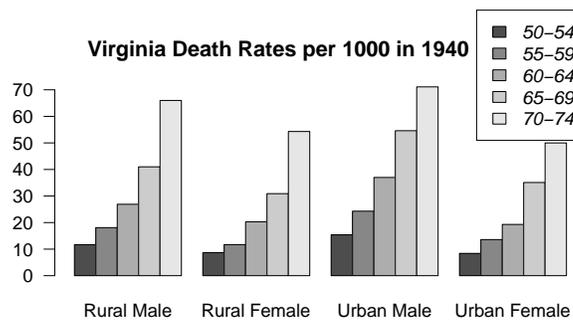


```
> barplot(VADeaths, beside = TRUE, legend = TRUE,
+         main = "Virginia Death Rates per 1000 in 1940")
```



Lots of information has been packed into this graphic, which is generated with just a single R command. Death rates are consistently increasing with age; death rates are higher for men than for women; there might be a slight advantage for women who live in the city. All of these conclusions, however, would have to be verified using an appropriate statistical test.

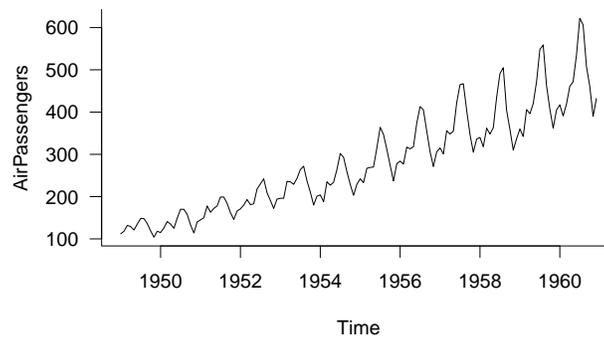
This ends the discussion of graphics for categorical data. The last section concerns high-level graphics functions for time-series data.

20.4 Time-series data

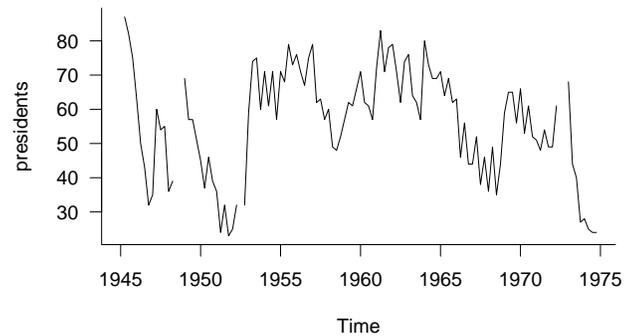
Many data sets consist of observations that are collected over time. One of the primary graphical exploratory data analysis tools for a time series is simply a plot of the time-series values over time. The `ts.plot` function can be used to plot a time series. This is applied to the built-in data set named `AirPassengers`, which contains the monthly number of airline passengers (in thousands) between 1949 and 1960:

```
> ts.plot(AirPassengers) # international airline passengers
```

The time-series plot reveals that there is a growth (perhaps nonlinear) in the number of passengers over time, a pronounced cyclic variation that appears to be seasonal, and an amplitude to the seasonal component that increases with time. A branch of statistics known as *time-series analysis* considers the development of probability models for complex time series such as this one. A second time series named `presidents` contains the quarterly U.S. presidential approval ratings from 1945 to 1974. This time series also contains several NA values in which such polls were not taken.



```
> ts.plot(presidents) # presidential approval ratings
```



The points associated with the NA values are left as gaps in the time series plot.

This concludes the brief survey of some high-level graphical functions in R. The table below summarizes the functions introduced in this chapter.

function	description
hist	histogram
ecdf	empirical cumulative distribution function
plot.ecdf	plot empirical cumulative distribution function
qqnorm	draw normal quantile–quantile plot
qqline	add line to quantile–quantile plot
boxplot	box plot
plot	generic plotting function
symbols	draw symbols
pairs	matrix of scatterplots
stars	star plots
contour	contour plot
image	colored image plot
persp	perspective plot
pie	pie chart
barplot	bar chart
ts.plot	time-series plot