Universidade de Brasília

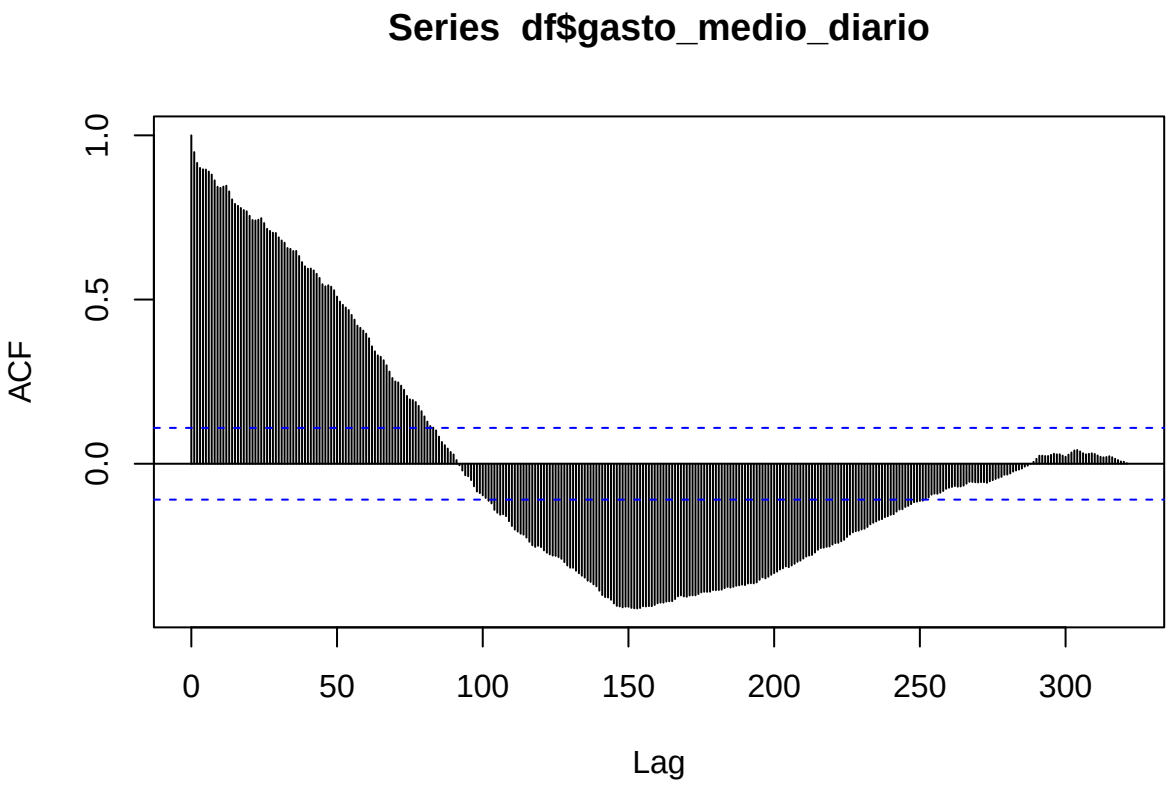
\begin{center} {DEPARTAMENTO DE ESTATÍSTICA} \

\vskip 1em {20 junho 2024} \vskip 3em {**Lista 4**} \ \vskip 5em {Prof. Dr. Raul Yukihiro Matsushita} \ \vskip 1em {Aluno: Bruno Gondim Toledo} \ \vskip 1em {Matrícula: 15/0167636} \ \vskip 1em {Análise de séries temporais} \ \vskip 1em {1º/2024} \ \vskip 1em \vskip 1em \end{center}

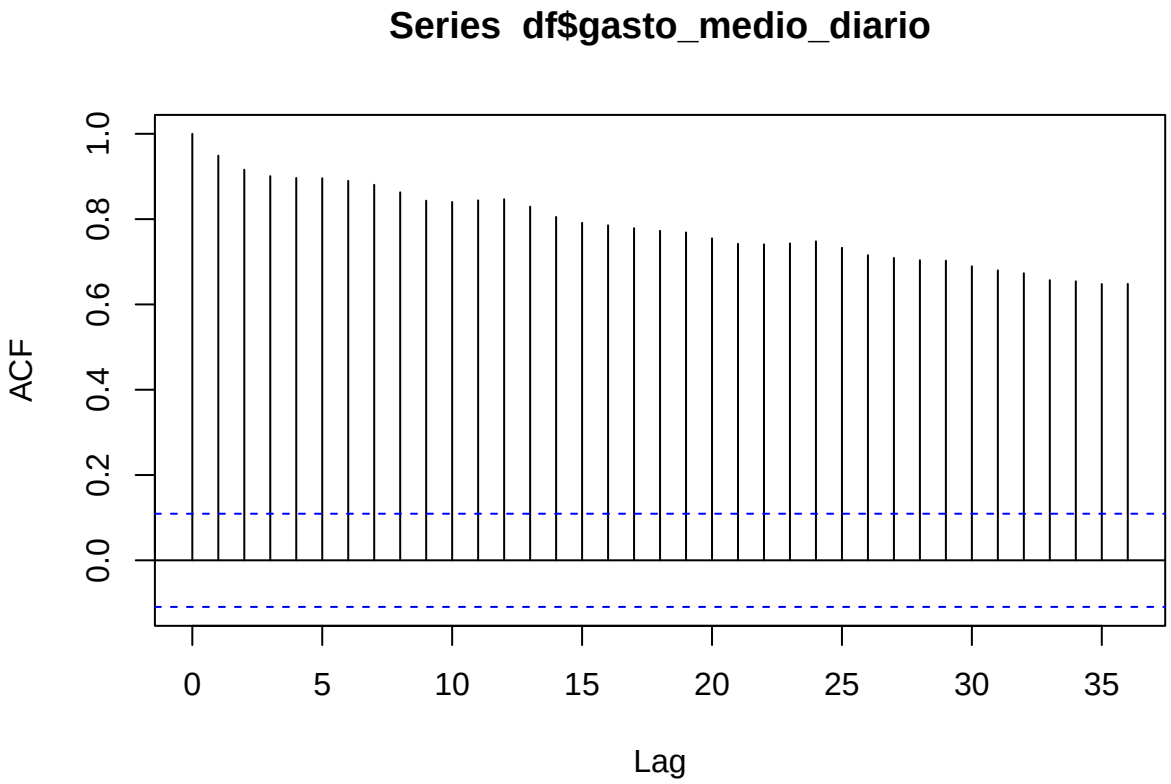
Parte 1

Reproduzindo os códigos e resultados apresentados em aula, com adição da observação referente à março de 2024.

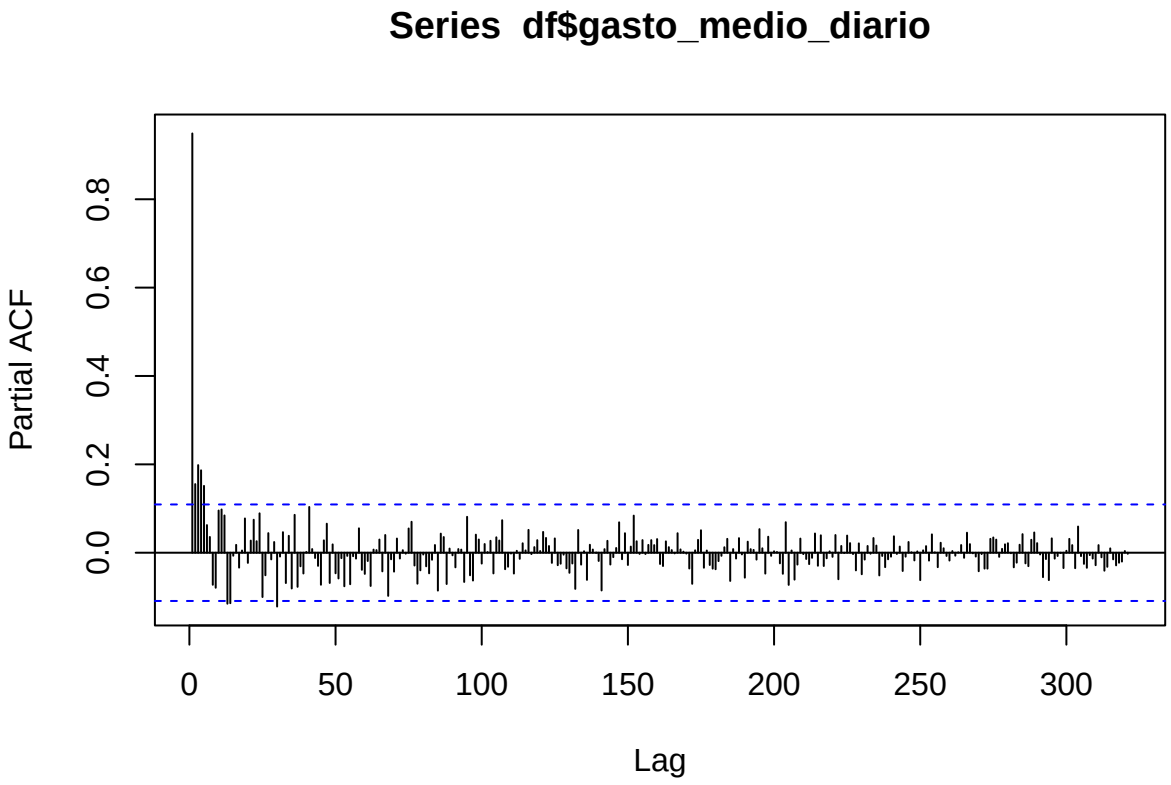
```
rho = acf(df$gasto_medio_diario, lag.max = nrow(df), plot = FALSE)
plot(rho)
```



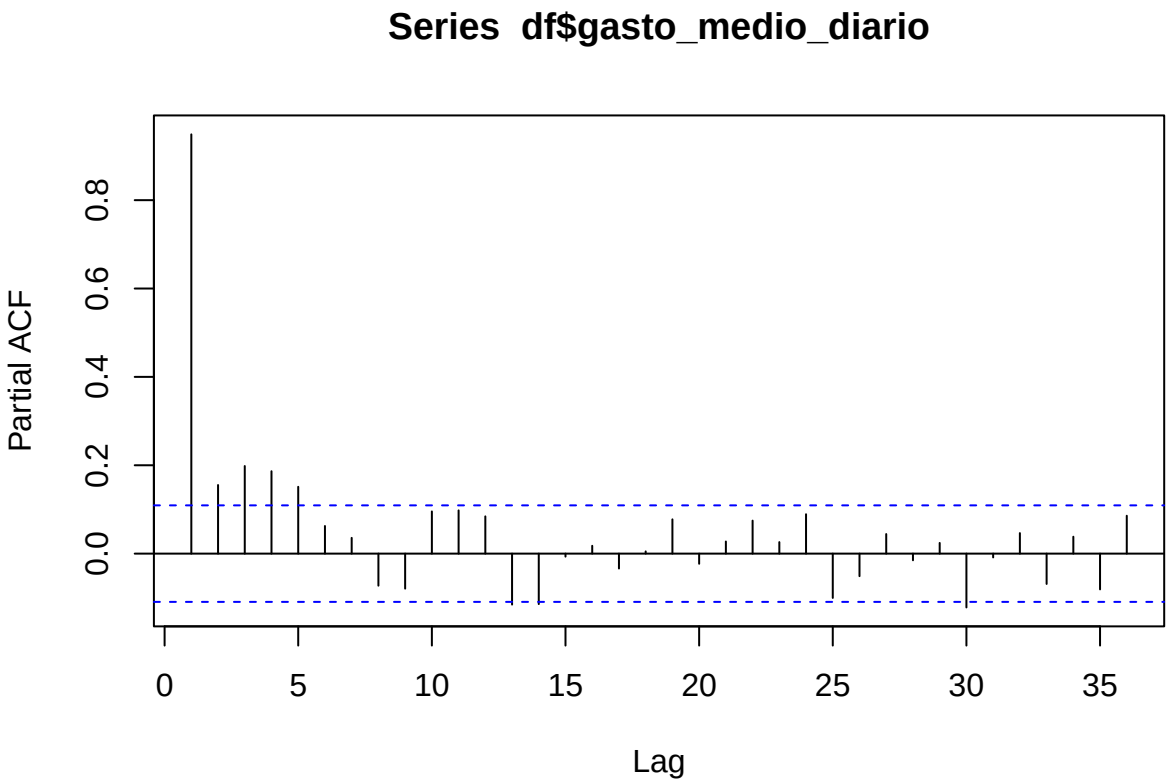

```
rho = acf(df$gasto_medio_diario, lag.max = 36, plot = FALSE)
plot(rho)
```



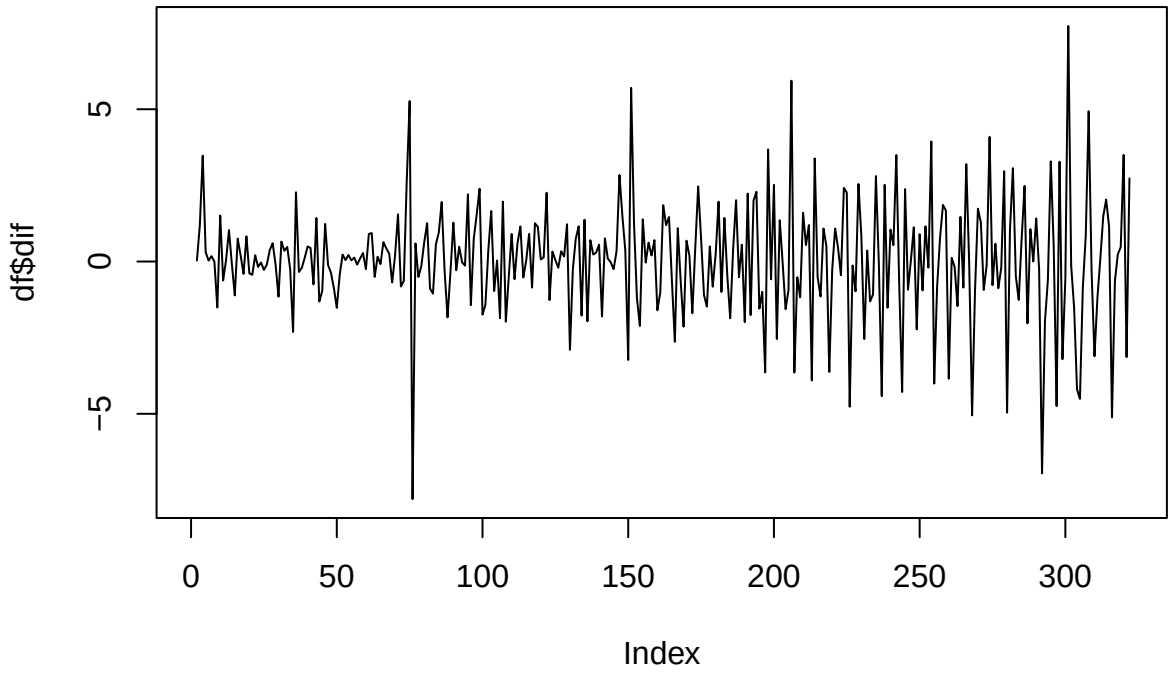

```r
phi = pacf(df$gasto_medio_diario, lag.max = nrow(df), plot = FALSE)
plot(phi)
```



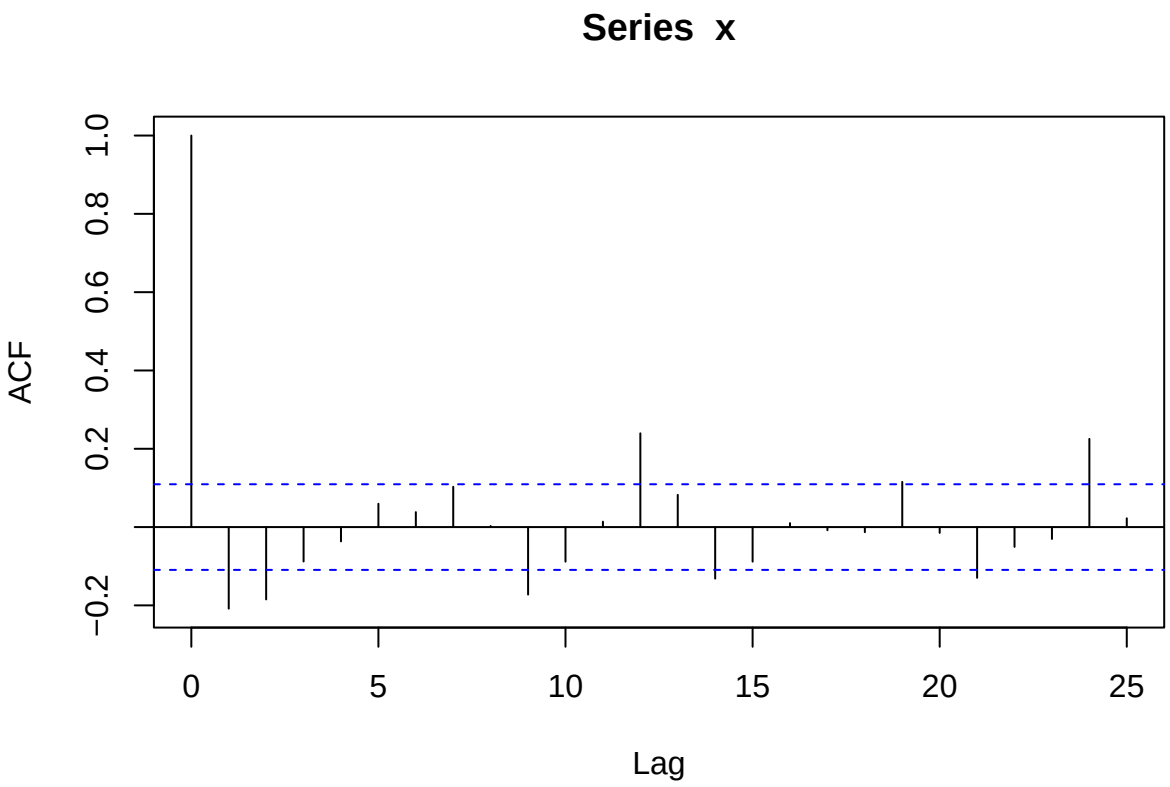
```r
phi = pacf(df$gasto_medio_diario, lag.max = 36, plot = FALSE)
plot(phi)
```



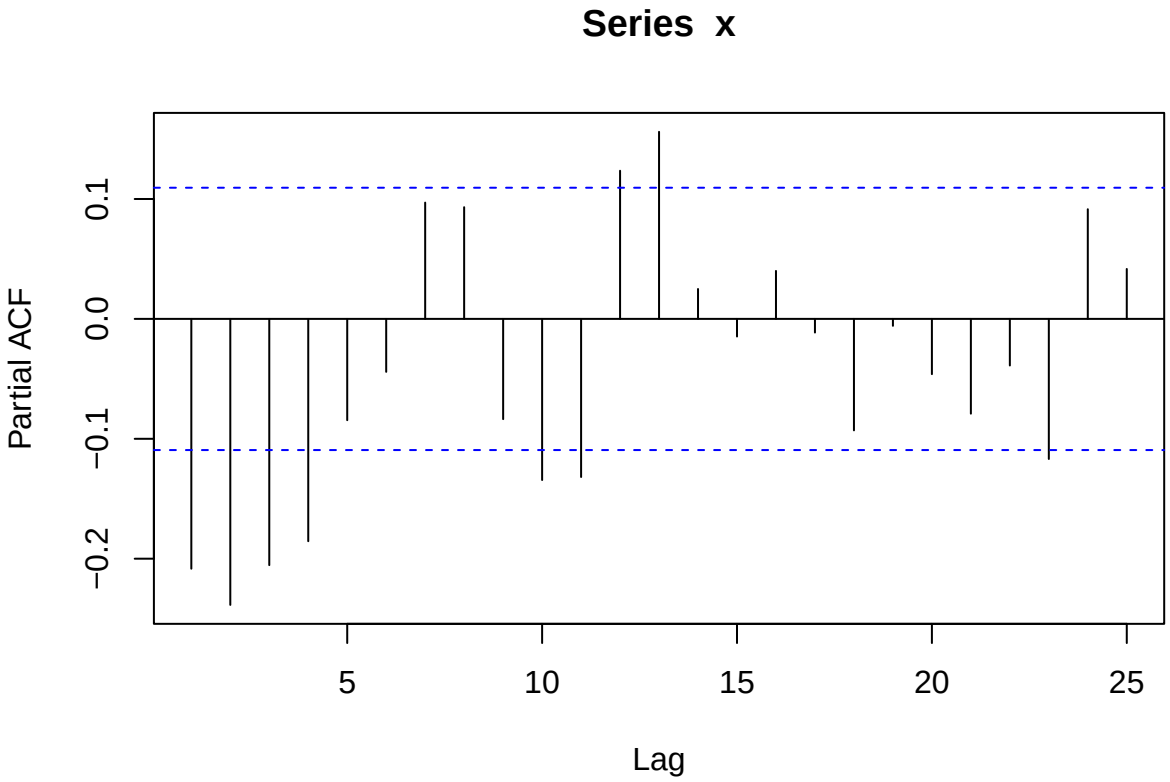

```r
df$gasto_medio_diario1 = c(NA,(df$gasto_medio_diario[1:(nrow(df)-1)]))

df$dif = c(NA,diff(df$gasto_medio_diario))
plot(df$dif, type = "l")
```



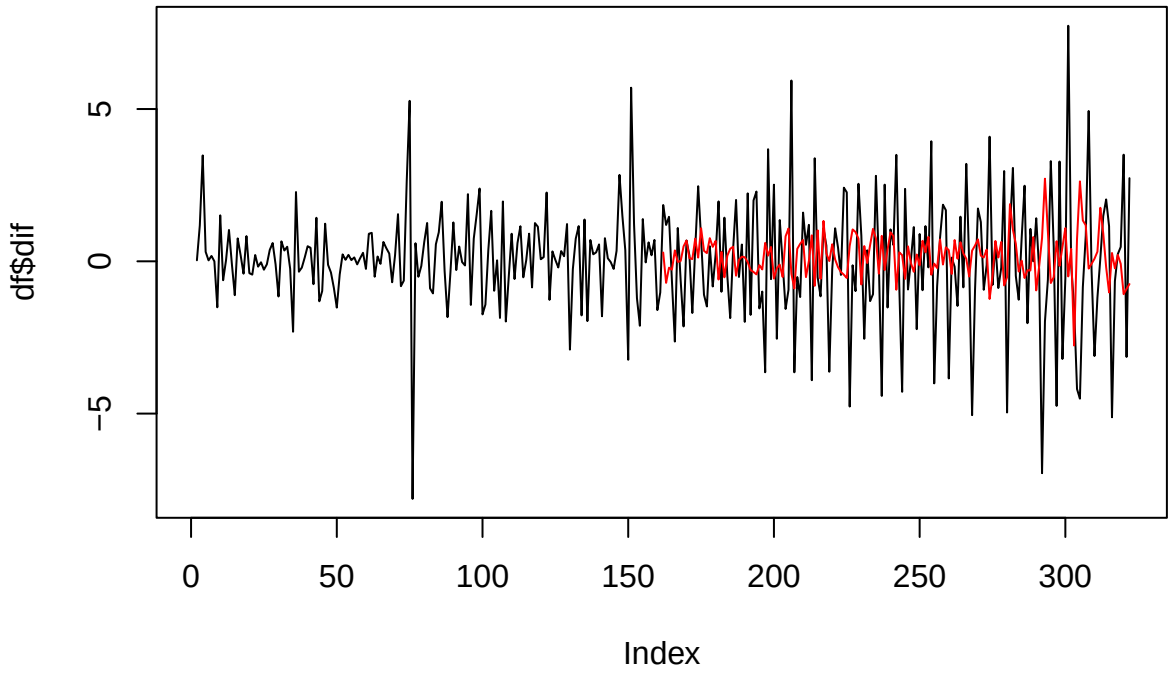
```r
x = na.omit(df$dif)
rho = acf(x, lag.max = nrow(x), plot = FALSE)
plot(rho)
```




```r
phi = pacf(x, lag.max = nrow(x), plot = FALSE)
plot(phi)
```




```
x = na.omit(df$dif)
n.size = nrow(df)
n.training = ceiling(n.size/2)
observed = NULL
predicted = NULL
for(t in (n.training+1):n.size){
  x.training = x[1:(t-1)]
  rho = acf(x.training, lag=(t-1),plot=F)
  last.lag = length(rho$acf)
  Rho = rho$acf
  Omega = toeplitz(Rho[-last.lag])
  beta = inv(Omega) %*% Rho[-1]
  beta.0 = mean(x.training)*(1-sum(beta))
  predicted[t] = beta.0 + sum(rev(beta)*x.training[-1])
  observed[t] = x[t]
}
plot(df$dif, type = "l")
lines(predicted, type = "l", col = "red")
```




```
cor(predicted,observed,use="complete.obs")
```

```
## [1] 0.3829436
```

```
MAE = mean(abs(na.omit(rev(predicted)[-1])-na.omit(rev(observed)[-1])))
MAE
```

```
## [1] 1.657283
```

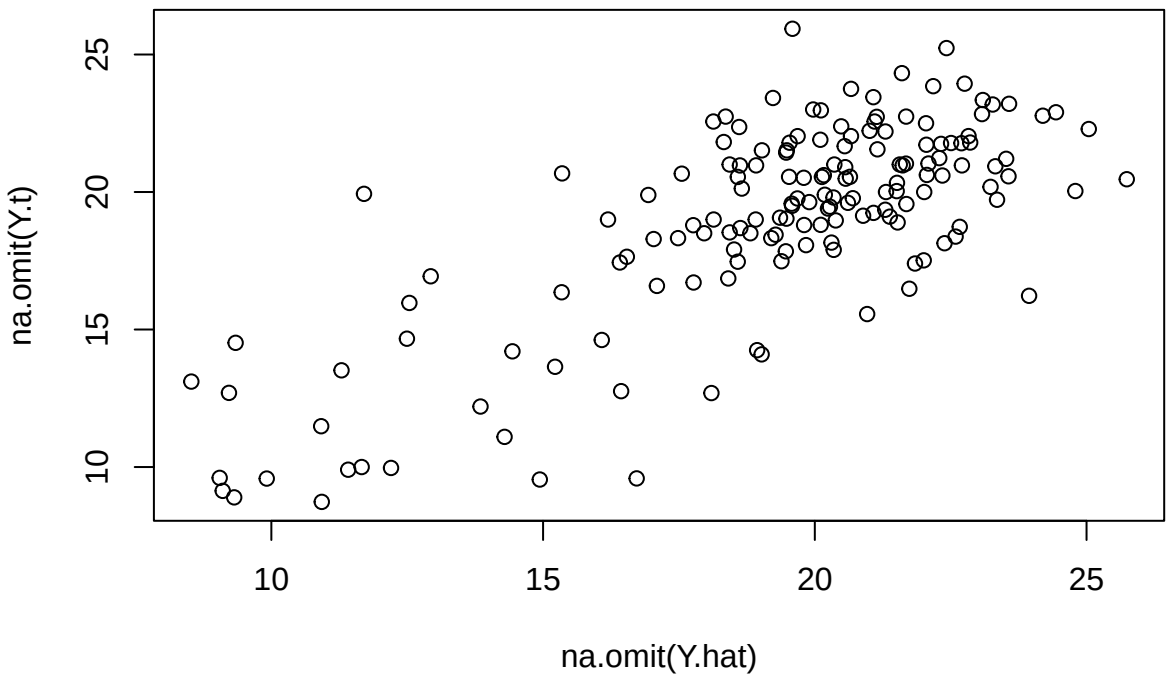
```
Y.hat = NULL
Y.t = NULL

for(h in (n.training+1):n.size){
Y.t[h+1] = df$gasto_medio_diario[h] + df$dif[h+1]
Y.hat[h+1] = df$gasto_medio_diario[h] + predicted[h+1]
}

MAE = mean(abs(na.omit(Y.hat)-na.omit(Y.t)))
MAE
```

```
## [1] 1.985953
```

```
MAPE = mean(abs(na.omit(Y.hat)/na.omit(Y.t)-1))
MAPE
```

```
## [1] 0.1139639
```

```
plot(na.omit(Y.hat),na.omit(Y.t))
```




```
cor(na.omit(Y.hat),na.omit(Y.t))
```

```
## [1] 0.7562581
```

```
shapiro.test(na.omit(Y.t-Y.hat))
```

```
##
##  Shapiro-Wilk normality test
##
## data:  na.omit(Y.t - Y.hat)
## W = 0.98985, p-value = 0.3073
```

```
sd(Y.t-Y.hat,na.rm=T)
```

```
## [1] 2.587739
```

Parte 2

Exercício proposto: utilizando a técnica de previsão com base na função de autocorrelação amostral, obtenha a previsão do consumo a ser faturado em abril de 2024.

```
serie <- ts(df$gasto_medio_diario,
            frequency = 12,
            start = c(1997,6),
            end = c(2024,3))

# Usando modelo AR(2)
AR = 2
fit <- Arima(serie, order = c(AR, 1, 0))
Y.next <- forecast(fit, h = 1)
Y.next
```

```
##          Point Forecast    Lo 80    Hi 80    Lo 95    Hi 95
## Apr 2024       12.74418 10.43174 15.05662 9.207615 16.28075
```

```
forecast(fit, h = 1) %>% autoplot()
```