State-dependent dependencies: A continuous-time dynamics for correlations*

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Abstract

We propose a new asset price model in continuous time where correlations and volatilities are functions of the current state of the market. The state of the market is based on a window of past asset realisations, the length of this window being a measure for the memory of the market. The approach is motivated by empirical findings from regression analyses in discrete time. A maximum likelihood approach is developed to estimate the parameters of the model from discrete asset realisations. We find strong empirical evidence that correlations increase in bear markets and for the existence of financial contagion in international markets. We analyse the severity of financial contagion dependent on market conditions. We explore consequences of market-state dependent volatilities and correlation in financial risk management and option pricing theory. We investigate the variance as a measure of portfolio risk and compare the variance from a model with constant correlation with the variance of a model with state dependent correlation. We propose a measure for losses in diversification due to a potential correlation breakdown.

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