State space models describe indirectly observed dynamic systems. In econometrics, linear state space models have been successfully used to estimate economic trends, business cycles, dynamic regression parameters, measures of volatility and other indirectly observed phenomena from macro-economic and financial data. This dissertation concentrates on the more general class of non-linear state space models. Inference in such models is considerably more complicated than in linear models, since with the exception of a small number of special cases, it is not feasible to calculate optimal estimates. In the first part of the dissertation, various approximations to optimal estimation are discussed. The second part applies a number of non-linear state space models to macro-economic and financial time series. Extensions to the widely used class of unobserved components models are developed, which allow the incorporation of asymmetry and time-varying parameters in the business cycle, and trend and cycle dependence in seasonal components. Together with a simulation study on volatility estimation, these applications demonstrate the applicability and feasibility of non-linear state space modeling for economic problems.

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