21BDS0340

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Programming for Data Science Lab

Digital Assignment – IV

**Code**

install.packages("quantmod")

install.packages("forecast")

install.packages("xlsx")

install.packages("tseries")

install.packages("timeSeries")

install.packages("dplyr")

install.packages("fGarch")

install.packages("prophet")

library(prophet)

library(quantmod)

library(forecast)

library("xlsx")

library(tseries)

library(timeSeries)

library(dplyr)

library(fGarch)

getSymbols("AMZN", src = "yahoo", from = "2015-01-01")

AMZN

print(adf.test(AMZN$AMZN.Close))

auto.arima(AMZN$AMZN.Close, lambda = "auto")

modelfit <- auto.arima(AMZN$AMZN.Close, lambda = "auto")

price\_forecast <- forecast(modelfit, h = 30)

plot(price\_forecast)

head(price\_forecast$mean)

head(price\_forecast$lower)

tail(price\_forecast$upper)

N = length(AMZN$AMZN.Close)

n = 0.7 \* N

train = AMZN$AMZN.Close[1:n, ]

test = AMZN$AMZN.Close[(n + 1):N, ]

trainarimafit <- auto.arima(train, lambda = "auto")

predlen = length(test)

trainarimafit <- forecast(trainarimafit, h = predlen)

meanvalues <- as.vector(trainarimafit$mean)

precios <- as.vector(test$AMZN.Close)

plot(meanvalues, type = "l", col = "red")

lines(precios, type = "l")

**Output**

> install.packages("quantmod")

also installing the dependencies ‘xts’, ‘TTR’

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/xts\_0.13.2.tgz'

Content type 'application/x-gzip' length 902876 bytes (881 KB)

==================================================

downloaded 881 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/TTR\_0.24.4.tgz'

Content type 'application/x-gzip' length 542283 bytes (529 KB)

==================================================

downloaded 529 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/quantmod\_0.4.26.tgz'

Content type 'application/x-gzip' length 1052992 bytes (1.0 MB)

==================================================

downloaded 1.0 MB

The downloaded binary packages are in

/var/folders/2f/9fz2wbqj7vlcygt681kl2k0m0000gn/T//Rtmpbq6hsX/downloaded\_packages

> install.packages("forecast")

also installing the dependencies ‘quadprog’, ‘fracdiff’, ‘lmtest’, ‘timeDate’, ‘tseries’, ‘urca’

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/quadprog\_1.5-8.tgz'

Content type 'application/x-gzip' length 40521 bytes (39 KB)

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downloaded 39 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/fracdiff\_1.5-3.tgz'

Content type 'application/x-gzip' length 127617 bytes (124 KB)

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downloaded 124 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/lmtest\_0.9-40.tgz'

Content type 'application/x-gzip' length 407278 bytes (397 KB)

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downloaded 397 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/timeDate\_4032.109.tgz'

Content type 'application/x-gzip' length 1427112 bytes (1.4 MB)

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downloaded 1.4 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/tseries\_0.10-55.tgz'

Content type 'application/x-gzip' length 418999 bytes (409 KB)

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downloaded 409 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/urca\_1.3-3.tgz'

Content type 'application/x-gzip' length 1101251 bytes (1.1 MB)

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downloaded 1.1 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/forecast\_8.22.0.tgz'

Content type 'application/x-gzip' length 2484322 bytes (2.4 MB)

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downloaded 2.4 MB

The downloaded binary packages are in

/var/folders/2f/9fz2wbqj7vlcygt681kl2k0m0000gn/T//Rtmpbq6hsX/downloaded\_packages

> install.packages("xlsx")

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/xlsx\_0.6.5.tgz'

Content type 'application/x-gzip' length 372567 bytes (363 KB)

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downloaded 363 KB

The downloaded binary packages are in

/var/folders/2f/9fz2wbqj7vlcygt681kl2k0m0000gn/T//Rtmpbq6hsX/downloaded\_packages

> install.packages("tseries")

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/tseries\_0.10-55.tgz'

Content type 'application/x-gzip' length 418999 bytes (409 KB)

==================================================

downloaded 409 KB

The downloaded binary packages are in

/var/folders/2f/9fz2wbqj7vlcygt681kl2k0m0000gn/T//Rtmpbq6hsX/downloaded\_packages

> install.packages("timeSeries")

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/timeSeries\_4032.109.tgz'

Content type 'application/x-gzip' length 2072512 bytes (2.0 MB)

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downloaded 2.0 MB

The downloaded binary packages are in

/var/folders/2f/9fz2wbqj7vlcygt681kl2k0m0000gn/T//Rtmpbq6hsX/downloaded\_packages

> install.packages("dplyr")

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/dplyr\_1.1.4.tgz'

Content type 'application/x-gzip' length 1595439 bytes (1.5 MB)

==================================================

downloaded 1.5 MB

The downloaded binary packages are in

/var/folders/2f/9fz2wbqj7vlcygt681kl2k0m0000gn/T//Rtmpbq6hsX/downloaded\_packages

> install.packages("fGarch")

also installing the dependencies ‘rbibutils’, ‘gss’, ‘stabledist’, ‘gbutils’, ‘Rdpack’, ‘fBasics’, ‘fastICA’, ‘cvar’

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/rbibutils\_2.2.16.tgz'

Content type 'application/x-gzip' length 1029790 bytes (1005 KB)

==================================================

downloaded 1005 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/gss\_2.2-7.tgz'

Content type 'application/x-gzip' length 1764859 bytes (1.7 MB)

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downloaded 1.7 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/stabledist\_0.7-1.tgz'

Content type 'application/x-gzip' length 73215 bytes (71 KB)

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downloaded 71 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/gbutils\_0.5.tgz'

Content type 'application/x-gzip' length 250421 bytes (244 KB)

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downloaded 244 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/Rdpack\_2.6.tgz'

Content type 'application/x-gzip' length 746967 bytes (729 KB)

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downloaded 729 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/fBasics\_4032.96.tgz'

Content type 'application/x-gzip' length 2678237 bytes (2.6 MB)

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downloaded 2.6 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/fastICA\_1.2-4.tgz'

Content type 'application/x-gzip' length 62774 bytes (61 KB)

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downloaded 61 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/cvar\_0.5.tgz'

Content type 'application/x-gzip' length 257290 bytes (251 KB)

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downloaded 251 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/fGarch\_4033.92.tgz'

Content type 'application/x-gzip' length 680701 bytes (664 KB)

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downloaded 664 KB

The downloaded binary packages are in

/var/folders/2f/9fz2wbqj7vlcygt681kl2k0m0000gn/T//Rtmpbq6hsX/downloaded\_packages

> install.packages("prophet")

also installing the dependencies ‘tensorA’, ‘distributional’, ‘matrixStats’, ‘posterior’, ‘inline’, ‘gridExtra’, ‘loo’, ‘QuickJSR’, ‘RcppEigen’, ‘dygraphs’, ‘extraDistr’, ‘rstan’, ‘rstantools’, ‘StanHeaders’

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/tensorA\_0.36.2.1.tgz'

Content type 'application/x-gzip' length 224376 bytes (219 KB)

==================================================

downloaded 219 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/distributional\_0.4.0.tgz'

Content type 'application/x-gzip' length 429003 bytes (418 KB)

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downloaded 418 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/matrixStats\_1.2.0.tgz'

Content type 'application/x-gzip' length 621826 bytes (607 KB)

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downloaded 607 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/posterior\_1.5.0.tgz'

Content type 'application/x-gzip' length 963383 bytes (940 KB)

==================================================

downloaded 940 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/inline\_0.3.19.tgz'

Content type 'application/x-gzip' length 127860 bytes (124 KB)

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downloaded 124 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/gridExtra\_2.3.tgz'

Content type 'application/x-gzip' length 1104752 bytes (1.1 MB)

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downloaded 1.1 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/loo\_2.7.0.tgz'

Content type 'application/x-gzip' length 1856325 bytes (1.8 MB)

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downloaded 1.8 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/QuickJSR\_1.1.3.tgz'

Content type 'application/x-gzip' length 3766336 bytes (3.6 MB)

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downloaded 3.6 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/RcppEigen\_0.3.4.0.0.tgz'

Content type 'application/x-gzip' length 4943708 bytes (4.7 MB)

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downloaded 4.7 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/dygraphs\_1.1.1.6.tgz'

Content type 'application/x-gzip' length 424406 bytes (414 KB)

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downloaded 414 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/extraDistr\_1.10.0.tgz'

Content type 'application/x-gzip' length 3706597 bytes (3.5 MB)

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downloaded 3.5 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/rstan\_2.32.6.tgz'

Content type 'application/x-gzip' length 8927989 bytes (8.5 MB)

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downloaded 8.5 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/rstantools\_2.4.0.tgz'

Content type 'application/x-gzip' length 166623 bytes (162 KB)

==================================================

downloaded 162 KB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/StanHeaders\_2.32.6.tgz'

Content type 'application/x-gzip' length 2874644 bytes (2.7 MB)

==================================================

downloaded 2.7 MB

trying URL 'https://cran.rstudio.com/bin/macosx/big-sur-arm64/contrib/4.2/prophet\_1.0.tgz'

Content type 'application/x-gzip' length 6164557 bytes (5.9 MB)

==================================================

downloaded 5.9 MB

The downloaded binary packages are in

/var/folders/2f/9fz2wbqj7vlcygt681kl2k0m0000gn/T//Rtmpbq6hsX/downloaded\_packages

> library(prophet)

Loading required package: Rcpp

Loading required package: rlang

> library(quantmod)

Loading required package: xts

Loading required package: zoo

Attaching package: ‘zoo’

The following objects are masked from ‘package:base’:

as.Date, as.Date.numeric

Loading required package: TTR

Registered S3 method overwritten by 'quantmod':

method from

as.zoo.data.frame zoo

> library(forecast)

> library("xlsx")

> library(tseries)

‘tseries’ version: 0.10-55

‘tseries’ is a package for time series analysis and computational finance.

See ‘library(help="tseries")’ for details.

> library(timeSeries)

Loading required package: timeDate

Attaching package: ‘timeSeries’

The following object is masked from ‘package:zoo’:

time<-

The following objects are masked from ‘package:graphics’:

lines, points

> library(dplyr)

######################### Warning from 'xts' package ##########################

# #

# The dplyr lag() function breaks how base R's lag() function is supposed to #

# work, which breaks lag(my\_xts). Calls to lag(my\_xts) that you type or #

# source() into this session won't work correctly. #

# #

# Use stats::lag() to make sure you're not using dplyr::lag(), or you can add #

# conflictRules('dplyr', exclude = 'lag') to your .Rprofile to stop #

# dplyr from breaking base R's lag() function. #

# #

# Code in packages is not affected. It's protected by R's namespace mechanism #

# Set `options(xts.warn\_dplyr\_breaks\_lag = FALSE)` to suppress this warning. #

# #

###############################################################################

Attaching package: ‘dplyr’

The following objects are masked from ‘package:timeSeries’:

filter, lag

The following objects are masked from ‘package:xts’:

first, last

The following objects are masked from ‘package:stats’:

filter, lag

The following objects are masked from ‘package:base’:

intersect, setdiff, setequal, union

> library(fGarch)

NOTE: Packages 'fBasics', 'timeDate', and 'timeSeries' are no longer

attached to the search() path when 'fGarch' is attached.

If needed attach them yourself in your R script by e.g.,

require("timeSeries")

Attaching package: ‘fGarch’

The following object is masked from ‘package:TTR’:

volatility

> getSymbols("AMZN", src = "yahoo", from = "2015-01-01")

[1] "AMZN"

> AMZN

AMZN.Open AMZN.High AMZN.Low AMZN.Close AMZN.Volume AMZN.Adjusted

2015-01-02 15.6290 15.7375 15.3480 15.4260 55664000 15.4260

2015-01-05 15.3505 15.4190 15.0425 15.1095 55484000 15.1095

2015-01-06 15.1120 15.1500 14.6190 14.7645 70380000 14.7645

2015-01-07 14.8750 15.0640 14.7665 14.9210 52806000 14.9210

2015-01-08 15.0160 15.1570 14.8055 15.0230 61768000 15.0230

2015-01-09 15.0740 15.1435 14.8340 14.8465 51848000 14.8465

2015-01-12 14.8780 14.9255 14.4640 14.5705 68428000 14.5705

2015-01-13 14.8740 15.0750 14.6615 14.7370 82728000 14.7370

2015-01-14 14.5965 14.7955 14.3250 14.6635 110774000 14.6635

2015-01-15 14.7000 14.8000 14.3410 14.3475 88384000 14.3475

...

2024-03-15 176.6400 177.9300 173.9000 174.4200 72115500 174.4200

2024-03-18 175.8000 176.6900 174.2800 174.4800 31250700 174.4800

2024-03-19 174.2200 176.0900 173.5200 175.9000 26880900 175.9000

2024-03-20 176.1400 178.5300 174.6400 178.1500 29947200 178.1500

2024-03-21 179.9900 181.4200 178.1500 178.1500 32824300 178.1500

2024-03-22 177.7500 179.2600 176.7500 178.8700 27964100 178.8700

2024-03-25 178.0100 180.9900 177.2400 179.7100 29815500 179.7100

2024-03-26 180.1500 180.4500 177.9500 178.3000 29659000 178.3000

2024-03-27 179.8800 180.0000 177.3100 179.8300 33272600 179.8300

2024-03-28 180.1700 181.7000 179.2600 180.3800 38027400 180.3800

> print(adf.test(AMZN$AMZN.Close))

Augmented Dickey-Fuller Test

data: AMZN$AMZN.Close

Dickey-Fuller = -1.9801, Lag order = 13, p-value = 0.5868

alternative hypothesis: stationary

> auto.arima(AMZN$AMZN.Close, lambda = "auto")

Series: AMZN$AMZN.Close

ARIMA(2,1,2) with drift

Box Cox transformation: lambda= -0.2133491

Coefficients:

ar1 ar2 ma1 ma2 drift

-0.3357 -0.9123 0.3396 0.9342 5e-04

s.e. 0.0779 0.0482 0.0681 0.0420 2e-04

sigma^2 = 6.83e-05: log likelihood = 7850.31

AIC=-15688.62 AICc=-15688.58 BIC=-15654.11

> modelfit <- auto.arima(AMZN$AMZN.Close, lambda = "auto")

> price\_forecast <- forecast(modelfit, h = 30)

> plot(price\_forecast)

> head(price\_forecast$mean)

Time Series:

Start = 2326

End = 2331

Frequency = 1

[1] 180.7254 181.0617 181.2000 181.4142 181.7851 182.0347

> head(price\_forecast$lower)

Time Series:

Start = 2326

End = 2331

Frequency = 1

80% 95%

2326 175.0356 172.1117

2327 173.0458 168.9768

2328 171.3621 166.4167

2329 170.0846 164.4349

2330 169.1729 162.9265

2331 168.2412 161.4532

> tail(price\_forecast$upper)

Time Series:

Start = 2350

End = 2355

Frequency = 1

80% 95%

2350 220.6896 241.5986

2351 221.7744 243.2479

2352 222.8718 244.9086

2353 223.8888 246.4832

2354 224.9046 248.0532

2355 225.9795 249.6837

> N = length(AMZN$AMZN.Close)

> n = 0.7 \* N

> train = AMZN$AMZN.Close[1:n, ]

> test = AMZN$AMZN.Close[(n + 1):N, ]

> trainarimafit <- auto.arima(train, lambda = "auto")

> predlen = length(test)

> trainarimafit <- forecast(trainarimafit, h = predlen)

> meanvalues <- as.vector(trainarimafit$mean)

> precios <- as.vector(test$AMZN.Close)

> plot(meanvalues, type = "l", col = "red")

> lines(precios, type = "l")

A graph with numbers and lines

Description automatically generated

A graph with a red line

Description automatically generated