Getting started with EViews 7

(Volume II)

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5.0 RESIDUAL DIAGNOSTICS

Before drawing conclusions/policy inference from any of the above estimated regressions, it is important to perform relevant diagnostic tests to verify the validity of the classical linear regression models. The most critical of these assumptions are:

- Linearity: That there is a linear relationship between the dependent variable (MD) and the independent variables (GDP and R). The violation of this assumption may imply that the model under consideration is non-linear or incorrectly specified.
- Homoscedasticity: Each disturbance term has the same finite variance. The violation of this assumption is an indication of the presence of heteroscedasticity in the model.
- Non-Autocorrelation: Each disturbance term is uncorrelated with other disturbance term. There is presence of autocorrelation if the assumption is violated.
- Normality: The disturbances are normally distributed. Its violation may imply non-normality of the error term.

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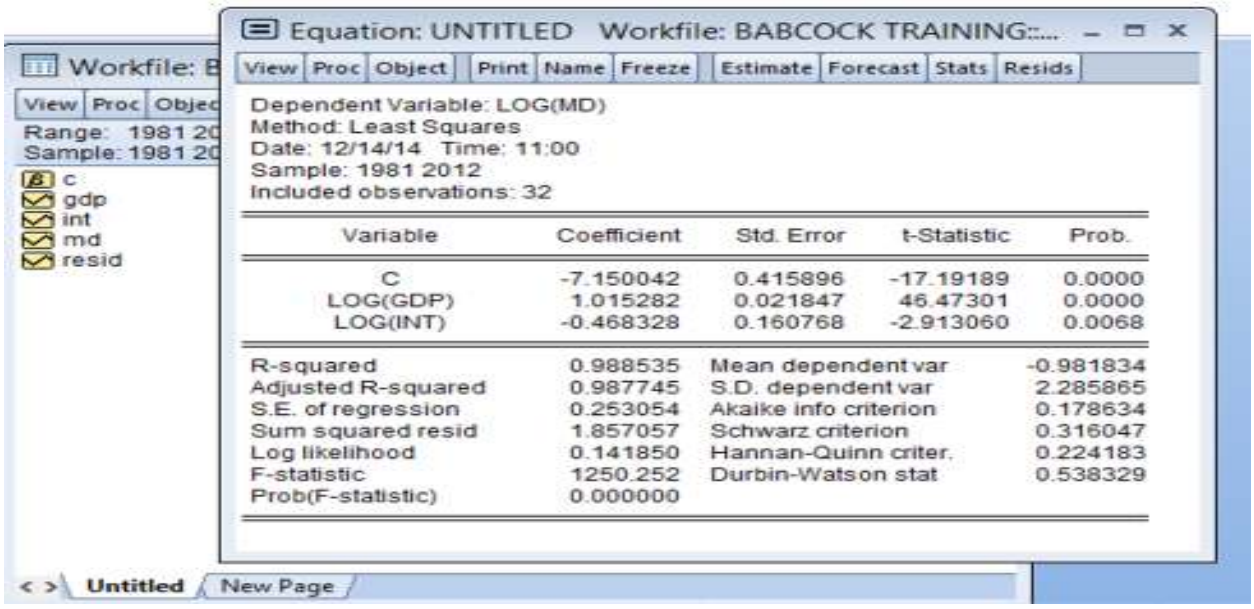
5.1 Testing for the presence of Serial Correlation

Is there evidence of autocorrelation problem in the estimated model? To answer this, **EViews** provides us with several methods of testing for the presence of serial correlation.

The two common residual tests of serial correlation are **Correlograms-Q-Statistics** and the **Breusch-Godfrey LM** tests.

- To perform any of these tests, let us consider the following double log regression results;

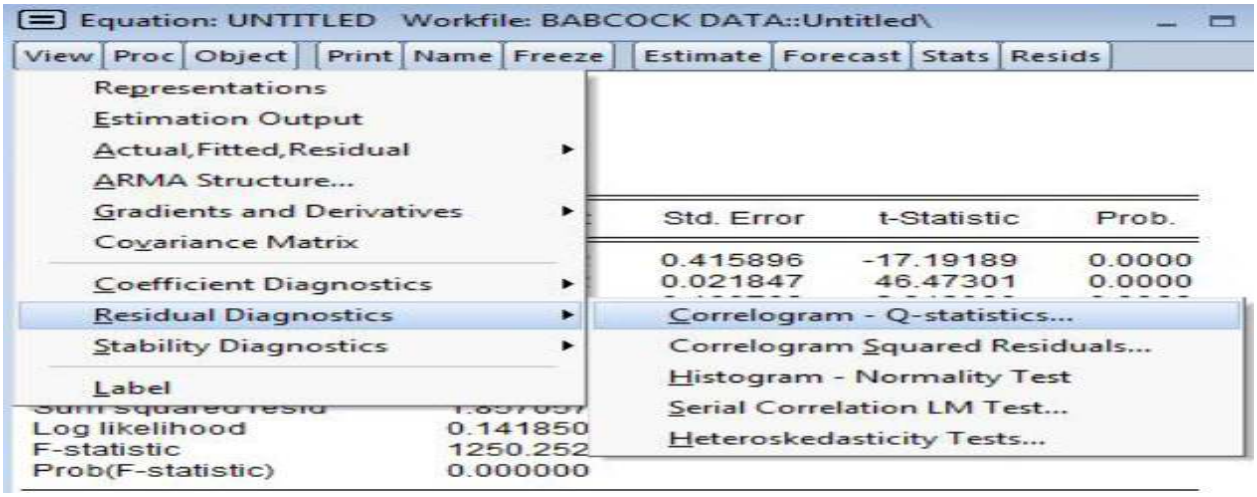


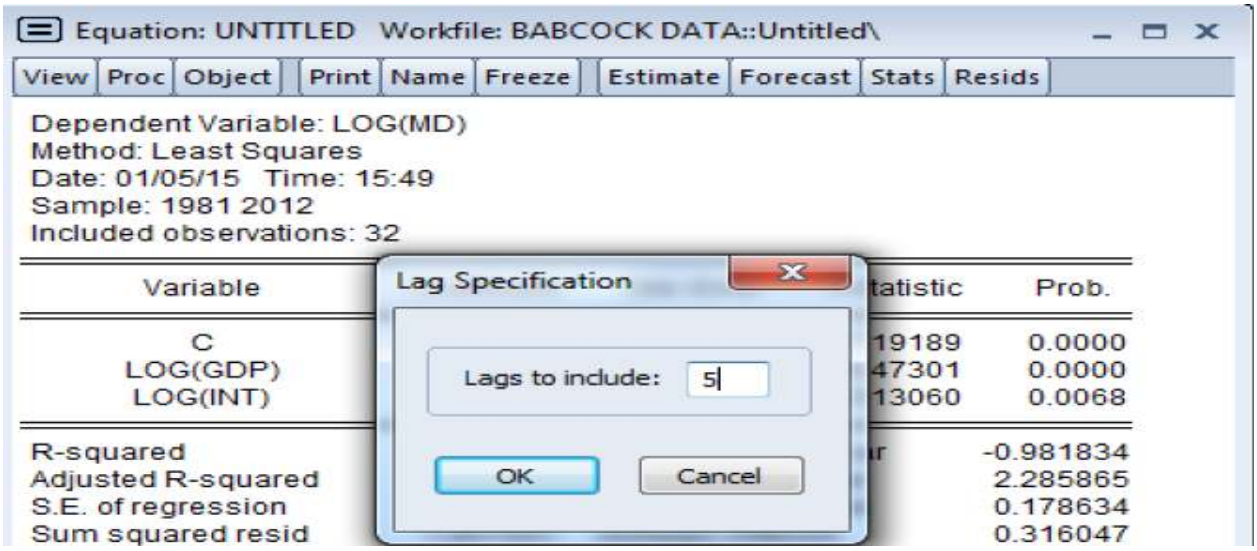
- A quick glance at the results reveals that the coefficients are statistically significant and the goodness of fit is very high. However, if the error term is serially correlated, the estimated OLS standard errors are inefficient which consequently renders the statistical inferences invalid.

5.1.1 Correlograms-Q-Statistics

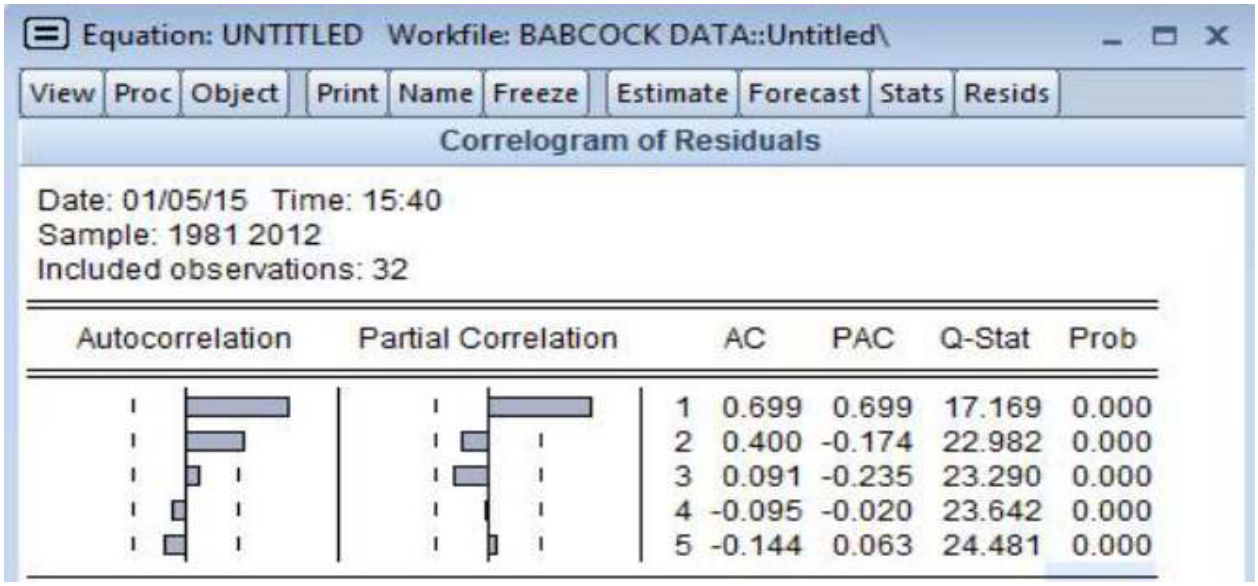
- To ascertain the validity or otherwise of the estimates via **Q-Statistics,** from the regression results above, select **View/Residual**

Diagnostics/Correlogram-Q-statistics → and enter the maximum lag order of serial correlation to be tested (say **5**) in the **Lag Specification dialog** then **Click OK**.





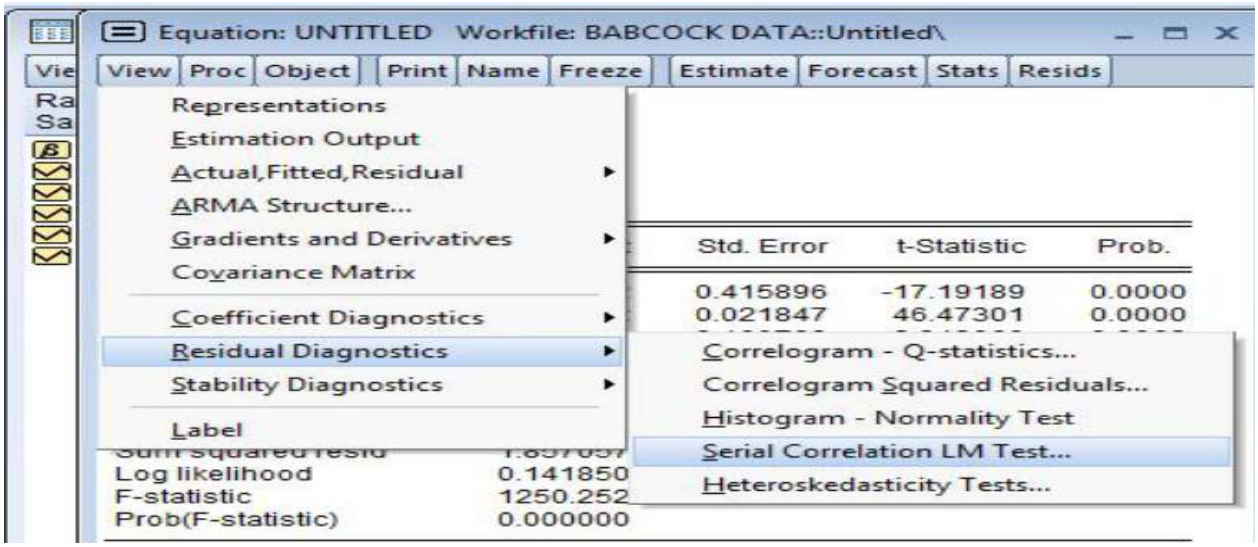
- EViews will display (**as shown below**) an **Autocorrelation and Partial autocorrelation** functions of the residuals as well as Ljung-Box Q-statistics for high-order serial correlation. If there is no serial correlation, then, all the Q-statistics should be insignificant. In other words, there is no serial correlation, if the pvalues are greater than 0.10.



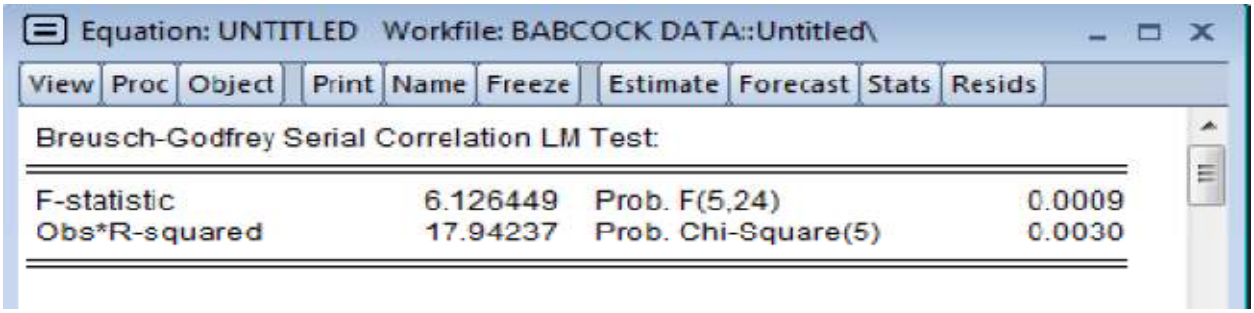
- The Q-statistics are significant at all lags, indicating significant serial correlation in the residuals. That is, there is presence of serial correlation.

5.1.2 Breusch-Godfrey Serial Correlation LM Test

- To ascertain the validity or otherwise of the estimates via **LM Test Statistics**, select **View/Residual Diagnostics/ Serial Correlation LM Test.**



- Again, enter the highest order of serial correlation to be tested in the **Lag Specification dialog** (i.e. **as previously demonstrated**) then **Click OK**. The results would appear as below:

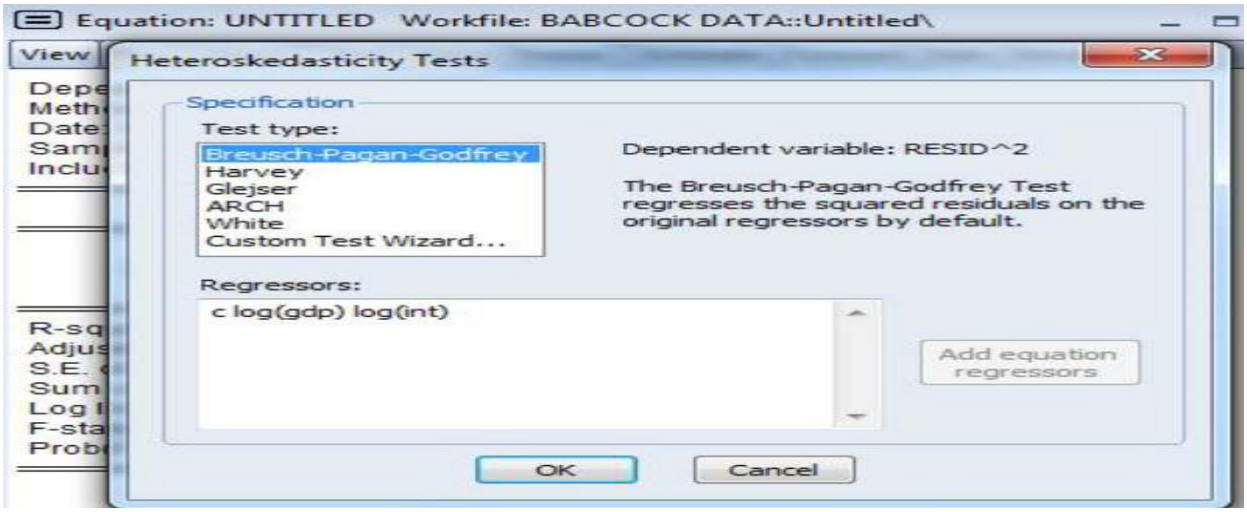


- The null hypothesis of the test is that there is no serial correlation in the residuals up to the specified lag order. **EViews** reports a statistic labeled "F-statistic" and "Obs*R-squared" statistic.
- Consequently, both statistics for the LM test reject the hypothesis of no serial correlation up to lag order five.
- Note also that both the Q-statistic and the LM test indicate that the residuals are serially correlated.
- The implication of this finding is that the regression results cannot be interpreted in their present form because of invalid statistical inferences.
- How do we resolve this problem? This will be addressed later.

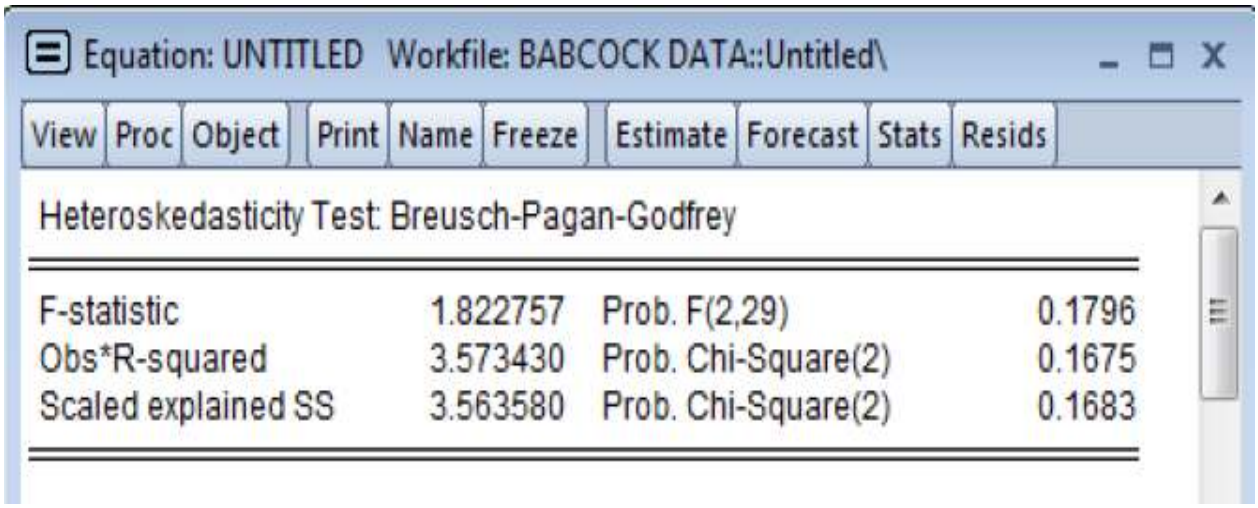
5.2 Testing for the presence of Heteroscedasticity

Again, the homoscedasticity assumption must be satisfied for the regression results to be valid. Therefore, testing for the presence of heteroscedasticity in a linear regression model is inevitable. EViews allows you to employ a number of different heteroscedasticity tests namely, **Harvey**, **Glejser**, **ARCH**, **White** and **Breusch-Pagan-Godfrey.** Since they are post-estimation tests, they are performed on the regression results.

- Using Eviews, from the estimation output, select **View/Residual Diagnostics/Heteroscedasticity Tests**. The following dialog box comes up.

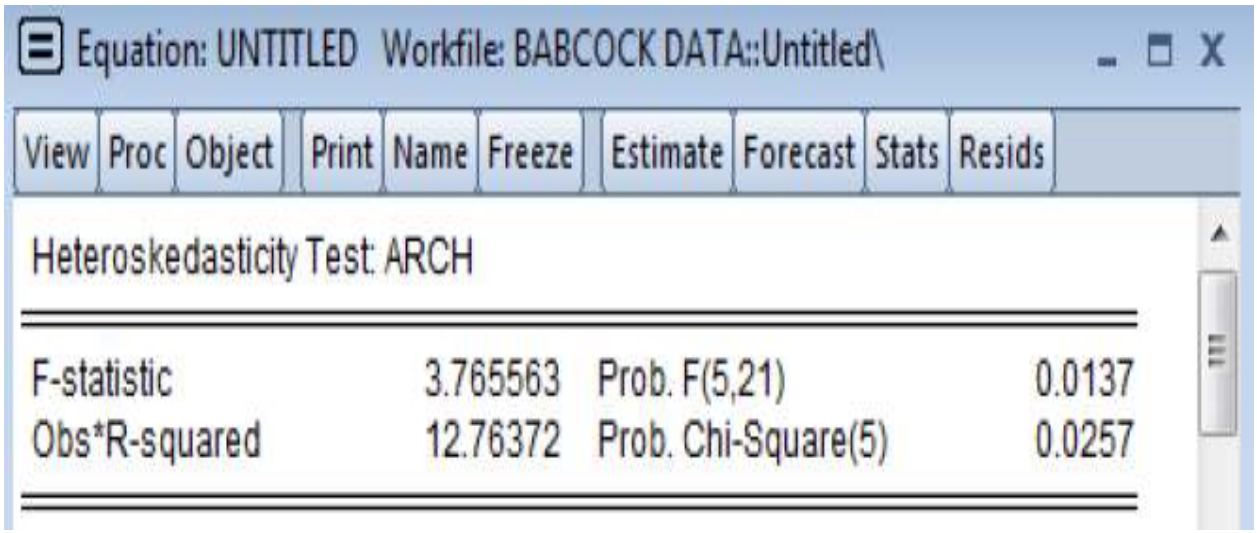


- Choose the default option by clicking on **Breusch-Pagan-Godfrey** in the **Test type box**. Click **OK** and the following results would appear;



- Given the insignificant F-statistic and Obs*R-squared based on the p-values, we cannot reject the null hypothesis of **homoscedasticity** against the alternative of **heteroscedasticity**.

- To further validate the robustness of this result, we may explore any of the alternative heteroscedasticity tests (i.e. ARCH LM test) from the list of Test Types using similar procedure as follows:



The result seems to suggest otherwise and since the ARCH LM test is more powerful; the result of the latter is more reliable and therefore, conclusion should be based on the ARCH-LM test.