Applied Econometrics
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Module - 8
Lecture - 69
Heteroscedasticity (Contd.)

Hello and welcome back to the lecture on Applied Econometrics. We are talking about heteroscedasticity and different tests. So, previously, we have seen Goldfeld Quandt test, Breusch Pagan test, Cook-Weisberg test. So, now we will talk about another test that is called White's test. Now, it is an extension of Breusch Pagan test; only there are some additional variables that we are going to include here. Let me write it down; White's test.

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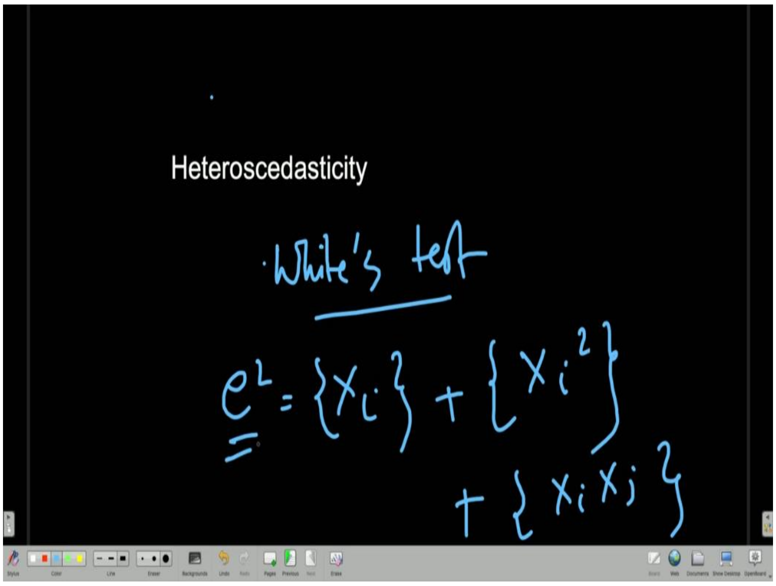

Now, how we do it? In case of White's test is that we basically use the same idea as Breusch Pagan test, where my dependent variable is going to be the error square. But however, my independent variable, I am going to incorporate many other independent variables here. So, what I mean by that is, let us say I have all the X i's; and then, I have all the square of the X i's. So, basically, if I have education in my X i, so, I will take another variable which is the education square.

And then, I will have the cross term like X i X j, all the cross product of different explanatory variables. So, essentially, the idea is that, when I am trying to understand the variance of the error term, and I am trying to understand its correlation with the explanatory variables, I am trying to see if it is also correlated with the square of my X term, because I am not really sure.

And as I mentioned previously, this is nothing but a proxy for the variance of the error term, you really never get the original, the variance of the error term. So, because of that, you need to actually, keep yourself open to see if the variance of the error term is actually varying with the square of the explanatory variable or the cross product of the explanatory variable. So, that is basically the idea of White's test. And like previously, it again

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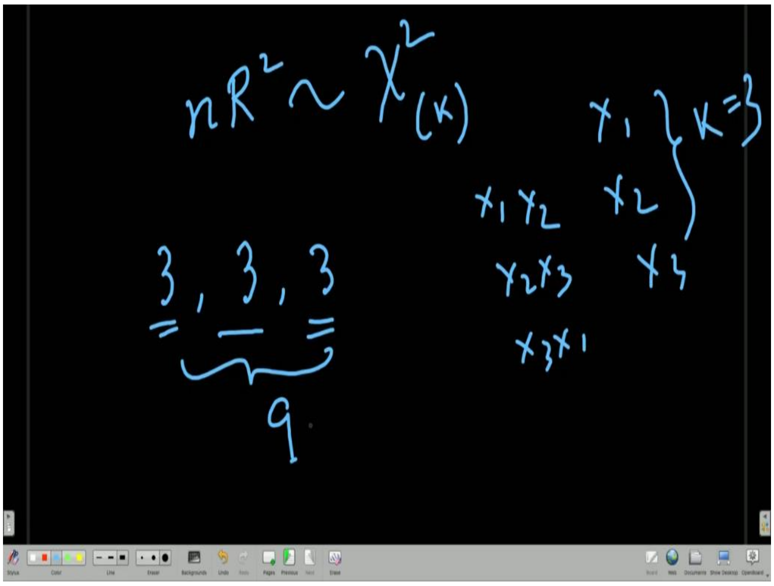

follows a chi square distribution where, if I get the R square value out of this regression equation that I run, if I use the R square value and the number of observations in the regression I used; and they actually follow a chi square distribution again, a chi square distribution with the degrees of freedom equal to the number of explanatory variables. Now, talking about explanatory variables, the one particular issue about White's test is that, we have too many explanatory variables now.

So, suppose if we had, let us say 3 explanatory variables previously, all numerical variables. And for these 3 explanatory variables, so, now you have like, we again have to square the 3 explanatory variables. So, that means, you are basically having 6. And then, you have to take cross product. So, if 3 C 2, that is again going to; so, if I have like X 1 X 2, X 2 X 3 and X 3 X 1; so, another 3 variables.

So, initially, if I had 3 variables, I could have my K, X 1 X 2 X 3, a K equal to 3. But now, my K = 9, because I am taking X 1 X 2 X 3, their squares and their cross product term. So, K = 9. So, problem with this is that, I am actually consuming a lot of degrees of freedom here. And because of that, White's test is performed and it is always advisable that you perform the White's test when you have a large number of observation, not a small number of observation.

And that is why, sometimes you may also find that, when you are actually testing for heteroscedasticity, you are getting different results for different tests; and that is because the sample size issue. So, you may might have small sample size and you perform the White's test, and you will end up getting a different result. Now, another point you need to remember is that for the dummy variable.

So, the categorical variables, so, it really does not matter if you square it or not, because this is just categories, 1 square is 1. So, for that cases, you do not have to do the square. So, you do not need to square a categorical variable. So, that is basically redundant. So, that way, you have to keep in mind when you actually perform the White's test. So, these are basically the major tests for heteroscedasticity.

And in the next lecture, we are going to see what we are going to do if we actually have heteroscedasticity in our data. I mean, what is the remedy? So, we will see some of the remedial measures in the next lecture. Thank you.