Time Series Analysis
Final Exam 03/28/19

0.1. Short theoretical questions. (4 points.)

1. (1 point) Specify the conditions to have a stationary and invertible ARMA(p,q) model.
2. (1 point) What is the effect of a big Level Shift outlier (LS) on the identification of the ARIMA model?.
3. (1 point) What is an ARCH model? When do we need one?
4. (1 point) Assume the last two observations of a time series are $x_n = 0{,}5$ and $x_{n-1} = 1$ and $x_{n-2} = 0{,}5$. Give the expressions and the values for the one-step and three-step ahead forecasts for the following cases:

   a) X_t is an MA(2) with $\theta_1 = 0{,}7$ and $\theta_2 = 0{,}25$.

   b) X_t is an AR(3) with $\phi_1 = 0{,}7$ and $\phi_2 = 0{,}5$ and $\phi_3 = 0{,}25$

0.2. Exercises (6 points).

1. (2 points) Consider the time series "Monthly Minneapolis public drunkenness intakes Jan.66 to Jul.78". In the early 70's Minneapolis legislature completely eliminated the criminal processing of public drunkennes. Use R to identify and estimate an ARIMA model and assess the impact of the decriminalization of drunknness.
2. (2 point) Consider the time series "Weekly closings of the Dow-Jones industrial average, July 1971 to August 1974.ªnd estimate the best model for it.
3. (2 point) Consider a simulated AR(2) processs with 200 observations, $\phi = 0{,}8$ and $phi_2 = -0{,}4$ and show the plots of the original vs the contaminated series and the residuals vs the contaminated residuals in the cases of:

   - A big AO in $t = 50$ with $\omega_A = 5$.
   - A big IO in $t = 50$ with $\omega_A = 5$
   - A big LS in $t = 50$ with $\omega_A = 5$