Quantitative Finance > Statistical Finance

Cross-Correlation Dynamics in Financial Time Series

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The dynamics of the equal-time cross-correlation matrix of multivariate financial time series is explored by examination of the eigenvalue spectrum over sliding time windows. Empirical results for the S&P 500 and the Dow Jones Euro Stoxx 50 indices reveal that the dynamics of the small eigenvalues of the cross-correlation matrix, over these time windows, oppose those of the largest eigenvalue. This behaviour is shown to be independent of the size of the time window and the number of stocks examined.

A basic one-factor model is then proposed, which captures the main dynamical features of the eigenvalue spectrum of the empirical data. Through the addition of perturbations to the one-factor model, (leading to a 'market plus sectors' model), additional sectoral features are added, resulting in an Inverse Participation Ratio comparable to that found for empirical data. By partitioning the eigenvalue time series, we then show that negative index returns, (drawdowns), are associated with periods where the largest eigenvalue is greatest, while positive index returns, (drawups), are associated with periods where the largest eigenvalue is smallest. The study of correlation dynamics provides some insight on the collective behaviour of traders with varying strategies.

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