# ARMA processes

Simulation of ARMA

Simulate a time series of length 100 using an ARMA model (you may choose the number and values of parameters in both the AR and the MA part of the model)

- Fit various ARMA models with different number of parameters and compare the AIC to choose a model - do you get the same order of the model as was used in the simulation?
- Estimate the parameters in the chosen model - if you got the right order, are the estimates then close to the parameters used in the simulation?

Simulate data (here an ARMA(1,1) model used with parameters alpha1 = 0.9 and beta1 = 0.9):

```r
x <- arima.sim(model = list(ar=0.9,ma=0.9), n = 100)
plot(x)
```
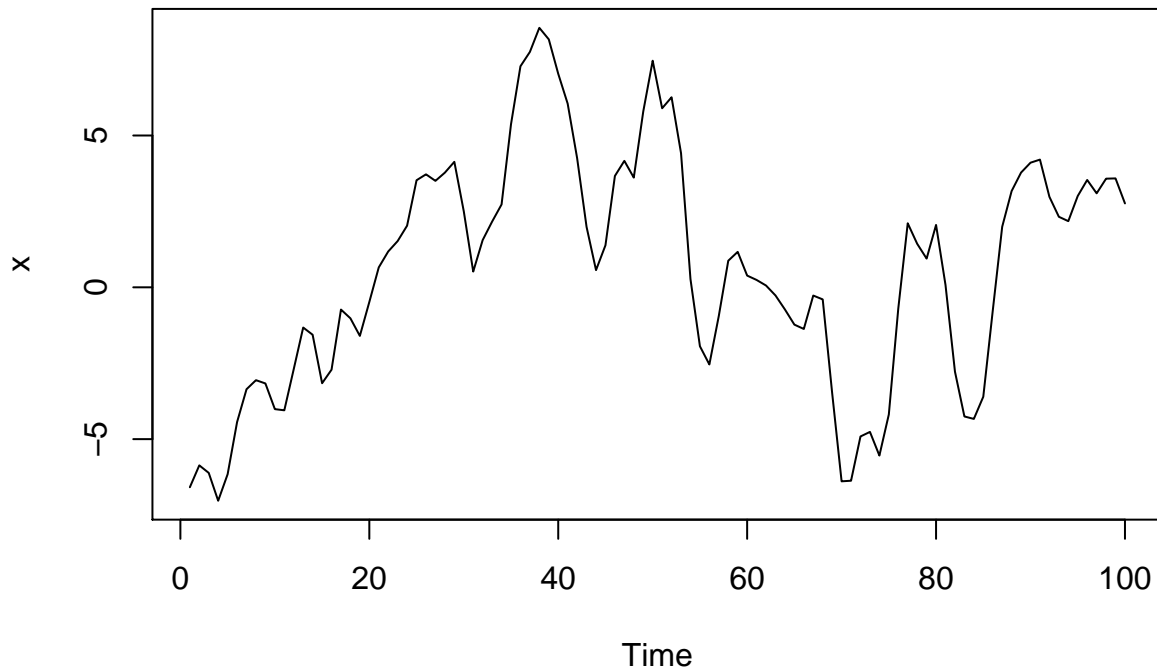

Try out various models, and look for the minimal AIC:

```r
fit10 <- arima(x,order=c(1,0,0))
fit01 <- arima(x,order=c(0,0,1))
fit11 <- arima(x,order=c(1,0,1))
fit20 <- arima(x,order=c(2,0,0))
fit02 <- arima(x,order=c(0,0,2))
AIC(fit10); AIC(fit01); AIC(fit11); AIC(fit20); AIC(fit02)
```

```
## [1] 353.3704
```

```
## [1] 429.487
```

```
## [1] 286.3885
```

```
## [1] 322.0852
```

```
## [1] 355.4966
```

Exactly which model has the lowest AIC depends on the simulation, so here we just take the ARMA(1,1) model:

```
fit11
```

```
##
## Call:
## arima(x = x, order = c(1, 0, 1))
##
## Coefficients:
##           ar1     ma1  intercept
##        0.8823  1.0000     0.2065
## s.e.   0.0465  0.0934     1.4860
##
## sigma^2 estimated as 0.8801:  log likelihood = -139.19,  aic = 286.39
```