Microeconomics: Theory & Applications
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Lecture – 22
Intertemporal Choice (Part - 2)

Welcome to the lecture series on Microeconomics. In the last lecture we have derived the budget constraint of a consumer when the consumer faces a choice between present consumption and future consumption and we have derived the budget constraint in that case. We have also introduced the concepts of present value and future value.

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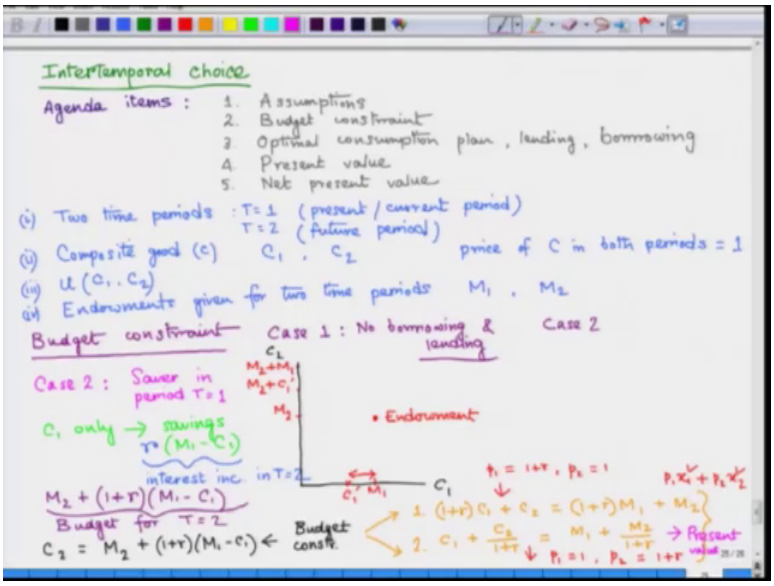

Now, let us illustrate the budget constraint in the consumption plane and let us find out the consumers equilibrium.

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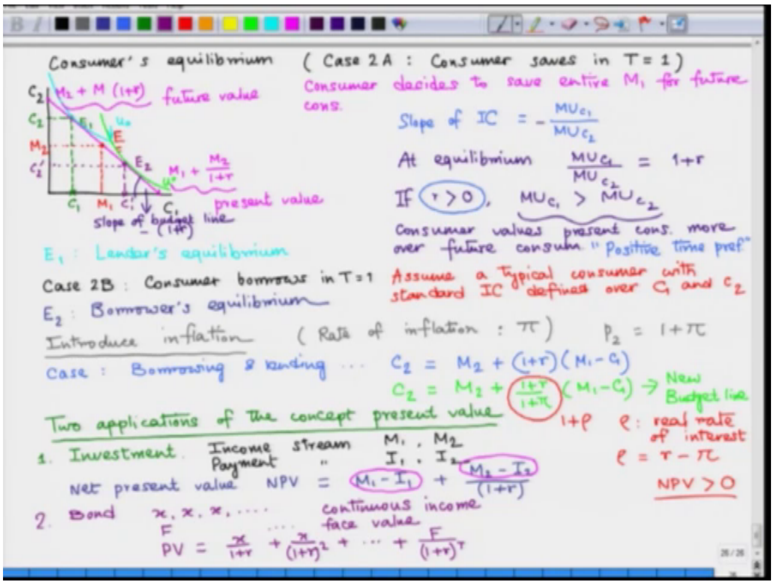

And we are going to discuss case 2 and let us call this case 2 A where the consumer saves in first period.

So, we will first start with the endowment point. So, let us assume that here is our endowment denoted by point E and that basically represents fixed money income in period 2 and period 1 M 1 and M 2 are the coordinates of endowment point. So now, there will be some saving right. So, now, let us assume that consumer decides to save entire money income in period 1 for future consumption. Why do we need to assume this because when we are drawing budget constraint, then we have to find the extreme points, right. So, the extreme point along the particle axis or future consumption axis will come from not only the endowment point that he or she has for that period but how much interest plus principle he or she will gain from period 1 saving.

So, that is the amount that we have seen earlier. So, suppose we are talking about this intercept which actually represents M 2 plus M 1 times 1 plus r because this is the interest plus principal in period 2 if he or she decides to save the entire money income M in period 1. So, then we need to join this two line two points and we need to extend that. So, that it meets the x axis as well and the x axis intercept will be M 1 plus M 2 divided by 1 plus r. So, that is the present value that we have discussed.

And remember we have spoken about two interpretations from the budget constant. So, we have talked about the present value. Here comes the second one and that is basically the future value. So, we have obtained finally our budget constraint. Now, we have to super impose our consumers preference in this consumption plane such that we can have indifference map and of course we know that we are looking for the tangency point between an indifference curve and the budget constraint. So, the utility function if you remember is defined over consumption in time period 1 and consumption in time period 2. Now, if we are interested in the slope of the indifference curve, then what will be the MRS in this case, the marginal rate of substitution will be marginal utility of consumption in period 1 divided by marginal utility of consumption in period 2.

So, let us write the slope of the indifference curve in this case and that will be marginal utility of consumption in period 1 divided by marginal utility of consumption in period 2. Note that the slope of this budget line or the budget constraint is negative of 1 plus r, right. So, that is the slope of the budget line. Now, note that at equilibrium, the slope of the budget line has to equal to the slope of the indifference curve sorry I forgot to place minus here. So, then basically the minus and minus will cancel out and finally, we have a mu c 1 marginal utility from consumption in period 1 and marginal consumption in period 2, the ratio of that the MRS will be equal to the absolute value of the slope of the budget line which are basically 1 plus r, right.

Now, that means, that if r is positive which is a pretty realistic assumption, then we have mu c 1 is greater than mu c 2. So that means, that the consumer values present consumption more over future consumption and this feature is known as positive time preference. In fact, we can tell the story from the other way also as the consumer has positive time preference. That is why we see the market rate of interest is positive. So, this is coming from the human psychology, this is not a very surprising result, right. People can sacrifice something in the present period only if they get more in the future time period. So, one unit of current consumption can substitute more than one unit of the future consumption.

Now, let us explain the value of the slope of the budget constraint. Why we got negative of 1 plus r, because rupee 1 today can be turned into 1 plus r rupees next period simply by lending it to the bank at an interested r. Now, we assume a typical consumer with standard indifference curve defined over c 1 and c 2 in order to find the consumers equilibrium. Now, the equilibrium position you know is uncertain. You know, there can be several possibilities of course, you know we can get back E as the equilibrium itself or there can be far more interesting cases where we can get this tendency occurring in either the northwest part of the point E or in the south east part of the point e.

Let us first look at the case 2 A where the consumer saves in time period 1. So, that means, that our consumer is a lender right. So, if the consumer is a lender; that means that he is consuming less compared to his or her money income or endowment M 1, so suppose he or she is consuming only c 1. So, if that is the case, then the consumer will go up and meet the budget constraint and then from there he will or she will find the value of the future consumption. So, this point on the budget line say let me call it point E 1. So, that will basically give the consumption value c 2 and we can write and we can draw an indifference curve which becomes tangent at this point E 1. So, let us assume that this is the indifference curve denoting some utility level u naught in case 2 A. So, E 1 gives a lenders equilibrium.

Now, let us continue with the discussion for a borrower. So now, we are going to assume that the person or the consumer has borrowed some money. So that means, his or her consumption point in period 1 shall be above M 1 and let me assume that that is c one prime here. So, if that is the case, again we have to follow the same procedure, we have to go back to the budget constraint to figure out the point on it ; the y coordinate of point will give the future consumption c 2 prime and this will be say let me call this E 2. So, this E 2 will basically give the borrowers equilibrium, and in that case we can superimpose the indifference curve in such a way that a new indifference curve but totally new indifference curve makes a tangent at that point E 2. So, in case number 2 B say, this is the indifference curve.

So, if, so if that is the case then, we got E 2 as the borrowers equilibrium. So, as we are talking about 2 or more time periods, one natural extension of the simple model could be adding inflation know. There may be some inflationary pressure on prices of this commodities. So, if we assume a constant rate of inflation how our model is going to be rewritten. Let us have a look at it. Let me assume the rate of inflation is given by the symbol pi. So, if there is inflation P 2 will become 1 plus pi. Remember, last time we have assume the value of P 2 equals 1.

So, now let us go back the case where the consumer is allowed to borrow and lend. So, if you go back to the previous slide, you will see that there we have expressed the budget constraint as in the following. Now, if we assume inflationary pressure pi then we have a new P 2. So, this budget equation we will now be written as. So, now, we can introduce another new concept which is real rate of interest. So, we can denote this complicated expression by a simpler expression 1 plus rho and then the rho is basically the real rate of interest. So, the real rate of interest is equal to r, the nominal rate of interest minus the rate of inflation.

So, we have obtained a consumers equilibrium and some related results. Now let us do little bit of digression, let us see how these small model or these simple concepts that we have discussed can be useful in some financial market analysis. So, let us talk about how to value and investment. We are going to discuss two applications of the concept present value. First, we are going to discuss in the case of an investment. Now, in an investment let us assume two time periods and there is some income stream or inflow of income. So, let us denote that by M 1 and M 2 respectively for period 1 and period 2 and there is some payment scheme or payment scheme that is basically outflow of money from consumers pocket and let me denote that by I 1 and I 2, these are basically investments made by the consumer.

So, if that is the case, then how do we value the investment? Whether the investment is beneficial for consumer or not to judge there is a concept called net present value that we are introducing now. That is abbreviated as N P V and that is given by M 1 minus I 1 plus the present value of the net income in period 2 which is M 2 minus I 2 divided by 1 plus r. Now of course, this can be extended to a third periods also. So, how do we interpret these things. So, this M 2 minus I and M 1 minus I 1 are basically the net cash flows and we are looking for the present value of the net cash flows that is coming to the consumer.

And how does a consumer decides whether to go for the investment or not. Of course, the consumer will benefit if the net present value results into a positive number. So that means that the future value of the cash inflows is higher than the future value of the cash outflows. So, in that case the consumer makes a positive return out of the investment.

Now, let us quickly look at another application of this concept of present value and we are going to discuss a concept known as bond which is very popular in financial markets. So, bonds are very common in borrowing and lending market. So, governments and corporations issue bonds and that is basically a promise made to the consumers that if the consumer purchases the bond, there will be a continuous stream of payments for a certain period of time and there will be a maturity period, at the end of the maturity period the consumer will get the face value of the bond and if that is a case, let us see how price of this kind of bond can be determined using the concept of present value.

So, basically we are going to look at some income streams and as the bond issuer has promised a fixed stream of payments say xxxxx and so on so forth and then, this is like continuous income stream and then there is a maturity. At the maturity period of the bond, the parts and also gets the face value of the bond, right. So, in that case, the present value can be written as x divided by 1 plus r x 1 plus r square and so on so forth. Suppose, the maturity period is period t that is a certain date. So, on that certain date.

So we have data if the present value formulation in the case of a bond and we can assume that this is the maximum price that a consumer is willing to pay for the bond, because if he or she pays more than this present value, then he or she is on the lost side, he or she is going to make a loss in this investment. Or if the price of the bond is less than the present value, then of course the investment will be a beneficial one for the consumer.