## Short time asymptotics for semimartingales and an application for short maturity index options in a multivariate jump-diffusion model

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We extend and unify the shorttime asymptotics of the marginal laws of a stochastic process to the more general case when  $\xi$  is a ddimensional discontinuous semimartingale with jumps. We compute the leading term in the asymptotics in terms of the local characteristics of the semimartingale. In contrast to previous derivations, our approach is purely based on Ito calculus, and makes no use of the Markov property or independence of increments. We derive in particular the asymptotic behavior of call options with short maturity in a semimartingale model: whereas the behavior of outofthemoney options is found to be linear in time, the short time asymptotics of atthemoney options is shown to depend on the fine structure of the semimartingale. Our multidimensional setting allows to treat examples which are not accessible using previous results (e.g the index process). We propose an analytical approximation for short maturity index options, generalizing the approach by Avellaneda & I 03 to the multivariate jump-diffusion case.