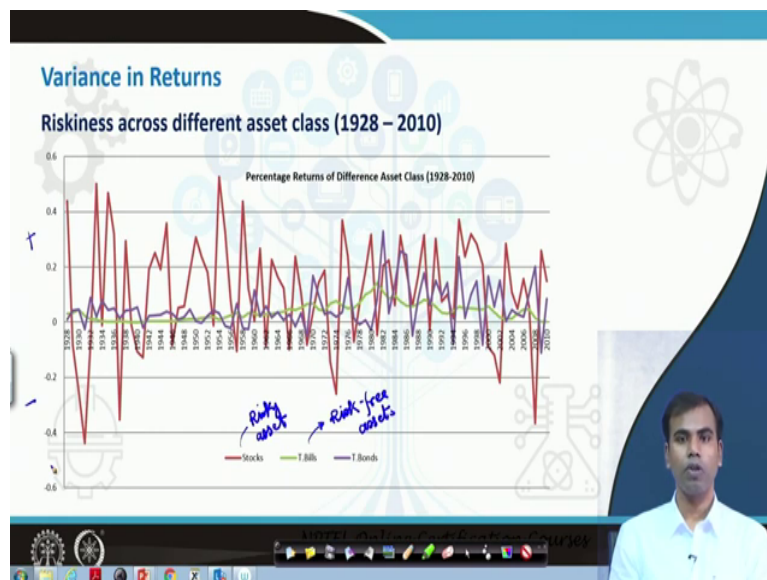
If we try to understand the riskiness of the in different type of investment in stock market this is how it looks like. So, the graph here shows a large number of observations from 1928 to 2010, the variation or the fluctuations of return for different type of assets. The asset that we

are considering here are stocks which is basically the stock market index and treasury bills and treasury bonds.

So, basically these are three different type of investment avenues that we mostly talk about in financial markets one is stocks which is basically a risky asset. So, a red line indicate a risky asset T Bill and T bond are basically risk free asset or it has less risk. So, if you look at the variation or the fluctuation in the graph, we can see that the redline or the curve in red basically fluctuates more frequently than other 2 asset lines.

This implies that the variation in stock market investment or the fluctuation in stock market investment is very frequent and very high compared to the fluctuations, in treasury bills and treasury bonds. This is why we claim or we say that stock market investments are more risky or more uncertain compared to the treasury bills or treasury bonds investment.

So, it essentially implies that if you put a sum of money in stock market you expect more fluctuations both towards positive or negative sides, basically this is positive side and this is negative side. So, this shows the possibility of getting return on both positive side and negative side is very much fluctuating compared to the investment done in bonds or treasury bills.

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Now, that we have learned how we calculate the return and risk associated with a single asset. We know that the return typically implies the change in price or change in value of the asset over a period of time, and risk essentially implies the variation or the standard deviation associated with those expected return over the period.

So, in technical terms we define return as the change in price, basically the percentage rate of change in price of assets or financial security and risk is defined as the standard deviation of the returns. These are the simplest definition that we use for understanding the financial market investment factors and so, far we have touched upon the methods to calculate or the approaches to understand the return and risk associated with a single investment or single assets, but the life is not really so simple.

So, we have to understand if there are more than one assets in the market, how do we calculate the return and risk in terms of the portfolio return and risk that is what we call it. So, let us have a look at the combination of assets where we try to understand the risk and return associated with more than one assets.

So, portfolio when we talk about it essentially it is a combination of assets or collection of financial securities or assets, that we have in different proportion these assets could be stocks bonds or any other assets financial securities such as cash, or fixed deposit, or precious metals, or anything else which has some economic value.

These combination can be manipulated or changed according to the convenience of the investor and investment objectives, because the factors such as risk tolerance or the ability to bear risk that investment horizon or the timeframe for which the investment is being made and the investment objective basically the goals for making the investment are major determinants of the combination of different assets.

For example, if an investor wants to set up an investment for purchasing a house 10 years down the line, then the combination of different assets would be varying from the combination of assets for an investor that wants to set up an investment for his retirement plans. So, basically risk tolerance; risk tolerance or the capability to be at the risk investment horizon. So, and investment objective these are three factors that determine the portfolio combination.

And, the ultimate objective of having a portfolio is essentially to diversify the risk, which means that an investor wants to minimize risk and maximize return in through his or her investment portfolios. When we talk about portfolio we know that we are trying to combine return and risk associated with different assets which are combined together in unique proportion for creating the portfolio.

And, when we understand the risk and return can be related with each other, what we are talking about essentially at the end of the process is an investor wants to have an objective,

which basically can be translated into investors dream of having the highest possible return with lowest possible risk.

So, this is the ultimate objective an investor by for which the investor is trying to construct or create of investment portfolio of different assets in different proportion. The ultimate objective is to achieve the maximum possible return for minimum possible risk. How this can be achieved or cannot be achieved will be discussed later when we talk more about personal finance context for now this is it.

Thank you very much.