

# Asymptotic mixed normality of realized covariance in high-dimensions

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**Abstract:** The asymptotic mixed normality of the realized covariance matrix for a multi-dimensional continuous semimartingale observed at a high-frequency is established, where the dimension may be much larger than the sample size. More precisely, a mixed-normal approximation of the error distribution in terms of the Kolmogorov distance is shown in such a setting. The proof is based on a variant of the Chernozhukov-Chetverikov-Kato theory on high-dimensional central limit theorems for sums of independent random vectors, where the theory is accommodated to random asymptotic covariance matrices with the help of Malliavin calculus. Application to testing the residual sparsity of a continuous-time factor model is presented.