Fixed and random coefficient
time series

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Linear modelling of data has been a major concern in time series for many years. One of the last outstanding problems has been the determination of the order of a model once a class of models has been decided upon. In Chapter 2 automatic criteria for the determination of the order of a multivariate autoregression are discussed. *Via* a law of the iterated logarithm for martingales, it is shown under what conditions an automatic criterion of a certain type is strongly consistent for the true order of the autoregression.

The theory of linear models is now essentially complete. Thus interest has shifted towards developments in non-linear modelling. The remainder of the thesis is concerned with non-linear models, and especially non-linear generalisations of the autoregressive models. In Chapter 3 a simple bilinear model reveals some of the complexities encountered when non-linear modelling is considered. Conditions are found for the existence of strictly stationary solutions to the model equations, and for the invertibility of such models. The methods are then extended to obtain conditions for the existence of strictly stationary solutions to simple random coefficient models.

In Chapter 4 a class of multivariate random coefficient autoregressive models is introduced. Conditions are found for the existence of second order stationary solutions and for the stability of such models. In Chapters 5 and 6, two-stage least squares and maximum likelihood estimation procedures, respectively, are proposed. In each case the estimates are

shown to be strongly consistent and to satisfy a central limit theorem. In Chapter 7, simulated processes are estimated using the techniques of Chapters 5 and 6, and the lynx data (which is well known to be generated by a non-linear mechanism) is remodelled, the new model then being compared with other models which have been considered in the past.

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