Applied Econometrics
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Lecture – 94
Non-Stochastic Regressor

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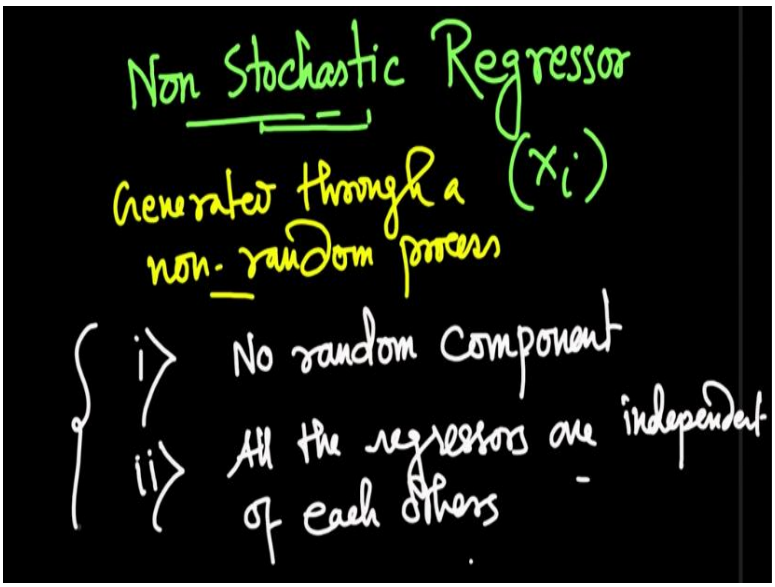

Hello and welcome back to the lecture on applied econometrics. Today we are going to talk about a concept called non-stochastic regressor. So, till now all the regressions we have been doing, we are using regressor which is essentially non-stochastic. So, in this lecture we are going to understand what exactly a non-stochastic regressor means and how it is different from some other regressor, which is actually more close to reality, which is stochastic regressor which we will talk about in the next lecture.

So, how these two types of regressors are actually different? So, by non-stochastic regressors, so we know the meaning of this term stochastic, stochastic always means random, so it is a non-random regressor So, what is the non-random regressor? Well, so, when we know the regressors are all our X i. So, when all these X i's are actually generated through a non-random process. So, let me write down generated through a non-random process.

What exactly it means? I should not jump from one **(()) (01:23)** to another. So, I should explain what do I mean by a non-random process. So, essentially, when I do not; my stochastic regressor does not have any random component, any component of uncertainty,

any component of unknowingness. So, let me write it down. So, the first thing is that no random component.

And there is another part of it, when I have my regressor non stochastic, so essentially all the regressors, all the X i's they are going to be independent of each other. So, all the regressors are going to be independent of each other that is a very restrictive assumptions that I am going to make. And I am going to make these assumptions because of what? Because it will make my life easy, so that is why I make this assumption that all the X i's or all the regressors are independent of each other.

So that is that assumption I am going to make. Now, I just will explain that there is actually not very real sort of assumption and that is why we have to deal with stochastic regressor. But because of these assumptions, when you do the regression, many assumptions get simplified. So, I will explain what do I mean by these two conditions. So, to actually explain non stochastic regressor let me actually give you an example that would be easier for us to understand.

Let us say you are doing a survey and basically we will be using the survey data and you have some idea about let us say the population census. When you want your regressor to be non-stochastic and I said that in non-stochastic regressor, there is no random component. So that essentially means that the experimenter or the researcher is actually giving the value for the X i's. So, the researcher actually allocating the value for the X i's.

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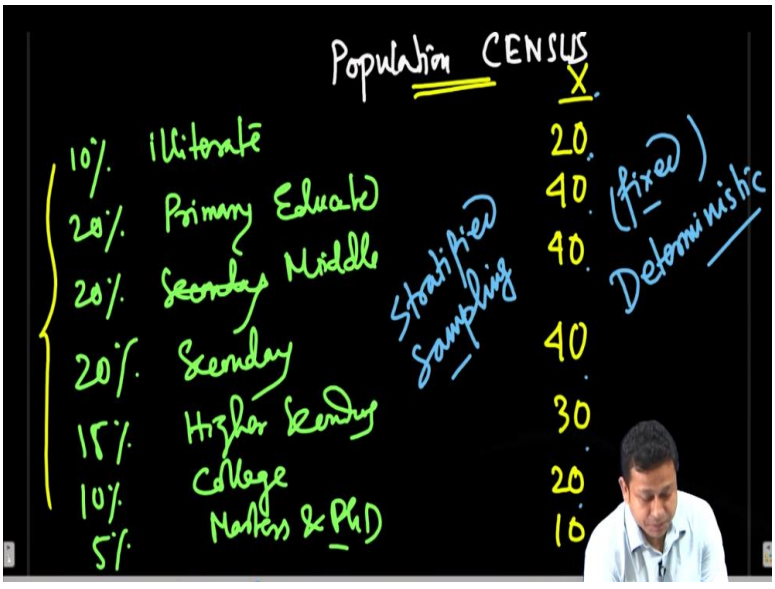

Now, if I know let us say the population census, let us take the example of let us say education distribution. So let us say I have seen the population census and I know that let us say there are 10% illiterate, then another 20% let us say they are primary educated, then another 20% secondary, let us say this is a middle, this is on the middle. And then another 20% secondary.

Then let us say another 15% higher secondary. Another 10% let us say is my college undergrad and then the rest 5, 60, 70, 80. 95 rest 5 is my Masters and Ph.D. Now, I know these distributions, the existing distribution already. Now when I select my sample since this is a non-stochastic regressor, since my X i is stochastic, I actually allocate the value for the excise. So what do I mean by that?

So that would mean that when I will select my sample for my studies, so I will select let us say I have a sample of 200%. So, what I will do? I will actually take this proportion to decide my sample for each of these categories. So, let say I have a total sample 200. So it would mean that I will actually select 20 illiterate, 40 primary educated, another 40 middle, another 40 for secondary, another 30 for higher secondary, another 20 for college and another 10 for Masters and PhD.

So, you see that I have actually given the values of the X i's. So, that is something it is not unknown to me, I actually know because I am actually deriving these values or actually I am designing my sampling in a way that it actually represents the population census and this type of sampling is known as stratified sampling, which is actually non-random process. Now, that way I actually allocated the values or assigned the values for X i.

So, one thing you need to remember sometimes people use the word fixed. So, perhaps it is a better idea to not use fixed values because the values of X i are actually changing, so it is perhaps a better idea to use the term deterministic. So, we have stochastic and this is deterministic. Now, this is for education. Now, let us say if we go back to our Mincerian wage regression again and we will have several other variables like experience, age, gender, rural, urban and so forth.

So for all the different variables you can actually assign or you get the values of X i based on your population. So, all these values are independently given, they are independent of each

other. Now, you can see the limitation here, I mean how all the variables could be independent; how the gender distribution, how the education distribution, how the caste distribution, rural element distribution, age distribution, how they can be independent of each other.

So, that is where the restriction comes in and that is why we need to use stochastic regressor. So, this is somewhat an unreal kind of scenario that we assume.

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One example I can give you about stochastic and non-stochastic regressor is time. So, time is perhaps one variable where we really do not have any random component, right, but that sort of variable you can hardly see in reality. So, with this we will actually end this lecture on non-stochastic regressor. And in the next lecture, we are going to talk about stochastic regressor and we will see the complexity that will arise if I take a stochastic regressor instead of a non-stochastic regressor. So, with this we will end this lecture here. Thank you.