# Deviation from the Normal Distribution in Finance and its Consequences

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## Abstract

The normal distribution is an important assumption in financial models. This paper reviews several financial models which assume the normal distribution. We checked daily, weekly and monthly returns of different assets for the normality of their distributions, for the auto-correlation and the stationarity. We discuss the consequence of non-normally distributed returns for estimating the Value-at-Risk (VaR). Historical Simulation, the Variance-Covariance model, the RiskMetrics approach, the GARCH (1, 1) approach and simulations, all were applied to calculate the Value-at-Risk. The Value-at-Risks were estimated under the normal distribution assumption and the t location scale distribution assumption. Improvements of VaR estimation methods in other papers and literatures are quickly reviewed and explained.

Our findings confirm the non-normality of the return distribution. VaRs assuming the normal distribution do underestimate risks and are exceeded far too often. The T location scale distribution helps to improve the performance of the VaR estimation. The findings suggest using the RiskMetrics T approach or the GARCH T approach to calculate the VaR.

**Keywords:** normal distribution, t location scale distribution, normality test, heavy tails, VaR, RiskMetrics approach, GARCH approach, simulation