Possible Models for Term Papers, ORFE 569

Group 1: GBM (or with jumps) type Micromovement Models

1. X_t is GBM. Poisson process for trading times has a constant intensity λ. Noise has rounding (tick size is 100 for stock, or 64 or 128 for bond), plus non-clustering with some forms of doubly geometric distributions. Then, plus clustering.

   Related References: Zeng (2003) (tick size 1/8), Spalding, Tsui, and Zeng (2006) (tick size 1/16).

2. X_t is GBM. Poisson process for trading times has a constant intensity λ. Noise has rounding (tick size is 100 for stock, or 64 or 128 for bond), plus non-clustering with a normal distribution with mean zero and variance γ^2.

   The estimate of γ is of particular interest related to how accurate the realized volatility estimates are. See Li and Mykland (2006) at (http://www.stat.uchicago.edu/techreports/tr564.pdf) pages 12-16.

3. Detection for the change of drift or/and diffusion in GBM with noise

   (a) X_t is GBM, but μ changes to μ_1 at an exponential time θ. Then, add the trading intensity and noise as above. The interesting question is to calculate the probability of the change time.

   (b) X_t is GBM, but σ changes to σ_1 at an exponential time θ. Then, add the trading intensity and noise as above. The interesting question is to calculate the probability of the change time.

   (c) X_t is GBM, but (μ, σ) changes to (μ_1, σ_1) at an exponential time θ. Then, add the trading intensity and noise as above. The interesting question is to calculate the probability of the change time.

4. Merton Lognormal Jump GBM Model (*Journal of Financial Economics* 1976) with the trading intensity and noise as described above (tick size can be 1/8).

5. Double Exponential Jump Diffusion (DEJD) Model (S. Kou *Management Sciences* 2002, or *Annals of Finance* Ramezani and Zeng 2007) with the trading intensity and noise as described above (tick size can be 1/8).

6. GBM Micromovement model for Ask - Bid Quotes (with the trading intensity and noise as described above (tick size can be 1/8).

Group 2: GBM with drift or diffusion term related to other variables (order flow or with some adjustment can be a good candidate) with similar trading intensity and noise.

Group 3: Stochastic Volatility type Micromovement Models

1. Heston Model (*Reviews of Financial Studies* 1993) with the trading intensity and noise as described above (tick size can be 1/8).

2. The limiting diffusion model of GARCH(1,1) (D. Nelson *Journal of Econometrics* 1990) with the trading intensity and noise as described above (tick size can be 1/8).

3. The limiting diffusion model of AR(1) Exponential ARCH(1,1) (D. Nelson *Journal of Econometrics* 1990) with the trading intensity and noise as described above (tick size can be 1/8).