Asymptotic Expansions for High-frequency Option Data

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We derive a nonparametric higher-order asymptotic expansion for small- time changes of conditional characteristic functions of Itô semimartingale increments. The asymptotics setup is of joint type: both the length of the time interval of the increment of the underlying process and the time gap between evaluating the conditional characteristic function are shrinking. The spot semimartingale characteristics of the underlying process as well as their spot semimartingale characteristics appear as leading terms in the derived asymptotic expansions. The analysis applies to a general class of Itô semi- martingales that includes in particular Lévy-driven SDEs and time-changed Lévy processes. The asymptotic expansion results are subsequently used to construct a test for whether volatility jumps are of finite or infinite variation. In an application to high-frequency data of options written on the S&P 500 index, we find evidence for infinite variation volatility jumps.