

Time series analysis is a part of mathematical statistics representing a useful tool for data elaboration in several areas. It has a lot of interesting applications. A time series is an ordered sequence of observations. We can record daily closing stock prices, weekly interest rates or monthly price indices in business and economics, annual birth or mortality rates in demography, accident rates or unemployment rates in social sciences, EKG and EEG tracings in medicine, annual crop production in agriculture, daily temperature or annual rainfall in meteorology, electric signals in engineering and many other characteristics in different fields of human activity.

It is possible to model such series in time or spectral domain the former being preferred for economic time series. The classical approach is represented by so called Box-Jenkins methodology working with stationary autoregressive and moving average processes, this means with linear models for univariate and multivariate time series (e.g. [13], [26], [22]). Recently, the theory of nonstationary and nonlinear models has developed rapidly corresponding to the need of such models in practice, we can mention description and forecasting financial time series (e.g. [17], [19], [25]).

Nevertheless, linear models are still frequently applied mainly due to the implementation of identification, estimation and prediction procedures in different types of statistical software. The common software products usually do not offer data analysis by means of more general nonstationary and nonlinear models. The normality of the process is assumed in most theoretical works on linear models. In this case, parameters of the models can be estimated using the well known least squares or maximum likelihood approach. The asymptotic behaviour of such estimates has been studied in detail.

Various situations in practice allow to suppose in advance that the data can be only non-negative. A nonparametric approach supposing that the distribution of the process may not be normal can be applied in such cases. Therefore some authors studied non-negative ARMA processes with a nonspecified continuous distribution during the last twenty five years and constructed procedures for estimating parameters in such models. It has been shown by simulation studies and by analysis of real data that they represent an acceptable alternative when a normal model does not fit the data well, especially in the case of simple ARMA models and small sample sizes (see e.g. [11], [4], [5], [1]).

This book summarizes some results obtained in this field by its author and other scientists. Both univariate and multivariate ARMA processes have been analyzed. The asymptotic properties of the proposed estimates are proved and investigated in simulation studies. Some models for estimating non-negative time series have been applied to real data sets from hydrology, meteorology and finances. The results received using new methods have been compared with the ones given by standard procedures implemented in various types of statistical and mathematical software.