

Statistical finance: Exam

3 hours-No document allowed

January 2023

- 1) What is the market portfolio ? In the CAPM model, at equilibrium, what is the portfolio of the agents made of ? Give the CAPM equation for the expected return of an asset. How can one test statistically for the validity of the CAPM ?
- 2) Define the Ridge estimator and provide its closed form formula (without proof). What is the interest of Ridge estimator compared to ordinary least squares ? What does Lasso mean ? Define the Lasso estimator. What is the interest of Lasso estimator compared to Ridge ? How do we choose the regularization parameter (λ) of the Ridge and Lasso estimators ? Give one example of situation where Ridge or Lasso estimators are useful in finance.
- 3) You work for a brokerage company, with access to an accurate database about past transactions, order flows and order books. Your mission is to build an algorithm enabling you to buy in 8 hours 600.000 Hermes stocks and 300.000 LVMH stocks. Which mathematical tools, models and statistical methods do you use to build it (give mathematical formulas when needed) ? How do you implement and calibrate the models ? What do you measure on data in the construction process ? How do you run some testing procedures ? (2 pages maximum)
- 4) How do you assess the quality of the tick value for a given asset ?
- 5) Based on the elements seen in the lectures, comment in a critical way the enclosed article (no need to go through the mathematical proofs).

Suggestion : Questions 1-4 : 1 hour, reading : 1 hour, comment : 1 hour.