Problem Set 3

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1 Analytical Exercises

1. A sample $\{X_t : t = 1, ..., 1000\}$ from a zero-mean stationary process gave sample autocovariances $\hat{\gamma}_0 = 3.68$, $\hat{\gamma}_1 = 2.29$ and $\hat{\gamma}_2 = 1.85$. Find the Yule-Walker estimates of ϕ_1, ϕ_2 and σ^2 in the $AR(2)$ model $X_t = \phi_1 X_{t-1} + \phi_2 X_{t-2} + \varepsilon_t$, where $\{\varepsilon_t\} \sim N(0, \sigma^2)$.

2. The following table shows the sample ACF and PACF of a time series $\{X_t : t = 1, ..., 400\}$ with $\hat{\gamma}_0 = 8.25$:

Lag	1	2	3	4	5	6	7	8
ACF	0.81	0.65	0.54	0.42	0.30	0.21	0.12	0.03
PACF	0.81	0.01	0.02	-0.07	-0.07	0.01	-0.06	-0.05

Specify a suitable $ARMA$ model for $\{X_t\}$, giving estimates of all its parameters. Justify your choice of model. (You might want to start by calculating the bounds of ACF and PACF.)

2 R Exercises

3. Use the dataset Unit root.csv file and find the order of integration.