ETW3420

Principles of Forecasting and Applications

Topic 2 Exercises

Question 1

Download the file `tute1.csv` from Moodle, open it in Excel and review its contents. You should find four columns of information. Columns B through D each contain a quarterly series, labelled Sales, AdBudget and GDP. Sales contains the quarterly sales for a small company over the period 1981-2005. AdBudget is the advertising budget and GDP is the gross domestic product. All series have been adjusted for inflation.

a. You can read the data into R with the following script:

```
tute1 <- read.csv("tute1.csv", header=TRUE)
```

b. Convert the data to time series.

```
mytimeseries <- ts(tute1[,-1], start=1981, frequency=4)
```

(The `[,-1]` removes the first column which contains the quarters as we don't need them now.)

c. Construct time series plots of each of the three series

```
autoplot(mytimeseries, facets=TRUE)
```

Check what happens when you don't include `facets=TRUE`.

```
autoplot(mytimeseries)
```

Question 2

Create time plots of the following time series: `writing`, `a10`, `h02`, `goog`

- Use `help()` to find out about the data in each series.
- For the `goog` plot, modify the axis labels and title.

```
autoplot(writing)
```

```
autoplot(a10)
```

```
autoplot(h02)
```

```
autoplot(goog) +
  xlab("Year") + ylab("Price ($)") +
  ggtitle("Google daily stock price")
```

Question 3

Use the `ggseasonplot` and `ggsubseriesplot` functions to explore the seasonal patterns in the following time series: `writing`, `a10`, `h02`.

- What can you say about the seasonal patterns?
- Can you identify any unusual years?

```
ggseasonplot(writing)
```

```
ggsubseriesplot(writing)
```

Question 4

Use the following graphics functions: `autoplot`, `ggseasonplot`, `ggsubseriesplot`, `gglagplot`, `ggAcf` and explore features from the following time series: `hsales`, `usdeaths`,

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gasoline.

- Can you spot any seasonality, cyclicity and trend?
- What do you learn about the series?

```
autoplot(hsales)
```

```
ggseasonplot(hsales)
```

```
ggsubseriesplot(hsales)
```
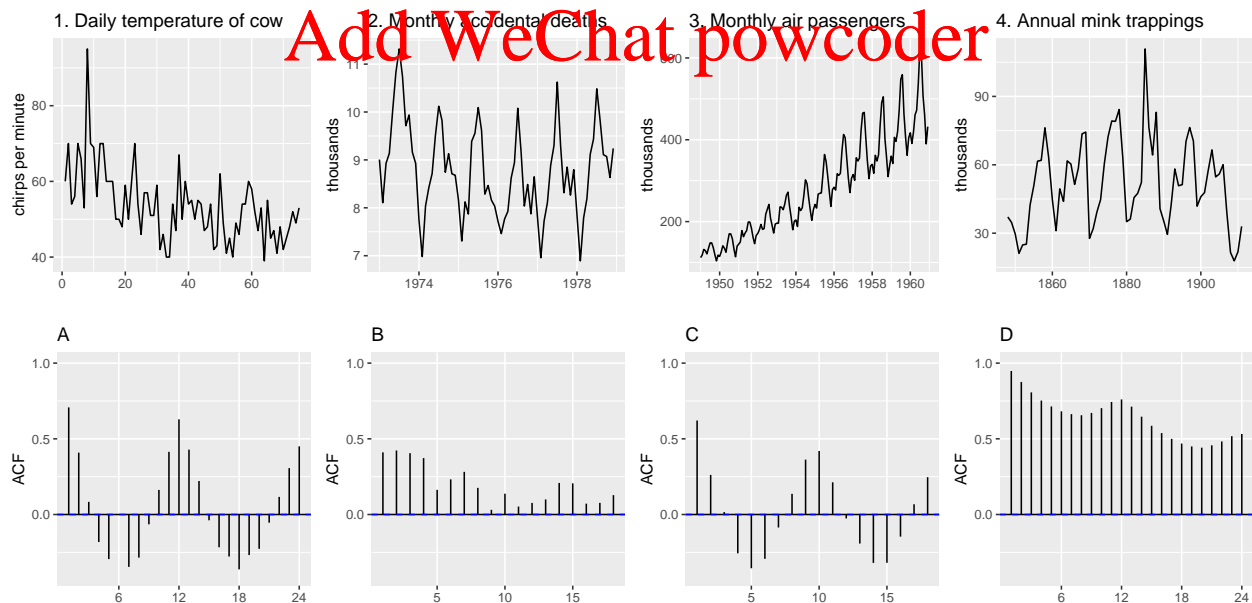
```
gglagplot(hsales, do.lines =F)
```

```
ggAcf(hsales)
```

Question 5

The following time plots and ACF plots correspond to four different time series. Your task is to match each time plot in the first row with one of the ACF plots in the second row.

Question 6

`dj` contains 292 consecutive trading days of the Dow Jones Index. Use `ddj <- diff(dj)` to compute the daily changes in the index. Plot `ddj` and its ACF. Do the changes in the Dow Jones Index look like white noise?

Note:

$$ddj_t = dj_t - dj_{t-1}$$

```
ddj <- diff(dj)


autoplot(ddj)

ggAcf(ddj, lag.max=30)
```