Behavioral and Personal Finance
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Module – 01
Behavioral Economics and Finance
Lecture - 19
Valuation of Financial Assets (Contd.)

Hi there welcome back to the course Behavioral and Personal Finance. If, you recall from the last lecture, we were discussing about how the valuation of financial securities such as shares, bonds or insurance policies, or for that matter any investment projects, can be evaluated using a simple cash flow evaluation approach. Where, what we try to do is to analyze the present value or the future value of different cash flows be it negative or positive, and then based on their present value or future value in some cases we decide whether to invest in that project or take that decision or not.

Taking the discussion forward, we will continue discussing about different methods of cash flow evaluation for financial investment decision making. And today's session is focused on understanding different approaches for net present value, where we will try to understand, how present value of different cash flows occurring at different points of time can be used to determine the decision criteria.

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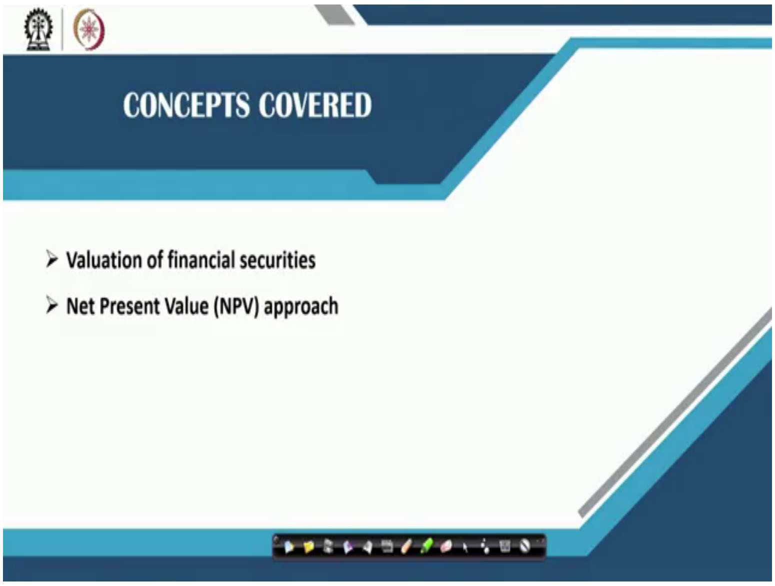

That, the topics that we are going to cover today are the simple approaches of net present value and how the valuation decision making can be done using the net present value of different nature?

Essentially, in a last session we touched upon the different characteristic of cash flows, such as the cash flows which are generated as annual cash flow or cash flows which are generated as perpetual cash flows. We also shown some examples, where the cash flows are of growth in their nature can also be used to associate with financial decision making.

Let us start today's discussion with understanding the nature of different cash flows of growth, annuity and perpetuity characteristics. First, we will start with simple illustration of how discounting or a compounding method can be used to understand the net present value of cash flows. And, then we will move on to different techniques that we apply for understanding the cash flows occurring from different investment choices.

In previous session I had highlighted that a cash flow occurring at different times of point and future can be associated with different investment opportunities such as investment in shares or bonds or 0 coupon bonds, in some cases convertible bonds, it could be insurance policies and corporate finance projects. There we understand that if we invest some amount in today's time that is present time and we are expecting some cash flows to be generated in future, we can understand the net present value of those future cash flows to compared with the present cash flow that we are incurring today and then make the decision.

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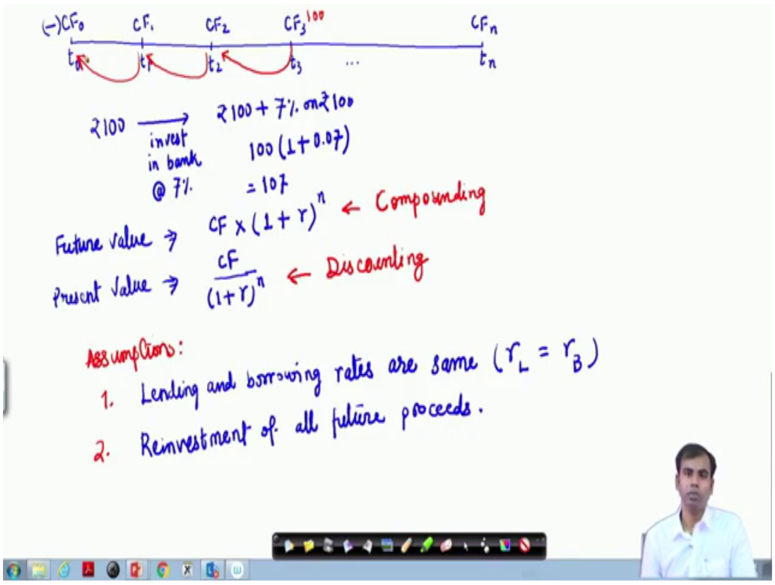

So, the whole the basic idea was to understand whether you have a timeline of cash flows, where the time can be explained in terms of t which we have explained earlier also, and then associated cash flows will be again given as different cash flows occurring at different points of time, where in general the initial cash flow is negative. Essentially, what it means is when you have initial investment, the initial cash flows can be considered negative and then subsequent cash flows are positive. So, the approach was let us say you have some amount of money now and that amount of money is to be invested in bank today.

So, if you have an amount of let us say 100 rupees which is investment in bank. So, let us say you invest this money 100 rupees and bank gives you a rate of interest of let us say 7 percent per annum. So, after 1 year or 1 period if that period is defined you get 100 rupees of your money plus the interest that you are generating on 100 rupees right, it is very simple. So, the amount of money that you are going to get is basically the amount of money that you have invested and the amount of money that you have earned as promised.

So, basically you are going to get 107 in this case after one period. So, if we want to understand the same approach in reverse calculation mode, then we can say that if you have some amount of money in future and you expect that the future amount of money can be brought to present time in terms of their economic value, the same can be calculated in a reciprocal way.

So, if it is future value that is defined as cash flow into 1 plus let us say r that is the rate of interest here and then time, which is basically the time of period you have invested the money for then present value can be shown as a reciprocal of that. So, basically it will be the cash flow that you are generating in future and then 1 plus r which is the rate of interest and n. So, if you have some amount of money in future that is C F you can discount it using the rate of interest that is given here and the period for which it has been invested.

So, if you try to give it a name here as given. So, this is known as compounding method and this particular thing is known as discounting method. So, when we have compounding, we try to calculate the future value of cash flows, which are basically present cash flows and if you are using discounting method, we are using basically the present value of future cash flows.

In case of financial decision making most of the time we try to use discounting method, because typically the decisions are based on the initial investment that we are making today versus the future promised cash flows which we are expecting to generate in future point of time. So, we use discounting method here in most cases.

Now, when we try to use discounting method there are two major assumptions. So, if we can highlight those assumption before we move on. So, the assumptions here are the first assumption is the lending and borrowing rate are same. So, what it means is so, you can say that rate of lending and rate of borrowing are equal.

So, what it implies that, when you are investing some money in the market, you can borrow as much money as you want at the same rate at which you are investing it for. So, if suppose here in this case you are investing it for 7 percent rate of interest 100 rupees of money in your bank deposit. So, you can borrow as much money from the same bank or any other bank at the same rate of interest.

So, that it what this assumption means; of course, this assumptions might not be realistic, but to begin with we can have this assumption in our hand. So, the first assumption is lending and borrowing rates are to be same. And, second assumption that we base our approaches here is the amount that we are making the amount that you are making in the process are basically reinvested, which means if you are making some amount of money in future in terms of rate of interest or the interest income, you are reinvesting that amount of money in future.

So, basically what it means that, if I try to highlight this assumption on the time line. Suppose, you have some amount of money to be generated in future in C as C F 3, which is basically your cash flow at point time 0.3. And, you are reinvesting that money, in future in the business or the bank where you are basically considering it to generate some return. So, that when you try to calculate that present value of future, you are actually bringing all future cash flows to present time with the interest income that is being generated for that period at the rate of r.

So, basically these are two major assumptions based on which the methods or the tools and techniques of present value calculation are formulated. Now, let us move on to understand the methods that we are going to use for different financial decisions.

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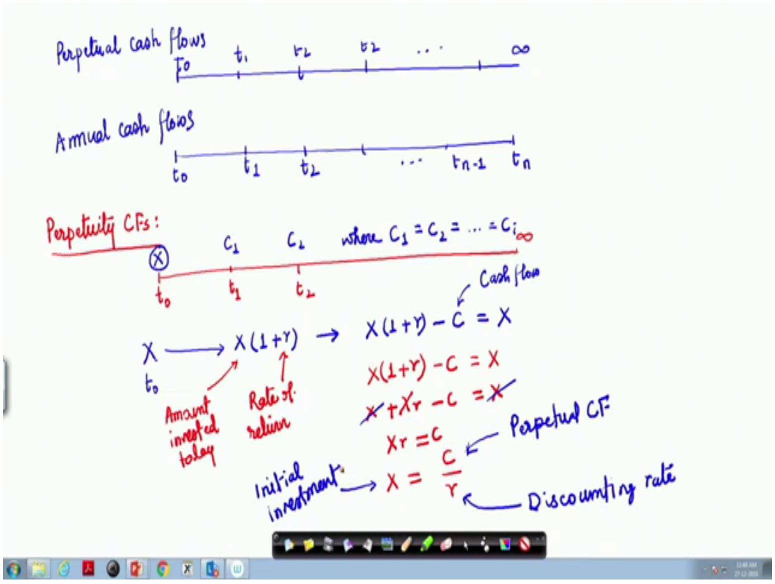

To start with let us say we had discussed earlier, that cash flows could be perpetual cash flows, which basically means the cash flows are going to be incurred in future for perpetual time period.

So, basically you have perpetual cash flows and then you have annuiy cash flows or annual cash flows which are basically. So, perpetual cash flows implies that the cash flows are to be generated for a perpetual time period in future and annuity cash flow or annual cash flows implies that, the cash flows will be generated for certain number of years and then after that it will stop.

I can quote some example suppose you invested some money in the stock of a company, the dividend that you are expecting from that investment is basically a perpetual kind of cash flow, which means that the company is expected to be doing business in future for perpetuity and the dividend income that is being generated are also considered to be perpetual in nature. This is an example of perpetual cash flow.

Now, if you invest some amount of money in fixed deposit. Let us say you invest some of money in bank in fixed deposit that fixed deposit will have certain tenure, let us say it is a 10 years fixed deposit. What it means that you will generate interest income every year for next 10 years. So, this is an annuity cash flow.

Similarly, if you have purchased an insurance premium which you are paying to secure an insurance policy, this is a kind of annuity or annual cash flows, which are going to be generated for certain number of years in future and after which it will stop. Similarly, if there are cases where cash flows are growing, which means if you are paying some money or earning some money at certain rate of interest, every period it is expected to grow at some growth rate and that could be the case of annual t as well as perpetuity cash flows.

So, perpetuity cash flows are basically the cash flows which are going to be in future. So, this is t 0, t 1 and so on and annuity cash flow will be given as for certain number of; so, these are two examples of cash flows that we are going to discuss with. Now, the first case here is the simple perpetuity cash flows.

So, let us start with that in perpetuity cash flow we expect that the cash flow is going to be there forever. So, suppose if I have to invest some want of money today and I expect that, I should be generating an income forever in future, this is a perpetual cash flow example.

Now, the amount of money that we are going to invest now and the amount of money that we are going to expect in future for perpetuity should be connected with in terms of some functional relation. Now, the situation here is I want to invest an amount of money today and this is basically perpetuity. So, what example I am trying to give here is I want to invest an amount of money, let us say this amount of money is rupees X and I want to get a cash flow every year in future, where every cash flow is same.

So, basically this is a perpetual cash flow, where we are expecting to generate a cash flow of C and we want to invest an amount of X. So, let us give an example here. Suppose, you have been approached by an alumnus of your institute and that alumnus wants to set up and scholarship in the college. So, in the college the alumnus desires to be a set up a scholarship that will be given to the topper of the batch every year for a certain amount of money. And, that amount of money is let us say C. So, the scholarship amount is C and the amount of money that has to be invested need to be found out. So, how do you calculate that?

Now, let us get through this example. So, suppose you have asked the alumnus to invest an amount of money X today and after 1 year so, this is basically today after 1 year you are expecting that you should get a return or an a value of your investment to be X into 1 plus r, right. So, x into one plus r is basically X amount of money invested and r is basically your rate of return. So, here X is amount invested today and r is rate of return.

So, if you expect that an amount of X is invested today and you are supposed to generate a return of r. At the end of the period which is basically at the end of year 1, you are also expected to pay a scholarship amount to the extent of C. So, which means next at the end of period 1, the amount of money that you had invested in the beginning plus the amount of money that you have generated minus cash flow which is basically the scholarship amount should be equal to X, right which means this scholarship amount cash flow.

Basically here the outflow, so, if you have sufficient amount of money in your investment at the end of period 1 and you have given out the scholarship amount of C at the beginning of next year you should have an amount of X here. So, that next period when you start you will again generate X you have a return of rate of return of r, again next year you will pay a scholarship amount of C and then it should be left with X, right. If, this process is repeated you should be able to pay out the scholarship money till perpetuity and that our scholarship money is C.

So, if we try to simplify this formula or this function, basically we can write it here like this X plus X r minus C is equal to X which is basically X r minus C or rather X r is equal to C, because these two X will cancel out. So, X will be C by r. So, this is a formula which will give you given that, this is the perpetual cash flow given that these are rate of return this let us call it discounting rate and this is initial investment.

So, given that perpetual cash flow amount of C and discounting rate of r, you can calculate what amount of money should be invested today? That is X so, that you should generate C amount of money every year or every period till perpetuity. So, this is the formula you can use to calculate the value of investment to be made today to generate a perpetual in return or perpetual cash flow in future to the extent of C.

So, going back to the scholarship example, if the alumnus wants to create a fund today so, that every year from next year onwards as a scholarship amount of C should be paid till perpetuity, this should be given as a function of X is equal to C by r, where C is the amount of scholarship r is the discounting rate and X is the amount of money invested today. So, this is an example where we can calculate the present value of situation or cash flows which can be considered for making a financial decision.

These kind of decisions are very commonly used in stock market. For example, if you are using C as the dividend income from the stock investment, you can use this C equal to the dividend income the annual dividend income that you are expecting from the investment, r will be the discounting rate that will be the cutoff rate for you. And using this dividend discounted with r, you can calculate what should be the price that of that stock, which you should be paying in order to generate a return of C.

So, this is one approach. Now, let us move on to next approach. So, after perpetual cash flows we can understand how this perpetual cash flow can be delayed?

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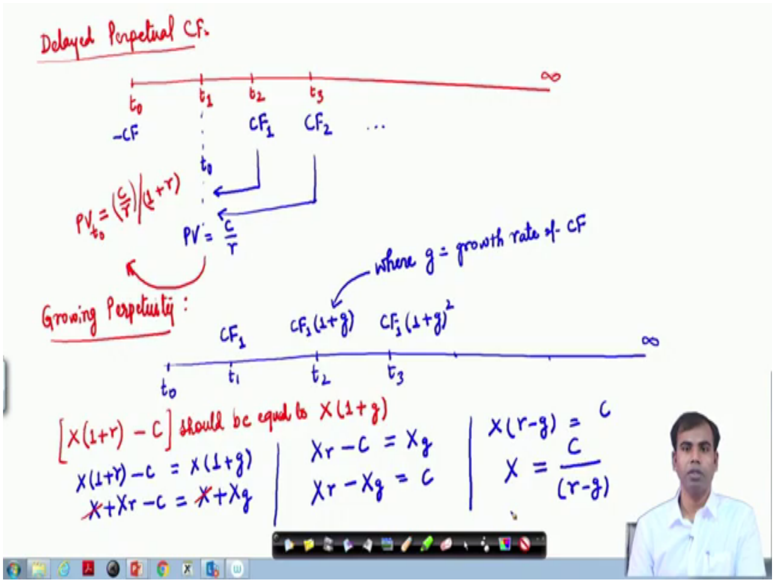

So, for example, if the cash flow is generated 1 year after, so, let us move on to the next situation where we discuss delayed perpetual cash flows. So, for example, if you have a timeline where you are actually investing some amount of money today and the amount of return that are being generated is coming in future. But, actually the situation, which is different here is you have to invest some amount of money today, but that first amount of money that you are generating is not at the time point of t 1 rather t 2, which means this is your first cash flow and then second cash flow and so on.

This kind of example can be seen in endowment based insurance policies, where you pay some investment for a certain number of years and after that you start generating income. This can also be considered to be an example of investment in education for individuals. So, you invest some amount of money for first 2 years and after graduation or after graduating from the college you expect some amount of return or income to be generated.

So, this is a case of delayed cash flows, where the calculation can be done. In this situation if we assume that this is our t 0 hypothetically. So, at this t 0, the present value of all these cash flows will be. So, present value of all these cash flow will be C by r as calculated earlier. And, if we try to take this present value back to one more period which is basically actual t 0, then present value of this cash flow will be C by r divided by 1 plus r, right.

So, since the cash flow is delayed for 1 year or 1 period in this case, we will discount it for one more period that is divided by 1 plus r as we have seen earlier. So, the situation here is if you have a delayed cash flow, you can discount it for the number of years for which it is delayed and this will be giving you the present value at current time.

Now, take a situation of growing cash flows, where the cash flow is growing at certain growth rate. So, if; so, earlier we discussed perpetual cash flow then we touched upon the delayed perpetual cash flows. Now, let us get into the growing perpetual cash flows the situation will be like this. So, suppose you have a time line for which you have different point of time and it is going to be there for forever.

And, the situation here is in year 1 you have C F 1 which is your first cash flow, in year 2, you do not have only C F 1 you have C F 1 growing at let us say growth rate g, where g is growth rate of cash flow. Which means if you have invested some amount of money in some investment, in first year it will generate a cash flow of C F 1, in second year it will generate a cash flow of C F 1 with a growth rate of g, which is C F into 1 plus g and in year 2 it will generate C F 1 into 1 plus g to the power 2 and so on.

So, it will keep on growing this kind of example can be seen in some cases, where dividends typically grow given by the companies as companies make more profit they start giving more dividends year after year. Similarly, if you have invested some money in some investment of revenue and that investment of revenue is growing in base value that could be a return with growth.

So, if you have situation like this, you can simply use the same approach that we have shown earlier. We have shown that as the present value of perpetual cash flow can be calculated using X using a formula known as X is equal to C by r, where X is the present value and C is the future expected cash flows are is the discounting rate.

So, if we repeat the same situation here, we can show that if a person has an investment X, which is to be growing at a rate of r which is basically the interest income. And, if you pay out the cash flow this whole should be sufficient enough to pay out the amount of money to be invested in next period.

So, essentially when we try to simplify this function it will be X into 1 minus r sorry, 1 plus r minus C which is your cash flow is equal to X into 1 plus g which is basically the growth in cash flows. And, if you simplify it further X plus X r minus C on the right hand side it will be X plus X g. If, we try to simplify it further these two X will cancel. So, what you are going to get next is X r minus C is equal to X g.

So, if you bring the X factors on one side so, you will have X r minus X g is equal to C and to simplify, it even further you have X r minus g, which is X common outside and C. So, the amount of money which is given by X should be equal to X C by r minus g.

So, basically what it means is if you have to find an investment of X that is to be made today and you expect that the cash flow will be C and discounting rate is going to be r. Given the growth rate of g you should be able to find using this function of X is equal to C by r minus g to in terms of the present value of growing cash flows. This situation is a cash flow which is growing for perpetuity at the rate of g.

Now, these two of, these three situations of simple perpetuity, delayed perpetuity and growing perpetuity can be used to find the present value of annuity as well which we will see in next session.

Thank you very much.