

7: Time Series

John H Maindonald

April 3, 2018

```
fig7.1 <- function(){  
  Erie <- greatLakes[, "Erie"]  
  plot(Erie, xlab="",  
        ylab="Level (m)")  
}
```

```
fig7.2 <- function(){  
  Erie <- greatLakes[, "Erie"]  
  opar <- par(oma=c(0,0,4,0))  
  lag.plot(Erie, lags=3,  
            do.lines=FALSE,  
            layout=c(2,3), main="")  
  mtext(side=3, line=3, adj=-0.155,  
         "A: Lag plots, for lags 1, 2 and 3 respectively", cex=1)  
  par(fig=c(0,1,0,0.6), new=TRUE)  
  par(mar=c(2.75, 3.1, 3.6, 1.6))  
  acf(Erie, main="", xlab="")  
  mtext(side=3, line=0.5, "B: Autocorrelation estimates at successive lags",  
        adj=-0.35, cex=1)  
  mtext(side=1, line=1.75, "Lag", cex=1)  
  par(fig=c(0,1,0,1))  
  par(opar)  
}
```

```
fig7.3 <- function(){  
  Erie <- greatLakes[, "Erie"]  
  df <- data.frame(height=as.vector(Erie), year=time(Erie))  
  obj <- gam(height ~ s(year), data=df)  
  plot(obj, shift=mean(df$height), residuals=T, pch=1, xlab="")  
}
```

```
fig7.4 <- function(){
  if(!require(forecast))return("Package 'forecast' must be installed")
  Erie <- greatLakes[, "Erie"]
  assign('Erie', Erie, pos=1)
  erie.ar <- ar(Erie)
  plot(forecast(erie.ar, h=15), ylab="Lake level (m)")
}
```

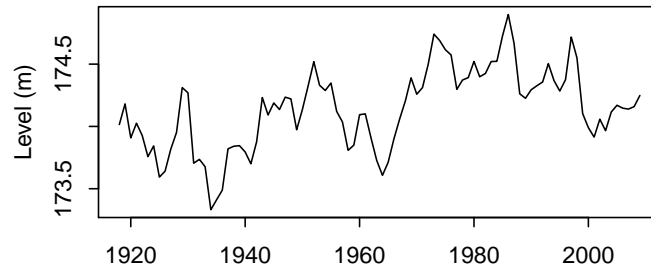
```
fig7.5 <- function(mf=3,nf=2){
  opar <- par(mfrow=c(mf,nf), mar=c(0.25, 4.1, 0.25, 1.1))
  npanel <- mf*nf
  for(i in 1:npanel){
    df <- data.frame(x=1:200, y=arima.sim(list(ar=0.7), n=200))
    df.gam <- gam(y ~ s(x), data=df)
    plot(df.gam, residuals=TRUE)
  }
  par(opar)
}
```

```
fig7.6 <- function(){
  mdbRain.gam <- gam(mdbRain ~ s(Year) + s(SOI), data=bomregions2012)
  plot(mdbRain.gam, residuals=TRUE, se=2, pch=1, cex=0.5, select=1)
  plot(mdbRain.gam, residuals=TRUE, se=2, pch=1, cex=0.5, select=2)
}
```

1 Show the Figures

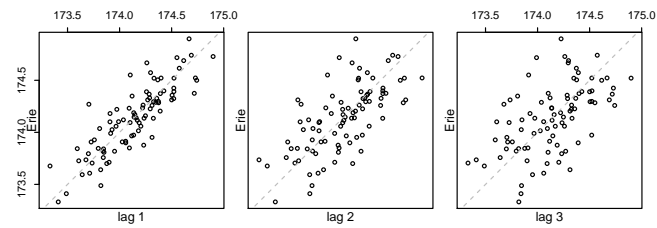
```
pkgs <- c("DAAG", "mgcv", "splines", "forecast")
z <- sapply(pkgs, require, character.only=TRUE, warn.conflicts=FALSE)
if(any(!z)){
  notAvail <- paste(names(z)[!z], collapse=", ")
  print(paste("The following packages require to be installed:", notAvail))
}
```

```
fig7.1()
```

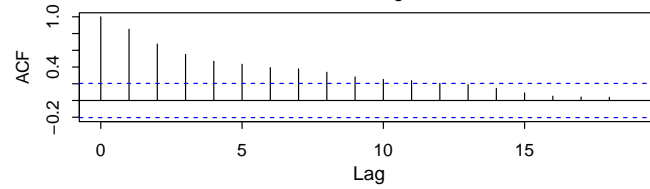


`fig7.2()`

A: Lag plots, for lags 1, 2 and 3 respectively



B: Autocorrelation estimates at successive lags



`fig7.3()`

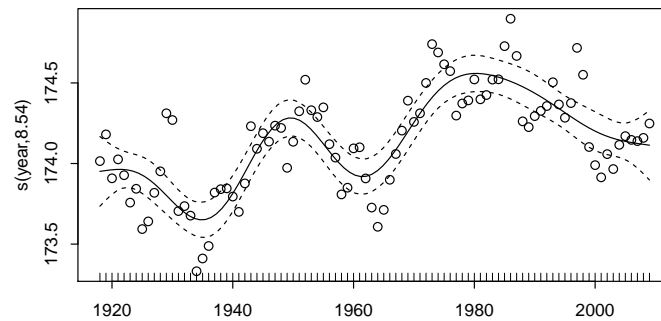


fig7.4()

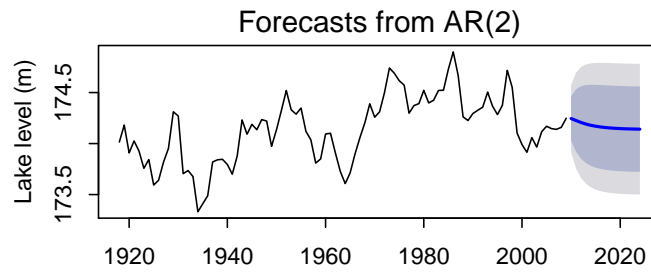


fig7.5()

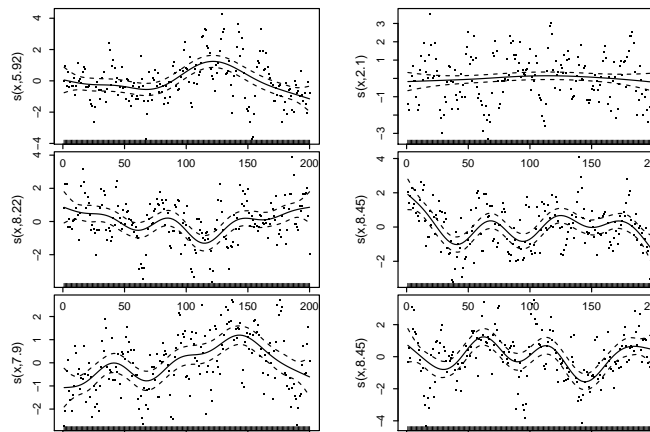


fig7.6()

