

# Exact and explicit forms and combinatorial content of Lévy stable distributions

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We briefly recall the origin, history and some physical applications of Lévy stable probability distributions. We report on recent findings of exact and explicit expressions for one-sided ( $0 < \alpha < 1$ ) and two-sided ( $1 < \alpha \leq 2$ ) Lévy stable densities  $g_\alpha(x)$ , of index  $\alpha$  for all  $\alpha = l/k$ , with  $k$  and  $l$  positive integers. We shall exemplify analytically and graphically several examples of known and infinite ensemble of new formulae for such distributions. We observe that in one-sided case ( $0 < l/k < 1$ )  $g_{l/k}(x)$  is a solution of the Stieltjes moment problem with *negative moments* being integer combinatorial sequences of factorial type. This last property, when seen as a conventional Stieltjes moment problem, can be solved with the use of inverse Mellin transform. In this way we derive an explicit formulae for  $g_{l/k}(x)$  in terms of Meijer G functions. The problem of non-uniqueness of so obtained solutions is discussed.