

# Testing for Weak Form Efficiency of Stock Markets

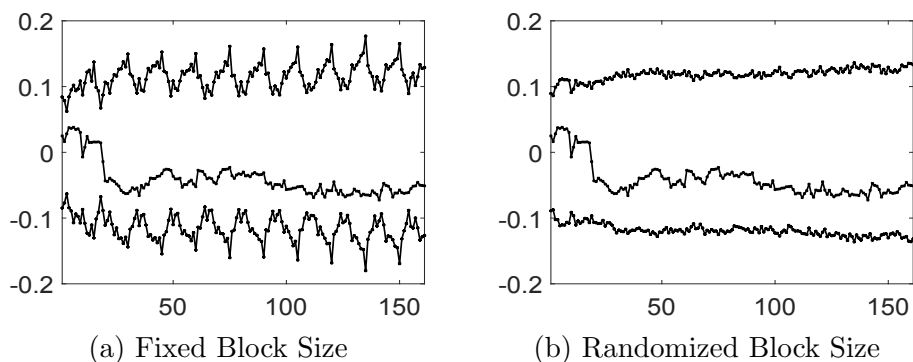
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## 1 Motivation

Weak form efficiency of stock markets is tested predominantly under the null hypothesis of independence or a martingale difference property. These properties rule out higher forms of dependence that may exist in stock returns. It is thus of interest to test whether returns are white noise, allowing for a wide range of conditional heteroskedasticity. Assisted by Shao's (2011) dependent wild bootstrap, we perform a variety of white noise tests. We adopt rolling window analysis to capture potentially time-dependent market efficiency.

## 2 Main Results

We reveal that, in rolling window analysis, the block structure of the dependent wild bootstrap inscribes an artificial periodicity in confidence bands. Figure (a) plots sample autocorrelations at lag 1 and the bootstrapped confidence bands for simulated iid data. We observe clear periodicity in the confidence bands over windows, even if the true DGP is serially independent. We eliminate the periodicity by randomizing the block size. As seen in Figure (b), randomness across windows removes the periodicity dramatically.



For the daily return of S&P 500, the white noise hypothesis is not rejected in non-crisis periods. During Iraq War and the subprime mortgage crisis, we often observe negative autocorrelations that are large enough to reject the white noise hypothesis.

## References

SHAO, X. (2011): "A Bootstrap-Assisted Spectral Test of White Noise under Unknown Dependence," *Journal of Econometrics*, 162, 213–224.