Applied Econometrics

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Lecture – 81

Autocorrelation (Contd.)

Hello and welcome back to the lecture on applied econometrics. So, we have been talking about autocorrelation and in the previous couple of lectures, we have looked into the data, we have looked into how to perform D W test, how to perform Breusch Godfrey Test using this data set and how to interpret the results? Now, in this lecture we are actually going to see well we have autocorrelation, we know that we have seen it.

So, how to actually really address autocorrelation? Now, go back to our first couple of lectures where we spoke about the sources of autocorrelation. Now, one source we said is the omitted variable bias. Often autocorrelation, 2 possibilities, One is the omitted variable bias and second is the model specification problem. So, let us start with the omitted variable bias first.

(Video Starts: 01:05) So, let us see the data set again, the data set we had and we had consumption, income, wealth and interest. Now, what I, we have not included in our model is that we included income and wealth but we have not included interest. Now, why interest is important for consumption? So, if there is a prevailing interest rate in the market. So, let us say the interest rate is pretty high.

So, any basic macroeconomics textbook will tell you that if interest rate is high, people will actually spend less and save more because it pays them more, if they save and it costs them more, if they consume. So, for a higher interest rate prevailing, if the interest is prevailing higher in the market. So, people will consume less. So that actually makes sense. So, inclusion of this macroeconomic variable could be important for a model.

Let us say we feed a simple O L S and we write regress consumption, income, wealth and interest. So, all I have done here is that I have included another explanatory variable that is

interest. And if I run it, well we have got our regression the R square value is still pretty high and the interest variable we actually can see a p value which is like actually telling that interest rate is a significant variable.

And we see a negative relation exactly what the you know, what the theory is and what it should be? So, interest could be a variable that is important. Now, let us see, if this result, if inclusion of interest is actually changing my D W stat. So, now, let us write down D W stat, all I have to write down is D W stat and I see now, I have 4 parameters to estimate and I have 54 number of observation and the D W stat is 1.31.

So, let us again go back to our for 4 degrees of freedom. Now, I have k is equal to 4. So, for 54 and k is equal to 4, I get these values. So, I leave 1, 2, 3, 4, 5, 6 values. So, my lower and upper is going to be 1.246 and 1.548.

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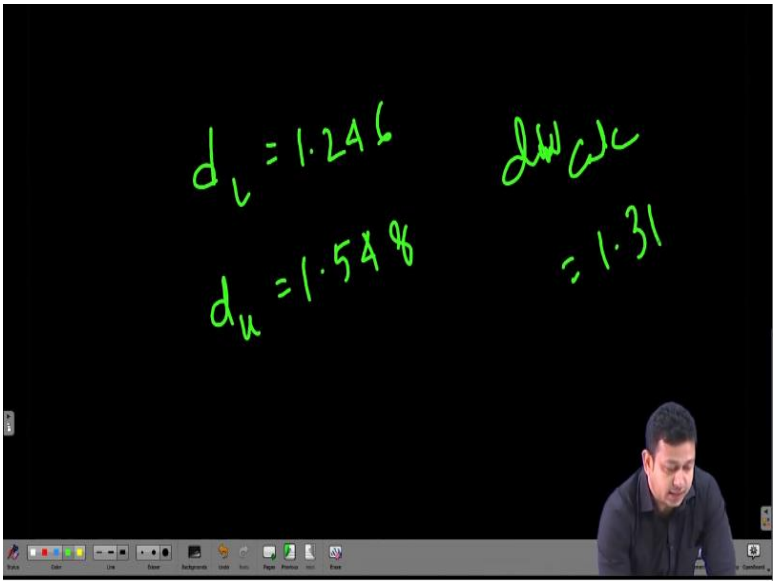

Let me write it down one point d u is one sorry d l is equal to 1.246 and d u is 1.548 and the D W calculated we have is equal to D W calculated is equal to 1.31.

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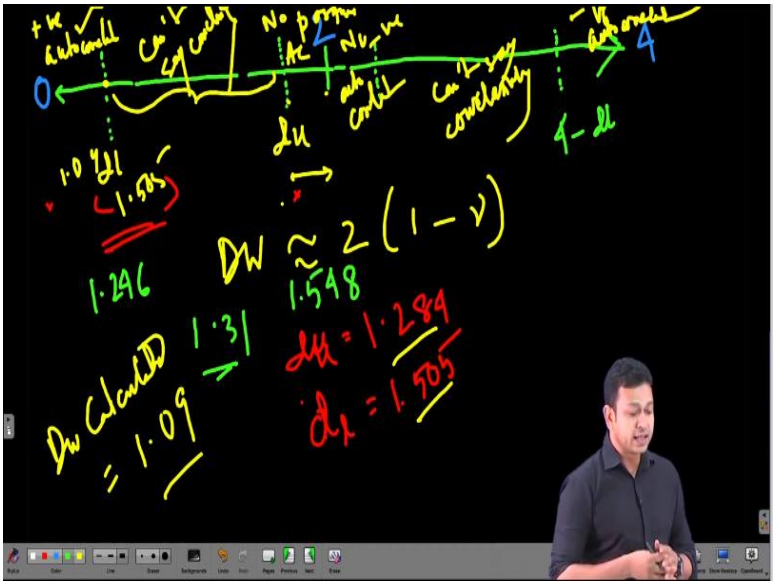

So, now, recall this line that we have drawn previously. So, I have here my d l 1.246 and my d u is 1.548 whereas my D W calculated is 1.31. So, it is going to be somewhere here 1.31. So, 1.31. So, perhaps you see that now, the Durbin Watson is saying that I cannot say anything conclusively. So, perhaps by just specifying the model correctly you might have taken you know taken out some of the autocorrelation that was previously present in your model.

So that is one way of actually dealing with autocorrelation. So, we can actually also see the residual. If we plot the residual, let us say just like before 2 way, I will do a line plot and I will plot oh I have to define y hat of course. So, let us say predict u hat is received oh I have already defined u hat. So, let us say predict u hat 1 for the residual of the model and then I sort of 2 way line u hat 1 and recede sorry and year.

If I do that. So, I will get this diagram. So, still we have something present here but you see that things have at least in this part, things have somehow become smooth. It has come within a specific you know range and it seems that the scatter is little less that than what we have seen previously. So, perhaps some of the problem is addressed here. Now, we can do the same thing using R also.

So, the point here is that, if you can specify your model correctly, you can actually take care of the sum of the problems. So, this is one way of you know looking into sort of addressing the error problem, the autocorrelation problem that we have that is omitted variable bias that might occur. Now, in the next part we are actually going to show how by actually you know

specifying the you know function the, if we, if you remember the functional specification part.

If we change the functional form of the model, if we can actually address some of the autocorrelation problems. So, let me actually do that. So, now, again I will go back to stata and what I will do here is now, remember that we already had something called log. So, instead of linear function I will actually take a logarithmic function to see, if that is actually making any difference. So, what I will do?

I will run the regression but instead and you know to sort of minimize the effort, I will write these. So, I actually the way I named the variables log consump and this I wrote l n d p I, disposable personal income. Then I wrote l n wealth and let us say we start with this. So, initially our base model that had some sort of autocorrelation present. Here, if we write the log function and if we do a D W stat so, we see that the value is 0.79.

And we know for 3 and 54 degrees of freedom it is going to be a positive autocorrelation. So, it is essentially showing that the result is not different. We have changed the functional form but the result is coming out to be same. So, it means that even, if we change the functional form, you may not necessarily find autocorrelation. So, we can do the same thing in R. So, we will definitely get the same result.

So that is or see we can actually do that mod 2 let us say l n consumption l n d p i and l n wealth. So, I am not including interest here. And then I run D W test mod2. So, here I get this value. D W stat value is point 0.79 and the p value is pretty small. So, it shows that there is a autocorrelation present in the model **(Video Ends: 09:40)**. So, with this we sort of end this lecture.

So, we talked about omitted variable problem, we talked about model specification but it does not like this these are some of the ways you can actually look into the you know how can you address autocorrelation problem. But there is another way and that is often prescribed to actually sort of you know take care of the autocorrelation problem and that is differencing and in the next lecture we are going to talk about differencing and addressing autocorrelation problem. Thank you.