

Title: Forecasting Value-at-Risk and Expected Shortfall in Large Portfolios

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Abstract: We develop concentration inequalities for the  $\ell$ -infinity norm of vector linear processes on mixingale sequences with sub-Weibull tails. These inequalities make use of the Beveridge-Nelson decomposition, which reduces the problem to concentration for the sup-norm of a vector-mixingale or its weighted sum. Using this decomposition, we derive a concentration bound for the maximum entrywise norm of autocovariance matrices of linear processes. These results are useful for estimation bounds for high-dimensional vector autoregressive processes estimated using  $\ell$ -1 regularization, high-dimensional Gaussian bootstrap for time series, and long-run covariance matrix estimation.