Analysis of Censored Data
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Markov Mesh Models for Filtering and Forecasting with Leading Indicators

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Abstract

In this paper, a new approach for forecasting a time series based on a Markov mesh model that incorporates some key features of a leading indicator series is proposed. The features of the leading indicator series are incorporated via a weighting scheme in which the weights are assessed by a Bayesian approach. The Bayesian approach is implemented by a Gibbs sampling technique. The overall scheme proposed here can be viewed as Kalman Filtering in two dimensions using the raster scan method.

Key Words: *Dynamic Linear Models, Gibbs Sampling, Image Processing, Kalman Filtering, Markov Fields, Mine Detection, Raster Scan, Simulation, Warranties.*

1 Introduction and Motivation

For forecasting a single time series, there are a wide variety of techniques that are currently available. Of these, those that are based on the theory of *dynamic linear models* (DLM) have recently gained much popularity. The DLMs, also known as Kalman Filter models, are discussed in the recent books, [9] and [6]. The inference and extrapolation algorithms of the DLMs can be justified via the Bayesian paradigm (cf. [4]). It is by now well known that forecasts from a single series can be greatly improved if certain key patterns and features from an associated series can be incorporated into the inference mechanism. The associated series is typically a series which precedes the series of interest, and [1] p.402, refers to such a series as a *leading indicator series.* The leading indicator series gives us advanced signals about potential changes in the behaviour of the series of interest, and in so doing, enhances our ability to provide improved predictions of the latter. For example, if the series of interest is the number of housing starts per month, then a leading indicator series could be the monthly change in population. Other such examples can be found in [1] pp.407-412.

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