Summary

This thesis addresses different aspects of observation-driven time series modeling. The main contributions concern the reliability of likelihood-based inference and the specification of dynamic models to capture complex behaviors observed in time series data.

As concerns inference, the main focus of the thesis is on invertibility conditions for observation-driven time series models. Invertibility plays a key role in ensuring the consistency of likelihood-based estimators. However, the invertibility conditions typically employed in the literature are often unfeasible to be checked. Therefore, the reliability of inference fails to be guaranteed in practice. This thesis contributes to the literature by deriving feasible conditions that ensure the consistency of the maximum likelihood estimator for a wide class of models. One of the most appealing features of our consistency results is that they hold for both correctly specified and misspecified models. Several empirical examples covering different observation-driven models are presented. These examples highlight the practical relevance of the theoretical results.

As concerns model specification, we cover two lines of research. The first is related to integer-valued time series data. We propose an extension to the class of Integer-valued Autoregressive models that allows the survival probability to vary over time. We show how our model can be easily estimated by maximum likelihood and we prove the consistency of the estimator. The flexibility of the proposed approach is shown through a simulation experiment and an application to a real time series of crime reports. Finally, the second line of research on model specification is an extension of the Generalized Autoregressive Score framework. We propose a class of models that updates time-varying parameters at different speeds in different time periods. The new updating equation can be employed to describe time series where the amount of information contained in the data is changing over time. This peculiarity is highlighted through a simulation study and we provide theoretical foundations for the proposed approach. Furthermore, two empirical applications to S&P 500 stock returns and US inflation illustrate how our method can be useful in practice.