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★**Elements of nonlinear time series analysis and forecasting.**

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The book describes main statistical procedures used in modern nonlinear time series analysis. Ideas lying behind these procedures are explained and detailed algorithms for calculating various (and sometimes rather complicated) statistics are presented. However, the book contains no theorems and consequently no proofs; instead, references to original articles are given.

In Chapter 1 the main study object, nonlinear time series, is introduced as an antithesis to linear models defined by

$$Y_t = \varepsilon_t + \sum_{i\geq 1} \psi_i \varepsilon_{t-i}, \quad t \in \mathbb{Z}, \tag{1}$$

where $\sum_i \psi_i^2 < \infty$ and (ε_t) is a family of iid random variables. Chapter 2 gives many examples of nonlinear models, while Chapter 3 defines some theoretical concepts (like ergodicity).

The next two chapters describe tests for linearity (the null hypothesis is that the observed time series follows (1) and gaussianity, which means that, in addition to (1), the ε_t are assumed to be normally distributed). Tests based on the properties of bispectrum of linear processes (Chapter 4), as well as tests based on embedding model (1) into some parametric class of nonlinear models (Chapter 5) are considered.

Chapter 6 is devoted to parameter estimation in the models, where both the conditional mean and variance of Y_t (given ε_s, $s < t$) are known parametric functions of $(Y_{t-1}, \ldots, Y_{t-p}, \varepsilon_{t-1}, \ldots, \varepsilon_{t-q})$. Information criteria for model selection (in particular, selection of p and q), as well as model diagnostics are briefly discussed. Chapter 7 presents many tests for serial independence, which are also used for model diagnostics.

Chapter 8 lies somehow aside of the main stream of the book and discusses various tests for time reversibility (which means that, for all $m \geq 2$, the vectors $(Y_1, \ldots, Y_m)$ and $(Y_m, \ldots, Y_1)$ are identically distributed).

The next two chapters are devoted to forecasting: non-parametric and semi-parametric methods are discussed in Chapter 9, while Chapter 10 presents procedures used in more specific parametric models. Finally, in Chapters 11 and 12 some statistical procedures discussed earlier are adopted for the vector-valued time series.

Each chapter ends with a section containing various exercises, both theoretical and simulation, which makes the book suitable for a graduate course in nonlinear time series. Each chapter also contains a section with useful information about the existing software (mainly in `MATLAB` and `R`) related to the topic of the chapter. *Vytautas Kazakevičius*