**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 $\lambda$. 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.


2. $X_t$ is GBM. Poisson process for trading times has a constant intensity $\lambda$. 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 $\gamma^2$.

   The estimate of $\gamma$ 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 $\mu$ changes to $\mu_1$ at an exponential time $\theta$. 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 $\sigma$ changes to $\sigma_1$ at an exponential time $\theta$. 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 $(\mu, \sigma)$ changes to $(\mu_1, \sigma_1)$ at an exponential time $\theta$. 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).