

# Financial Econometrics - Homework 2

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## 1 Guidelines

- Deadline: Before April 26, 2019 by email to rombouts@essec.edu; oscarjoel.leonsandoval@essec.edu.
- If you use R, integrate your solutions into R-Markdown allowing you to embed the answers and code in one pdf file. if you use Python, make a Jupyter notebook file.
- Work in groups of 2.
- Explain the code making comments in each step of it.
- Professional presentation and visualisations are part of the evaluation.

## 2 Replication the VIX index?

We are interested in replicating the CBOE Volatility Index or the VIX. We also want to know how good is our estimation of the VIX.

To do this homework, use the file SPX\_2016\_options.csv and download from Yahoo Finance daily adjusted closing prices of the VIX from January 2016 to April 2016.

## QUESTIONS:

1. Clean the data. There are some NaN values.
2. Create a new column with the price of the options (average of the ask and bid prices).
3. Use data with prices larger than 0.05 dollar.
4. Select the options which are Out the Money (for a Call:  $S$  lower than  $K$  and for a Put:  $S$  higher than  $K$ ).
5. For each day and for each maturity in that day, calculate the implied volatility. Hint: Use `RiskNeutralVolatilitySkewKurt_JV KR_3.ipynb`
6. For each date, use the information obtained in the last step and interpolate to get an implied volatility for a maturity of 30 days.
7. Plot the actual VIX and the implied volatility obtained in the last step, and calculate the correlation between this estimate and the actual VIX. Comment.

## 3 EXTRA FOR THE FAST (for fame only)

Calculate the skew and the kurtosis for the same period, and plot them.