43 Integer-valued autoregressive models: reliable and practical multivariate perspectives

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SECTION: Discrete-Valued Time Series

In recent years, a considerable effort has been devoted to the development of models appropriate for discrete valued time series (Fokianos, 2012; Davis et al., 2014). Such data usually occur in the form of counts rendering the traditional ARMA-type models rather impractical. Among the most popular count time series models are those based on the notion of binomial thinning (Steutel et al., 1979). These models, namely the integer-valued autoregressive (INAR) processes, were introduced by McKenzie (1985) and Al–Osh; Alzaid (1987) as a convenient way to transfer the usual autoregressive structure to discrete valued time series. Several attempts have since be made to extend and generalize the simplest INAR(1) process. One of the most interesting but less developed generalizations that have appeared in the literature to date is the extension of INAR-type models to the multi-dimensional space. Most attempts to this direction consider the bivariate case ($n = 2$) since the complexity of the model increases rapidly for $n \geq 3$. We consider a simplified version of the multivariate INAR(1) process proposed by Pedeli; Karlis (2013) where the innovations $\boldsymbol{\epsilon}_t$ are assumed to be independent random variables. Therefore, cross-correlation between the series of the multivariate process is only due to the non-diagonal autocorrelation matrix $\boldsymbol{A}$. It is shown that such a specification is extremely advantageous in terms of practical implementation without significant precision losses. A multivariate time series of earthquakes is used to illustrate the model. Its appropriateness for syndromic surveillance and outbreak detection purposes is also discussed.

44 Bivariate moving average models for integer-valued time series

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SECTION: Discrete-Valued Time Series

Time series of counts are available in a wide variety of fields and the need to analyse such data adequately led to a multiplicity of approaches and a diversification of models that explicitly account for the discreteness of the data. One such approach consists in replacing the multiplication in the conventional ARMA models by an appropriate random operator, denominated thinning operator, originating the so called INARMA models. In the context of univariate time series of counts, the class of INARMA models has been widely studied in the literature. However, for multivariate time series of counts several difficulties arise and the literature is not so elaborate. Bivariate integer-valued time series models, with finite and infinite support have been considered in the literature but their moving average counterparts have not received much attention. However, moving average (MA) models are widely used in econometric data. For example, inventories are often considered to be well described by MA processes since the periodic resetting of inventories to optimal levels implies an upper limit on the number of periods

that shocks can affect inventory levels, leading to autocorrelations functions characteristic of this type of processes. In this work, we consider bivariate integer valued moving average, BINMA, models which allow for dependence between thinning operations. The probabilistic and statistical properties of BINMA models are discussed and the generalized method of moments is used to estimate the parameters.

45 Multivariate integer-valued autoregressive process with periodic structure

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SECTION: Discrete-Valued Time Series

In this paper the periodic integer-valued autoregressive model of order one with period T is studied in some detail. Basic probabilistic and statistical properties of this model are discussed. Moreover, parameter estimation is also addressed. Specifically, the methods of estimation under analysis are the method of moments, least squares-type and likelihood-based ones. Their performance is compared through a simulation study.

46 Ein Mischverteilungsmodell zur Prognose nullinflationierter Preisveränderungszeitreihen

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Die wöchentliche Veränderung diverser Rohstoffpreise für Milchprodukte wie Magermilchpulver und Butter weist nicht nur die bei Preiszeitreihen üblichen Muster (stylized facts) wie Mittelwertabhängigkeit und Volatilitätsclusterung, sondern auch einen hohen Anteil von Nullwerten aufgrund fehlender Preisänderungen auf. Derartige Zeitreihen können nicht mit den bekannten Kombinationen von ARIMA und GARCH Modellen erklärt und prognostiziert werden. In diesem Vortrag wird ein neues Mischverteilungsmodell (Kömm & Küsters 2014) vorgestellt, in dem die aus der Mikroökonometrie und der Modelltheorie für sporadische Nachfragen bekannten nullinflationierten Modelle mit einem traditionellen ARIMA(1,1,0)-GARCH(1,1) Modell kombiniert wird. Im Vortrag werden die Modellkomponenten, der dahinterstehende Datengenerierungsprozess, die auf Maximum-Likelihood und Simulationsverfahren beruhende Schätzung sowie die Berechnung von Punkt- und Intervallprognosen mittels Resamplingtechniken skizziert. Empirisch wird das Modell auf einer Niedrigfrequenzzeitreihe, konkret den wöchentlichen Preisveränderungen der Magermilchpulverpreise (SWP) der Süddeutschen Butter- und Käse-Börse Kempten angewandt. Der Modellvergleich findet mit Hilfe von Likelihood-Ratio-Tests und dem AIC Kriterium statt. Die ex-ante Prognosegüte wird auf der Grundlage einer rollierenden Prognosesimulation mit diversen Prognoseevaluationsmaßen sowie Überdeckungs- und Unabhängigkeitstests bewertet. Einige Hinweise zur Berechnung der Schätzer und Prognosen mit R auf Parallelrechnern des Leibniz-Rechenzentrums München runden den Vortrag ab.