

**Krühner, Paul; Schnurr, Alexander**

**Time change equations for Lévy-type processes.** (English) Zbl 1382.60110  
Stochastic Processes Appl. 128, No. 3, 963-978 (2018).

Summary: We consider time change equations for Lévy-type processes. In this context we generalize the results of *B. Böttcher* et al. [Lévy matters III. Lévy-type processes: construction, approximation and sample path properties. Cham: Springer (2013; [Zbl 1384.60004](#))] significantly. Namely, we are able to incorporate measurable instead of continuous multipliers. This opens a gate to find whole classes of symbols for which corresponding processes do exist. In order to establish our results we carefully analyze the connection between time change equations and classical initial value problems. This relationship allows us to transfer well-known results from this classical subject of pure mathematics into the theory of stochastic processes. On the way to prove our main theorem we establish generalizations of results on paths of Lévy-type processes.

**MSC:**

60J75 Jump processes (MSC2010)  
45G10 Other nonlinear integral equations  
60G17 Sample path properties

Cited in 1 Document

**Keywords:**

Lévy-type process; symbol; random time change; multiplicative perturbation

**Full Text:** [DOI](#) [arXiv](#)

**References:**

- [1] Barndorff-Nielsen, O. E., Processes of normal inverse Gaussian type, *Finance Stoch.*, 2, 41-68, (1998) · [Zbl 0894.90011](#)
- [2] Blumenthal, R. M.; Gettoor, R. K., *Markov Processes and Potential Theory*, (1968), Academic Press · [Zbl 0169.49204](#)
- [3] Böttcher, B.; Schilling, R. L.; Wang, J., *Lévy Matters III*, (2013), Springer
- [4] Cinlar, E.; Jacod, J.; Protter, P.; Sharpe, M. J., Semimartingales and Markov processes, *Z. Wahrscheinlichkeitstheor. Verwandte Geb.*, 54, 161-219, (1980) · [Zbl 0443.60074](#)
- [5] Döring, L., A jump-type sde approach to real-valued self-similar Markov processes, *Trans. Amer. Math. Soc.*, 367, 7797-7836, (2015) · [Zbl 1326.60109](#)
- [6] L.Döring, B. Horvath, J. Teichmann, Functional Analytic (Ir-)Regularity Properties of SABR-Type Processes. Preprint, submitted. · [Zbl 1396.91579](#)
- [7] Dorroh, J. R., Contraction semigroups in a function space, *Pacific J. Math.*, 19, 35-38, (1966) · [Zbl 0143.16504](#)
- [8] Engelbert, H. J.; Schmidt, W., On solutions of stochastic differential equations without drift, *Z. Wahrscheinlichkeitstheor. Verwandte Geb.*, 68, 287-317, (1985) · [Zbl 0535.60049](#)
- [9] Ethier, S.; Kurtz, T., *Markov Processes. Characterization and Convergence*, (1986), Wiley · [Zbl 0592.60049](#)
- [10] Fuglede, B., *Finely Harmonic Functions*, (1972), Springer · [Zbl 0248.31010](#)
- [11] Fukushima, M.; Oshima, Y.; Takeda, M., *Dirichlet Forms and Symmetric Markov Processes*, (2011), Walter deGruyter
- [12] A. Gabrielli, J. Teichmann, Pathwise construction of affine processes, [arxiv:1412.7837](#), preprint.
- [13] Gustafson, K.; Lumer, G., Multiplicative perturbation of semigroup generators, *Pacific J. Math.*, 41, 731-742, (1972) · [Zbl 0228.47028](#)
- [14] Jacob, N., Further pseudodifferential operators generating Feller semigroups and Dirichlet forms, *Rev. Mat. Iberoam.*, 9, 373-407, (1993) · [Zbl 0780.31007](#)
- [15] Jacob, N.; Schilling, R. L., Lévy-type processes and pseudo-differential operators, (Barndorff-Nielsen, O. E.; Mikosch, T.; Resnick, S. I., *Lévy Processes: Theory and Applications*, (2001), Birkhäuser), 139-167
- [16] Jacod, J.; Shiryaev, A., *Limit Theorems for Stochastic Processes*, (2003), Springer · [Zbl 1018.60002](#)
- [17] Kallenberg, O., *Foundations of Modern Probability*, (2002), Springer · [Zbl 0996.60001](#)
- [18] Kallsen, J., A didactic note on affine stochastic volatility models, (Kabanov, Y.; Liptser, R.; Stoyanov, J., *From Stochastic Calculus to Mathematical Finance*, (2006), Springer), 343-368 · [Zbl 1104.60024](#)

- [19] Karatzas, I.; Shreve, S., *Methods of Mathematical Finance*, (1998), Springer · [Zbl 0941.91032](#)
- [20] Lamperti, J., Semi-stable Markov processes. I., *Z. Wahrscheinlichkeitstheor. Verwandte Geb.*, 22, 205-225, (1972) · [Zbl 0274.60052](#)
- [21] Revuz, D.; Yor, M., *Continuous Martingales and Brownian Motion*, (2005), Springer · [Zbl 1087.60040](#)
- [22] Schilling, R. L., Growth and Hölder conditions for the sample paths of Feller processes, *Probab. Theory Related Fields*, 112, 565-611, (1998) · [Zbl 0930.60013](#)
- [23] Schilling, R. L.; Song, R.; Vondraček, Z., *Bernstein Functions: Theory and Applications*, (2012), De Gruyter
- [24] Schnurr, A., Generalization of the blumenthal-gettoor index to the class of homogeneous diffusions with jumps and some applications, *Bernoulli*, 19, 2010-2032, (2013) · [Zbl 1301.60092](#)
- [25] Volkonskii, V. A., Random substitution of time in strong Markov processes, *Theory Probab. Appl.*, 3, 310-326, (1958)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.