3rd set of assignments Time Series Analysis

1. An AR(1) process is given by

   $Y_t = 0.5 + 0.9\,Y_{t-1} + \varepsilon_t$ where $\{\varepsilon_t\}$ is Gaussian White Noise $\varepsilon_t \sim N(0.9)$

   Compute $E(Y_t)$ and $Var(Y_t)$. Compute the first 5 auto covariances $\gamma_1, \gamma_2, \cdot\cdot, \gamma_5$ and plot the corresponding autocorrelations $\rho_1, \rho_2, \cdot\cdot, \rho_5$.

   Hint $\rho_j = \frac{Cov(Y_t, Yt-j)}{\sqrt{Var(Y_t)}\sqrt{Var(Y_{t-j})}} = \frac{\gamma_j}{\gamma_0}$

2. Show by applying the "brute force" method that the sequence of autocovariances for an AR(1) process

   $Y_t = c + \phi Y_{t-1} + \varepsilon_t$

   can be written as

   $\gamma_j = \frac{\phi^j}{1-\phi^2}\,\sigma^2$

3. Express the stochastic process in 1) in an alternative representation that has the change of Y_t(i.e. $Y_t - Y_{t-1}$) on the left hand side and the difference of the lagged value of Y_t(i.e. Y_{t-1}) and $E(Y_t)$ on the right hand side ("Ohrnstein-Uhlenbeck-representation" $\Rightarrow$ lecture notes)
   Using this representation: What is the expected change $E(Y_t - Y_{t-1})$ given a deviation of $Y_{t-1} - E(Y_t) = 10$ in the previous period?
   What is the variance of $Y_t - Y_{t-1}$ given $Y_{t-1} - E(Y_t) = 10$?

4. From the course page you can download the EVIEWS workfile svar.wf1. The file contains macroeconomic variables at a quarterly frequency. The series ZS3MLIBQ contains an interest rate series, the 3-month Swiss France LIBOR (1974-2002). The series BIPNSA contains the nominal gross domestic product (seasonally adjusted)of Switzerland (1974-2002). The series WKUSDQ contains the Swiss France/US dollar exchange rate (1974-2002).
   Select and estimate an ARMA(p,q) model for
   a) the series ZS3MLIBQ
   b) the log-difference(natural logs) of the BIPNSA series
   c) the log-difference of the WKUSDQ series.
   Let the significance of the parameter estimates, the Akaike and Schwartz Information criteria and the sample autocorrelations guide your specification search.