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The short-time asymptotic behavior of option prices for a variety of models with jumps has received much attention in recent years. In the present work, a novel second-order approximation for ATM option prices is derived for a large class of exponential Lévy models with or without Brownian component. The results hereafter shed new light on the connection between both the volatility of the continuous component and the jump parameters and the behavior of ATM option prices near expiration. The asymptotic behavior of the corresponding Black-Scholes implied volatilities is also addressed. Our approach is sufficiently general to cover a wide class of Lévy processes which satisfy the latter property and whose Lévy densities can be closely approximated by a stable density near the origin. Our numerical results show that first-order term typically exhibits rather poor performance and that the second-order term significantly improves the approximation's accuracy. (Received August 15, 2013)