

Thesis abstract

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Testing For Independence Through Empirical Copula Process (Job Market Paper)

Independence assumption is central to econometric modeling. I propose a new copula test for statistical independence which, unlike correlation or regression-based methods, can accurately detect any type of dependence in the data, including highly non-linear co-movements among extreme values in the tails of the distribution. The test has power advantage over competing methods and does not require distributional assumptions. I provide additional results which permit using the test with estimated quantities instead of direct observations. This allows testing for independence between unobserved random variables such as regression model errors. I illustrate the application of these results by using the test to detect heteroscedasticity in the standard linear regression model by operating on the underlying copula of the regressors and unobserved model errors. I find that the copula test has a significant power advantage over the White test both in small and in large samples. To my knowledge, this is the first application of copula theory to testing for heteroscedasticity.

The proposed integral-type test statistic is easy to work with. I provide an exact computational formula and tabulate asymptotic critical values for the statistic. I also show that finite sample distributions quickly converge to the asymptotic distribution, meaning that the test can be used in relatively small samples.

Beyond Auto-Correlations: The Serial Dependence Function

The auto-correlation function (ACF) remains one of the most popular tools for non-parametric analysis of time series. Despite its popularity, it has a major limitation in that it is only capable of detecting serial dependence of linear type. Several recent studies identified serial dependence signals in common financial data that are highly non-linear in nature. Since non-linear dependence can exist in the absence of correlation, ACF has no power at detecting co-movements in uncorrelated data. Practitioners using the ACF risk missing certain dependence signals entirely. In this paper I propose a counterpart to the ACF which is based on the weighted serial copula process. I call the new test statistic the serial dependence function (SDF). Unlike the ACF, the SDF can consistently detect serial dependence of any form, including highly non-linear tail or extreme value dependence, even in complete absence of linear correlation.

Macroeconomic News Index

What moves stock prices? It is well known that the inflow of fundamental information about the underlying state of the economy, such as news on output, employment, corporate profits or dividends, explains only a small fraction of movements in stock market indices. A key limitation of earlier studies on the effect of news on financial markets is that they use narrow measures of news, such as scheduled economic data releases. In reality, market participants receive large amounts of other often qualitative information in between scheduled data releases. This information has never been quantified. In this paper I construct a broad measure of real-time market-relevant news which I call the Macroeconomic News Index (MNI). The index is based on keyword quantification of over ten thousand news releases by Reuters News Wire and accurately captures both the polarity and volume of a broad set of real-time market-relevant news. The index quantifies additional and often qualitative information including political events, comments made by government officials and industry experts, and even natural disasters. I find that this broad measure of fundamental news explains almost half of the variation in the U.S. stock market indices. This is several times more than previously thought, suggesting that the excess volatility in stock prices often attributed to behavioral factors is much smaller.