# On the construction of a Lévy-type process associated with a stable-dominated Lévy-type kernel

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Consider the integro-differential equation operator $L$, defined on functions from the space $C^2_\infty(\mathbb{R}^d)$ of twice continuously differentiable functions with vanishing at infinity derivatives as

$$Lf(x) := \int_{\mathbb{R}^d} \big(f(x+u) - f(x) - u\cdot\nabla f(x) 1_{\{|u|\le 1\}}\big)\, \nu(x,du), \tag{1}$$

where the kernel $\nu(x,du)$ is comparable with a Lévy measure $\nu_0$, such that

$$\nu_0(A) = \int_{\mathbb{S}^d}\int_0^\infty 1_A(r\theta) r^{-1-\alpha}\, dr \mu_0(d\theta)\,, \quad A\subset\mathbb{R}^d, \quad \alpha\in(0,2), \tag{2}$$

$\mu(A)=\mu(-A)$ for $A\subset\mathbb{R}^d$, and for small $r$

$$\nu_0(B(x,r)) \le r^\gamma, \quad |x|=1, \quad \gamma+\alpha>d.$$

Our goal is to show that the extension of $(L, C^2_\infty(\mathbb{R}^d))$ is the generator of a Feller semigroup $(T_t)_{t\ge 0}$, on the space $C_\infty(\mathbb{R}^d)$ of continuous functions vanishing at infinity, which in turn corresponds to a Feller process $X_t$:

$$T_t f(x) = \mathbb{E}^x f(X_t), \quad f\in C_\infty(\mathbb{R}^d),\ t>0.$$

Our construction relies on the parametrix method. As a part of the construction, we prove that the process $X$ admits the transition probability density, derive the the upper bound on it, and prove some regularity properties.

The talk relies of the joint work with Krzysztof Bogdan and Pawel Sztonyk.

## References

[1] K. Bogdan, V. Knopova, P. Sztonyk. *Transition densities of parastable Markov processes.* In preparation.