Modelling share price evolution as a Continuous Time Random Walk with non-independent waiting times and price changes.

Przemysław Repetowicz and Peter Richmond
Department of Physics, Trinity College Dublin 2, Ireland

In the talk I am going to explain how stock market share prices can be described quantitatively as a continuous time random walk with independent, identicaly distributed Lévy stable increments. Previous works [1,2,3] which exploit this approach assume that commodity price changes x and waiting times between transactions t are independent random variables. Real market data does not seem to support this assumption though; ie statistical χ^2 tests suggest that there should be a monotonuous dependence of x on t. I will present a theory, developed in our group, which bases on [1,2,3] and drops the assumption of independence of x and t. The analytical results are compared with Japanese Yen/US $ exchange rate data collected over the period from 1989 to 1998 with a minute frequency. The goodness of the fit and the kind of dependence of x on t is discussed.

[1] F. Mainardi et al., Fractional calculus and continuous-time finance II: the waiting time distribution, Physica A **287** (2000) 468–481
[2] E. Scalas et al., Fractional calculus and continuous-time finance, Physica A **284** (2000) 376–384
[3] E.W Montroll, G.H. Weiss, Random walks on lattices II, J. Math. Phys. **6** (1965) 167–181