Yale University **ECON 556a Guest Lectures**

These are review questions that you can use to self-study the material. Some are difficult, others are fairly straightforward. You can find most of the answers to these questions in the slides. Enjoy!

Sequential Monte Carlo

Q1. What are the three steps in each iteration of a SMC algorithm? Why is the selection step needed? Why is the mutation step needed?

Q2. What is the difference between likelihood tempering and data tempering? What are the advantages and disadvantages of the two tempering schemes?

Q3. Does the the tuning parameter λ affect the number of required likelihood evaluations?

Q4. What would be the advantage of executing multiple Metropolis-Hastings steps during the mutation phase?

Q5. In the book we recommend to initialize the SMC with draws from the prior distribution. What are potential advantages and disadvantages of this initialization?

Q6. Provide an outline for a recursive proof that shows that the SMC approximation $\bar{h}_N$ converges almost surely to $\mathbb{E}_\pi[h]$.

Particle Filters

Q1. What is the difference between the bootstrap particle filter and the conditionally-optimal particle filter?

Q2. Can the conditionally-optimal particle filter be implemented in a nonlinear DSGE model?

Q3. Why is the resampling step needed in the particle filter?

Q4. TRUE or FALSE: the smaller the measurement error in the state-space representation, the more accurate the particle filter approximation. Explain.

Q5. How do outliers in your sample affect the accuracy of particle filter approximations?

Q6. Is the particle filter approximation of the likelihood function unbiased? Why do we care?