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Functional time series model identification and diagnosis by means of auto- and partial autocorrelation analysis

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Abstract-

Quantifying the serial correlation across time lags is a crucial step in the identification and diagnosis of a time series model. Simple and partial autocorrelation functions of the time series are the most widely used tools for this purpose with scalar time series. Nevertheless, there is a lack of an established method for the identification of functional time series (FTS) models. Functional versions of the autocorrelation and partial autocorrelation functions for FTS based on the L2 norm of the lagged autocovariance operators of the series are proposed. Diagnostic plots of these functions coupled with prediction bounds derived from large sample results for the autocorrelation and partial autocorrelation functions estimated from a strong functional white noise series are proposed as fast and efficient tools for selecting the order and assessing the adequacy of functional SARMAX models. These methods are studied in numerical simulations with both white noise and serially correlated functional processes, which show that the structure of the processes can be well identified using the proposed techniques. The applicability of the method is illustrated with two real-world datasets: Eurodollar futures contracts and electricity price profiles.

Index Terms- Autocorrelation; Partial autocorrelation; Functional time series; Model diagnosis

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