KERNEL ESTIMATES FOR KOLMOGOROV EQUATIONS WITH UNBOUNDED DIFFUSION COEFFICIENTS

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Abstract. Using time dependent Lyapunov functions, we prove pointwise upper bounds for the heat kernels of a large class of Kolmogorov operators with possibly unbounded drift and diffusion coefficients. As an application we show that the kernel $p_t$ of the semigroup generated by the operator

$$(A\varphi)(x) = (1 + |x|^m)\text{Tr}(Q^0(x)D^2\varphi(x)) - b(x)|x|^{p-1}x \cdot \nabla \varphi(x)$$

satisfy

$$0 < p_t(x,y) \leq t^{-\beta}e^{-\delta_0 t^\alpha|y|^{p+1-m}}, \quad t \in (0,1], x, y \in \mathbb{R}^d,$$

where $m \geq 0$, $p > \max\{m - 1,1\}$, $\alpha > (p + 1 - m)/(p - 1)$ and $\delta_0$, $\beta$ are suitable positive constants. Here $Q^0$ and $b$ are, respectively, a matrix valued function and a scalar function satisfying appropriate conditions. This generalizes the examples in [1] and [2].

References


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