

# Banks Exercise

João Guilherme Osório

## Banks Portfolio - Class Exercise

For this exercise our Professor told us to calculate the mean return and volatility of a portfolio composed only by Brazilian bank stocks. We used the historical scenarios methodology, which consists in calculate how would your equity vary if allocated that amount of money in those stock a  $t$  periods ago (in this case, 1 month ago).

Originally two information were given to us: the banks stock prices in a given window of time and how much did we had to allocate in each investment. In order to make a more hands-on R exercise, I took the prices from RStudio connection with Yahoo! Finance provided by quantmod package. This approach demand some previous organization of the data, before actually starting the class exercise.

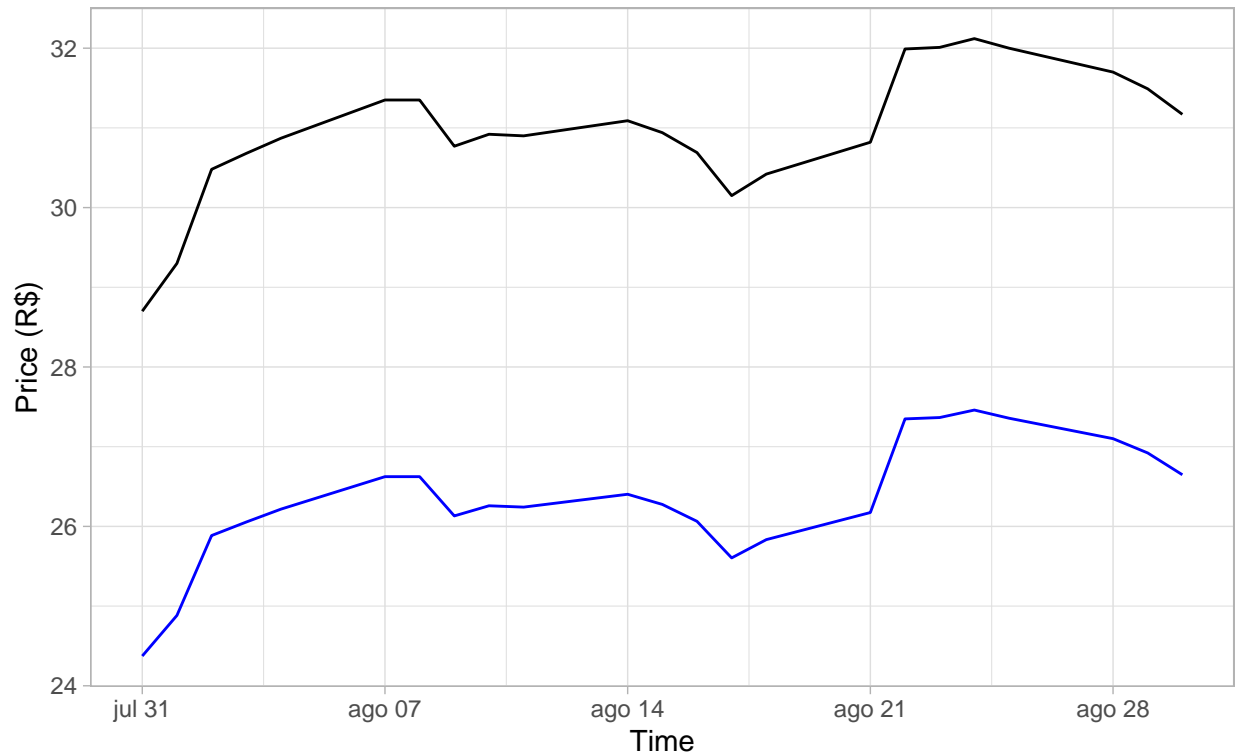
```
##          BBAS3.SA.Open BBAS3.SA.High BBAS3.SA.Low BBAS3.SA.Close
## 2017-07-31          28.73          28.86          28.62          28.70
## 2017-08-01          28.87          29.50          28.75          29.30
## 2017-08-02          29.35          30.61          29.20          30.48
## 2017-08-03          30.48          30.95          30.37          30.68
## 2017-08-04          30.77          30.99          30.52          30.87
## 2017-08-07          30.99          31.47          30.75          31.35
##          BBAS3.SA.Volume BBAS3.SA.Adjusted
## 2017-07-31          3605600          24.37329
## 2017-08-01          7301900          24.88284
## 2017-08-02          8142100          25.88495
## 2017-08-03          7189400          26.05480
## 2017-08-04          4974900          26.21616
## 2017-08-07          4805500          26.62380
```

It's easy to see that the columns are not friendly named. The `getSymbols` function returns the OHLC prices (Open, High, Low and Close, respectively) with the volume and adjusted prices. A good thing to notice is the difference between closing and adjusted price: closing prices include the dividend yield not payed yet, also it do not count for inplits or splits, distortions which preserve the portfolio value of the investor who retains the stocks.

In an example, if I have 10 stocks of Bradesco with value equals to 40, this means that each stock costs 4 Brazilian Reais. Now Bradesco has splitted in a 1:2 ratio and I have 20 stocks, but still 40 in total equity. It happens because of the price dropped from 4 to 2 Brazilian Reais, since there are twice as much Bradesco's stocks in the market as it were before the distortion. The following graphic may clear this up, now with the column names changed.

```
## Don't know how to automatically pick scale for object of type xts/zoo. Defaulting to continuous.
```

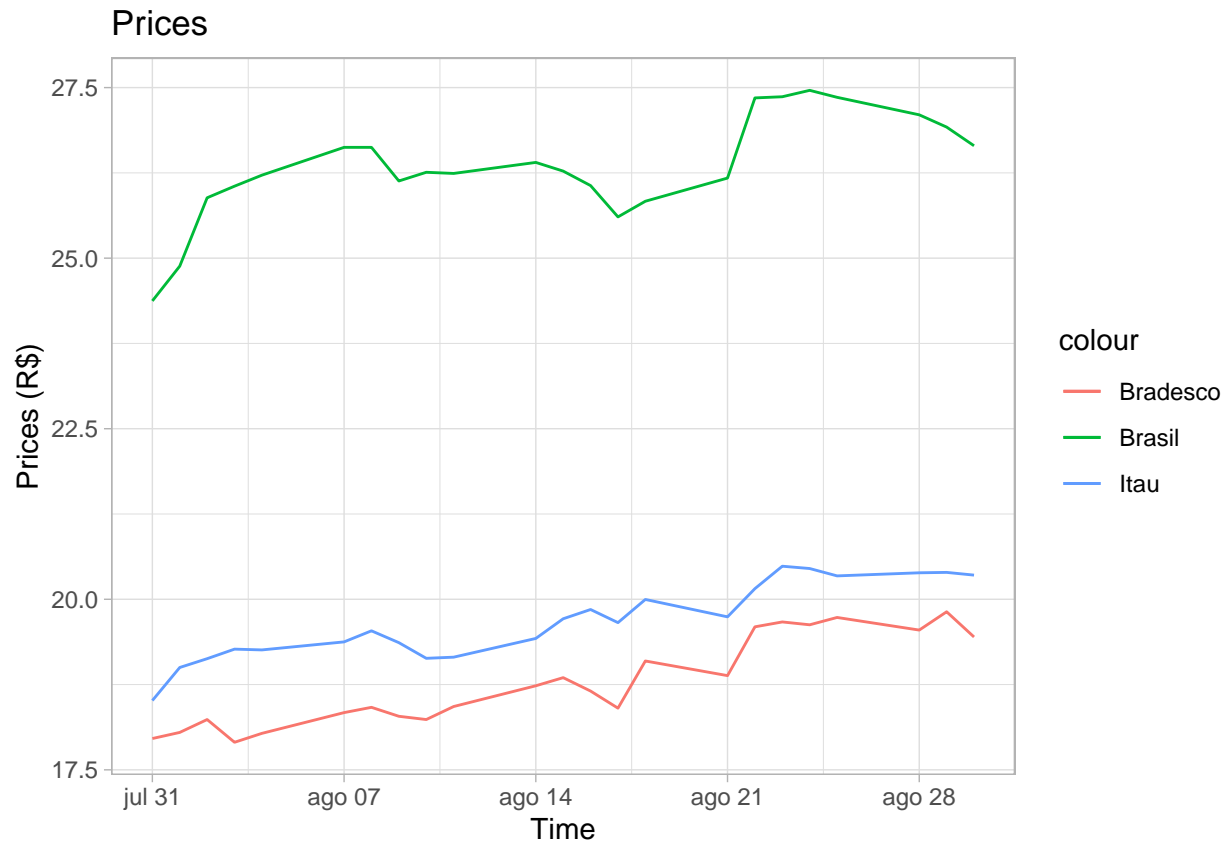
## Close X Adjusted Price Banco do Brasil



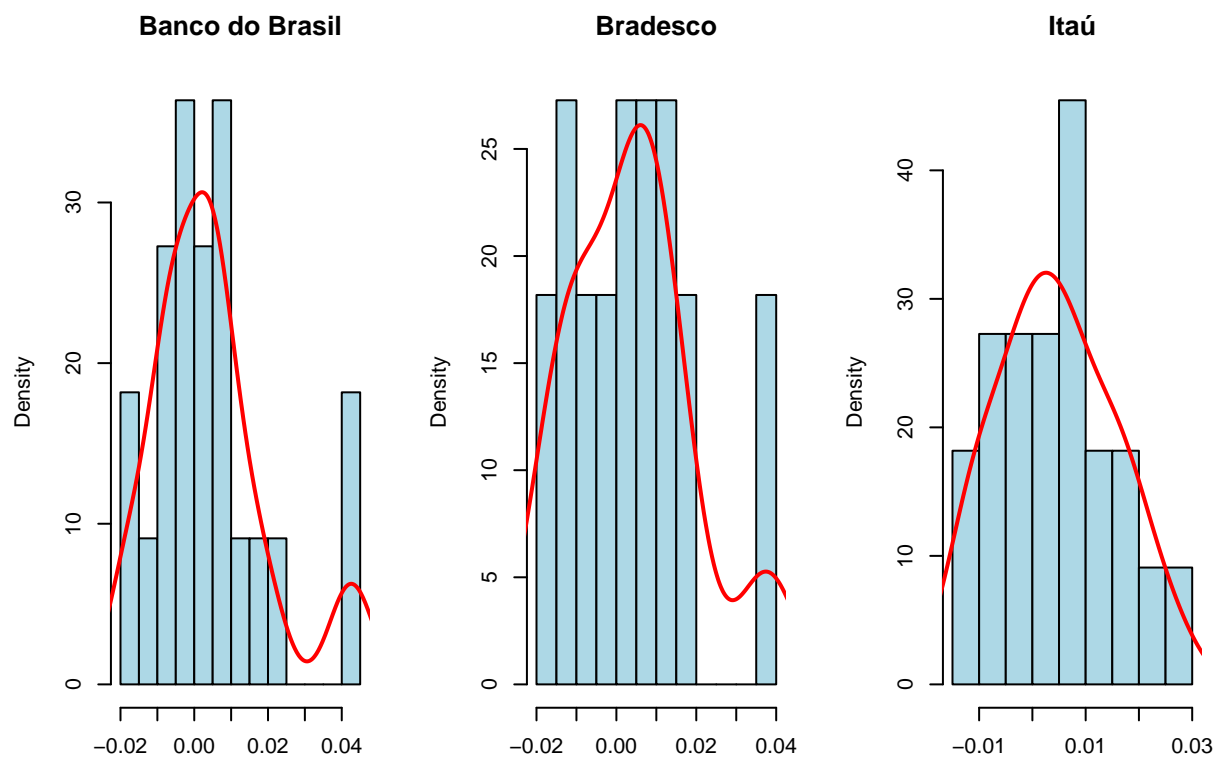
Well, for this analysis I will use only the Adjusted columns. Here it follows a plot of all prices together after merging them into a xts object.

As we can see, their correlation tend to be positive and between 0.3 and 0.6 (I guess). It's very intuitive, these 3 are big banks in Brazilian market and they represent, together, a considerable amount in the Ibovespa, Brazilian principal stock index (^BVSP in Yahoo!Finance).

##	Index	Brasil	Bradesco	Itau
##	Min. :2017-07-31	Min. :24.37	Min. :17.90	Min. :18.52
##	1st Qu.:2017-08-07	1st Qu.:26.06	1st Qu.:18.26	1st Qu.:19.26
##	Median :2017-08-15	Median :26.26	Median :18.65	Median :19.66
##	Mean :2017-08-14	Mean :26.34	Mean :18.78	Mean :19.68
##	3rd Qu.:2017-08-22	3rd Qu.:26.78	3rd Qu.:19.50	3rd Qu.:20.25
##	Max. :2017-08-30	Max. :27.46	Max. :19.82	Max. :20.48



After have seen some statistics, ensure that there are no NA's in the sample and plotting the price evolution, the next step is to calculate the returns in order to continue the portfolio analysis. The corresponding code contains 3 approaches to calculate the returns, I will spare this paper space and focus on the next step: analyzing the characteristics and plotting some information of the returns.

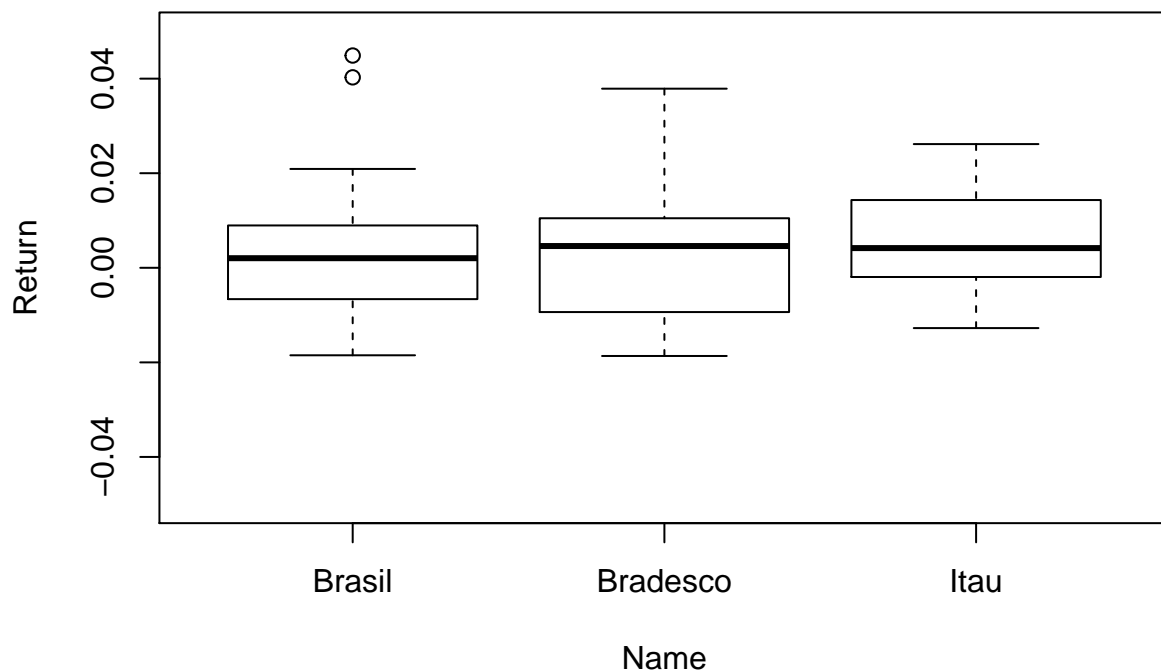


Here, in my opinion, there ain't enough data for us to approximate a Normal or a *t-student* distribution to any of these stocks. Moving forward with the visualization, let's look at the statistics and boxplot of all 3 banks

##	Index	Brasil	Bradesco
##	Min. :2017-07-31	Min. : -0.018501	Min. : -0.018647
##	1st Qu.:2017-08-07	1st Qu.: -0.006175	1st Qu.: -0.008802
##	Median :2017-08-15	Median : 0.002031	Median : 0.004600
##	Mean :2017-08-14	Mean : 0.004183	Mean : 0.003736
##	3rd Qu.:2017-08-22	3rd Qu.: 0.008357	3rd Qu.: 0.010472
##	Max. :2017-08-30	Max. : 0.044889	Max. : 0.037879
##		NA's :1	NA's :1

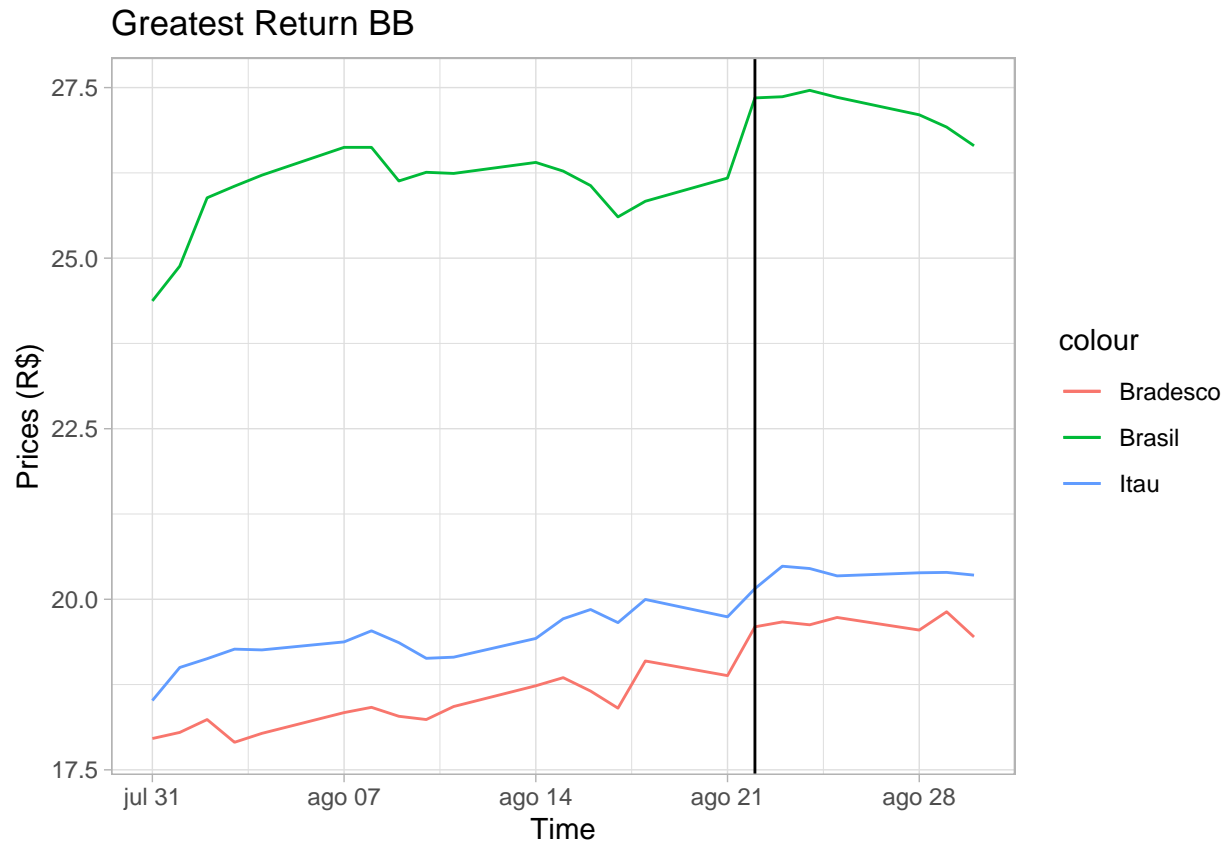
  

##	Itau
##	Min. : -0.012748
##	1st Qu.: -0.001873
##	Median : 0.004167
##	Mean : 0.004368
##	3rd Qu.: 0.012841
##	Max. : 0.026161
##	NA's :1

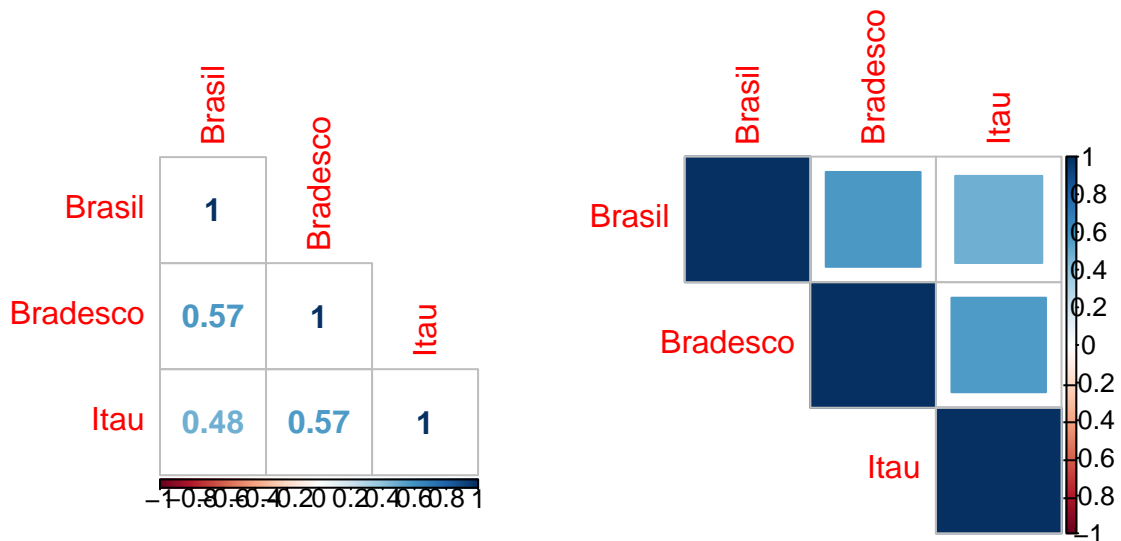


Despite Bradesco and Itaú have no sign of outliers, Banco do Brasil do not show that, those 2 circles in it's boxplot show the occurrence. I will draw a vertical line in the “Prices” plot in the index that maximizes the return on “Brasil” column.

```
##           Brasil   Bradesco      Itau
## 2017-08-22 0.04488892 0.03787899 0.02094653
```



Next step is to calculate the allocations with other information given in class. Also, it'd be nice to check the diversification level (which is low, since all assets are pretty much similar).



Here I confirm my guess, correlated assets. If there is a portfolio like this, it couldn't be classified as a at least "ok" in terms of diversification level.

```
##      Mean Volatility
## 57674.72 162040.79
```

And here is the end of the analysis. We were asked to calculate the mean and volatility of the portfolio using the historical scenarios approach in Excel. I extended the exercise by myself by displaying some visualizations, taking guesses from the density distribution and calculating the correlation. Also, not in this document, I performed 3 different ways of calculating the returns, 2 of them are quite optimal, the other may not be.