Lista II: Q1

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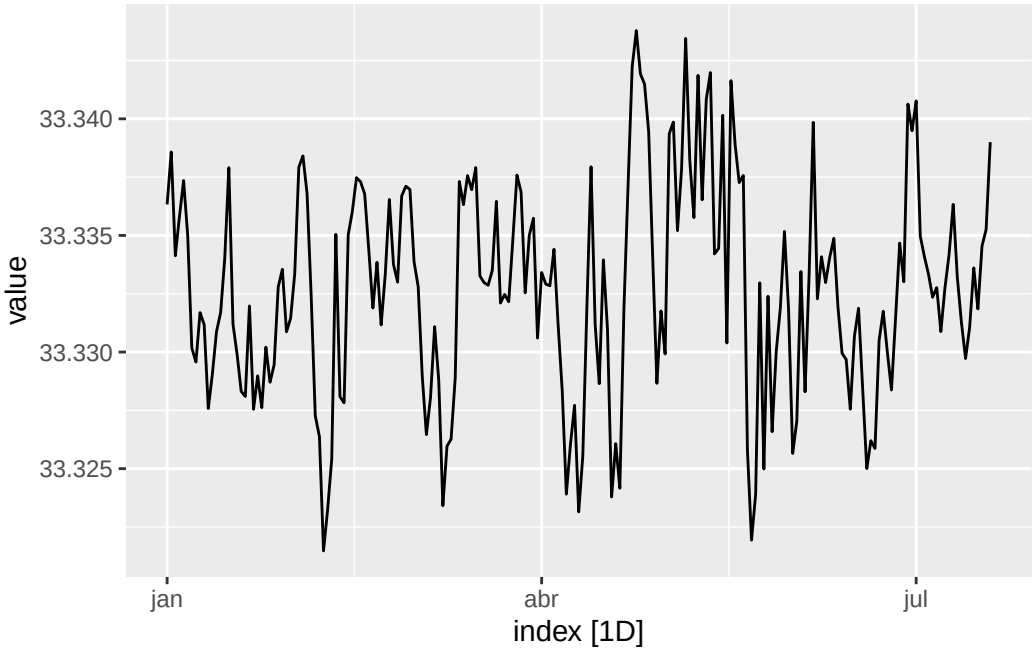
1 MODELAGEM BOX-JENKINS: SÉRIE I

O primeiro passo é a importação e visualização da série. Como não há informação sobre o período, usarei diário e tentarei identificar a partir de um padrão sazonal, se houver.

```
# importando dados
load("data/lista II.RData")
data = data.frame(
    value = conjunto1[, 1],
    index = seq(
        as.Date("2000-01-01"),
        by = 1,
        length.out = length(conjunto1[, 1])
    )
) |> tsibble(index = index)
```

A série é compacta, ou seja, de amplitude baixa, não requerindo transformação para redução de variância.

```
# plot série
autoplot(data, .vars = value)
```



O segundo passo é testar se a série é estacionária no primeiro momento. Não há evidências de raiz unitária tanto nos testes quanto nos gráficos de autocorrelação.

```
# KPSS test
data |>
    features(value, unitroot_kpss)
```

```
# A tibble: 1 x 2
  kpss_stat kpss_pvalue
      <dbl>       <dbl>
1     0.108         0.1
```

```
# Phillips-Perron test
data |>
    features(value, unitroot_pp)
```

```
# A tibble: 1 x 2
  pp_stat pp_pvalue
    <dbl>     <dbl>
1   -6.43      0.01
```

```r
# Augmented-Dickey-Fuller test
data |>
    (\(x) ur.df(x$value, selectlags = "AIC", type = "trend", lags = 12))() |>
    summary()
```

```
###############################################
# Augmented Dickey-Fuller Test Unit Root Test #
###############################################

Test regression trend


Call:
lm(formula = z.diff ~ z.lag.1 + 1 + tt + z.diff.lag)

Residuals:
       Min         1Q     Median         3Q        Max
-0.0102211 -0.0022799  0.0000216  0.0020829  0.0102631

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.141e+01  2.057e+00   5.549 9.87e-08 ***
z.lag.1     -3.424e-01  6.171e-02  -5.549 9.87e-08 ***
tt           3.313e-06  4.807e-06   0.689    0.492
z.diff.lag  -8.474e-03  7.397e-02  -0.115    0.909
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.00356 on 184 degrees of freedom
Multiple R-squared:  0.171, Adjusted R-squared:  0.1574
F-statistic: 12.65 on 3 and 184 DF,  p-value: 1.487e-07


Value of test-statistic is: -5.5495 10.2859 15.411

Critical values for test statistics:
      1pct  5pct 10pct
tau3 -3.99 -3.43 -3.13
phi2  6.22  4.75  4.07
phi3  8.43  6.49  5.47
```

```
data |>
    (\(x) ur.df(x$value, selectlags = "AIC", type = "drift", lags = 12))() |>
    summary()
```

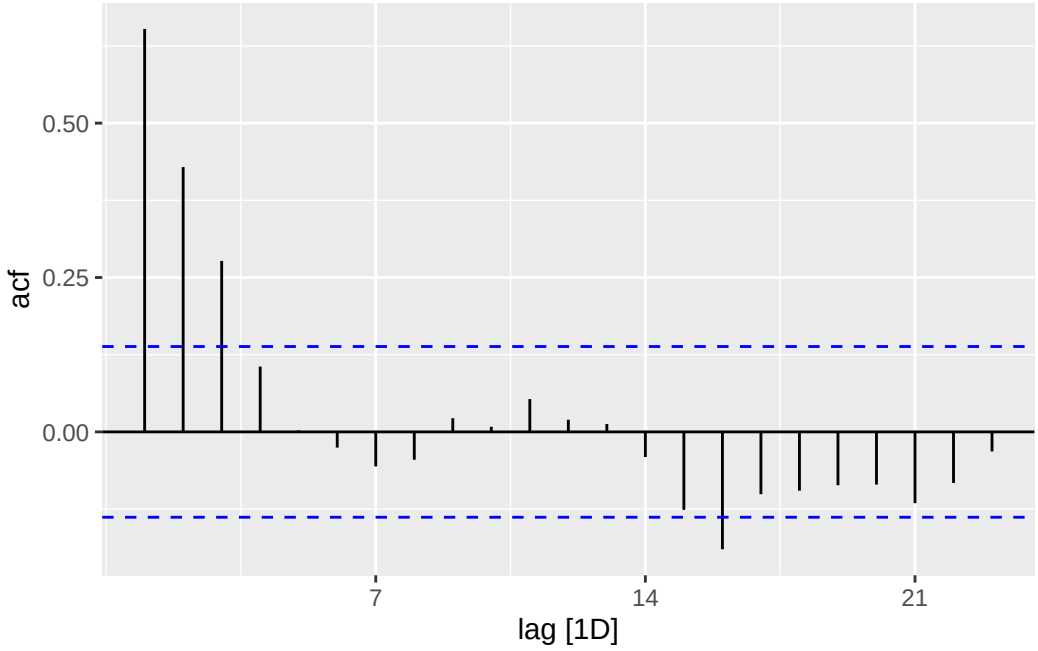
```
###############################################
# Augmented Dickey-Fuller Test Unit Root Test #
###############################################

Test regression drift


Call:
lm(formula = z.diff ~ z.lag.1 + 1 + z.diff.lag)

Residuals:
       Min         1Q     Median         3Q        Max
-0.0101264 -0.0022878 -0.0000252  0.0020877  0.0103523

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 11.27905    2.04454   5.517 1.15e-07 ***
z.lag.1     -0.33838    0.06134  -5.517 1.15e-07 ***
z.diff.lag  -0.01060    0.07380  -0.144    0.886
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.003555 on 185 degrees of freedom
Multiple R-squared:  0.1688,    Adjusted R-squared:  0.1598
F-statistic: 18.79 on 2 and 185 DF,  p-value: 3.73e-08


Value of test-statistic is: -5.5166 15.2347

Critical values for test statistics:
      1pct  5pct 10pct
tau2 -3.46 -2.88 -2.57
phi1  6.52  4.63  3.81
```

```
data |>
    (\(x) ur.df(x$value, selectlags = "AIC", type = "none", lags = 12))() |>
    summary()
```

```
###############################################
# Augmented Dickey-Fuller Test Unit Root Test #
###############################################

Test regression none


Call:
lm(formula = z.diff ~ z.lag.1 - 1 + z.diff.lag)

Residuals:
       Min         1Q     Median         3Q        Max
-0.0126568 -0.0024009  0.0001073  0.0021428  0.0090807

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
z.lag.1      1.691e-06  8.054e-06   0.210 0.833965
z.diff.lag1 -2.703e-01  7.373e-02  -3.666 0.000325 ***
z.diff.lag2 -2.039e-01  7.549e-02  -2.701 0.007580 **
z.diff.lag3 -1.276e-01  7.622e-02  -1.674 0.095896 .
z.diff.lag4 -2.248e-01  7.510e-02  -2.993 0.003153 **
z.diff.lag5 -2.176e-01  7.532e-02  -2.889 0.004338 **
z.diff.lag6 -1.352e-01  7.648e-02  -1.767 0.078909 .
z.diff.lag7 -1.657e-01  7.501e-02  -2.209 0.028467 *
z.diff.lag8 -1.859e-01  7.320e-02  -2.540 0.011941 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.00368 on 179 degrees of freedom
Multiple R-squared:  0.1383,    Adjusted R-squared:  0.095
F-statistic: 3.193 on 9 and 179 DF,  p-value: 0.001316


Value of test-statistic is: 0.2099

Critical values for test statistics:
      1pct  5pct 10pct
tau1 -2.58 -1.95 -1.62
```

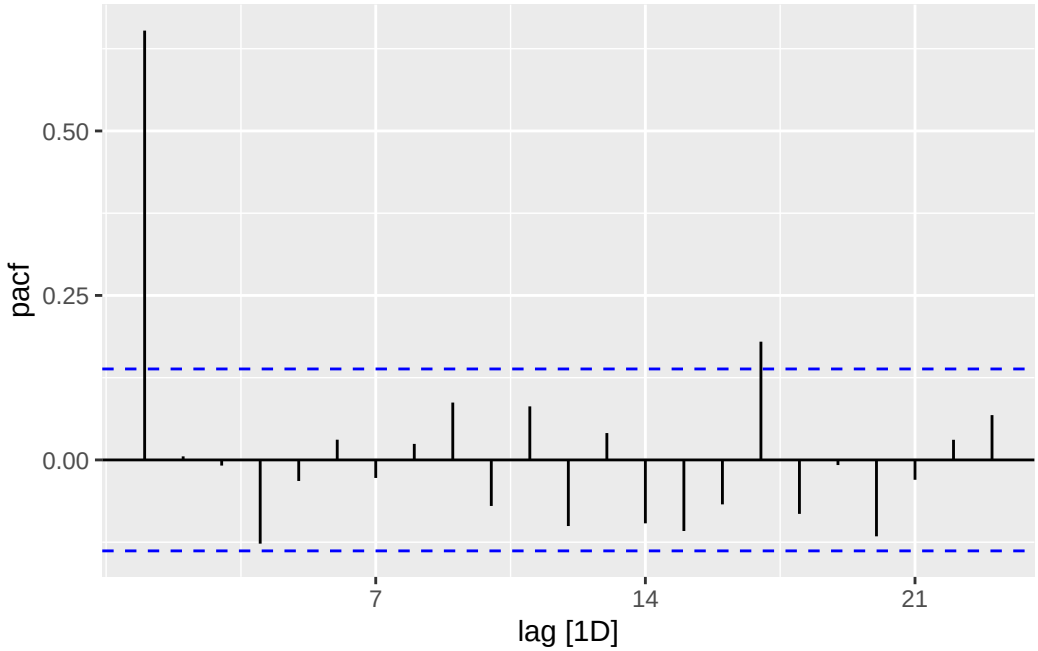
```r
# ACF
data |> ACF() |> autoplot()
```

```
Response variable not specified, automatically selected `var = value`
```



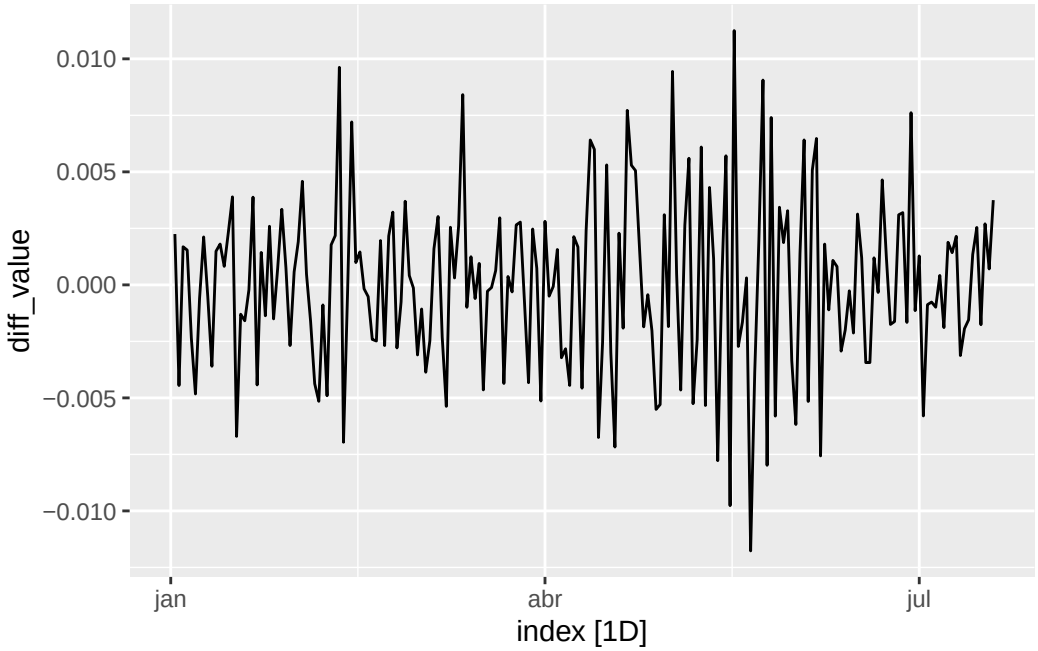

```
# ACF
data |> PACF() |> autoplot()
```

```
Response variable not specified, automatically selected `var = value`
```




```
# diferenciando
data |>
    dplyr::mutate(diff_value = difference(value)) |>
    autoplot(.vars = diff_value)
```

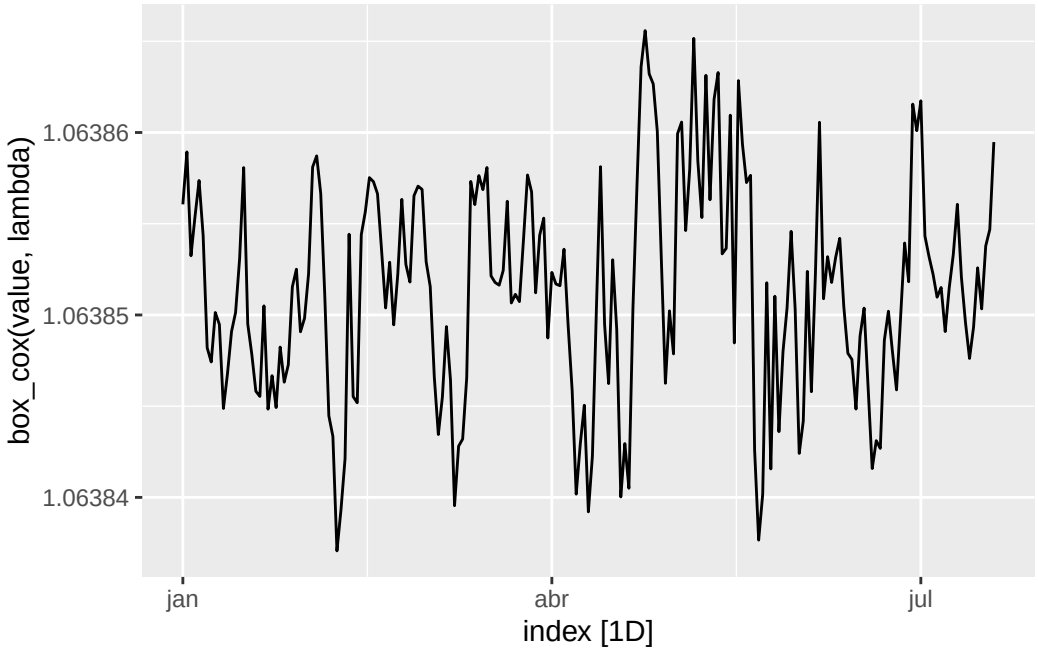
```
Warning: Removed 1 row containing missing values (`geom_line()`).
```



A MODELAGEM BOX-JENKINS: SÉRIE II

A série não parece estável. Recomendável transformação para estabilização da variância.

```
lambda = data |>
  features(value, features = guerrero) |>
  (\(x) x[["lambda_guerrero"]])()

data |>
    autoplot(box_cox(value, lambda))
```


box_cox(value, lambda)
1.06386
1.06385
1.06384
jan
abr
jul
index [1D]