# Homework 2

ECON312 Time Series Analysis
Instructor: Narek Ohanyan

## Instructions

- The homework is due at due-time on **due-date**.
- Homeworks must be typeset in Latex and submitted (uploaded to the course page) in `zip` format named `HW2_Name_Surname.zip`.
- The submission must contain both the `.tex` file and the `.pdf` file.

## Assignment 1

Consider the following AR(1) model

$$y_t = c + \phi y_{t-1} + e_t$$

where the error terms are themselves AR(1) processes

$$e_t = \rho e_{t-1} + u_t \qquad u_t \sim WN(0, \sigma^2).$$

1. Show that the process may be written in the form of an Augmented Dickey-Fuller test equation

   $$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \alpha_1 \Delta y_{t-1} + u_t$$

   and conclude that autocorrelation in the error terms can be eliminated by augmenting the model with a lagged first difference of the dependent variable.

2. What is the relationship between the parameters of the original model $(c, \phi, \rho)$ and the parameters of the new model $(\alpha_0, \gamma, \alpha_1)$?

3. Under what parameter values of $(\phi, \rho)$ does the process become a unit root process (i.e. $\gamma = 0$)?