Title: Options under Stable Laws.

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Abstract: Stable laws play a central role in the convergence problems of sums of independent random variables. In general, densities of stable laws are represented by special functions, and expressions via elementary functions are known only for a very few special cases. The convenient tool for investigating the properties of stable laws is provided by integral transformations. In particular, the Fourier transform and Mellin transform are greatly useful methods. We first discuss the Fourier transform and we give overview on the known results. Next we consider the Mellin transform and its applicability on the problem of the product of two independent random variables. We establish the density of the product of two independent stable random variables, discuss the properties of this product density and give its representation in terms of power series and Fox's H-functions. The fourth chapter of this thesis is focused on the application of stable laws into option pricing. In particular, we generalize the model introduced by Louise Bachelier into stable laws. We establish the option pricing formulas under this model, which we refer to as the Lévy Flight Model, or more succinctly the levy model. We discuss the resulting self-similar volatility surfaces, give the approximative formulas of the volatility smiles and consider the hedging issues under levy model.

Keywords: one-dimensional stable laws, Mellin transform, product of independent random variables, levy model, self-similar volatility surfaces