

Reference Reading List for SEMM Doctoral Preliminary Examination

Statistics

References

- DS** DeGroot, Schervish. *Probability and Statistics*. 4th Edition, Pearson, 2012.
HTZ Hogg, Tanis, Zimmerman. *Probability and Statistical Inference*. 10th Edition, Pearson, 2018.
PP Papoulis, Pillai. *Probability, random variables, and stochastic processes*. 4th Edition, McGraw-Hill, 2002

Subject

1. **Basic rules of probability:** axioms of probability, conditional probability, Bayes' rule, statistical independence, the law of total probability
 - DS Chapter 1 and Chapter 2
 - HTZ Chapter 1
 - PP Chapter 1,2,3

2. **Probability distributions:** random variables, probability mass functions, probability density functions, cumulative distribution functions, conditional distributions, functions of random variables, basic probability models: uniform, Binomial, Poisson, Gaussian, discrete-time finite-state Markov chain
 - DS Chapter 3 and Chapter 5
 - HTZ Chapter 2,3,4,5 (HTZ does not cover Markov chains)
 - PP Chapter 4,5,6,7,15

3. **Expectations:** variance, covariance, moments, (Pearson) correlation coefficient, expectations of functions of random variables, conditional expectations, moment generating functions
 - DS Chapter 4
 - HTZ Chapter 2,3,4,5
 - PP Chapter 5,6,7

4. **Asymptotic theorems:** Markov and Chebyshev inequalities, the law of large numbers, the central limit theorem
 - DS Chapter 6
 - HTZ Chapter 5
 - PP Chapter 7

5. **Statistical Inference:** maximum likelihood estimation, method of moments, Bayesian estimation, binary hypothesis test
 - DS Chapter 7 and Chapter 9
 - HTZ Chapter 6 and Chapter 8
 - PP Chapter 8

6. **Regression:** linear regression with maximum likelihood estimation
 - DS Chapter 11
 - HTZ Chapter 6