AUTOKORELASI

EKONOMETRIKA 1

Al Muizzuddin F., SE., ME.

Definition

The term autocorrelation may be defined as correlation between members of series of observations ordered in time (as in time series data) or space (as in cross-sectional data). In the regression context, the classical linear regression model assumes that such autocorrelation does not exist in the disturbances μ.

Symbolically : $Cov(\mu_i \mu_j) = 0$

There are several reason, why does serial correlation occur?

- Inertia
- Specification bias: excluded variables case
- Specification bias: incorrect functional form
- Lags
- Manipulation of data

Consequences of Autocorrelation

- The OLS estimators are unbiased
- The variance μ, is underestimate
- The variance OLS estimators are to be larger
- The prediction based on the OLS estimators will be inefficient

Detecting Autocorrelation

- **Graphical Method**
- **Durbin–Watson *d* Test**
- **A General Test of Autocorrelation: The Breusch–Godfrey (BG) Test**

Uji Autokorelasi DW Stat

Jika hipotesa H_o adalah bahwa tidak ada serial korelasi positif, maka jika:

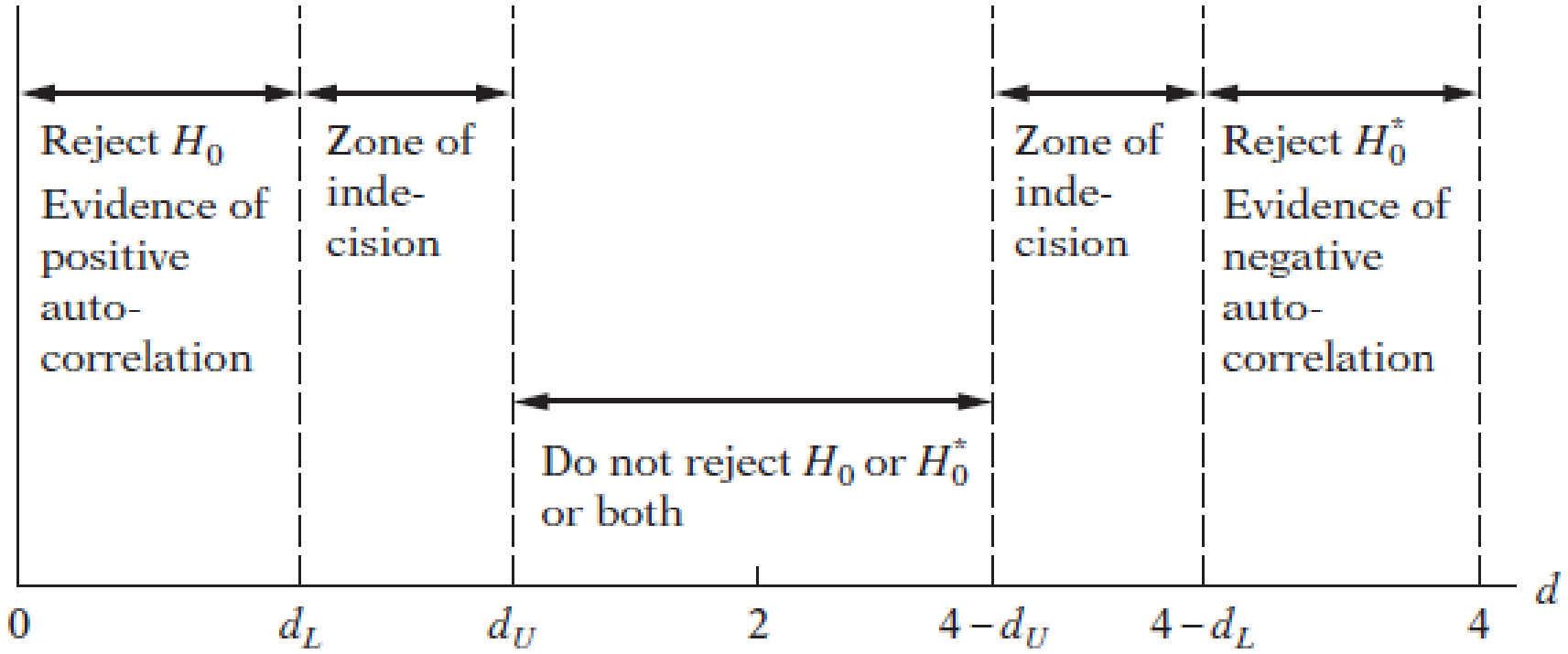
- $d < dL$ = menolak H_o
- $d > dU$ = tidak menolak H_o
- $dL \leq d \leq dU$ = pengujian tidak meyakinkan

Jika hipotesa nol (H_o) adalah bahwa tidak ada serial korelasi negatif, maka jika:

- $d > 4 - dL$ = menolak H_o
- $d < 4 - dU$ = tidak menolak H_o
- $4 - dU \leq d \leq 4 - dL$ = pengujian tidak meyakinkan

Jika H_o adalah dua ujung, yaitu bahwa tidak ada serial autokorelasi baik positif maupun negatif, maka jika:

- $d < dL$ = menolak H_o
- $d > 4 - dL$ = tidak menolak H_o
- $dL \leq d \leq dU$ = tidak meyakinkan, atau
- $4 - dU \leq d \leq 4 - dL$ = pengujian tidak meyakinkan


Reject H_0
Evidence of positive auto-correlation
Zone of inde-cision
Do not reject H_0 or H_0^* or both
Zone of inde-cision
Reject H_0^*
Evidence of negative auto-correlation
d
0
d_L
d_U
2
$4-d_U$
$4-d_L$
4
Legend
H_0: No positive autocorrelation
H_0^*: No negative autocorrelation

To illustrate the mechanics, let us return to our wages–productivity regression. From the data given in Table 12.5 the estimated d value can be shown to be 0.1229, suggesting that there is positive serial correlation in the residuals. From the Durbin–Watson tables, we find that for 40 observations and one explanatory variable, $d_L = 1.44$ and $d_U = 1.54$ at the 5 percent level. Since the computed d of 0.1229 lies below d_L, we cannot reject the hypothesis that there is positive serial correlations in the residuals.

Although extremely popular, the d test has one great drawback in that, if it falls in the **indecisive zone**, one cannot conclude that (first-order) autocorrelation does or does not exist. To solve this problem, several authors have proposed modifications of the d test but they are rather involved and beyond the scope of this book.[25] In many situations, however, it has been found that the upper limit d_U is approximately the true significance limit and therefore in case d lies in the indecisive zone, one can use the following **modified *d* test:** Given the level of significance α,

1. $H_0: \rho = 0$ versus $H_1: \rho > 0$. Reject H_0 at α level if $d < d_U$. That is, there is statistically significant positive autocorrelation.

TABLE 12.6 DURBIN–WATSON *d* TEST: DECISION RULES

Null hypothesis	Decision	If
No positive autocorrelation	Reject	$0 < d < d_L$
No positive autocorrelation	No decision	$d_L \leq d \leq d_U$
No negative correlation	Reject	$4 - d_L < d < 4$
No negative correlation	No decision	$4 - d_U \leq d \leq 4 - d_L$
No autocorrelation, positive or negative	Do not reject	$d_U < d < 4 - d_U$

[25]For details, see Thomas B. Fomby, R. Carter Hill, and Stanley R. Johnson, *Advanced Econometric Methods,* Springer Verlag, New York, 1984, pp. 225–228.

Mekanisme pengujian DW test

The mechanics of the Durbin–Watson test are as follows, assuming that the assumptions underlying the test are fulfilled:

1. Run the OLS regression and obtain the residuals.
2. Compute d from Eq. (12.6.5). (Most computer programs now do this routinely.)
3. For the given sample size and given number of explanatory variables, find out the critical d_L and d_U values.
4. Now follow the decision rules given in Table 12.6. For ease of reference, these decision rules are also depicted in Figure 12.10.

Kesimpulan

- Dw kurang dari 1,10 ada auto korelasi
- 1,10 sampai 1,54 tanpa kesimpulan
- 1,55 sampai 2,46 tidak ada korelasi
- 2,46 sampai 2,90 tanpa kesimpulan
- Lebih dari 2,90 ada autokorelasi

Uji Normalitas (Normality Test)

- Aliman (2000) menjelaskan bahwa dalam literatur Statistika maupun Ekonometrika, ada beberapa uji untuk dapat mengetahui normal atau tidaknya faktor gangguan (u_t) antara lain Jarque-Bera test atau J-B test.

- Hipotesis pengujiannya :
- H_o : Mempunyai residual atau faktor pengganggu berdistribusi normal
- H_1 : Mempunyai residual atau faktor pengganggu yang tidak berdistribusi normal
- Bandingkan nilai $JB_{hitung} = X^2_{hitung}$ dengan nilai $X^2_{tabel,}$ dengan pedoman sebagai berikut :
  - Jika nilai JB_{hitung} > nilai X^2_{tabel}, maka hipotesis yang menyatakan bahwa residual, u_t adalah berdistribusi normal ditolak.
  - Jika nilai JB_{hitung} < nilai X^2_{tabel}, maka hipotesis yang menyatakan bahwa residual, u_t adalah berdistribusi normal diterima.

- SELESAI