Time Series Analysis

Fall 2018

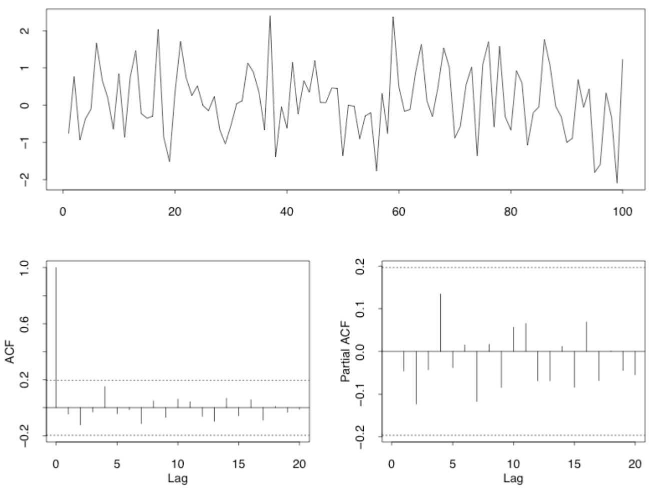
Andreas Jakobsson

Identification

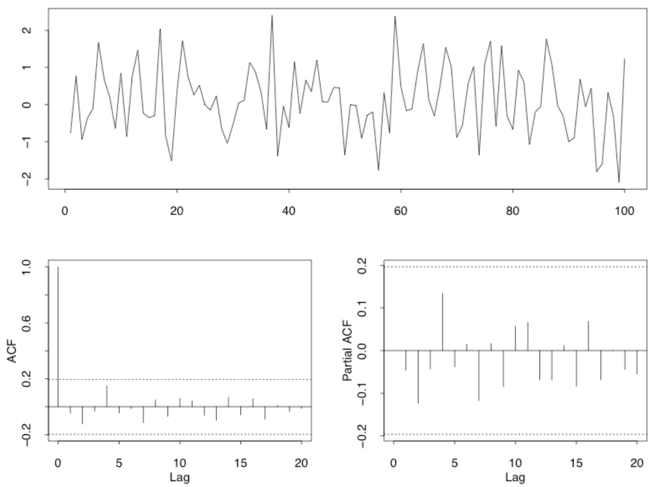
Characteristics for the autocorrelation functions:

	ACF $\rho(k)$	PACF ϕ_{kk}
$AR(p)$	Damped exponential and/or sine functions	$\phi_{kk} = 0$ for $k > p$
$MA(q)$	$\rho(k) = 0$ for $k > q$	Dominated by damped exponential and or/sine functions
$ARMA(p, q)$	Damped exponential and/or sine functions after lag $q - p$	Dominated by damped exponential and/or sine functions after lag $p - q$

What is an appropriate structure?



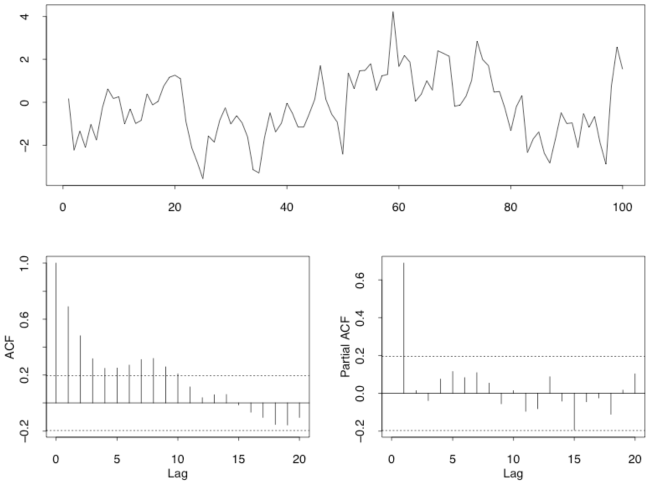
What is an appropriate structure?



MA(1)

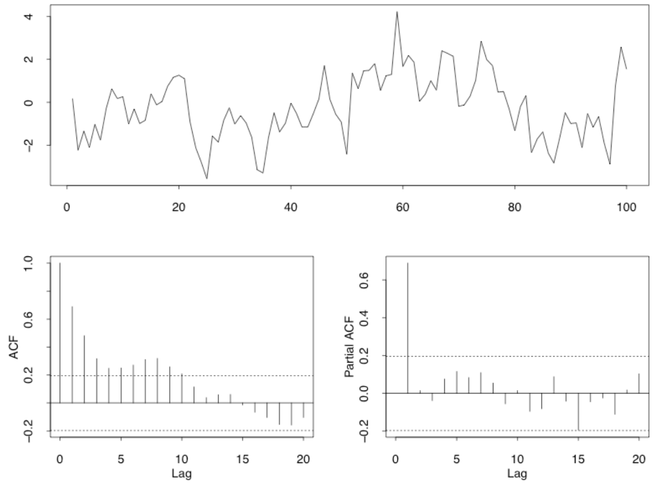
Time series analysis

What is an appropriate structure?



Time series analysis

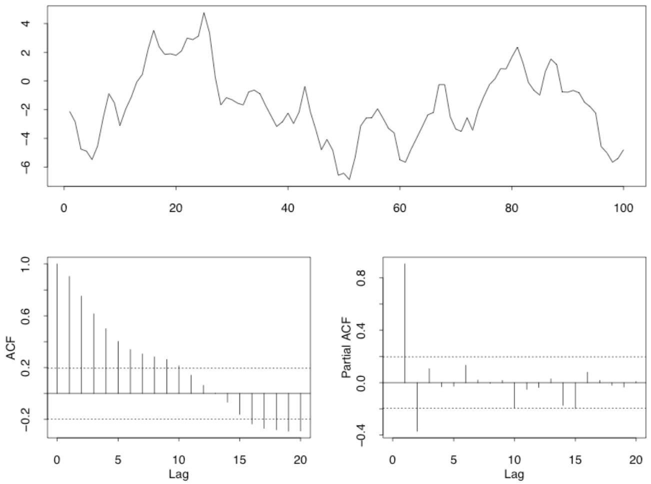
What is an appropriate structure?



AR(1)

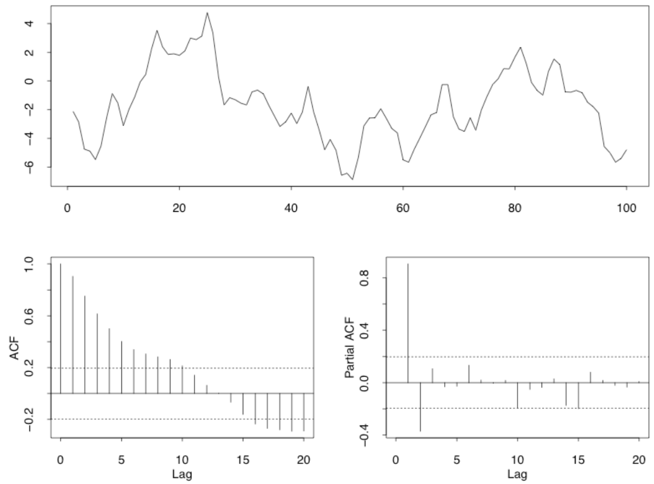
Time series analysis

What is an appropriate structure?



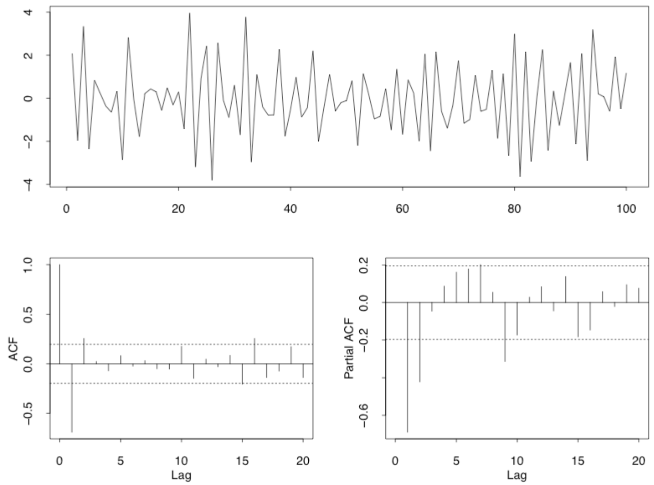
Time series analysis

What is an appropriate structure?

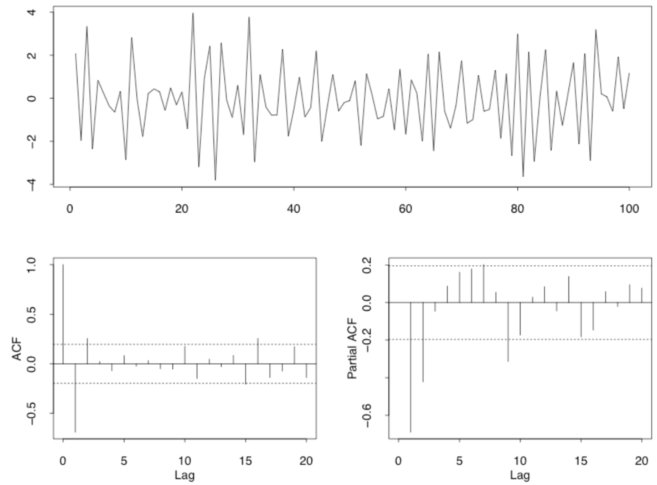


AR(2)

What is an appropriate structure?

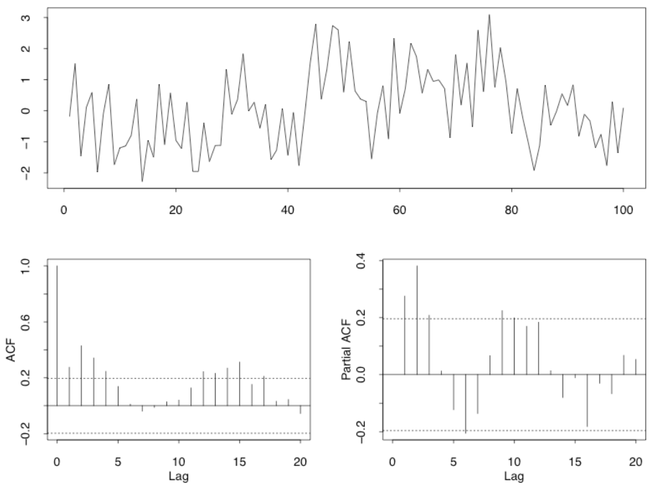


What is an appropriate structure?

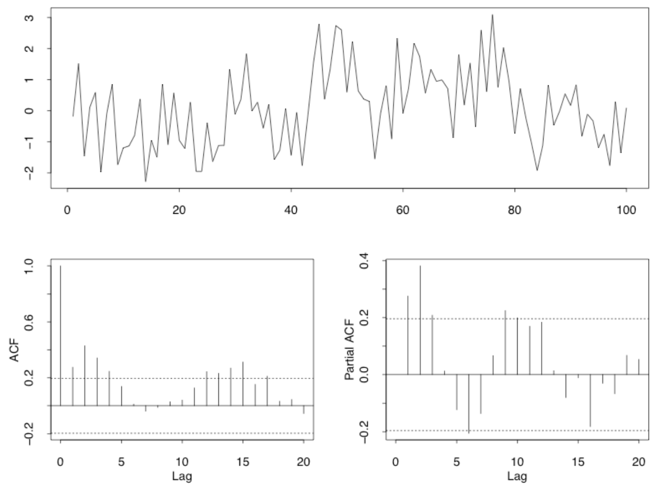


MA(2)

What is an appropriate structure?

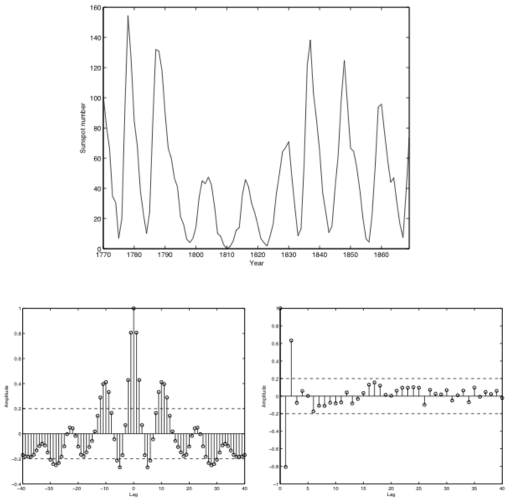


What is an appropriate structure?

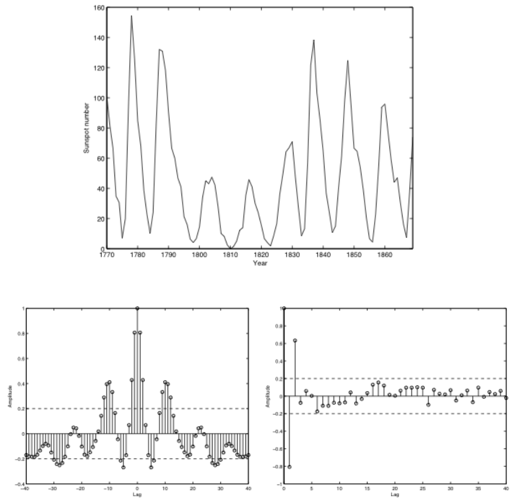


ARMA

How can one model the sunspot data?

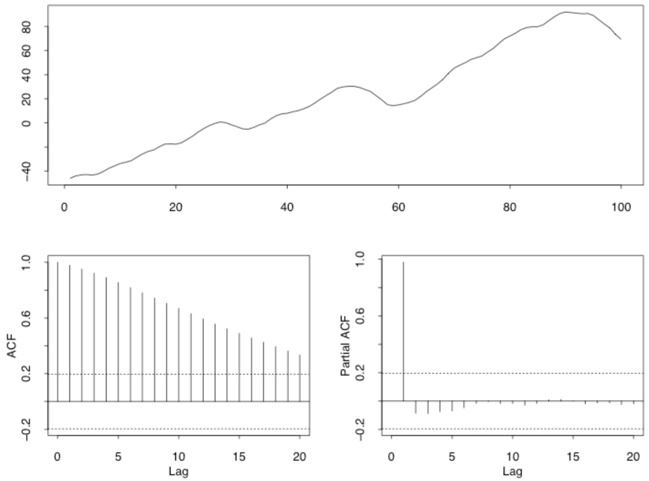


How can one model the sunspot data?

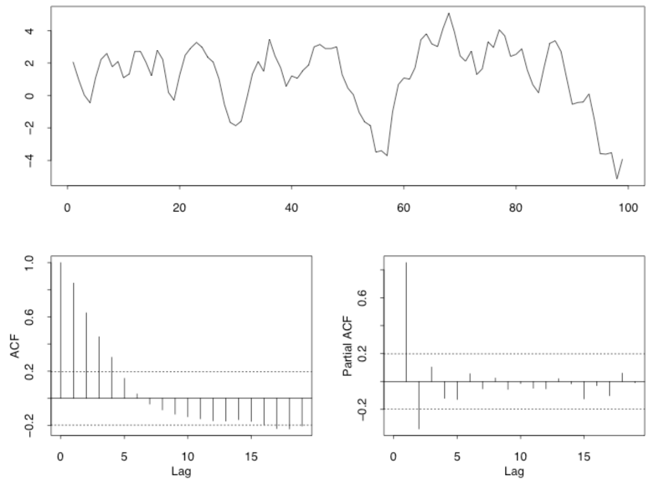


AR(2)

What is an appropriate structure?

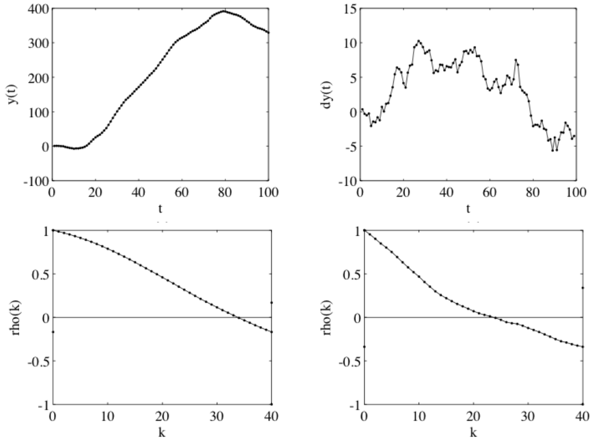


What is an appropriate structure?

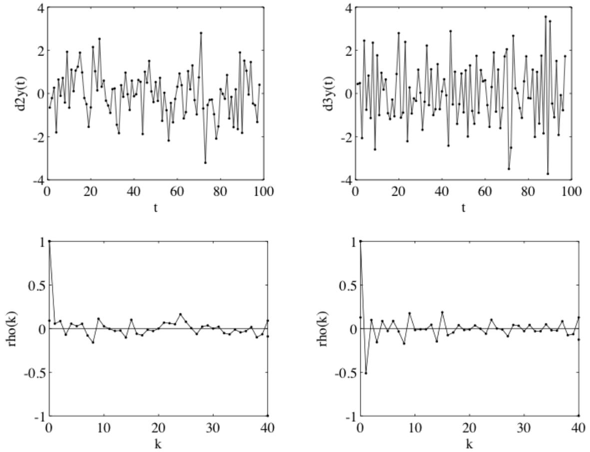


∇y_t

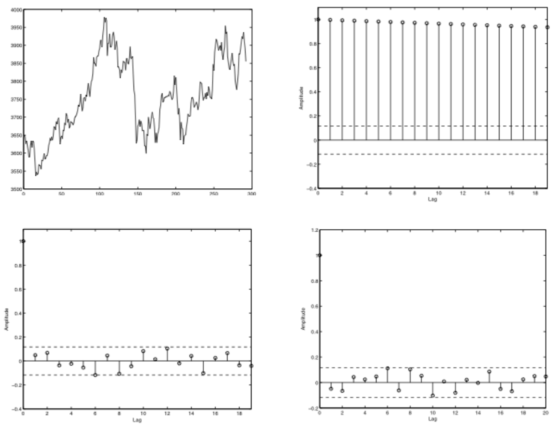
Simulated ARIMA(0,2,0)



Simulated ARIMA(0,2,0)

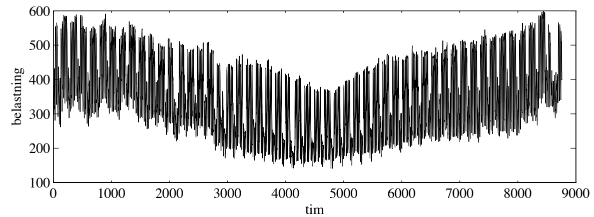


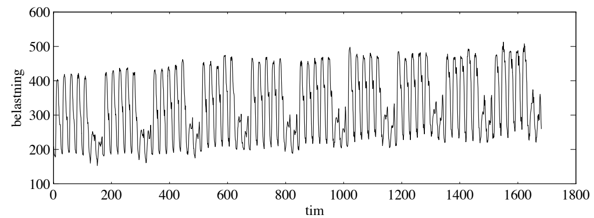
Dow Jones index



$$\nabla y_t = e_t$$

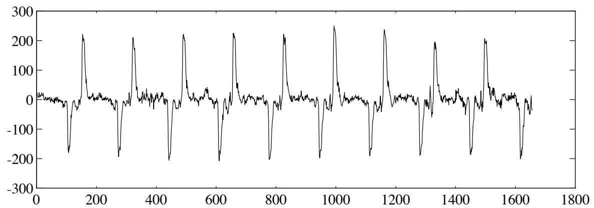
Electricity consumption



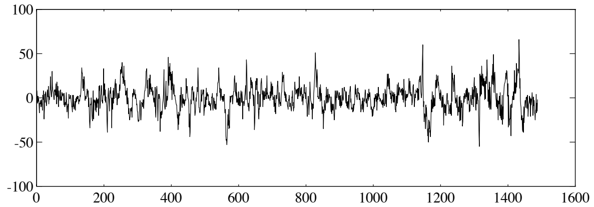


$$y_t$$

Electricity consumption

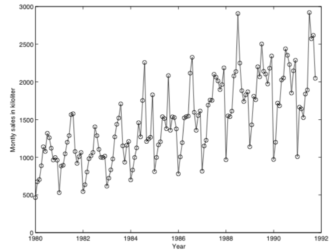


$$\nabla_{24} y_t$$



$$\nabla_{24} \nabla_{168} y_t$$

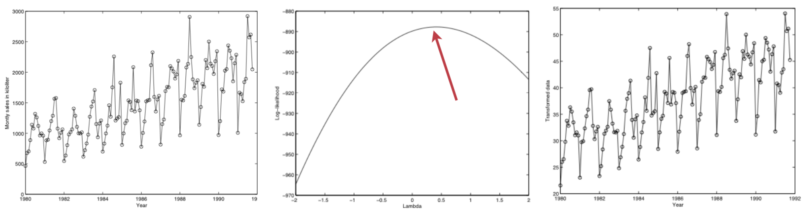
Transforming the data



$$y_t^{(\lambda)} = \begin{cases} \lambda^{-1}\left(y_t^{\lambda} - 1\right), & \lambda \neq 0 \\ \log(y_t), & \lambda = 0 \end{cases}$$

$$L(\lambda) = -\frac{N}{2} \log\left\{\hat{\sigma}_y^2(\lambda)\right\} + (\lambda - 1)\sum_{t=1}^{N} \log(y_t)$$

Transforming the data



Values of λ	Transformation
-2.0	y_t^{-2}
-1.0	y_t^{-1}
-0.5	$y_t^{-1/2}$
0.0	$\log(y_t)$
0.5	$\sqrt{y_t}$
1.0	y_t
2.0	y_t^2