

# PROBABILITY SEMINAR

## Title: Modeling Financial Time Series with Lévy Driven Ornstein-Uhlenbeck Processes

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Date: 05/18/2018

Time: 2:15pm

Place: Room MAT-A(Miniauditorium)

**Abstract:** In this seminar, we present some challenges and alternatives for the parameter estimation of Lévy driven Ornstein-Uhlenbeck (OU) processes. In particular, we describe the attempts to estimate the parameters of a Lévy driven OU process that models the empirical data of the dollar interest rate, from the perspective of a Brazilian resident (the so called *foreign exchange coupon*), implied by the difference between the USD-BRL rate in future and in spot markets. The goodness of fit is evaluated through a Kolmogorov-Smirnov test between the distribution of the changes in the empirical data and the distribution of changes in the process simulated from the estimated parameters.

## References

- [1] Abdelrazeq, I., Ivanoff, B., and Kulik, R. (2014). Model verification for Lévy-driven Ornstein-Uhlenbeck processes. *Electronic Journal Of Statistics*, **8**(1), 1029-1062. doi: 10.1214/14-ejs919
- [2] Abdelrazeq, I. (2015). Model verification for Lévy-driven Ornstein-Uhlenbeck processes with estimated parameters. *Statistics & Probability Letters*, **104**, 26-35. doi: 10.1016/j.spl.2015.04.014
- [3] Barndorff-Nielsen, O., and Shephard, N. (2001). Non-Gaussian Ornstein-Uhlenbeck-based models and some of their uses in financial economics. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, **63**(2), 167-241. doi: 10.1111/1467-9868.00282
- [4] Brockwell, P., Davis, R., and Yang, Y. (2007). Estimation for Nonnegative Lévy-Driven Ornstein-Uhlenbeck Processes. *Journal Of Applied Probability*, **44**(04), 977-989. doi: 10.1017/s0021900200003673
- [5] Brockwell, P., and Schlemm, E. (2013). Parametric estimation of the driving Lévy process of multivariate CARMA processes from discrete observations. *Journal Of Multivariate Analysis*, **115**, 217-251. doi: 10.1016/j.jmva.2012.09.004

- [6] Chertok, A., Kadaner, A. I., and Sokolov, G. T. (2016). Regime switching detection for the levy driven Ornstein-Uhlenbeck process using CUSUM methods. *Informatics and Applications*, **10**(12), 46-56. doi: 10.14357/19922264160405
- [7] Diop, A., and Yode, A. (2010). Minimum distance parameter estimation for Ornstein-Uhlenbeck processes driven by Lévy process. *Statistics & Probability Letters*, **80**(2), 122-127. doi: 10.1016/j.spl.2009.09.020
- [8] Stein, J., Lopes, S., and Medino, A. (2016). Continuous processes derived from the solution of generalized Langevin equation: theoretical properties and estimation. *Journal of Statistical Computation and Simulation*, **86**(14), 2819-2845. doi: 10.1080/00949655.2015.1132318
- [9] Long, H. (2009). Least squares estimator for discretely observed Ornstein-Uhlenbeck processes with small Lévy noises. *Statistics & Probability Letters*, **79**(19), 2076-2085. doi: 10.1016/j.spl.2009.06.018
- [10] Jongbloed, G., Van Der Meulen, F., and Van Der Vaart, A. (2005). Nonparametric inference for Lévy-driven Ornstein-Uhlenbeck processes. *Bernoulli*, **11**(5), 759-791. doi: 10.3150/bj/1130077593
- [11] Spiliopoulos, K. (2009). Method of Moments Estimation of Ornstein-Uhlenbeck Processes Driven by General Lévy Process. *Annales de l'I.S.U.P.*, **53**(2-3).
- [12] Mai, H. (2014). Efficient maximum likelihood estimation for Lévy-driven Ornstein-Uhlenbeck processes. *Bernoulli*, **20**(2), 919-957. doi: 10.3150/13-bej510
- [13] Masuda, H. (2004). On multidimensional Ornstein-Uhlenbeck processes driven by a general Lévy process. *Bernoulli*, **10**(1), 97-120. doi: 10.3150/bj/1077544605
- [14] Valdivieso, L., Schoutens, W., and Tuerlinckx, F. (2008). Maximum likelihood estimation in processes of Ornstein-Uhlenbeck type. *Statistical Inference For Stochastic Processes*, **12**(1), 1-19. doi: 10.1007/s11203-008-9021-8