Financial Econometrics I

Project: Volatility Forecasting

Deadline: day before exam | Summer semester 2023/2024 | Max points: 25

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) - for example Group Nr. 1 is going to analyze asset number 24 stored as "24.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).

The project should include following parts:

1. **Data description**: Provide short summary of descriptive statistics, ACF plots and plots of data you are goding 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.

Table 1: groups - assets

Group Nr.	Student 1	Student 2	Assigned Asset
1	Aydin Caglar		24
2	Bakošová Diana, Bc.	Tesařová Štěpánka	27
3	Blihárová Terézia	Moravčíková Gabriela	3
4	Brunner Bernhard	Křenková Pavlína, Bc.	30
5	Černý David, Bc.	Hrušák Jan, Bc.	25
6	Daňa Marek	Vondrášek Martin, Bc.	15
7	Doškář Jakub, Bc.	Chilima Nundo	18
8	Dvořáková Natálie, Bc.	Švíková Kateřina, Bc.	33
9	Erben Marek, Bc.	Kubů Vít, Bc.	13
10	Escudero Rivera Nicolas		26
11	Hadžić Aner, Bc.	Šamaj Tomáš, Bc.	12
12	Hakenová Anna, Bc.	Pachl Michael, Bc.	6
13	Hatalová Lucia Mária, Bc.	Sůva Daniel, Bc.	32
14	Hodzic Aida	Zayat Alex Farid	34
15	Horváth Ondrej, Bc.	Zoubková Michaela, Bc.	21
16	Hutahaean Andrew Daud		22
17	Jisl Václav	Štěpánová Sára, Bc.	10
18	Jurišta Jakub, Bc.	Kotlan Ivan, Bc.	7
19	Khalilov Arif		5
20	László József Bence		35
21	Liehman Jan, Bc.		17
22	Louda Jaroslav, Bc.	Žáček Vít	31
23	Markalousová Tereza, Bc.	Strašlipka Jakub, Bc.	11
24	Mikulenka Jiří		1
25	Novotný Lukáš, Bc.	Ovcharenko Vladyslav, Bc.	8
26	Odvárková Zuzana, Bc.	Vo Quang Linh, Bc.	19
27	Orjonikidze Ekaterina, B.Sc.	Skeja Lum	14
28	Pivoňková Alexandra, Bc.	Vandasová Daniela, Bc.	29
29	Robovský Tomáš		23
30	Rulíšek Filip, Bc.	Zelený Ondřej, Bc.	4
31	Svoboda Tomáš, Bc.	Veřtát Kryštof, Bc.	2
32	Šuráň František, Bc.	Usov Artem, Bc.	9
33	Zhumagulova Aigerim		28
34			20
35			16