THE APPLICATION OF WAVE FORM DICTIONARIES TO STOCK MARKET INDEX DATA

ABSTRACT

A matching pursuit algorithm is used to implement the application of wave form dictionaries to decompose the signal in the stock market (Standard and Poor's 500) index. A wave form dictionary is a class of transforms that generalizes both windowed Fourier transforms and wavelets. Each wave form is parametrized by location, frequency, and scale. Such transforms can analyze signals that have highly localized structures in either time or frequency space as well as broad band structures.

The Standard and Poor's 500 stock market index is found to be highly complex, but not a random walk. There are bursts of high energy that arise suddenly with very localized energy and die out equally quickly. In addition there is evidence of Dirac delta functions representing impulses, or shocks, to the system that seem to cluster more than would be expected under an hypothesis of random variation. It would appear that the energy of the system is largely internally generated, rather than the result of external forcing. Finally, there is apparently some evidence for a quasi-periodic occurrence of oscillations that are well localized in time, but that involve almost all frequencies.