5QQMN938 – Forecasting Project

Project Brief

Climate change is now at the top of politicians' agendas around the globe. In 2015, the Paris Agreement was adopted by 196 Parties in an attempt to curb global warming to below 2 degrees:

*"To achieve this long-term temperature goal, countries aim to **reach global peaking of greenhouse gas emissions as soon as possible** to achieve a climate neutral world by mid-century."*[1]

The Paris Agreement works on a 5-year cycle in which emissions targets are set and evaluated. Forecasting variables like CO_2 emissions over a 5-year period is therefore very important.

You have been assigned a country (see "Country Allocation" below) and will work on a project to provide forecasts of CO_2 emissions growth in that country up to 2025. You have been given the dataset *"CO2.xlsx"* which contains CO_2 emissions (in metric tonnes) for a large number of countries and global regions. The data are taken from the BP Statistical Review of World Energy[2] and have annual observations from 1965 to 2019.

Your task is to produce a **four slide PowerPoint presentation** which could be presented at an international climate change convention. The design and layout of the presentation is up to you (text, graphics, tables, equations, infographics etc. are all allowed), but the purpose of the slides should be as follows:

1. **Analysis:** To provide background and context to CO_2 emissions in your country and an analysis of the historic time series properties and behaviour of the annual growth rate of CO_2 emissions.
2. **Econometric Modelling:** To identify and report an appropriate forecasting model for annual CO_2 emissions growth by selecting between an AR(1), AR(2), AR(3) and AR(4) model using the BIC. You should provide a discussion and evaluation of the model and modelling approach and its limitations.
3. **Forecasting:** To produce and display iterated multi-step forecasts for annual CO_2 emissions growth for the period 2020-2025 (in other words, six out-of-sample forecasts). An evaluation of the forecasts and their uncertainty should be provided, as well as a conclusion in light of the objectives of the Paris Agreement.
4. **Appendix:** To provide all Stata codes used in the analysis.

Hint

The variable "Date" in the dataset is an annual (integer) variable and does not require any formatting for use with `tsset`.

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[1] See: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement [Last accessed: 30/01/21]

[2] See: https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html [Last accessed: 30/01/21]

Submission

You must submit a PowerPoint document or a pdf to Turnitin. The presentation must only contain four slides, and **the font size should not be smaller than size 16** (except for the Appendix where you may decrease the font size for the Stata codes). There is no specific word limit in addition to the font size limit, but part of the marks for the project are awarded for presentation (see "Marking" below) which involves providing concise discussion. Any superfluous text is likely to detract from the project.

Marking

This coursework contributes 40% towards the final grade for this module. Slides 1, 2 and 3 all carry an equal weight of 25% and the remaining 25% is for presentation. See the separate marking criteria document. The Appendix slide will not directly receive any grades, but it <u>must</u> be provided and there will be a penalty for not including the Stata codes.

Country Allocation

You have each been allocated a country from the dataset *"CO2.xlsx"*. Only countries with CO_2 emissions greater than 0.5% of world emissions (as of 2019) have been included. This ranges from China (28.76%) to Argentina (0.51%). Please find your student ID number and country in the table below:

Student ID	Country	Student ID	Country
1632102	China	19000879	France
1672050	United States	19001058	Vietnam
1747015	India	19001063	United Arab Emirates
1786804	Japan	19001111	Taiwan
1801994	Germany	19001520	Spain
1804272	Iran	19001565	Malaysia
1811329	South Korea	19001695	Singapore
1814766	Indonesia	19005361	Egypt
1829845	Saudi Arabia	19005853	Pakistan
1832918	Canada	19007139	Netherlands
1836830	South Africa	19008356	Argentina
1837226	Mexico	19010501	China
1845430	Brazil	19010553	United States
1852610	Australia	19010711	India
1856553	United Kingdom	19011005	Japan
1874843	Turkey	19011654	Germany
1891352	Italy	19011746	Iran
1892832	Poland	19012660	South Korea
1901098	Thailand	19012672	Indonesia
1903226	France	19013208	Saudi Arabia
1903608	Vietnam	19013521	Canada
1903701	United Arab Emirates	19017167	South Africa
1904246	Taiwan	19018158	Mexico
1904905	Spain	19019193	Brazil
1905051	Malaysia	19021081	Australia
1905357	Singapore	19021338	United Kingdom
1908052	Egypt	19021736	Turkey
1908721	Pakistan	19025013	Italy
1908772	Netherlands	19027069	Poland
1909731	Argentina	19027114	Thailand

1910756	China	19027373	France
1912085	United States	19030597	Vietnam
1912228	India	19030680	United Arab Emirates
1914394	Japan	19031151	Taiwan
1918887	Germany	19031422	Spain
1919351	Iran	19032521	Malaysia
1919812	South Korea	19033151	Singapore
1920807	Indonesia	19034247	Egypt
1921238	Saudi Arabia	19034683	Pakistan
1921250	Canada	19037156	Netherlands
1923581	South Africa	19037208	Argentina
1924692	Mexico	19044482	China
1925506	Brazil	19046128	United States
1926674	Australia	19053942	India
1928660	United Kingdom	19066713	Japan
1929993	Turkey	19067647	Germany
1929999	Italy	19068897	Iran
1930113	Poland	19077370	South Korea
1932724	Thailand		