

# Financial Econometrics I

## Project: Volatility Forecasting

Deadline: day before exam

Summer semester 2021/2022

Max points: 25

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**General information:** Form groups of two students. Project should be submitted to SIS in the module "Study group roster" (Studijni mezivysledky) - Financial Econometrics I - Lecture - Empirical Project as a single file for the whole group, please include names of both students in the file name. Please use HTML generated from Jupyter notebook as a solution file. The solution should be in a form of empirical project with all comments, discussions as well as reproducible codes. Data for the homework are stored in the SIS as "data\_project.zip". "data\_project.zip" contains 35 assets and each group was assigned one asset (see Table 1 on page 3) - for example Group Nr. 1 is going to analyze asset number 4 stored as "4.RData". Each ".RData" file contains an xts file with

- returns (ret),
  - realized volatility (RV),
  - positive realized semi-volatility (RV\_p),
  - negative realized semi-volatility (RV\_n),
  - realized skewness (RS),
  - realized kurtosis (RK).
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The project should include following parts:

1. **Data description:** Provide short summary of descriptive statistics, ACF plots and plots of data you are going to use.
2. **In-sample fit:** Estimate parameters of the following volatility models with full sample size: AR(1)-RV, HAR, HAR-RS, HAR-Rskew-RKurt, Realized GARCH, ARMA-GARCH. Discuss the fits and compare qualitative differences of the estimates shortly. Note you can simply use the plot comparing in-sample fits of all models.

3. **Forecasts:** Compare an out-of-sample forecasting performance of the models from previous part using two forecasting schemes:
  - (i) Expanding window, with starting window length of 750.
  - (ii) Rolling window, with the window length 750.Plot and compare forecast errors from all models, compute loss functions (MSE and MAE), compare model forecasts statistically using the Diebold-Mariano test (use the MSE loss). Evaluate all single model forecasts with the Minzer-Zarnowitz regression.
4. **Summary:** Write a short summary (up to 1/2 page) focused on comparison of model performance.

**Final Exam information:** During the oral final exam, members of the group will be examined together. The final exam will start with short summary of the project, followed by general discussion. Students should show a clear understanding of problems covered during the semester.

Group Nr.	Student 1	Student 2	Assigned Asset
1	Baylan Su Hazal	Ergüzel Oylum Sehvez	4
2	Bartušek Daniel, Bc.	Čala Petr, Bc.	18
3	Čechová Tereza, Bc.	Tůma Adam, Bc.	11
4	Jarina Vesna, Bc.	Šešulka Marek, Bc.	29
5	Petřík Theodor, Bc.	Vaněk Karel, Bc.	17
6	Pinlová Adriana, Bc.	Teiml Matěj, Bc.	5
7	Kubal Jan, Bc.	Mattanelli Matyáš, Bc.	31
8	Suchánek Jan, Bc.	Suchánek Vojtěch, Bc.	30
9	Cvrček Jan, Bc.	Stuchlík Jan, Bc.	20
10	Krejcar Vilém, Bc.	Stejskal Jakub, Bc.	19
11	Karlíček Ondřej, Bc.	Kvorka Matej, Bc.	16
12	Bajgarová Barbora, Bc.	Matoušek Daniel, Bc.	3
13	Broško Daniel, Bc.	Gregor Jiří, Bc.	1
14	Dvořáček Petr, Bc.	Provazník Jan, Bc.	21
15	Kohoutová Petra, Bc.	Slavík Adam	24
16	Kalashyan Nelli	Mertová Veronika, Bc.	2
17	Konvičný Martin	Beran Lukáš	27
18	Mikušek Vít, Bc.	Ratajová Kateřina	34
19	Řanda Martin, Bc.	Kořínek Matěj, Bc.	28
20	Stavarová Nikola, Bc.	Žiačík Jan, Bc.	6
21	Juračková Martina, Bc.		10
22	Zhang Lin, M.A.	Qu Weiwei	12
23	Krouparová Ivana, Bc.	Barotov Timur, Bc.	14
24	Laursen Sebastian Wium Berko	Kos Jiří	8
25	Žíla Eric, Bc.	Vachušková Karolína, Bc.	25
26	Chen Ziran	Leiendeckers Jérôme	9
27	Toulová Natálie, Bc.	Ježek Jan, Bc.	32
28	Suchomel Tomáš, Bc.	Leiva Fung Manuel Alfonso Lucio	35
29	Suntychová Petra, Bc.	Neumann Pavel, Bc.	13
30			7
31			26

Table 1