Econometrics

End Sem

Faisal Rafiq

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Q1

a) The models estimated to resolve autocorrel depend ~~if~~ ~~the~~ on the autocorrelation co-efficient. If its not significantly different from 1, then first difference model is estimated and if its not the the generalised difference model is estimated.

As the models are estimated in different scenarios, one can't be preffered over the other

b) The problem can't always be distinguished from specification bias, ∴ we add ~~can~~ add a time variable and then re check

c) ~~b)~~ Park's Test : The assumption is

$$\sigma_i^2 = \sigma^2 X_i^{\beta} e^{v_i}$$

In Park's test ~~there is a~~ a random disturbance term (v_i) is present, which may not satisfy the assumptions of OLS and may itself have heteroscedasticity problem

Goldfeld - Quandt - Test : Here the assumption is $\sigma_i^2 = \sigma^2 X_i^2$, as there is no other random disturbance term we can say that Goldfeld test can give more robust conclusions as compared to Park's Test.

2) a) $Y_i = \alpha_1 + \alpha_2 X_{2i} + \alpha_3 X_{3i} + u_i$

b) $Y_i = \beta_1 + \beta_2 X_{2i} + v_i$

c) $Y_i = \gamma_1 + \gamma_3 X_{3i} + w_i$

$r_{23} = 0$

We have: $\hat{\alpha}_2 = \dfrac{\left(\sum x_{2i} y_i\right)\left(\sum x_{3i}^2\right) - \sum\left(x_{3i} y_i\right)\left(\sum x_{2i} x_{3i}\right)}{\left(\sum x_{2i}^2\right)\left(\sum x_{3i}^2\right) - \sum\left(x_{2i} x_{3i}\right)^2}$

$$\hat{\alpha}_2 = \frac{\dfrac{\left(\sum x_{2i} y_i\right)\left(\sum x_{3i}^2\right) - \sum\left(y_i x_{3i}\right)\left(\sum x_{2i} x_{3i}\right)}{\cancel{\left(\sum x_{2i}^2\right)\left(\sum x_{3i}^2\right)}}}{\dfrac{\sum\left(x_{2i}^2\right)\left(\sum x_{3i}^2\right) - \left(\sum x_{2i} x_{3i}\right)^2}{\cancel{\left(\sum x_{2i}^2\right)\left(\sum x_{3i}^2\right)}}}$$

$$= \frac{\hat{\beta}_2 - \hat{\gamma}_3\left(r_{23} \dfrac{\sigma_3}{\sigma_2}\right)}{1 - r_{23}^2}$$

σ_2 is the standard dev of X_2

σ_3 " " " " X_3

We have $r_{23} = 0 \Rightarrow \hat{\alpha}_2 = \hat{\beta}_2$

Similarly Divide both num & dem of $\hat{\alpha}_3$ ~~to get~~ by $\left(\sum x_{2i}^2\right)\left(\sum x_{3i}^2\right)$ to get

$$\hat{\alpha}_3 = \frac{\hat{\gamma}_3 - \hat{\beta}_2\left(r_{23}\frac{\sigma_2}{\sigma_3}\right)}{1 - r_{23}^2}$$

$r_{23} = 0 \Rightarrow \hat{\alpha}_3 = \hat{\gamma}_3$.

Now $\quad Var(\hat{\alpha}_2) = \dfrac{\sigma_u^2}{\sum x_{2i}^2\left(1 - r_{23}^2\right)} \quad \left(r_{23} = 0 \right.$

$$Var(\hat{\alpha}_2) = \frac{\sigma_u^2}{\sum x_{2i}^2} = \cancel{Var}$$

$$Var(\hat{\alpha}_3) = \frac{\sigma_u^2}{\sum x_{3i}^2}$$

$$Var(\hat{\beta}_2) = \frac{\sigma_v^2}{\sum x_{2i}^2}$$

$\sigma_u \neq \sigma_v \quad \therefore \quad Var(\hat{\alpha}_2) \neq Var(\hat{\beta}$

Similarly $\quad Var(\hat{\alpha}_3) \neq Var(\hat{\gamma}_3)$

as $\sigma_u \neq \sigma_w$

Q3 The problem of autocorrelation occurs when the assumption $(E(u_i u_j) = 0)$ is violated $\Rightarrow$ that there is a dependence among the random disturbance terms.
The problem is likely to occur in time-series data as it naturally follows an order. for e.g. the year on year GDP of a country is likely to show a trend of some relation among it.

One can't apply the durbin watson test if there is auto regression or there is no intercept as it violates the assumptions of the test.

Q4 The chow test can't be carried out if the the variances of the random difference terms are not equal because the F-Stat requires RSSS which can't be calculated if the variances are different. If the condition is not satisfied the chow test can't be carried out

Q5 β_4

$$Y_i = \alpha + \beta_1 D_{1i} + \beta_2 D_{2i} + \beta_3 (D_{1i} \times B_{2i}) + \beta_4 X_i + \beta_5 (D_{1i} (*) X_i) + \beta_6 (D_{2i} * X_i) + u_i$$

$\beta_1 \rightarrow$ If its significant & +ve, we can say that Urban areas have higher consuption as compared to rural.

$\beta_2 \rightarrow$ " " " " ", we can say that Above Povertty line households have higher consuption as compared to rural.

$\beta_3 \rightarrow$ " " " " " " " Urban & Above Poverty line have significantly more consuption as compared to other cases

$\beta_4 \rightarrow$ " " " " " " " we can say that higher household income will mean higher consuption.

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$\beta_5 \rightarrow$ Let $D_1 = 1$ & $D_2 = 0$

$$Y_1 = \alpha + \beta_1 + \beta_4 X_1 + \beta_5 X_i + u_i$$
$$= \alpha + \beta_1 + (\beta_4 + \beta_5) X_i + u_i$$

If β_5 is significant & +ve, it'll cause a (+ve) change in the slope coefficient, which shows that consumption will be higher irrespective of the poverty line conditions of the households

Similarly $\beta_6 \rightarrow$ It'll show consumption will be higher irrespective of area of household.