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Fuzzy coefficient volatility (FCV) models with applications

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Abstract

Recently, Carlsson and Fuller [C. Carlsson, R. Fuller, On possibilistic mean value and variance of fuzzy numbers, Fuzzy Sets and Systems 122 (2001) 315–326] have introduced possibilistic mean, variance and covariance of fuzzy numbers and Fuller and Majlender [R. Fuller, P. Majlender, On weighted possibilistic mean and variance of fuzzy numbers, Fuzzy Sets and Systems 136 (2003) 363–374] have introduced the notion of crisp weighted possibilistic moments of fuzzy numbers. In this paper, we propose a class of FCV (Fuzzy Coefficient Volatility) models and study the moment properties. The method used here is very similar to the method used in Appadoo et al. [S.S. Appadoo, M. Ghahramani, A. Thavaneswaran, Moment properties of some time series models, Math. Sci. 30 (1) (2005) 50–63]. The proposed models incorporate fuzziness, subjectivity, arbitrariness and uncertainty observed in most financial time series. The usual forecasting method does not incorporate parameter variability. Fuzzy numbers are used to model the parameters to incorporate parameter variability.
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1. Introduction

The sophisticated analysis used by the financial industry has lent increasing importance to time series modeling. Recently, there has been growing interest in using fuzzy numbers in finance and economics. Many financial series, such as returns on stocks and foreign exchange rates, exhibit leptokurtosis and volatility varying in time. Many decision making problems exhibit some level of arbitrariness, vagueness and fuzziness (Carlsson and Fuller [4] and Fuller and Majlender [2]). These features have been the subject of extensive studies ever since Zadeh [5] has reported them. Decision-making problems, in general, involved uncertainty as their model parameters are not precisely known. As a result there has been growing interest in using fuzzy algebra in such models. Historically, probability theory is presented as forming theoretical foundations for reasoning and decision making in situations involving uncertainty. However, often one is faced with the situations in which decisions are required to be made on the basis of ill-defined variables and imprecise (vague) data. Fuzzy algebra is a simple but potentially a useful way to study impreciseness

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