

Background Course in Probability and Statistics + Matlab course outline

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1 The general aim of the course and skills to be learnt

The main goal of the course is to give the researchers introduction to the formal, measure theoretic probability theory. I start from combinatorics, this allows me to base the discussion on researchers' intuitions and basic knowledge from their undergraduate studies (I assume this as a minimum); the material covered here is also useful in the Econometrics Block I course. Then I move to measure theory and explain its application to probability, I emphasize also the connections/discrepancies with combinatorial approach and concentrate on explaining this highly abstract approach; the material covered here is the basis of modern probability and decision theory, statistics and econometrics as well as some micro-foundations of economics, essential for understanding and working in any field just enumerated. Finally I discuss the connection of probability with statistics and introduce a key concept of conditional probability.

The hard skills I expect the researchers to master are mainly working with formal and abstract concepts by proving theorems; this skills will be needed in other courses of the Econometrics and Statistics sequence and the researchers should get used to this formalization. A set of examples showing some connection with "real life" is provided as well.

The Background Course in Probability and Statistics is supplemented with some introductory classes to numerical computing environment Matlab.

This introduction is supposed to cover the most basic, general and practical issues. Some examples illustrating probability concepts will be given.

2 The plan of the course

The course consists of six classes of the main course plus two classes of Matlab introduction. The basic concepts are explained in the lectures, homework is then assigned together with complementary readings, finally exercises are solved together in the exercises classes. The plan is as follows (subject to changes):

1. combinatorics – lecture (30 Aug)
2. Matlab (31 Aug)
3. combinatorics – exercises (1 Sep)
4. probability theory – lecture (2 Sep)
5. Matlab (3 Sep)
6. probability theory – exercises (6 Sep)
7. statistics – lecture (8 Sep)
8. statistics – exercises (10 Sep)

3 Texts and references

1. main text: *Probability and Statistical Inference* by Bartoszynski and Niewiadomska-Bugaj chapters 2–4 (LIB 519.2BAR), but any introductory probability textbook is good
2. supplementary readings