Abstract

We study the one-dimensional stochastic differential equation of the form
\[ X_t = x_0 + \int_0^t B(X_s^-)dM_s + K_t, \quad t \geq 0, \]
where the volatility \( b : [0, \infty) \to \mathbb{R} \) is a Borel measurable function, \( x_0 \in [0, \infty) \) is an arbitrary initial value, the process \( X \) is nonnegative, \( K \) is a right-continuous increasing process with \( K_0 = 0 \), and \( M \) is a symmetric stable process of arbitrary stability index \( 0 < \alpha \leq 2 \) with \( M_0 = 0 \). The process \( K \) satisfies the condition
\[ \int_0^\infty 1_{\{X_t \neq 0\}} dK_t = 0, \]
that means that \( K \) is a reflecting force for the solution \( X \). For every \( x_0 \in [0, \infty) \) we prove the existence and uniqueness of a reflected solution \( X \) with \( X_0 = x_0 \). In particular, our results generalize the results of W. M. Schmidt (1989) who considered the given SDE in the case of the Brownian motion (\( \alpha = 2 \)).