An autoregressive state-space model for National Football League (NFL) scores

by

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Abstract

State-space models are a flexible and convenient class of models for describing data when underlying model parameters may vary in time. We examine a state-space model for National Football League (NFL) football game scores for the period 1988–1993; the model parameters of primary interest, measures of team strength, are expected to vary over time. The team strength parameters are assumed to follow a first-order autoregressive process. The model incorporates two sources of variation in team strengths; week-to-week changes in team strength due to injuries and other random factors, and season-to-season changes resulting from changes in personnel and other longer term factors. The aim of the analysis is to obtain inferences concerning team strength and other model parameters and predict future game outcomes. Iterative simulation is used to obtain samples from the joint posterior distribution of all model parameters. We demonstrate a procedure for updating the posterior distribution on a continual basis so that the costly iterative simulations need not be performed anew as additional data is obtained.

Keywords: Kalman filter, dynamic models, hidden Markov models, iterative simulation, parameter updating