

Prototype Comprehensive Exam Questions  
Accompanying Week 2

1. Explain why Mandelbrot argued in 1963 that stock returns are not normally distributed.
  - What did Mandelbrot propose as a model for stock return distributions?
    - (a) Explain in detail how this model is different from / similar to the normal distribution.
    - (b) Explain Blattberg and Gonedes' (1974) critique of Mandelbrot's model.

*Hints: The property of stability under addition should be discussed intuitively and formally. Answers should stress that these are models of marginal distributions (i.e., unconditional). Your answer should include the parameterization of the models. Your answer should show familiarity with the empirical literature on return distributions.*

2. Provide an intuitive and formal discussion of Clark's 1973 subordinated stochastic process model for speculative prices. Discuss in detail Clark's empirical analysis.
3. Describe in detail the model that Tauchen and Pitts (1983) estimate. Show carefully how they estimate their model—providing a discussion of exactly what they estimate and how they do it. Discuss the sense in which Tauchen and Pitts *test* their model.
4. Write down the likelihood function of a Gaussian GARCH(1,1) model. Discuss how you can use the BHHH algorithm to estimate the model and obtain the variance-covariance matrix of the coefficients. Discuss how testing the model may give rise to a “Davies’ problem.” Explain the essence of this “Davies’ problem,” and how a Bayesian econometrician handles it differently from a frequentist.
5. Discuss in detail the model estimated by Lamoureux and Lastrapes (1990 *Journal of Finance*). How is this related to Clark (1973) and Tauchen and Pitts (1983)? Discuss Lamoureux and Lastrapes' results, with emphasis on their implications for understanding the origins of “GARCH effects” in stock returns.
6. Demonstrate Roll's (1984) “simple implicit measure of the bid-ask spread. How do Niederhoffer and Osborne (1966) anticipate this?
7. Provide a sketch of the Hull and White (1987) model of option valuation with stochastic volatility. Explain how this model generates a “volatility smile.”
8. Contrast Heston's model of option valuation with stochastic volatility (1993) with that of Hull and White (1987). Discuss the empirical performance of both models.

9. Provide a précis of the realized volatility literature. Be sure to include careful discussions of the quadratic variation theorem and Zhang, Mykland, and Aït-Sahalia's 2005 *JASA* paper.
10. Write down Merton's jump-diffusion model for option pricing, and explain the appeal of jumps in modeling stock return dynamics. Following Honoré (1998) explain formally why "standard" maximum likelihood estimation of this model is "invalid."