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Prediction error matrix under model misspecification for multivariate harmonic time series regression models

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Abstract. We consider the one-step-ahead prediction error matrix under misspecification caused by overfitting periodic components in the multivariate harmonic regression models. We show that the prediction error matrix obtained from the multivariate harmonic regression model admits a decomposition into the prediction error matrix of an autoregressive model and a periodic component characterized by the spectral density matrix. This decomposition provides a theoretical characterization of the effect of the model misspecification on prediction accuracy. In the data analysis, we apply the proposed decomposition with estimated parameters to the temperature data, leading to a basis for constructing an information criterion for selecting periodic components.