

# Adaptive estimation for Weakly Dependent Functional Times Series

Hassan Maïssoro<sup>1,2</sup>, Valentin Patilea<sup>1</sup>, and Myriam Vimond<sup>1</sup>

<sup>1</sup>Univ Rennes, Ensai, CNRS, CREST (Center for Research in Economics and Statistics) - UMR 9194,  
F-35000 Rennes, France

<sup>2</sup>Datastorm, F-91120 Palaiseau - France

## Abstract

We study the local regularity of weakly dependent functional time series, under  $L^p - m$ -approximability assumptions. The sample paths are observed with error at possibly random, design points. Non-asymptotic concentration bounds of the regularity estimators are derived. As an application, we build nonparametric mean and autocovariance functions estimators that adapt to the regularity of the sample paths and the design which can be sparse or dense. We also derive the asymptotic normality of the adaptive mean function estimator which allows for honest inference for irregular mean functions. An extensive simulation study and a real data application illustrate the good performance of the new estimators.

**Key words:** Adaptive estimator; autocovariance function; Hölder exponent; Optimal smoothing  
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