

Amostrador de Gibbs

Distribuição normal bivariada

2026

As distribuições condicionais completas levam em conta que se

$$\begin{pmatrix} X_1 \\ X_2 \end{pmatrix} \sim \text{normal}_2 \left(\begin{pmatrix} \mu_1 \\ \mu_2 \end{pmatrix}, \begin{bmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{12} & \sigma_2^2 \end{bmatrix} \right),$$

então

$$X_1 | X_2 = x_2 \sim \text{normal} \left(\mu_1 + \frac{\sigma_{12}}{\sigma_2^2}(x_2 - \mu_2), \sigma_1^2 - \frac{\sigma_{12}^2}{\sigma_2^2} \right)$$

e

$$X_2 | X_1 = x_1 \sim \text{normal} \left(\mu_2 + \frac{\sigma_{12}}{\sigma_1^2}(x_1 - \mu_1), \sigma_2^2 - \frac{\sigma_{12}^2}{\sigma_1^2} \right).$$

```
# Separador decimal: ","
options(OutDec = ",")

# Número de iterações
M <- 500
descarte <- 100

# Médias, desvios padrão e covariância
mu1 <- 2
mu2 <- 1
sig1 <- sqrt(3)
sig2 <- 1
sig12 <- 0.7

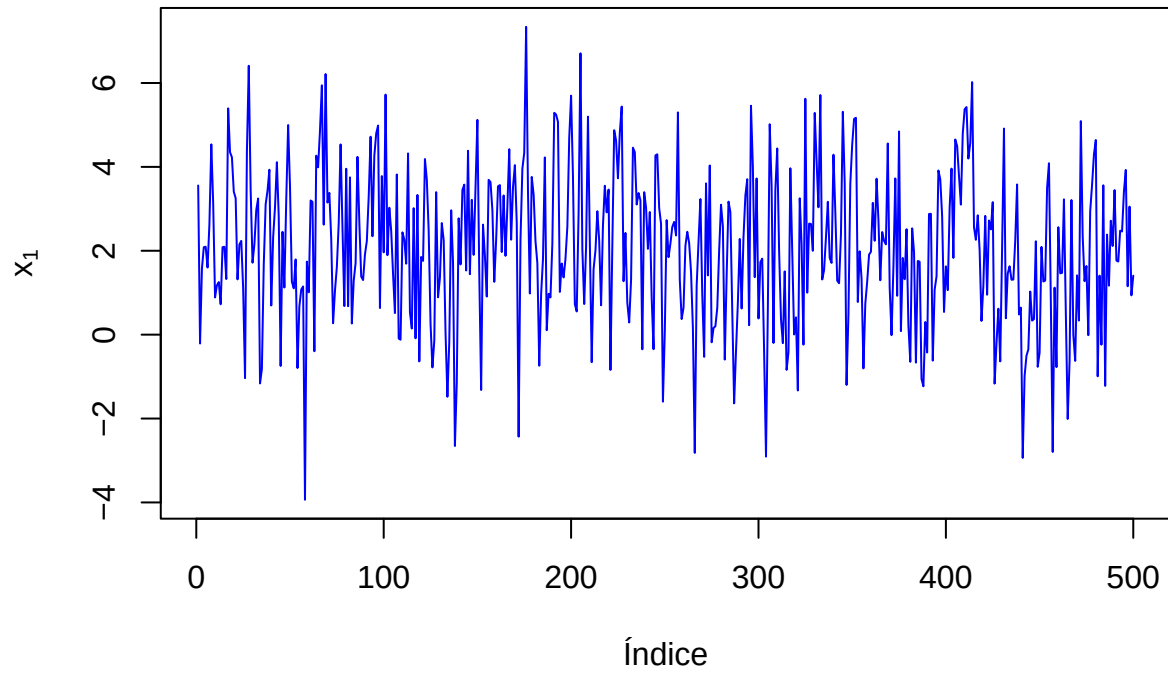
# Desvios padrão das dist. condicionais
sigx1 <- sqrt(sig1^2 - sig12^2 / sig2^2)
sigx2 <- sqrt(sig2^2 - sig12^2 / sig1^2)

# Valores iniciais
x1 <- x2 <- c()
x1[1] <- 5
x2[1] <- -2

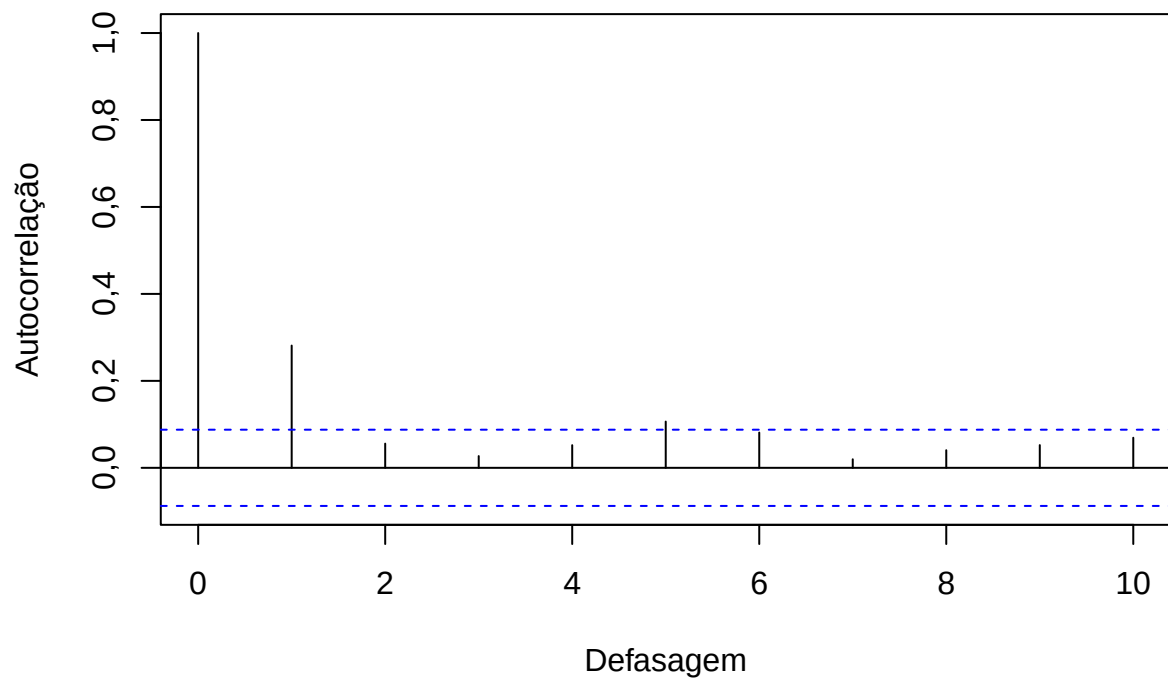
set.seed(147)
for (j in 2:(descarte + M)) {
  x1[j] <- rnorm(1, mu1 + sig12 * (x2[j - 1] - mu2) / sig2, sigx1)
  x2[j] <- rnorm(1, mu2 + sig12 * (x1[j] - mu1) / sig1, sigx2)
}

x1 <- x1[-(1:descarte)]
x2 <- x2[-(1:descarte)]
```

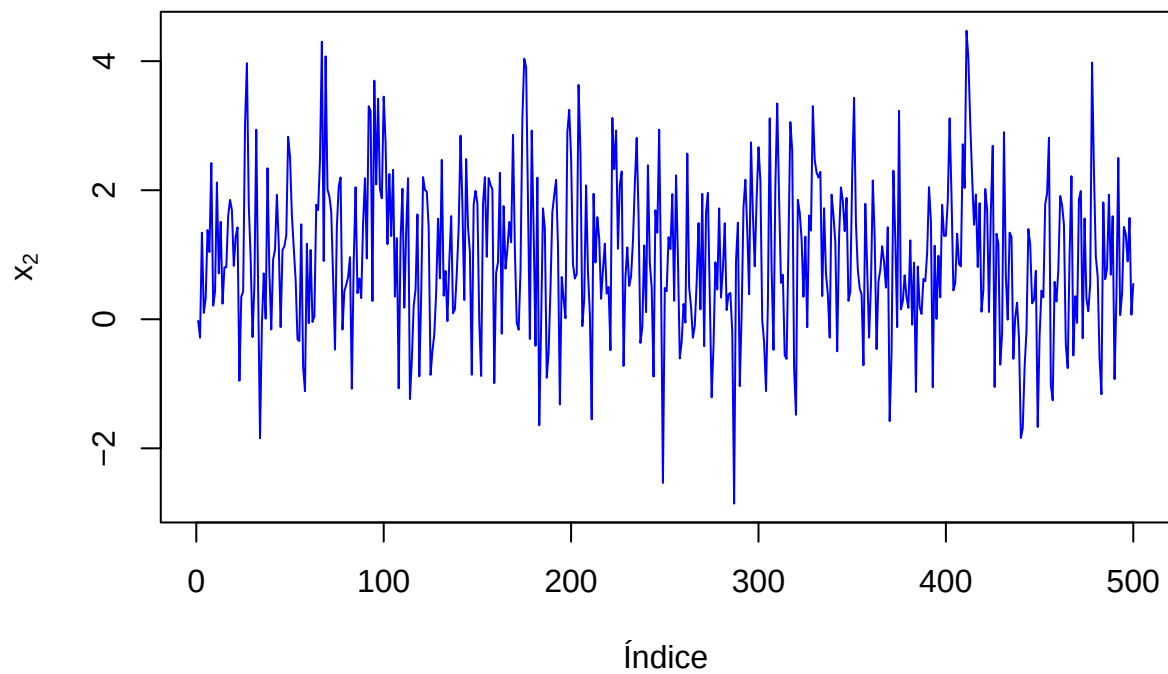
```
plot(x1, type = "l", xlab = "Índice", ylab = expression(x[1]), col = "blue")
```



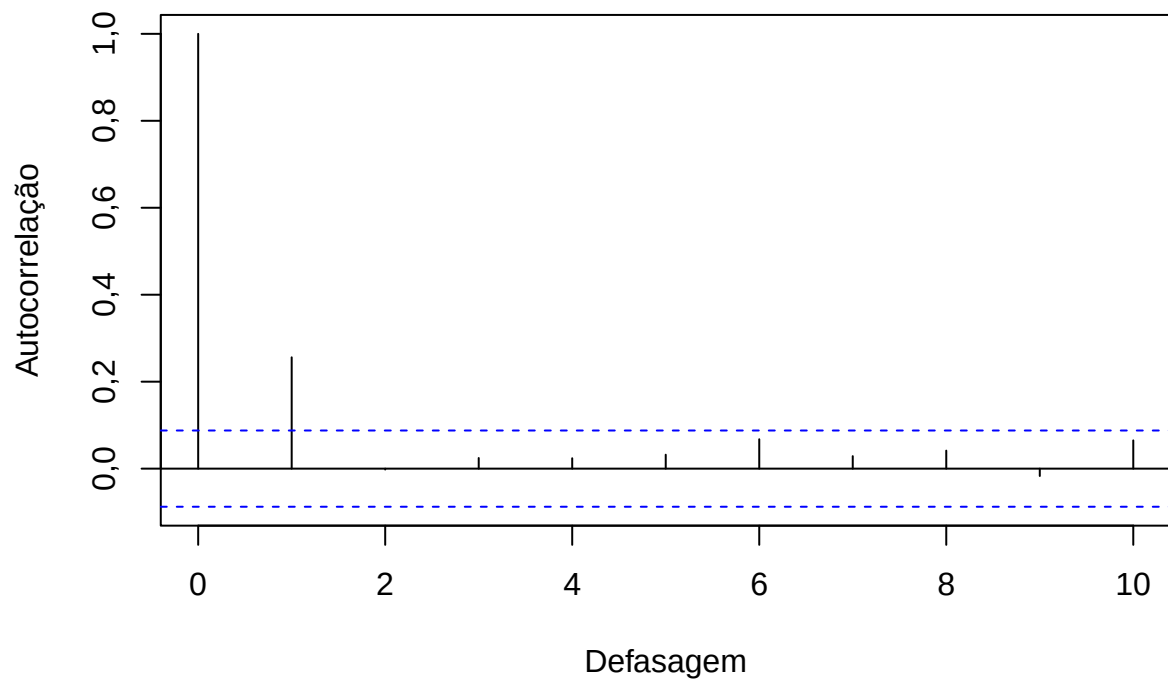
```
acf(x1, lag.max = 10, main = "", xlab = "Defasagem", ylab = "Autocorrelação")
```



```
plot(x2, type = "l", xlab = "Índice", ylab = expression(x[2]), col = "blue")
```



```
acf(x2, lag.max = 10, main = "", xlab = "Defasagem", ylab = "Autocorrelação")
```



```
# (X1, X2)
plot(x1, x2, pch = 20, xlab = expression(x[1]), ylab = expression(x[2]),
     col = "red")
```

