



Covariance matrix estimation for stationary time series

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We obtain a sharp convergence rate for banded covariance matrix estimates of stationary processes. A precise order of magnitude is derived for spectral radius of sample covariance matrices. We also consider a thresholded covariance matrix estimator that can better characterize sparsity if the true covariance matrix is sparse. As our main tool, we implement Toeplitz [Math. Ann. 70 (1911) 351-376] idea and relate eigenvalues of covariance matrices to the spectral densities or Fourier transforms of the covariances. We develop a large deviation result for quadratic forms of stationary processes using m-dependence approximation, under the framework of causal representation and physical dependence measures.

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