Problem Set 5

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You must upload one **ZIP file** including your

- .R-file
- pdf including your solutions (plots and regression output) and explanations

by **Wednesday the 25th of January at 14:45**.

Your R-Code has to run on every computer without modifying it. Make sure that this is the case before submitting it. Otherwise, points will be deducted.

Disclaimer: If any of the two files is missing, you do not get any points.

General Instructions: This time we will use data from the World Bank. To simplify the data collection, you will use a specific R-package that connects directly to the World Bank API, *wbstats*[1]. The four data objects and their World Bank codes that you will need are,

1. Nominal GDP - NY.GDP.MKTP.CD
2. Real GDP - NY.GDP.MKTP.KD
3. Inflation - FP.CPI.TOTL.ZG
4. Unemployment - SL.UEM.TOTL.NE.ZS

For Problem 1, you need to download the first three data objects for all countries for the years 1960 up until 2019. After downloading, identify the countries that have no NA values and create a balanced sample.[2].
Unemployment data is only needed for four countries from 1971 onward for Problem 2. You can exclude it when creating the balanced sample for Problem 1.

[1] Read the documentation to find the necessary commands.
[2] You should end up with 41 countries

Problem 1. In the main lecture, you discussed the empirical estimation of the output-inflation tradeoff by Ball et al. (1988)[3]. Since this paper was published over 30 years ago, it is interesting to see if the results have changed and if they did how.

To obtain the "trade-off" parameter, estimate the following equation using OLS

$$y_{i,t} = c + \gamma_{i,t} + \tau_i \Delta x_{i,t} + \lambda_i y_{t-1} \tag{1}$$

where $y_{i,t}$ is log real GDP, $\gamma_{i,t}$ is a time trend, $\Delta x_{i,t}$ is the change in log nominal GDP and $y_{i,t-1}$ is lagged log real GDP. i is the country indicator and t is the time indicator.
τ_i is the variable of interest for us.

a Give the economic interpretation of τ. What does it mean if τ is low or high?

b Choose a subset of three countries and compare your results to those of Ball et al. (1988). Did the parameter τ change under your period of study compared to that by Ball et al. (1988)?

c Equivalent to Ball et al. (1988) produce a scatterplot where τ is on the y-axis and mean inflation is on the x-axis. How does your graph compare to the one by Ball et al. (1988)?

d What are potential explanations for any cross-counry differences in τ? Hint: Read the lecture notes and (parts of) Ball et al. (1988).

Problem 2. We want you to work on the Phillips curve by describing its theoretical foundation and checking whether it has been stable in selected economies.

a Describe the Phillips curve and the relationship between its variables.

b Plot the Phillips curves for Austria, France, the United Kingdom and the United States from 1990 until today. Plot the inflation rate on the y-axis and the unemployment rate on the x-axis.
When using the ggplot command to visualize your findings, add the following command line: *+ geom_smooth(method = "lm", formula = y x + I(x^2))*. This command will estimate a quadratic Phillips curve from the data.
Describe and compare your findings for each country.

[3] See *New Keynesian Economics: Price Adjustment* slide 12-14

c Check the stability of the Phillips curve through time. Plot the Phillips curve for Austria and the United Kingdom from 1971 to 1986, from 1987 to 2002 and from 2003 until today separately for each country in one graph.
Does the Phillips curve change or remain constant? If it changes, explain how.

d What are possible reasons for a change in the Phillips curve over time?

References

Ball, L., Mankiw, N. G., Romer, D., Akerlof, G. A., Rose, A., Yellen, J., & Sims, C. A. (1988). The new keynesian economics and the output-inflation trade-off. *Brookings papers on economic activity*, *1988*(1), 1–82.