

Time Series of Functional Data for Forecasting the Yield Curve and Electricity Prices

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We develop time series analysis of functional data, treating the whole curve as a random realization from a distribution on functions that evolve over time. The method consists of principal components analysis of functional data and subsequently modeling the principal component scores as vector ARMA process. We carry out the estimation of VARMA parameters using the equivalent state space representation. We derive asymptotic properties of the estimators and the fits. We apply the method to two different data sets. For term structures of interest rates, this provides a unified framework for studying the time and maturity components of interest rates under one set-up with few parametric assumptions. We compare our forecasts to the parametric Diebold and Li (2006) model. We apply this approach to hourly spot prices of electricity and obtain fits and forecasts that are better than those existing in the electricity literature.

Key Words: Functional Principal Component, Vector Autoregressive Moving Average, Yield Curve, Electricity Spot Price, Functional Regression, Forecast.