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On stationary solutions of the SDE $dV_t = V_{t-}dU_t + dL_t$

Abstract: The starting point of our research is the SDE

$$dV_t = V_{t-}dU_t + dL_t, t \geq 0$$

where $(U_t, L_t)_{t\geq 0}$ is a bivariate Lévy process.
In the case that $(U_t)_{t\geq 0}$ exhibits no jumps of size less or equal to -1 the unique solution $(V_t)_{t\geq 0}$ of the given SDE is known to be the generalised Ornstein-Uhlenbeck process

$$V_t = e^{-\xi_t}\left(V_0 + \int_0^t e^{\xi_{s-}} d\eta_s\right), t \geq 0$$

driven by $(\xi_t, \eta_t)_{t\geq 0}$ with starting random variable V_0. Hereby the bivariate Lévy process $(\xi_t, \eta_t)_{0\leq t}$ is completely determined by $(U_t, L_t)_{t\geq 0}$.
If the starting random variable V_0 is independent of $(\xi_t, \eta_t)_{t\geq 0}$, the process $(V_t)_{t\geq 0}$ is called causal. Stationary solutions of causal generalised Ornstein-Uhlenbeck processes have been studied by Lindner and Maller [LM] in detail. In our research we generalise these results on the one hand by allowing $(U_t)_{t\geq 0}$ to exhibit jumps which are smaller or equal to -1 and on the other hand by disposing of the causality condition.

This is joint work with Alexander Lindner and Ross Maller.

References

[LM] Lindner, A.; Maller, R.: Lévy integrals and the stationarity of generalised Ornstein-Uhlenbeck processes. *Stochastic Process. Appl.*, **115**, 10, 1701-1722, (2005).