

Sample Period Selection and Long-Term Dependence: New Evidence from the Dow Jones Index

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This study investigates the sensitivity of the long-term return anomaly observed on the Dow Jones Industrial Average (DJIA) to sample and method bias using daily data from 1/1/1970 to 17/3/2004. We employ both the classical rescaled adjusted range statistic (R/S statistic), developed by Hurst and the Lo modification to eliminate low-order dependence. Initially, the CUSUM statistic is employed to identify sub-periods of subtle sign shifts in the mean returns. This allows the series to be subdivided in two main ways: (a) pre- September 1987 crash and post September 1987 crash; and (b) into several subperiods from 1/1/1970 to 2/05/74; 3/05/1974 to 3/05/74, 4/05/1974 to 18/8/82, and 19/8/82 to 17/3/2004.

To ensure the robustness of the initial findings using raw returns, each of the whole sample and sub-period data was filtered for AR(1), MA(1), ARMA (1,1) and GARCH (1,1) dependencies. Hurst exponent and V-statistic values for each of the filtered series for the whole sample and subperiods were then estimated. Spline techniques were also employed to provide a continuous plot of the V-statistics. Interestingly, when plots are made of the V-statistics from the DJIA series, we find the cycles are oscillating and also have varying lengths.

Overall, we find that the null hypothesis of no long-term dependence is accepted for the whole sample and every sub-period using the modified rescaled range test, but not necessarily using the classical rescaled adjusted range test. The later test does however reveal episodes of both positive and negative dependence over the various sample periods, which have been reported by other researchers.

We conclude that sample period selection and the statistical methods employed for determining long-term dependence remains an important issue in modelling stock returns, as well as volatility.