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Extreme dependence in the NASDAQ and S&P 500 composite indexes

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More generally, the study of extreme dependence may reveal contrasts which are obscured when examining the conditional second moment.

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Notes

¹ Extreme events are defined with respect to each market, as the largest negative (or positive) returns on that market.

² Note that this is distinct from cross-sectional dependence in extreme events across markets.

³ Another variation on this theme is to consider the asymptotic dependence of the observations if there exists a $\alpha > 0$ such that α is referred to as the tail index. In this case, $(1 - F_X(x)) = O(x^{-\alpha})$ as $x \rightarrow \infty$. The asymptotic dependence of the observations can be estimated using the asymptotic theory of the bootstrap (see, for example, [Ferre et al. \(2003\)](#)).

⁴ The asymptotic dependence of the observations can be estimated using the asymptotic theory of the bootstrap (see, for example, [Ferre et al. \(2003\)](#)).

⁵ Note that if we were to choose a common numerical threshold instead, the higher variance of returns on the NASDAQ would imply a greater total number of exceedances, guaranteeing that the blocks method would show a greater mean cluster size for that market, since the number of blocks is the same for each market.

⁶ We do not present here results on the tail indices of the two markets. However, a variety of different estimates, and statistical inference using the test of Loretan and Phillips ([1994](#)), show no discernible difference in the two tail indices.

⁷ An estimated two-sided p-value of zero implies that no bootstrap replication of the processes yielded a statistic, $\hat{\theta}$, as low as the hypothesized value.

⁸ The analysis in Longin ([2000](#)) also suggests that ignoring dependence in the data leads to underestimating the VaR, but concludes that the impact of dependence is not statistically significant at the daily frequency, and that the measures of dependence are smaller again at lower frequencies, for the sample that Longin considered (S&P 500 from January 1962 to December 1993). We have already concluded that there is significant extreme dependence in both asset returns and that the dependence is significantly stronger in the NASDAQ series. This difference in the conclusions results in part from the application of recent developments in estimation, and consequent differences in estimated values of the extremal index: Longin ([2000](#)) estimates θ for the daily S&P 500 series, while with interexceedance times we estimate θ to be in the neighborhood of 0.5 (again, see Fig. 1(a)).

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