

**AFE6019-B Econometrics**  
**Coursework 1: Individual data analysis report**

**Submission date:** 3 PM, 10<sup>th</sup> January 2022

**Word limit:** Up to 2000 words

**Weighting:** 40 percent

- 
1. You should provide answers to ALL the questions. Your coursework should make use of appropriate academic literature and statistical software. You should also provide necessary references of your research work.
  2. Your name and UB number should be on the cover of your report.
  3. You are advised to plan your work carefully and back-up your work. Computing problems will NOT be accepted as reasons for non-submission.
  4. Word count excludes title cover, tables, figures, and appendices where applicable.
  5. Tables and figures:
    - 5.1 Tables and figures must be numbered consecutively in order of appearance within the report.
    - 5.2 Each table and figure should be given an appropriate title, which is mandatory. Add note(s) below to the table(s) where applicable.
    - 5.3 Tables and figures should be cited in the relevant text by using sentences such as "Table 1 reports ..." or "Figure 1 shows ...".
    - 5.4 Failing to meet the requirements for tables and figures will be penalized.

**Marking criteria:**

Your research report should illustrate your level of understanding on theoretical and empirical linkages and data analysis. The report will be assessed mainly using following criteria:

1. Clarity in presentation and use of data
2. Depth of subject knowledge
3. Rigour and evaluation

Assessment will be marked against the University of Bradford undergraduate marking scheme which is provided in the module handbook.

## Economic Growth and Environmental Degradation.

Cop-26 climate summit-**Nov 2021**- among other things aims to reduce carbon emission by reducing use of coal in production activities and adopting cleaner production methods.

The aim of this research is to examine the relationship between per capita GDP and per capita emissions (greenhouse gas carbon dioxide ( $CO_2$ )) to observe the possible influence of economic growth on environmental degradation. The countries such as China, United States, India, Japan, Germany are among the list of world biggest carbon emitters. **Use at least following four suggestive variables in your analysis. You can choose additional variables in the model as an explanatory variable as deemed appropriate.**

- 1-  $(CO_2 \text{ emissions/Capita})_i$  = Carbon dioxide ( $CO_2$ ) emissions measured in tons per capita of country  $i$  in a year
- 2-  $(GDP/Capita)_i$  = GDP per capita (current US\$) of country  $i$  in a year
- 3- **Renewable energy consumption (% of total final energy consumption)** of country  $i$  in a year.

$$4- \quad \text{Trade openness}_i = \frac{\text{Export}_i + \text{Import}_i}{GDP_i}$$

where  $\text{Export}_i$  is total export of country  $i$  in a year, measured in current US dollars;  $\text{Import}_i$  is total import of country  $i$  in a year, measured in current US dollars.  $GDP_i$  is gross domestic product of country  $i$  in a year, measured in current US dollars.

Each student should collect data on variables for a minimum of 50 countries. **The countries such as China, United States, India, Japan, Germany and Russian must be included in your final data selection.**

You are required to collect data for world Bank. The data is available at the World Bank – World Development Indicators(WDI): <https://databank.worldbank.org/source/world-development-indicators>

**Each student should choose his/her own data from WDI and should not share that selected data with others. This is not a group exercise.**

**Q1.** Briefly explain theoretically the association between economic growth with carbon emissions. Also, in the light of theory, briefly discuss the association of other variables listed above with carbon emissions. Obtain data on all variables list above from WDI for a specific year (choose any one year between 2014-18) and at least 50 countries observations. Produce histogram of per capita income and analysis and discuss the shape of histogram. Label it and provide a title for it. **(5 marks)**

**Q2.** Obtain data required to compute the association between GDP per capita and CO2 emission/capita. Produce a scatter plots of CO2 emission per capita (y-axis) against per capita income (x-axis), renewable energy consumption and trade openness. Based on visual inspection, discuss any pattern and outliers in the data that emerge. Identify the outliers and discuss the impact of outliers on the regression. **(10 marks)**

**Q3.** Present and discuss the table of summary statistics. This table should contain at least number of observations, mean, standard deviation, minimum, and maximum values for your chosen variables. **(5 marks)**

**Q4.** Compute and present a correlation matrix. Discuss correlation between CO2 emission/ capita, GDP per capita, Renewable energy consumption (% of total final energy consumption) and trade openness. **(5 marks)**

**Q5.** (5a) Specify a regression model that explains how CO2 emissions/ capita depends on explanatory variables in the light of theoretical association of independent variables with dependent variable and test an appropriate hypotheses. Estimate the model by applying an appropriate econometric method. Interpret your estimated results following theoretical associations between variables/hypotheses testing and by choosing an appropriate level of significance. Reflect your understanding on the overall degree of fit of the model. Present your estimated results in a table and discuss your findings. **(10 marks)**

(5b) Based on the regression results in Q5(a), what are the marginal effects of GDP/ Capita, and renewable energy consumption (% of total final energy consumption). **(5 marks)**

**Q6.** In the model specified in Q5, you decide to test the possibility that explanatory variable (s) is (are) irrelevant by dropping one or more variables from model and rerunning the equation. Discuss the reason why the variable(s) should and or should have not be included in your model. Specify a final regression model which includes all relevant variable(s) that you identified as relevant explanatory variable(s) (Hint: be sure to use our four specification criteria). Present the results in a table and discuss them. **(15 marks)**

**Q7.** Explain a distinction between an equation that is linear in the coefficients and one that is linear in variables. Examine whether log transformation of dependent and independent variables provides better estimates compared to regression analysis conducted using **level-level** regression model estimated in Q6. Furthermore, can you compare R-squared estimated results of level-level model with the estimated regression results of double log regression model? If not, explain the rationale behind it. Present your estimated results using double log model in a table and discuss your findings. **(15 marks)**

**Q8.** (8a) Specify your final choice of estimated model following analysis conducted at Q6 and Q7. What do we mean by heteroskedasticity? Apply an alternate method of testing for heteroskedasticity in your model. Discuss the strengths and weaknesses of those alternate methods for heteroskedasticity. Present your estimated model results in a table

and discuss the heteroskedasticity implications for estimated coefficients in your model. **(15 marks)**

(8b) What are the remedies for heteroskedasticity? Use an alternate test to correct for heteroskedasticity in estimated model and reproduce the estimated results based on the heteroskedasticity corrected standard errors in a table. Compare this estimated model with your estimated model results obtained in 8(a) and discuss your findings. **(15 marks)**