Abstract

This thesis consists of four contributions to the literature on data-driven and non-parametric modelling of time series. In the first paper, we study the synchronisation of business cycles and propose a multivariate co-movement measure based on time-frequency cohesion. We suggest that economic integration may lead to increased co-movement of business cycles, which may reflect the benefits of convergence and coordination of economic policies. The second paper presents a new methodology for identifying persistence in macroeconomic variables. Using time-varying frequency response functions, we identify heterogeneous persistence effects in US macroeconomic variables. The third and fourth papers propose data-driven techniques for probabilistic forecasting of time series using deep learning. We introduce a multi-output neural network that selects the most appropriate distribution for the data. The distributional neural network is valuable for modelling data with non-linear, non-Gaussian and asymmetric structures. The third paper demonstrates the usefulness of the method by estimating information-rich macroeconomic fan charts and distributional forecasts of asset returns. In the last paper, we present the distributional neural network to obtain the probability distribution of electricity price forecasts. We forecast hourly day-ahead data for German electricity and make comparisons with state-of-the-art models in the electricity price forecasting literature.

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Author's e-mail	`lubos.hanus@gmail.com`
Supervisor's e-mail	`vachal@utia.cas.cz`