Financial Market - Petrobras Time Series Analysis

Data Science Academy

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I believe that many already know Yahoo Finance, a website that provides financial news and stock quotes. In this study, I recreated the Candlestick Chart on the website and added the Bollinger Bands to the chart.

Bollinger bands are a volatility indicator to predict whether an asset is overbought, stable or oversold. More volatile markets have the most distant bands from the average, while less volatile markets have the bands closer to the average.

This is an initial study, where several subsequent analyzes could be made, such as predictive modeling to solve business problems.

Step 1 - Defining the working directory and Loading the packages

```
# Defining the working directory
setwd("D:/Documentos/FCD/BigDataRAzure/Cap07")
getwd()
```

```
## [1] "D:/Documentos/FCD/BigDataRAzure/Cap07"
```

```
# Loading packages
library(quantmod)
library(xts)
library(moments)
```

Step 2 - Download data from Yahoo Finance period

```
# Selecting the analysis period
startDate = as.Date("2020-01-01")
endDate = as.Date("2020-11-23")
```

```
# Download data from Yahoo Finance period
# Petrobras = PETR4.SA
getSymbols("PETR4.SA", src = "yahoo", from = startDate, to = endDate, auto.assign = T)
```

```
## 'getSymbols' currently uses auto.assign=TRUE by default, but will
## use auto.assign=FALSE in 0.5-0. You will still be able to use
## 'loadSymbols' to automatically load data. getOption("getSymbols.env")
```

```
## and getOption("getSymbols.auto.assign") will still be checked for
## alternate defaults.
##
## This message is shown once per session and may be disabled by setting
## options("getSymbols.warning4.0"=FALSE). See ?getSymbols for details.
```

```
## Warning: PETR4.SA contains missing values. Some functions will not work if
## objects contain missing values in the middle of the series. Consider using
## na.omit(), na.approx(), na.fill(), etc to remove or replace them.
```

```
## [1] "PETR4.SA"
```

```
head(PETR4.SA)
```

```
##            PETR4.SA.Open PETR4.SA.High PETR4.SA.Low PETR4.SA.Close
## 2020-01-02         30.51         30.70        30.31          30.70
## 2020-01-03         30.88         31.24        30.45          30.45
## 2020-01-06         30.43         30.94        29.95          30.81
## 2020-01-07         30.82         30.88        30.47          30.69
## 2020-01-08         30.69         30.77        30.24          30.50
## 2020-01-09         30.47         30.62        30.25          30.40
##            PETR4.SA.Volume PETR4.SA.Adjusted
## 2020-01-02        37774500          30.69773
## 2020-01-03        71595600          30.44775
## 2020-01-06        81844000          30.80772
## 2020-01-07        32822000          30.68773
## 2020-01-08        48215600          30.49774
## 2020-01-09        36102700          30.39775
```

We have Open, High, Low, Close, Volume and Adjusted data. In this study, we are going to use the Closing data
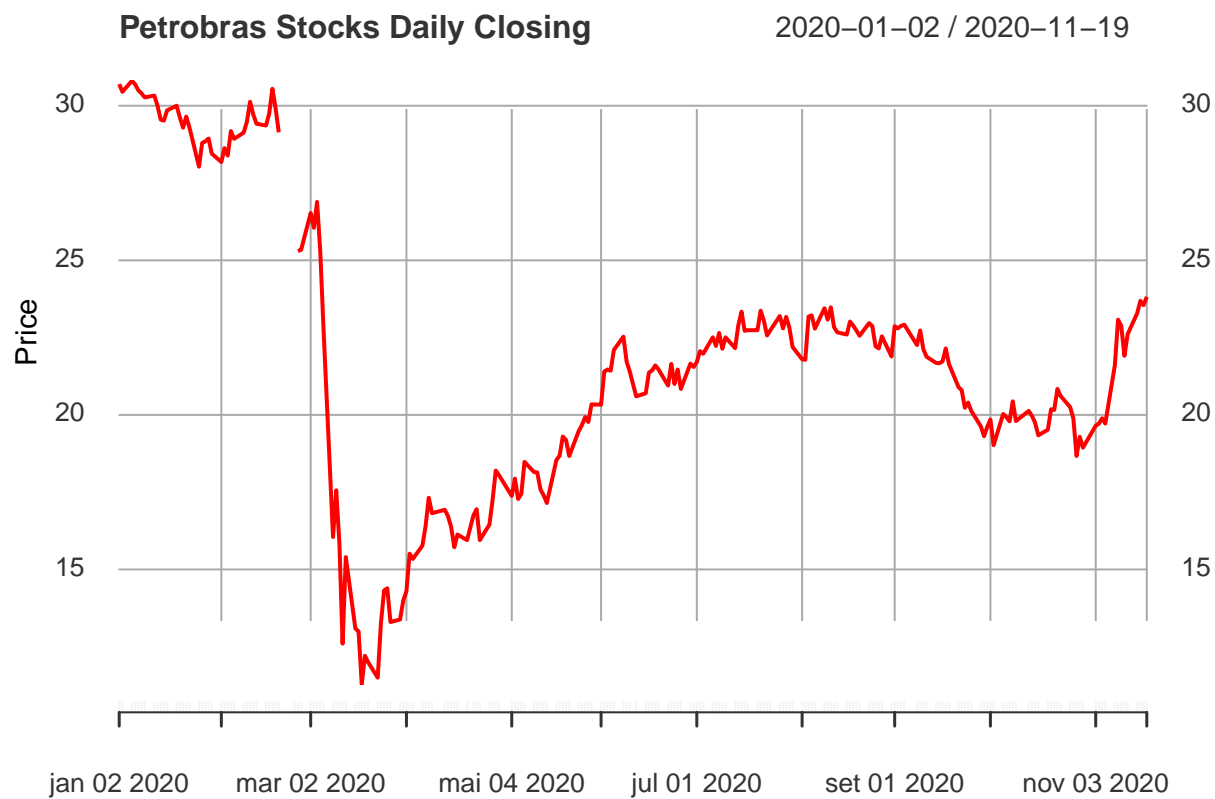
```
# Analyzing the closing data
PETR4.SA.Close <- PETR4.SA[, "PETR4.SA.Close"]
```

Step 3 - Petrobras candlestick chart

```
# Petrobras candlestick chart
candleChart(PETR4.SA)
```

```
# Closing Plot
plot(PETR4.SA.Close, main = "Petrobras Stocks Daily Closing",
     col = "red", xlab = "Date", ylab = "Price", major.ticks = 'months',
     minor.ticks = FALSE)
```

Petrobras Stocks Daily Closing   2020–01–02 / 2020–11–19

Step 4 - Adding Bollinger bands to the chart

```
# Adding Bollinger bands to the chart, with an average of 20 periods and 2 standard deviations
addBBands(n = 20, sd = 2)
```

```
# Adding the ADX indicator with 11 periods
addADX(n = 11, maType = "EMA")
```

```r
# Calculating daily logs
PETR4.SA.ret <- diff(log(PETR4.SA.Close), lag = 1)


# Removing NA values in prosition 1
PETR4.SA.ret <- PETR4.SA.ret[-1]


# Plotting return rate
plot(PETR4.SA.ret, main = "Petrobras Stocks Daily Closing",
     col = "red", xlab = "Date", ylab = "Return", major.ticks = 'months',
     minor.ticks = FALSE)
```

Petrobras Stocks Daily Closing   2020−01−03 / 2020−11−19