Microeconomics: Theory and Applications
Prof. Deep Mukherjee
Department of Economic Sciences
Indian Institute Technology, Kanpur

Lecture – 24
Consumer Choice Involving Risk (Part-1)

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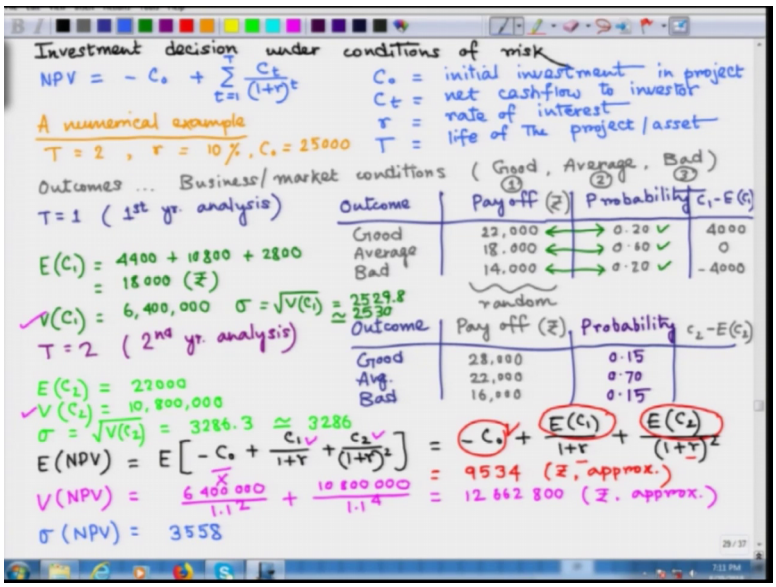

Hello, welcome back to the lecture series on Microeconomics. Now how can we measure variance of this random variable net present value? And we can see that here this C naught is not a random variable. So, variance of this item will be 0, now this is a random variable that is a random variable. So, the variance will take care of these two cases C 1 and C 2 we have already found the values V of C 1 and V of C 2.

So, we can directly introduce this numbers to save time, and r value a also we are introducing here right. So, if that is the expression that gives us around a number approximately this, again in rupees approximate. After computing the variance of the random variable net present value of the project let us also compute standard deviation because it has a different use for risk analysis. So, the standard deviation of net present value comes around 3558.

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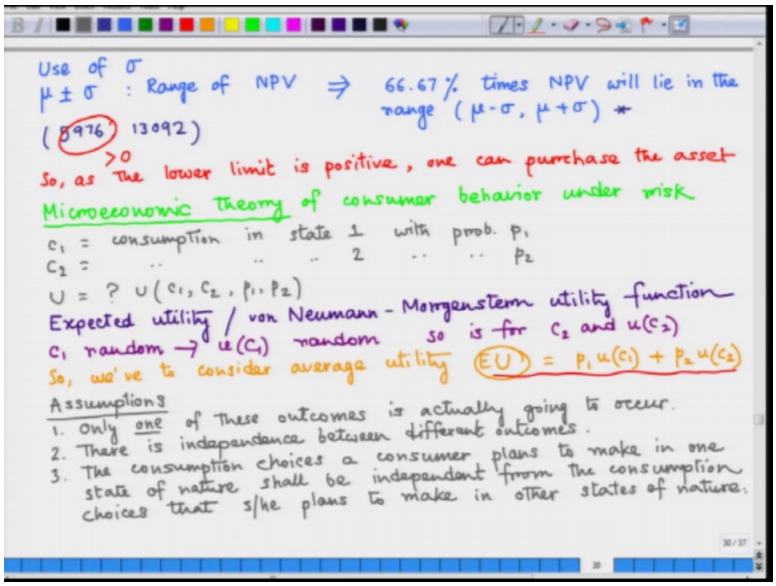

Now, let us look at what use of these standard deviation measure we can make. So, one can compute mu plus minus sigma and that gives a range of this random variable NPV Net Present Value. So, if we compute this mu plus sigma what is the usefulness or interpretation? So, if we assume that the random variable net present value follows a normal distribution, then 66.6 percent times the actual value or the realizable value of NPV will lie in the range, mu minus sigma, and mu plus sigma.

So, now let us look at the values. So, in our particular case we have a range if we plug the value of mu and sigma in the expression this one we can get 5976 comma 13092. So, as the lower limit of the range is positive, so as the lower limit is positive one can purchase the asset, or continue with the project.

So with this we are done with our discussion on project appraisal in the case of a risky world. Now we are going to move to a different dimension of choice under risk and we are going to see a new concept called expected utility, and we are going to see how a consumer can take a decision on how much insurance coverage to purchase.

So, now from illustrations and cases we move to the theory development of consumer behaviour under risk. The main question is this, how a person values consumption in one state as compared to the other and we assume that this will depend on the probability that the state in question actually occur ok.

So, let us start with some notations first. So, we assume C 1 equals the consumption in state 1 that is basically outcome one of some random phenomenon with probability P 1, C 2 is basically conjunction in state 2 with probability P 2. And let us now have a look at the utility function.

What is going to be the form of the utility function in this case? How a person values consumption in a particular state with respect to consumption in another state depends on the probability with which these states will occur. The rate at which a consumer is willing to substitute consumption in a state, in a bad state say when an accident occurs, or a natural calamity occurs for consumption in another state. It is a good state where this kind of events do not occur will definitely depend on the consumers belief about the likelihood of this events to happen.

So, of course the utility function of the consumer will not only depend on the specific values of consumption in this particular realized states, but also will depend on the probabilities or the likelihoods of these states to occur in reality. So, we can now write down this utility function as functions of the values of consumptions values of consumption levels in each state, and the probabilities with which the states may occur in reality.

Now, we are going to introduce a new concept called expected utility, to model utility in this uncertain world. So, this expected utility is also popularly known as von Neumann Morgenstern utility function after the names of its inventors. So, in this case what happens? As C 1 is random, then utility from C 1 or the utility in a particular state 1 is also random, and so is C 2 and u of C 2. So, we have to consider an average utility level as we do not know which state in reality is going to occur.

So, if we have to consider average utility then in the case of random variable we know that we have to take expectation of the random variable. So, in this case we have expected utility EU, and we can write that as P 1 times u of C 1 plus P 2 u of C 2. Now we are going to make couple of assumptions, which are critical behind the existence of expected utility function.

Assumption number 1 would be although there can be k possible outcomes, only one of these outcomes is actually going to occur. Number 2; there is independence between different outcomes.

Number 3rd; would be the consumption choices a consumer plans to make in one state of nature realized of course, shall be independent from the consumption choices that he or she plans to make in other states of nature, so states of nature are basically outcomes. Having stated assumptions behind the existence of expected utility function, let us have a look at the functional form through a graph.

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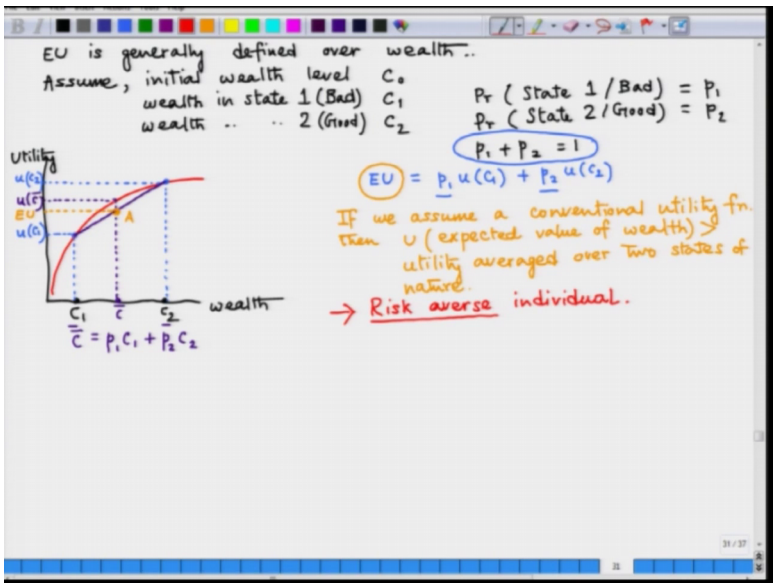

So, the expected utility function EU is generally defined over wealth level or income level. But as you know as you do not save in this model wealth is basically equivalent of consumption. So, we can write that there is some initial wealth level before a state of nature has actually realized and that is denoted by C naught.

Now, there is wealth in state 1, and we can assume that that is a bad state. So, in that case the consumer has C 1 units of wealth similarly we can assume wealth in state 2 which is a good state the wealth of the consumer is C 2. And we assume that is probability of state 1 to occur or the bad state to occur is p 1, and probability of state 2 or good state to occur is P 2. And if we assume that there are only 2 states or nature or 2 possible outcomes we can have these result P 1 plus P 2 equal to 1.

So, let us measure wealth along the horizontal axis and utility along the vertical axis. So, as we are talking about C 1 as the consumption level of the consumer in state 1 which is a bad state it is safe to assume that C 2 is greater than C 1. So, let us have two specific levels of consumption C 1, and let us plot C 2 over here. Now we assume a typical utility

function concave to origin showing diminishing marginal utility from consumption or wealth.

So, now let us find out the implication or expected utility function. So, u of C 1 is the consumption level u of C 1, is the utility level from consumption in state 1 which is anyway a random variable we do not know it a priori. Similarly u of C 2 is the utility level that the consumer derives from consumption in state 2. If state two is realized which is a good state where consumption level is high, so u of C 2 is also a random variable.

So, when we talk about expected utility then the expected utility could be given as P 1 times u of C 1 plus P 2 times u of C 2. So, we are taking an average and this is basically a weighted average where weights are probabilities or likelihoods of each state to happen and note that as P 1 plus P 2 is equal to 1, we are talking about a convex combination of u 1. We are talking about a convex combination of u of C 1 and u of C 2. So, basically we can join u of C 1 and u of C 2 these two points on a utility function through a straight line. And we can also measure C bar which is basically the expected value of consumption level; because C 1 and C 2 are random variables too.

So, we can talk about expected value of consumptions also right, so that is basically my C bar. So, for this expected value of wealth or consumption also then the consumer get some utility from the utility function. And utility out of these average consumption level C bar is given by u of C bar. Now note one interesting thing this point here denoted by say point A gives that convex combination value expected utility, so we get EU here.

So, what do you observe? We observe that if we assume a conventional utility function, it implies diminishing marginal utility. Then utility from the expected value of wealth or consumption is greater than utility averaged over two or more states of nature. If we observe this type of behaviour from the consumer, then we say that our consumer is a risk averse individual.

There are cases where an individual could be risk neutral and risk lover, but let us not get into those cases. We are going to state, we are going to stick to the more usual type consumer who is basically a risk averse person. So, with this let us stop our discussion for the moment, in the next lecture we are going to continue with that discussion.