Harvard Extension Data Science

Dynamic Modeling and Forecasting in Big Data

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Assignment 2

A Simple Model to Predict GDP Growth Dynamics

- Read my memo, "A simple model for GDP growth prediction." The data to build the models are in CountryData.xlsx.
- Write a program script to replicate all the 10 models (Equations 1 to 10 in Appendix 2 of the memo). By practicing these 10 models, you should have a deeper understanding of OLS and the fixed effect (both country and year) models.
  Note: in the memo, I use the name "time_trend", which is "year" as a numeric variable. In this case, it has a totally different meaning compared to the year fixed effect.
- In R, use "predict" function, you will be able to make in-sample predictions as shown as blue line (Eq01) and green line (Eq04) in the charts in Appendix 1. Make prediction and plot those charts for three countries: U.S., China, and the other one of your choice. You can write a R or Python script to generate these charts or you can simply export the data and plot those charts on your own preferred method. Copy those charts to your submission file.
- Read my updated memo, "A simple model for GDP growth prediction-2022 update," in which I added four more countries: France, Italy, Spain, and Mexico and one more variable: housing price growth. The updated data are in CountryData_update.xlsx.
- Run Equations 11 and 12.
- Briefly comment and compare on all these 12 models.
- If we assume China's input growth (%) in 2023 is as follows: econg= +4.4, co2g= +3.6, eximg= -6, hpg= -20, what is the predicted China's GDP growth based on Equation 11.
- Assignment submission:
  (1) A R script (or Python/Jupyter script if you prefer).
  (2) A word or PDF file to show visualizations and with a brief summary.

- *Additional Note:* I was thrilled to see the result when I first developed this model—a simple 3 variable model could capture pretty well of US GDP growth dynamics in the history. Note that U.S. GDP is comprised of hundreds of economic and financial variables. You can see here for more GDP components: https://www.atlantafed.org/cqer/research/gdpnow.
  These three/four- variable simple model would be similar to some degree with the dynamic factor model we will learn later.