On the stability of stochastic dynamic systems and their use in econometrics

Nientker, M.H.C.

2019

document version
Publisher's PDF, also known as Version of record

Summary

This thesis has explored the concept of stability for time series in a number of settings: purely theoretical, finance and macro economics. It has started of in Chapter 2 by introducing a new invertibility condition that opens the door for statistical analysis of a class of resetting models. Specifically, moderate conditions for stationarity, ergodicity and mixing are provided and discussed. The assumptions seem strict at first, but have many possible applications in models containing bubble collapses or regime switching models in general. One such application is explored in Chapter 3, where a new model for the study of speculative financial bubbles is discussed. This model includes explosive regions and discontinuities within the state space that allow for more flexibility to describe bubble behavior. A demonstration of the flexibility is included by filtering the Bitcoin/US dollar exchange rate.

Stability in a macro economic setting is explored in Chapter 4, where various approximation methods to the solution of dynamic stochastic general equilibrium models are studied. It is discussed how the widely used perturbation method provides sample paths that do not satisfy desirable stochastic properties needed for parameter estimation and statistical inference. Chapter 4 provides a correction that does produce stable solution paths by multiplying higher order monomials with a decaying exponential and denotes this solution method transformed perturbation. This solution method is fast, easy to implement and very accurate within the setting of local approximation methods. A very detailed comparison study including various highly nonlinear models highlights the advantages of the method.