BE2006-Statistics and Econometrics

Assignment - 2008/2009

Note: *You are allowed to use any statistical software that you find convenient to solve this assignment. If you choose to use the software Time Series Modelling (TSM), you can find it installed in the computers of Rooms 116 and 206, Streatham Ct, and in the Xfi computer suite. You can also install TSM on your own PC if you wish. Visit http://www.timeseriesmodelling.com for downloads and installation instructions. As well as the TSM installation program you will need two other components, Ox 4 Console and the Sun 'JRE' Java package. Ox is a free download for students. Java is also free, and is often installed on PCs by the manufacturer, but updating to the latest version is recommended.*

You will also need a licence key, and you may use the time-limited licence issued to the university. After installing and starting the program, open Help / Register this Copy... and type in the codes that you can find on the course web page http://people.exeter.ac.uk/pmd202/local/BEE2006.html.

Assignment Length: *The maximum length of the Assignment is 10 sides of A4 (including Appendices).*

Whenever conducting a test use a 5% significance level. Also be sure to state null and alternative hypotheses, null distribution (with degrees of freedom), rejection criterion and your decision. **Do not answer questions with a "yes" or "no" only, but carefully justify your answers. You will be penalized if you present tables and results that are not subsequently discussed in your answers.**

In this Assignment you are going to estimate a so-called gravity model. In applied international economics the gravity model has been a successful empirical model for explaining bilateral trade flows between countries. Its basic specification relates trade flows between trading partners with their size and trade costs. Typically size is approximated by income, while trade costs are measured by geographical distance between trading partners.

The gravity model has been estimated for a wide range of countries and periods. Usually researchers find positive effects for income, that is, large countries trade more with each other than small countries. Concerning distance, a negative effect on trade flows has been found often as transaction costs are low when countries are neighbours (e.g. Spain and France or Canada and the US), but rise with distance. Hence, trade flows between countries depend negatively on distance.

In this Assignment you are going to analyze bilateral trade flows for a cross section of OECD countries. In total 221 observations are available. The data have been extracted from a database used in Glick and Rose ("Does a currency union affect trade: The time series evidence", *European Economic Review*, vol46, June 2002, 1125-1151). Both the paper and the database can be found at http://faculty.haas.berkeley.edu/arose/.

On the web page http://people.exeter.ac.uk/pmd202/local/BEE2006.html 10 different EXCEL and TSM files are available named grav88.xls, ..., grav97.xls and grav88.tsm, ..., grav97.tsm respectively. Each Excel and TSM file contains data for a particular year. TSM files also contains the settings for the Assignment.

The specific year you have to analyze is determined by the 9^{th} digit of your student ID number:

0 1988	**5** 1993
1 1989	**6** 1994
2 1990	**7** 1995
3 1991	**8** 1996
4 1992	**9** 1997

For example, if the 9 digits of your student ID number are 555488567, you choose year 1995 and download grav95.xls or grav95.tsp (click on the right button of your mouse, choose Save Target As and choose a directory and click OK). If you choose to use the TSM software, click on the TSM file. The 4 imported series are:

$ltrade$ = logarithm of real bilateral trade
$lrgdp$ = logarithm of real GDP
$ldist$ = logarithm of distance
$regional$ = 1 if two countries have regional trade agreement, 0 otherwise.

1. [5%] Briefly describe the main features of the data. [Hint: Consider first descriptive

statistics, for example, means, medians, variances/standard deviations, minima and maxima, graphs of variables, histograms, cross- plots of variables, comparisons of data across various groups and correlation matrices.]

2. [10%] Basic gravity models relate trade flows to GDP and distance. Estimate the model

$$ltrade = \beta_0 + \beta_1 lrgdp + \beta_2 ldist + u$$

Given the specific functional form explain in words what the regression coefficients β_1 and β_2 measure. Interpret the results obtained.

3. [5%] Suppose you are working on this assignment together with a fellow student. Your colleague claims that the least squares estimators of the regression in question 2 are unbiased because the fit of the regression is satisfactory. More specifically, it is claimed that least squares estimators are unbiased because the R^2 is large and all regression coefficients are significant. Do you agree?

4. [10%] For the model in question 2 perform Ramsey's RESET test. What do you conclude about the validity of the estimation results from question 2?

5. [10%] In the empirical literature on international trade an important issue is whether regional trade agreements have an impact on bilateral trade relations. An additional measure of trade costs is the presence of a regional trade agreement (regional). Estimate the following model and interpret the results

$$ltrade = \beta_0 + \beta_1 lrgdp + \beta_2 ldist + \beta_3 regional + u.$$

6. [10%] Use the estimates of question 5 to test whether regional trade agreements have a significant impact on trade.

7. [10%] Using your model estimated in 5, construct a 95% confidence interval for $E[ltrade|lrgdp = \overline{lrgdp}, ldist = \overline{ldist}, regional = 1]$, where $\overline{lrgdp}$ and $\overline{ldist}$ denote the sample means of $lrgdp$ and $ldist$ respectively. Assuming normality of the error term u, estimate $E[trade|lrgdp = \overline{lrgdp}, ldist = \overline{ldist}, regional = 1]$, where $trade$ = real bilateral trade.

8. [10%] In the existing empirical literature the usual way of measuring a trade agreement effect on trade flows is to incorporate the dummy variable regional as an intercept shifter as in question 5. It is possible, however, that the regression model as a whole is different for trading partners with and without trade agreement. Estimate again the model of question 2, but now for two subsamples, i.e. both trading partners have a trade agreement or not. Use the Chow Test to test whether the regression coefficients differ between the two subsamples.

9. [10%] An alternative way of testing on a structural break is by using the dummy variables. Construct a model using dummy variables that allows you to test the same null hypothesis of the Chow Test in 8, that is of no structural break. Use the Lagrange Multiplier statistic to test the null hypothesis of no structural break.

10. [10%] In your model estimated in 8, test if the error term is homoskedastic. What do you conclude about the validity of the tests performed in 8 and 9? In case you consider that these tests are invalid, test whether the regression coefficients differ between the two subsamples using the appropriate test statistic.

11. [10%] For the model estimated in question 9 perform Ramsey's RESET test. What do you conclude? If you find evidence that the model is misspecified, suggest an alternative model that does not have specification problems and interpret the results.