Queen Mary
University of London

School of Mathematical Sciences

MTH6139 TIME SERIES — Computer Lab 4

(12 November 2008, 10.00 - 12.00, LRC2)

NOTE:
You ***do not*** *hand in your solutions for marking, but you are welcome to discuss them with me at my office hours if you wish. Also, the solutions will be given at the course website on Wednesday, 19th November.*

4.1 Sales of Industrial Heater of a certain company in successive months (Jan 1965 – Dec 1971)

Chatfield, C. (2004). *The Analysis of Time Series. An Introduction*. Chapman and Hall

Download the data from STU directory and do the following:

4.1.1 Draw the time series plot of the data.

4.1.2 Find a transformation stabilizing the variance and transform the data.

4.1.3 Detrend the transformed data using Stat → Time Series → Trend Analysis… and draw the time series plot of the detrended data.

4.1.4 Deseasonalize the detrended data using the Stat → Time Series → Decomposition… (Additive model for seasonal components only).

4.1.5 Draw the sample ACF of the detrended and deseasonalized data. What kind of a model does the sample ACF suggest?

4.1.6 Use the option Stat → Time Series → ARIMA to fit an appropriate model for the detrended and deseasonalized data. Note that ARIMA(p,0,q) ≡ ARMA(p,q). As the model diagnostic tools use plots of the residuals and their sample ACF as well as the tests given in the Minitab output (T-test for the parameters of the model and LBQ-test for the residuals' autocorrelations).

4.1.7 Put the graphs and relevant numerical results into your report. Write down the form of the fitted model and your comments on all the Minitab output. Note that Minitab uses $-\theta$ in place of θ in our model notation.

4.2 Theory questions

4.2.1 Using the Bartlett's formula, given in Section 5.2 of the lecture notes, for the variance of estimator of ACF at lag τ, $w_{\tau\tau}$, derive the confidence bounds for $\rho(1)$, $\rho(2)$ and for $\rho(\tau)$, for $\tau > 2$, for MA(2): $X_t = Z_t + \theta_1 Z_{t-1} + \theta_2 Z_{t-2}$, where $Z_t \sim WN(0,\sigma^2)$.

4.2.2 Calculate 95% confidence bounds for the autocorrelation function at lags $\tau = 1,2,3,\ldots$ for an MA(2) model for which $\hat{\rho}(1) = 0.5356$, $\hat{\rho}(2) = 0.3961$ and the size of the data is n = 84.