

# **A Flexible Approach to Parametric Inference in Nonlinear Time Series Models**

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Abstract:

Many structural break and regime-switching models have been used with macroeconomic and financial data. In this paper, we develop an extremely flexible parametric model which can accommodate virtually any of these specifications -- and does so in a simple way which allows for straightforward Bayesian inference. The basic idea underlying our model is that it adds two simple concepts to a standard state space framework. These ideas are ordering and distance. By ordering the data in various ways, we can accommodate a wide variety of nonlinear time series models, including those with regime-switching and structural breaks. By allowing the state equation variances to depend on the distance between observations, the parameters can evolve in a wide variety of ways, allowing for everything from models exhibiting abrupt change (e.g. threshold autoregressive models or standard structural break models) to those which allow for a gradual evolution of parameters (e.g. smooth transition autoregressive models or time varying parameter models). We show how our model will (approximately) nest virtually every popular model in the regime-switching and structural break literatures. Bayesian econometric methods for inference in this model are developed. Because we stay within a state space framework, these methods are relatively straightforward, drawing on the existing literature. We use artificial data to show the advantages of our approach, before providing two empirical illustrations involving the modeling of real GDP growth.