TOPICS AND READINGS

This outline lays out the topics that we should try to cover in this half of the course. If viewed online, there should be clickable links in the text.

Kallenberg (2002) is an advanced, thorough, account of probability and stochastic process theory. It assumes solid grounding in real analysis and measure theory. It is listed here only as a reference, for students whose mathematical background is strong and may want to pursue topics in this course at a more advanced or rigorous level.

The Hamilton (1994) book covers many widely used models, though it is somewhat dated and has little coverage of modern Bayesian approaches.

The Bauwens, Lubrano, and Richard (1999) book is closer in approach to this part of the course than is Hamilton's but because of its variations in mathematical level and choice of topics only parts of it are assigned reading.

This half of the course will primarily discuss inference from a Bayesian perspective. Books that lay out this perspective incude Schervish (1995), Robert (1994), Berger (1985), Geweke (2006), Lancaster (2004) and Gelman, Carlin, Stern, Dunson, Vehtari, and Rubin (2014). They have somewhat different choices of topics and assume varying levels of mathematical background, with Schervish the most demanding and Lancaster or Gelman et al the least, in this respect. Geweke and Lancaster are both oriented toward econometrics, while the others are oriented toward statistics.

A reference for Monte Carlo computational methods for sampling from posterior densities is Robert and Casella (2004).

A book written by the computer scientist MacKay (2003), provides an introduction to many of the ideas you will encounter in this course the principles of Bayesian inference, its connection to decision theory, Monte Carlo methods for characterizing posterior distibutions, and contrasts of Bayesian and frequentist interpretations of evidence. It uses lots of examples, though none of these are from economics. It also contains material on machine learning and information theory that will not connect to this course but that has potential application in economic theory and econometrics. The book can be purchased (for about $50), but it also is available for online viewing and can be downloaded (but not printed out) at no charge, via the URL `http://www.inference.phy.cam.ac.uk/mackay/itprnn/book.html`.

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Exercises will require computation and use of some computer language. Since I use R almost exclusively now, code examples that I provide will be in R. Though Matlab is somewhat more widely used among economists, you might consider learning R even though you already know Matab (or Octave, its open-source near-equivalent). R is free to download, has some advantages over Matlab as a language, and has a huge list of "packages" that aid in various kinds of analysis.

(1) Inference: Bayesian basics
    (a) Decision theory
    (b) Complete class theorems
    (c) Likelihood principle
    (d) Bayesian scientific reporting
    (MacKay, 2003, Sections 2.1-3, Chapter 3, Chapters 21-24, 36-37)
    Ferguson (1967)
    Class notes.
(2) Priors and posteriors for VARs
    (a) Dummy observation priors.
        Sims and Zha (1998)
        Notes: Dummy observation priors
        Giannone, Lenza, and Primiceri (2016)
    (b) Impulse response functions
        Sims and Zha (1999)
(3) Exogeneity, Granger causality, Wold and Granger causal orderings
(4) Modeling initial conditions and trend
    (a) High-order AR + conditioning on initial conditions + flat prior belief in likely historical uniqueness of sample start date
    (b) Unit roots
    (c) Cointegration
    (d) Realistic modeling of uncertainty about the long run vs. removing trend.
    Sims (revised 1996)
    Sims (1989)
    Sims (2000)
    (Hamilton, 1994, section 19.1)
    Sims and Uhlig (1991)
(5) Structural VARs and identification
    (a) Delay restrictions
    (b) Long run restrictions
    (c) Restrictions on impulse responses
    (d) Identification through heteroskedasticity
(6) Importance Sampling, Metropolis-Hastings MCMC
    (a) Importance sampling and its pitfalls

(b) Metropolis Markov Chains and their pitfalls
(c) Metropolis-Hastings
(d) "Gibbs" Sampling
(e) Assessing convergence
(f) Computing marginal data density
(MacKay, 2003, Chapters 27-30)
Gelman, Carlin, Stern, and Rubin (2004), Chapters 10-13
Notes: Proof of Fixed Point Property for Metropolis Algorithm"
Bridge and path sampling. Gelman and Meng (1998)
Sequential MCMC for DSGE's: Herbst and Schorfheide (2016)

(7) Particle Filtering
Kantas, Doucet, Singh, Maciejowski, and Chopin (2915)
Doucet and Johansen (2008)
Shephard (2013)

(8) More models
(a) Dynamic factor models
(b) Stochastic volatility

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