**Exam format**

1. Part 1. Pick up randomly one of the topics below. 20 minutes preparation and then be ready to talk about the topic for about 15 min. Introduce the topic and expose what you know about it in detail. You will not be interrupted, possible questions at the end if something is wrong or not precise.

* By 20 min preparation, I mean the following. Before your exam starts, we pick up a topic at random, you are given 20-30 minutes to collect the ideas and focus on this topic only, then your exam starts. If another student is taking the exam, your preparation time terminates when his/her examination is over.
* For this part you can write down (on a piece of paper or a blackboard) formulas and equations, providing comments and interpretation. You are not asked to prove any result. However, you need to know how the proofs work and know when and where certain assumptions are needed in proofs (e.g. “assumption about zero-mean errors is needed to prove the unbiasedness of the OLS estimator”). Details on proofs may be asked if there are problems and flaws with your exposition, or if the exam is very good and you are about to go for a quite high mark.
* In the exam sessions that are entirely online, you won’t write down anything, the exposition is entirely oral. Nevertheless, you should be able to tell e.g. definitions, and show that you know how things are computed and mathematically work. Provide details and be convincing that you know what you are talking about. Be ready for detailed questions after your exposition is over and for a discussion on it.
* No notes allowed (at the exam, yes during preparation).

To make online and face to face exams fair:

* As those taking the exam online are clearly not writing down anything, you **can** use the blackboard or paper **if you want** during face-to-face exams.

1. Part 2. Random question from a chapter different than the one from the topic. Quite generic, not with too mathematical details.
2. Part 3. Question about a topic in chapter 4.

**Topics, tentative to clearily defined by the end of the course**

1. Prices, Returns, Distribution of returns, LOB (1:2, 1:3) – Part 2 on chapter 2 (OLS) or 3 (Statistical & Asymptotic Properties)
2. Moments and Stylized facts (1:4, 1:5) – Part 2 on chapter 2 or 3
3. OLS (2:3$1-5) – Part 2 on chapter 1 (Moments &stylized facts) or 3
4. MLR (3:1, 3:2, 3:3) – Part 2 on chapter 1 or 2
5. Statistical properties (3:4, 3:5) – Part 2 on chapter 1 or 2

1:2 means Chapter 1, section 2. 2:3$1 means Chapter 2 section 1 subsections 1 to 5.

**Macro-areas for questions in Part 2**

Chapter 1:

* Types of data
* Prices & Returns & Distribution of returns
* Limit-order book
* Moments
  + Moments and moments estimators, finite sample distribution
  + Definition and interpretation of convergence in probability and distribution, asymptotic distribution of the sample mean and variance
* Stylized facts

Chapter 2:

* CAPM
  + Risks
  + Sharpe-Lintner CAPM
* OLS
  + Idea, assumptions (Derive the OLS estimator, b0 and b1 are unbiased, sig^2 is the unconditional variance of u, variance of b0 and b1)
  + Properties of the estimators
  + Normality and testing

Chapter 3:

* The MLR model and assumptions, OLS for MLR (Proofs: Derivation of the OLS solution)
* Statistical properties of the OLS estimator (Proofs: show that the estimator is unbiased, variance of the OLS estimator, normality of the finite sample distribution for b)
* Asymptotic properties

Chapter 4 – **Any of these is asked in Part 4**

* Tests:
* Normality: JB
* Homoscedasticity: GQ
* Autocorrelation: White, DW, BG, Test on ACF (1:5)
* Multicollinearity issue and RESET test
* Omitted variable, Parameter stability, Chow test
* Error in variable models