

Teste intercalar - cadeira de Séries Temporais

Parte 2

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```
set.seed(123)

# import main libraries
library(astsa)
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.1 --

## v ggplot2 3.3.5      v purrr 0.3.4
## v tibble 3.1.5       v dplyr 1.0.7
## v tidyr 1.1.4        v stringr 1.4.0
## v readr 2.0.2        v forcats 0.5.1

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()      masks stats::lag()
```

Generating random experience

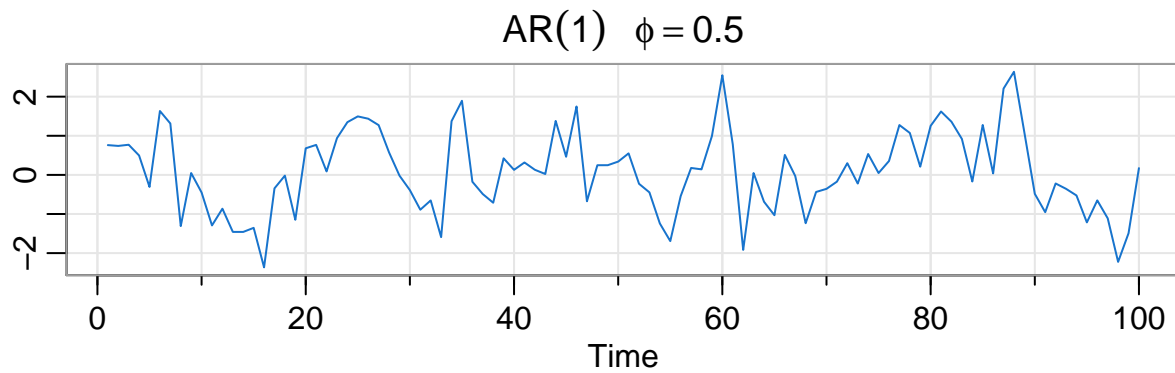
```
# initial index for numbered experience
n_exp <- data.frame( index = seq(1:1000) )

# data from theoretical model
data <- arima.sim(n = 100, model = list( c(1,0,0) , ar = 0.5) )

# random experience
experience <- function(index) {
  data <- arima.sim(n = 100, model = list( c(1,0,0) , ar = 0.5) ) # random AR process
  m <- arima(data, order = c(1,0,0)) # estimating parameters
  result <- m$coef[1] # extracting coefficients
  return(result)
}

# execute random experiences
coef_vector <- n_exp %>% pmap(experience) %>% bind_rows()
```

```
tsplot(data, col = 4, ylab = "", main = expression(AR(1)~--phi==0.5))
```



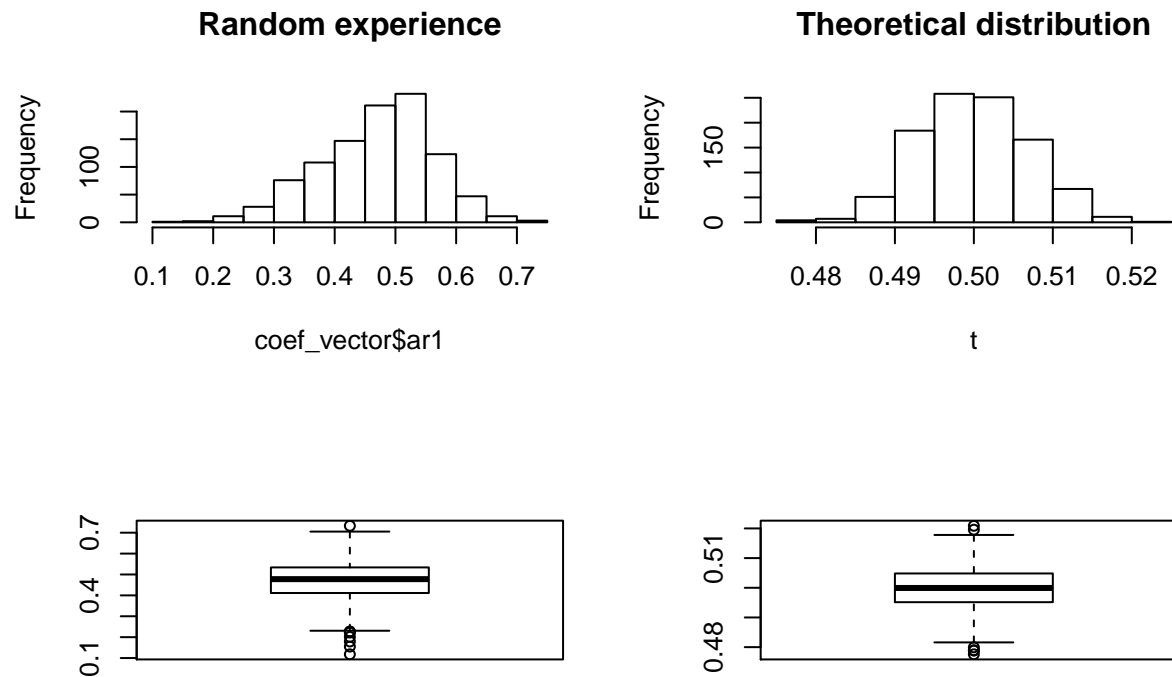
Comparing with theoratical distribution

```
mean = 0.5
sd = (1-0.5^2)/100

t <- rnorm(1000, mean, sd )

par(mfrow = c(2,2))

hist(coef_vector$ar1, main = "Random experience")
hist(t, main = "Theoretical distribution")
boxplot(coef_vector$ar1)
boxplot(t)
```



```
# summary statistics
```

```
summary(t)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.4776  0.4952   0.4999   0.5000  0.5048   0.5209
```

```
summary(coef_vector$ar1)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.1180  0.4114   0.4777   0.4702  0.5338   0.7330
```

Commenting on the results

Based on the plots from both the random experience and a sample of 1000 observations from a theoretical distribution they both follow a normal distribution with mean around 0,48 - 0,5. Nonetheless, the random experience results shows a higher variance. Using t-test for the difference of means with $H_0 : \mu_a - \mu_b = 0$ and a $\alpha = 0.05$ we reject the null hypothesis.

```
t.test(coef_vector$ar1, t, conf.level = 0.95)
```

```
##
## Welch Two Sample t-test
```

```
##
## data:  coef_vector$ar1 and t
## t = -10.156, df = 1010, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.03562397 -0.02408635
## sample estimates:
## mean of x mean of y
## 0.4701940 0.5000492
```