Time Series Analysis 2020/2021 – Home Project #2

deadline #1: 2021-07-10
deadline #2: 2021-09-10

Project description:

The aim of the project is to estimate *Value-at-Risk* (VaR) of the portfolio consisting of four financial instruments on the basis of two GARCH-family models (see Engle 2001).

In oder to acomplish the task you should:

1. Choose two models from the GARCH family (for example GARCH and EGARCH).
2. Build the portfolio which consists of **four** financial instruments:
   - list of financial instruments to include: SP&500, DAX, WIG20 and one of the following cryptocurrencies: 1) BTC, 2) ETH, 3) XRP, 4) LTC and 5) BCH
   - weights of each instrument should be equal tp 25% for each day of analysis
3. Conduct for this portfolio a comparison analysis of: (a) estimates of annualized conditional standard deviation in the *in-sample* period produced by the two models, and (b) estimates of the *Value-at-Risk* produced by the two models in the *out-of-sample* period.
4. Prepare a short report on it.

Additional information:

1. Quotations of equity indices are available on the website: `www.stooq.com`
2. Quotations of cryptocurrencies are available on the website: `www.coinmarketcap.com`
3. Alternatively, both equity indices and cryptocurrencies can be downloaded with `getSymbols()` function from the `quandmod` package.
4. The choice of the cryptocurrency to be included in the portfolio should be based on the following formula:
$$\sum_{j=1}^{6} x_j \mod 5 + 1$$
where x_j is the j-th digit of your student ID and mod is the modulo operator. Erasmus students should take digit 9 for the letter `K` in their student ID.
5. The *in-sample* period should start on 2018-01-02.
6. The *out-of-sample* period should last for 365 days and should start on 2020-k-01 where k is given by formula:
$$k = \sum_{j=1}^{6} x_j \mod 6 + 1$$
7. The project should be prepared by the team of **one** or **two** students. If the team consists of two students, the lower student ID should be used for calculations in point 4 and in point 6
8. In your submission you should send a zipped RStudio project which should include:
   - an `Rmd` file your report, including all necessary calculations and visualizations

- a corresponding output file (`html` or `pdf`)
- if necessary, all the data placed in the `csv` files inside the `data/` subfolder.

9. The report should also include: names of the author(s), title, short abstract (4-5 sentences), aim of the study, short data description and results of the analysis.

10. If you keep the deadline #1 you will get the grade before summer vacation.

References:

Engle R. (2001) GARCH 101: The Use of ARCH/GARCH Models in Applied Econometrics, *Journal of Economic Perspectives*, vol. 15, no. 4, pp. 157-168, `https://www.aeaweb.org/articles?id=10.1257/jep.15.4.157`

Good luck!

Maciek and *Paweł*