

Joint Extremal Behavior of Hidden and Observable Time Series with an Application to GARCH Processes

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We study the behavior of a real-valued and unobservable process (Y_t) under an extreme event of a related process (X_t) that is observable. Our analysis is motivated by the well-known GARCH model which represents two such sequences, i.e. the observable log returns of an asset as well as the hidden volatility process. Our results complement the findings of Segers (2007) and Smith (1992) for a single time series. We show that under suitable assumptions their concept of a tail chain as a limiting process is also applicable to our setting. Furthermore, we discuss existence and uniqueness of a limiting process under some weaker assumptions. Finally, we apply our results to the GARCH (1,1) case.

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