# Problem Set 1: Europe and the US: Comparative Economic Analysis.

This problem set is due on Tuesday, May 18 at 12am. Please hand in your answers to the questions and your STATA do file. You can either email me ([afiedler@wiwi.uni-frankfurt.de](afiedler@wiwi.uni-frankfurt.de)) or hand in your printouts after lecture on Tuesday. The data set EurostatPanel.dta can be found in the folder DATA on webct. For convenience, remember to store the data in that folder on your computer which you set to be your working directory in STATA.

## Exercise 1   "GDP growth in Europe and the US"

a) Show the following **analytically**: If GDP grows at a constant rate g every period t, the slope of log(GDP) as a function of time t is given by g.

b) Plot the time series of gdp per capita. Create one graph with US and EU12-members and another one with EU15-members [*xtline*,option:*overlay*]. *Hint: for convenience you may want to make use of the variable "EUgroup". Remember that you have to declare your data as panel data [xtset] to be able to use time-series-commands as xtline.*

c) Look at your time series from (b) and carefully look at the variable description [*describe*]. Are the following statements true or false or does the data not tell? Comment your answer:

 (1) The gdp per capita in Luxemburg during the last decade has always been at least twice as high as the European average.

 (2) Gdp per capita in Portugal grew at roughly the same rate as did gdp per capita in the whole EU-27.

 (3) The US outperforms all EU-12 countries in terms of gdp per capita growth during the entire period under observation.

d) As the time series shows US gdp per capita exceeds the gdp per capita of most European countries. Does this still hold if we look at gdp per employee series? Construct time series of GDP/employee and plot them! *Hint: Recall the definitions of participation rates and unemployment rates.*

**Exercise 2   "Refresher: Derivation of the Phillips-Curve"**

*Hint: A detailed derivation of the Phillips Curve can be found in the textbook "Macroeconomics" (Oliver Blanchard), Chapter 8.*


(a) Recall the wage setting relation $w = P^e F(u, z)$ and the price setting relation $P = (1 + \mu)w$ . Describe these two equations in words and address the following issues:  Does $w$ refer to real or nominal wages? What do $P^e$, $u$, $z$ and $\mu$ denote? How do wages change if unemployment increases? How do wages change if unemployment insurance increases? How are these relationships captured by the model?


(b) Assume now that *F(u,z)* takes the linear form: $F(u, z) = 1 - \alpha u + z$. Use the AS relation, which states that in equilibrium both, the wage setting and the price setting relation must hold, to derive the expectations augmented Phillips Curve:

$$\pi = \pi^e + \mu + z - \alpha u$$

*[Hint: use the definitions of the inflation rate $\pi = \frac{P - P(-1)}{P(-1)}$, expected inflation rate $\pi^e = \frac{P^e - P(-1)}{P(-1)}$ and the approximation $(1 + a)(1 + b) \approx 1 + a + b$ for small a,b.]*


(c) The natural rate of unemployment is the unemployment rate $u_n$ at which expected inflation equals actual inflation ($\pi = \pi^e$). In the case of perfectly adaptive expectations ($\pi^e = \pi$) the natural rate of unemployment is hence the unemployment rate which is required to keep the inflation rate constant. Use the Phillips Curve from (b) to derive an expression for $u_n$!


(d) Use this expression for $u_n$ to derive the expectations augmented Phillips Curve used by Blanchard in "European Unemployment: the evolution of facts and ideas": $\pi = \pi(-1) - a(u - u_n)$. How are inflation expectations formed here?

**Exercise 3 "A look at the data: Unemployment across countries"**

(a) Plot the unemployment time series for the EU15 (aggregate), the EU27 (aggregate) and the US in one graph [*xtset*, *xtline* option: *overlay*]. Comment on the graph: when do the EU15 and the EU27 unemployment rates start to converge? Give a reason for the converging behavior. Compare the US and European unemployment rates over time and comment on what you find remarkable.

(b) Which countries were hit hardest by the crisis in terms of unemployment? Redo the figure 3 from Blanchard's paper "European unemployment: the evolution of facts and ideas" where he graphs unemployment rates for the members of EU15 in the year 2005 [*hbar* , option:*over,* over_subopts: sort(), des ]. Create the same figures for the "after-crisis-year" 2009. Does the pattern that especially large economies have high unemployment rates continue to hold? Construct similar graphs for the years 2007 and 2009 where you now include all EU27 countries and the US.

(c) Calculate the natural rate of unemployment. Hint: First construct a time series for the first difference in inflation rates. Then smooth this time series of differences inflation rates by applying a moving average filter, where you include the current period and two previous periods. Hint: recall the timeseries-operators from class! [*sort, gen* ,Prefix:*by*].

Plot the natural rate of unemployment and the actual unemployment rate for the US, France, Germany and Spain. Which common and distinct patterns do you observe in the years 2007 to 2009?