Simulando séries temporais lineares

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- index.Rmd: código fonte da apresentação

ruído branco Gaussiano

Um ruído branco é uma sequência de variáveis aleatórias independentes e identicamente distribuídas (iid) com média e variância finitas. Se a sequência tem distribuição normal com média zero e variância σ^2 temos uma série de ruídos brancos Gaussianos.

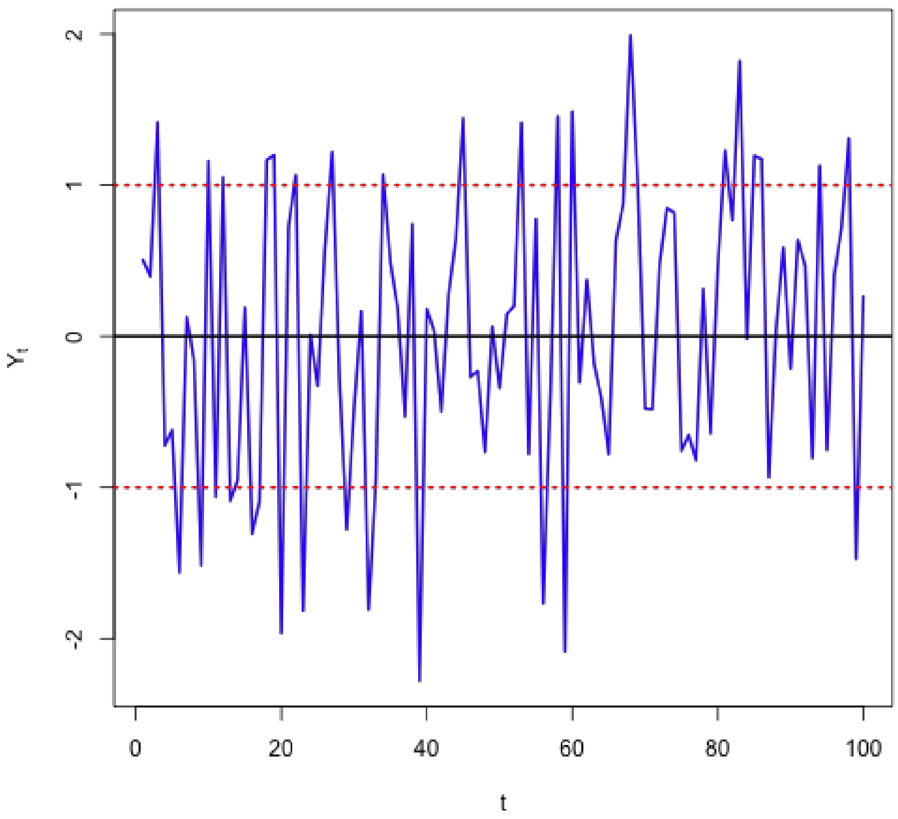
$$Y_t \sim iid\, N(0, \sigma^2) \; \forall \; t$$

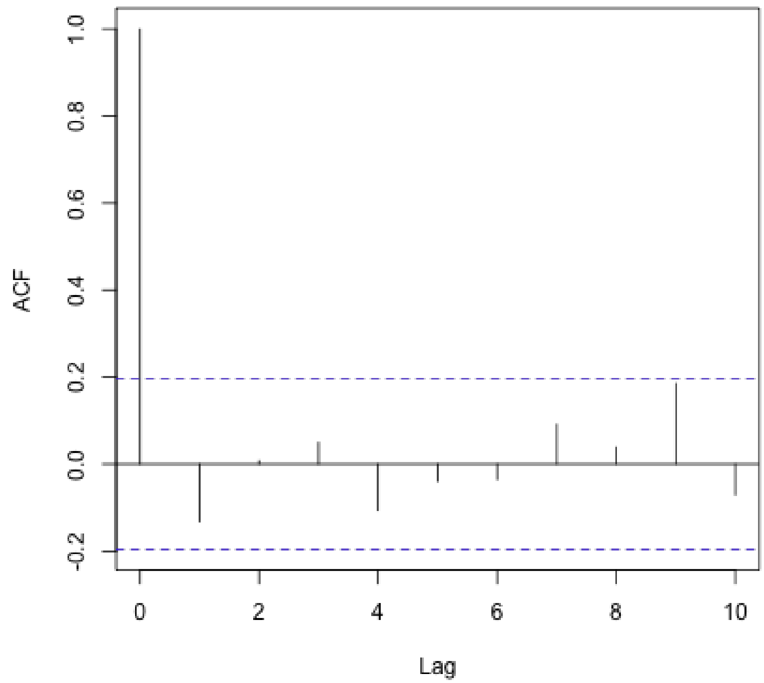
$$\mathbb{E}[Y_t Y_s] = 0 \; \forall \; t \neq s$$

```
y = rnorm(100)
```

```
## [1]  0.5049  0.3959  1.4155 -0.7223 -0.6184 -1.5626
```

ruído branco Gaussiano





random walk process

Uma série temporal y_t é um *random walk* se satisfaz

$$y_t = y_{t-1} + \varepsilon_t$$

$$\varepsilon_t \sim iid\, N(0, \sigma^2)\ \forall\ t$$

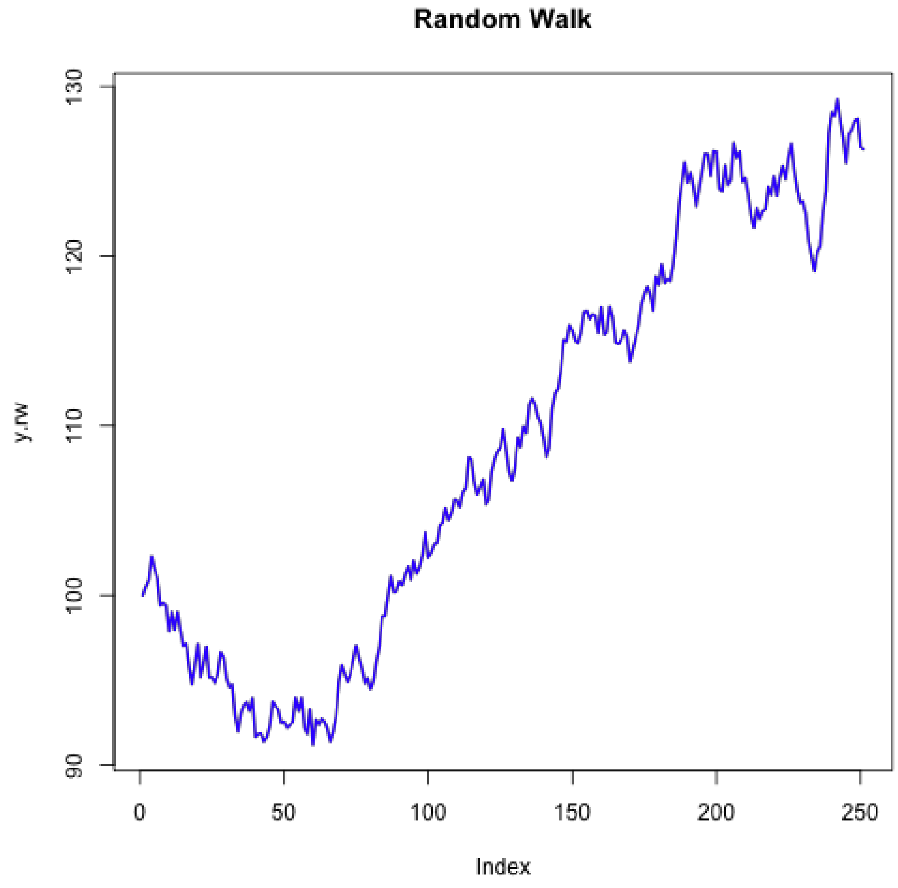
$$\mathrm{E}[\varepsilon_t \varepsilon_s] = 0,\ \forall\ t \neq s$$

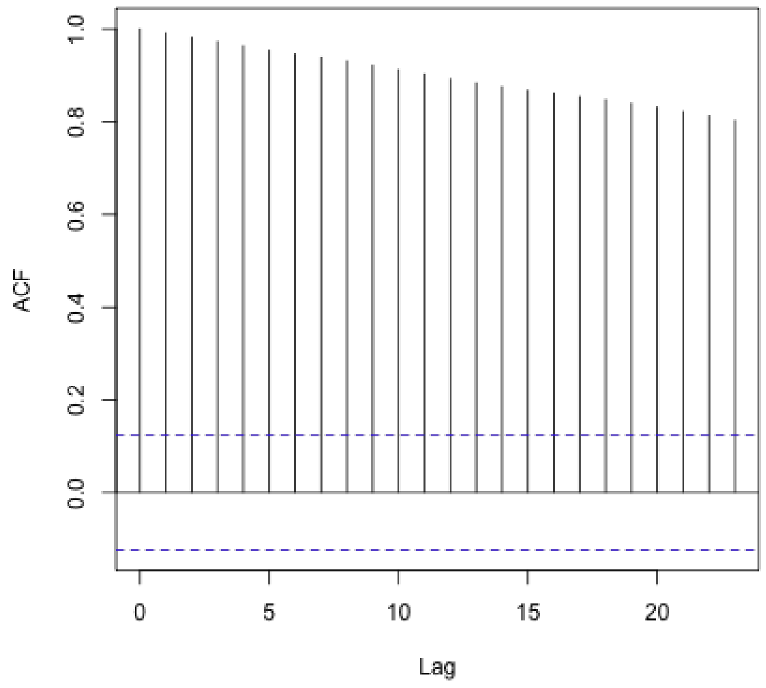
onde p_0 é o valor inicial da série.

```
e = c(100, rnorm(250))  # p_0 = 100
y.rw = cumsum(e)
```

```
## [1] 100.0 100.5 100.9 102.3 101.6 101.0
```

random walk process



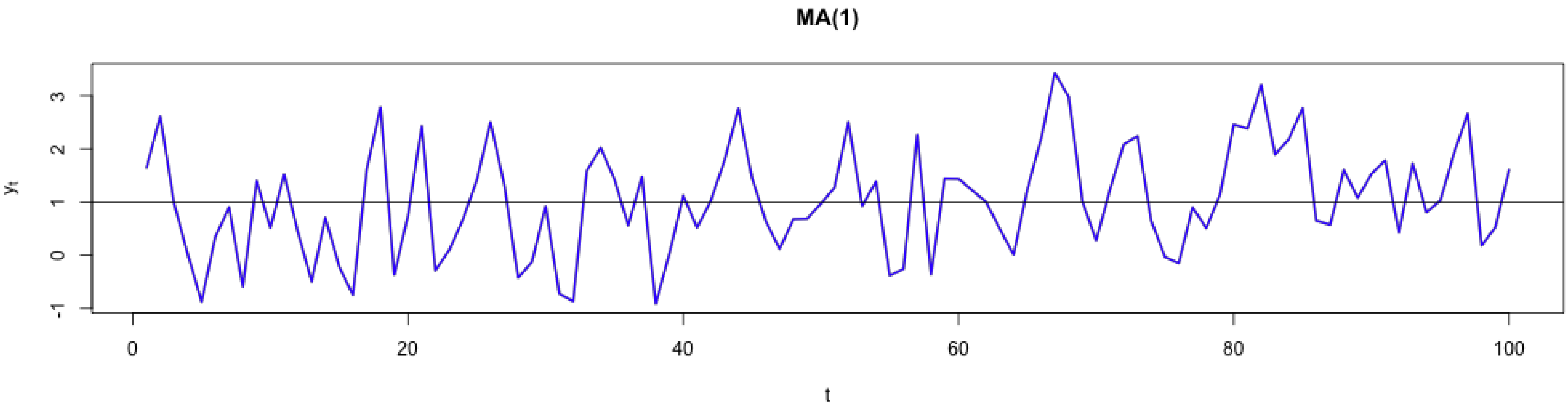


simulando MA(1)

Uma série temporal MA(1) satisfaz

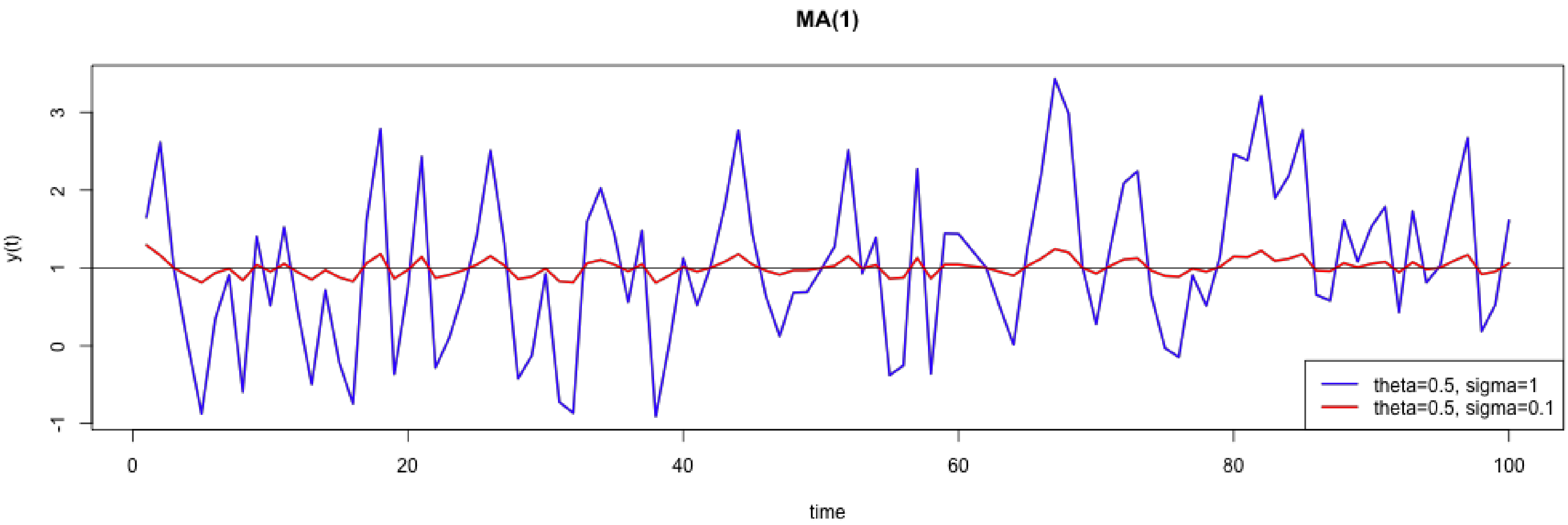
$$y_t = \mu + \varepsilon_t - \theta\varepsilon_{t-1},\ \varepsilon_t \sim iid\, N(0, \sigma^2)$$

```
# theta = 0.5, sigma = 1
ma1.model = list(ma = 0.5)
mu = 1
ma1.sim.1 = mu + arima.sim(model = ma1.model, n = 100)
```



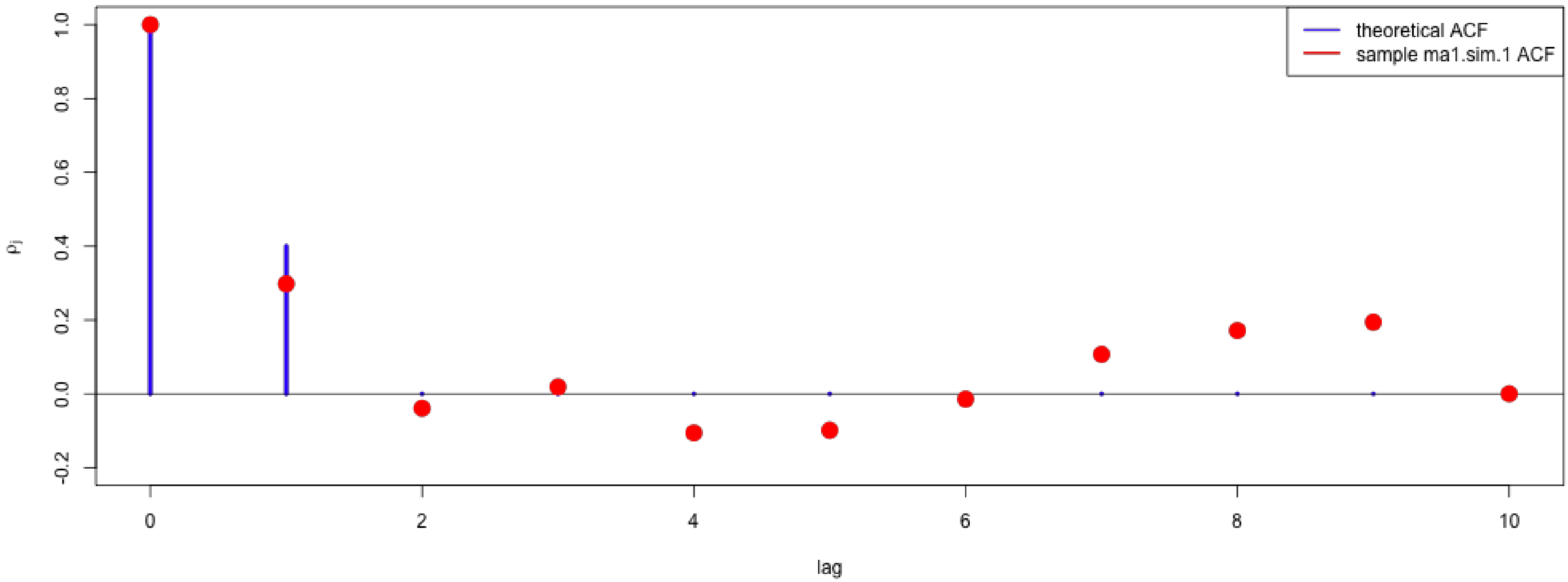
simulando MA(1)

```
# theta = 0.5, sigma = 0.1
ma1.model = list(ma = 0.5)
mu = 1
ma1.sim.2 = mu + arima.sim(model = ma1.model, n = 100, innov = rnorm(n = 100,
    mean = 0, sd = 0.1))
```



MA(1) autocorrelation function

```
ma1.acf = ARMAacf(ar = 0, ma = 0.5, lag.max = 10)
```

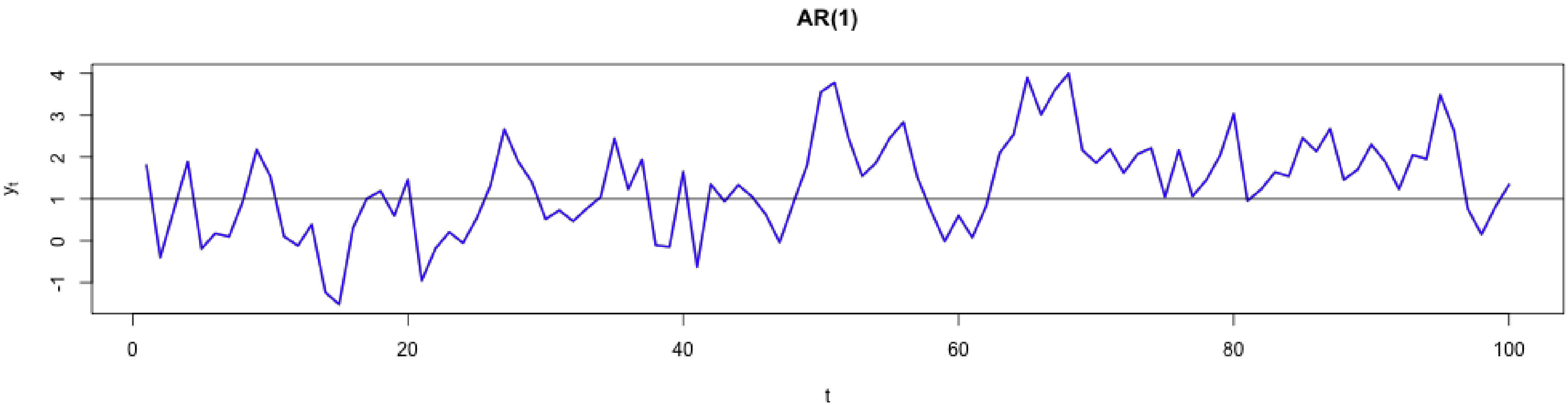


simulando AR(1)

Uma série temporal AR(1) satisfaz

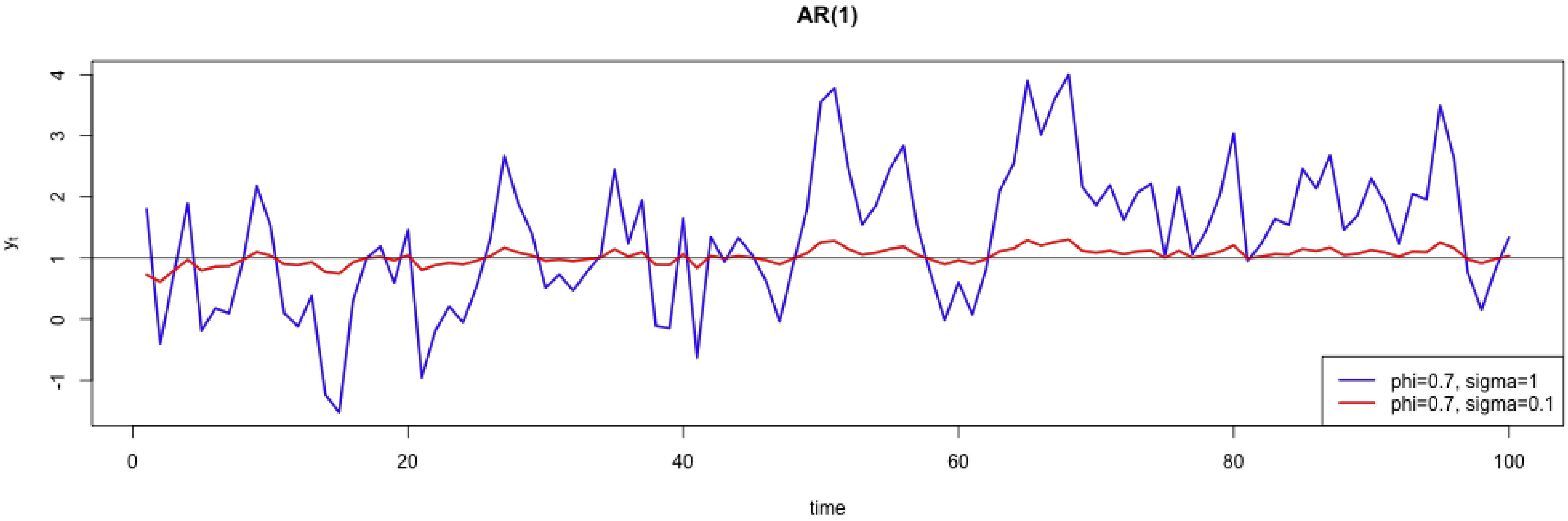
$$y_t = \mu + \phi y_{t-1} + \varepsilon_t,\ \varepsilon_t \sim iid\, N(0, \sigma^2)$$

```
# phi = 0.7, sigma = 1
ar1.model = list(ar = 0.7)
mu = 1
ar1.sim.1 = mu + arima.sim(model = ar1.model, n = 100, innov = rnorm(n = 100,
    mean = 0, sd = 1))
```



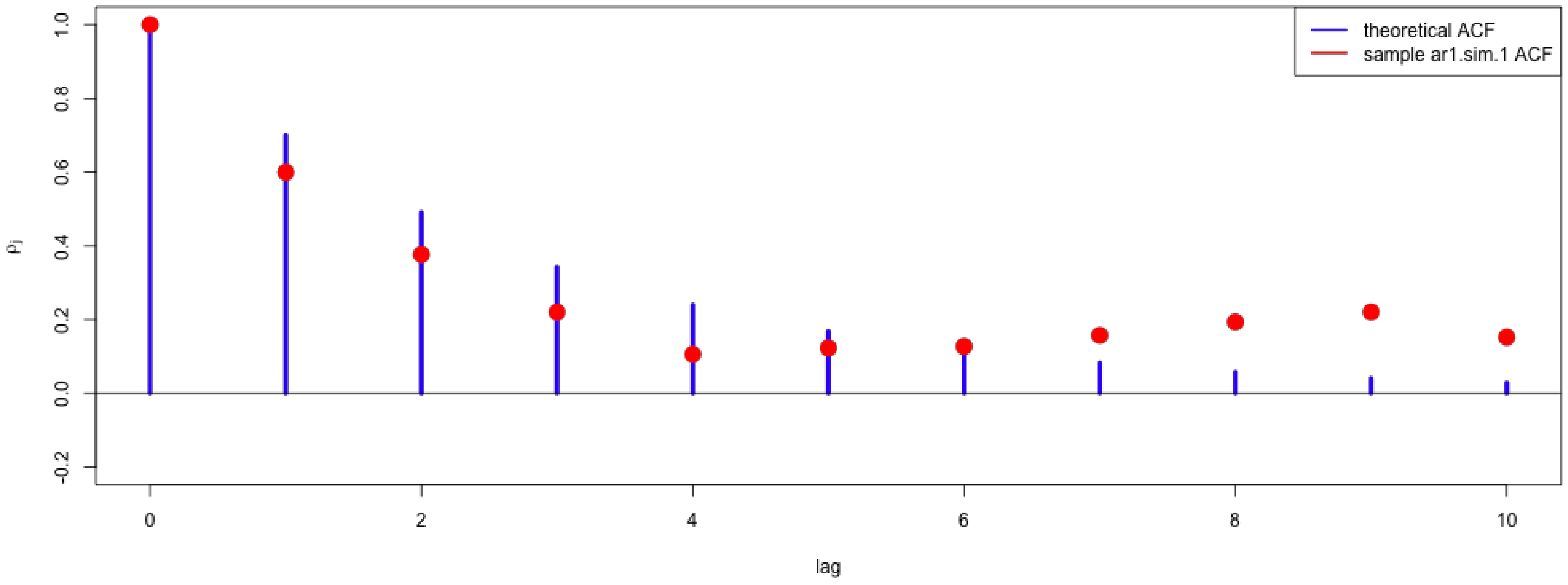
simulando AR(1)

```
# phi = 0.7, sigma = 0.1
ar1.model = list(ar = 0.7)
mu = 1
ar1.sim.2 = mu + arima.sim(model = ar1.model, n = 100, innov = rnorm(n = 100,
    mean = 0, sd = 0.1))
```



AR(1) autocorrelation function

```
ar1.acf = ARMAacf(ar = 0.7, ma = 0, lag.max = 10)
```



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