

Proof-Based Math Readings

Session: Large Sample Theory*

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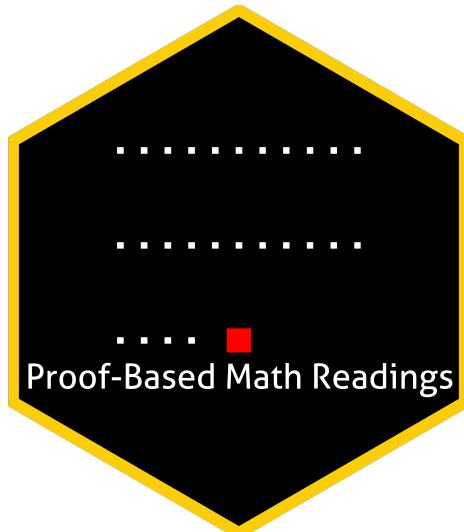
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Table of contents

0 Motivation	2
1 Prerequisites	2
2 Format	2
3 Resources	2
3.1 Main Book and Main Book's Playlist	2
3.2 Supplementary	2
3.2.1 Large-Sample Theory	2
3.2.2 Proof Techniques	2
3.2.3 Real Analysis	2
4 Reading Schedule	3
5 Further Readings (Optional)	3



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0 Motivation

- *Proof-Based Math Readings* is a free, independent online reading group where we study the mathematics required for economics master's and PhD programs through an intuitive approach. Active since May 2023.
- This session of the reading group is on *Large Sample Theory*.

1 Prerequisites

- Proof Techniques and Real Analysis resources below.
- Please use the  [Application Form](#) to join our reading group; you will receive a response within a week.

2 Format

- This session takes 12 weeks. We do not have face-to-face/online meetings due to the size of the group.
- Members read the main book and discuss the topics/exercises in the Proof-Based Math Readings Discord .

3 Resources

3.1 Main Book and Main Book's Playlist

Elements of Large-Sample Theory - Erich L. Lehmann (1999) is our main book for this session because it is well-written and well-structured.

Jingyi Jessica Li's playlist is our main playlist because her narrative is great.

-  Elements of Large-Sample Theory - Erich L. Lehmann (1999) → Easier but doesn't contain solutions
-  Elements of Large-Sample Theory - Erich L. Lehmann (1999, Errata)
-  A Course in Large Sample Theory - Thomas S. Ferguson (2002) → Harder but contains solutions
-  A Course in Large Sample Theory - Thomas S. Ferguson (2002, Errata)
-  A Course in Large Sample Theory - Thomas S. Ferguson (2002, Playlist by Jingyi Jessica Li)
-  A Course in Large Sample Theory - Thomas S. Ferguson (2002, Notes by Jingyi Jessica Li)

3.2 Supplementary

3.2.1 Large-Sample Theory

-  Notes for a Graduate-Level Course in Asymptotics for Statisticians - David R. Hunter (2025)
-  Understanding Convergence Concepts: A Visual-Minded and Graphical Simulation-Based Approach - P. Micheaux, B. Liquet (2009)

3.2.2 Proof Techniques

-  Book of Proof - Richard Hammack (3.4 Edition, 2025)
-  Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Jeremy Teitelbaum)
-  Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Michael Penn)

3.2.3 Real Analysis

-  Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.2, 2025)
-  Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.2, 2025, Playlist by Casey Rodriguez)
-  Introduction To Metric Spaces - Paige Bright (2023)

4 Reading Schedule

- ELST is the abbreviation of Elements of Large-Sample Theory - Erich L. Lehmann (1999).

ELST, Chapter 1: Mathematical Background	Week 01-02	
1.1 The concept of limit 1.2 Embedding sequences 1.3 Infinite series 1.4 Order relations and rates of convergence 1.5 Continuity 1.6 Distributions		
ELST, Chapter 2: Convergence in Probability and in Law	Week 03-04-05-06	
2.1 Convergence in probability 2.2 Applications 2.3 Convergence in law 2.4 The central limit theorem 2.5 Taylor's theorem and the delta method 2.6 Uniform convergence 2.7 The CLT for independent non-identical random variables 2.8 Central limit theorem for dependent variables		
ELST, Chapter 3: Performance of Statistical Tests	Week 07-08-09	
3.1 Critical values 3.2 Comparing two treatments 3.3 Power and sample size 3.4 Comparison of tests: Relative efficiency 3.5 Robustness		
ELST, Chapter 4: Estimation	Week 10-11-12	
4.1 Confidence intervals 4.2 Accuracy of point estimators 4.3 Comparing estimators 4.4 Sampling from a finite population		

5 Further Readings (Optional)

Asymptotic Theory for Econometricians - Halbert White (Revised Edition, 2000)