Phenomenological Models for the time Evolution of Financial Markets

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We discuss various phenomenological models for the time evolution of financial markets. The results from empirical data are compared and contrasted with theory and simulations.

We propose various models inspired by statistical physics for the collective time evolutions of share portfolios.
Our share portfolio, which is simply a set of shares held by an investor, is identified with a corresponding system of interacting Ising spins.

In our models we identify each share with a given Ising spin. We then transform the high frequency time series of each share into a sequence of possible values of +1 and -1 for the corresponding Ising spin; here, +1/-1 corresponds to an up/down spin. An empirical Hamiltonian for the system is then written in terms of the share-share (spin-spin) interactions.

We assume that there is a *quenched* interaction between any random group of *p*-shares in the portfolio.
Hence, our model for the time evolution of share portfolios is similar to the generalised *p*-spin Sherrington-Kirkpatrick model in spin-glasses.

We obtain the constant interaction coefficients using several different means.

We compare and contrast the results from empirical data for varying values of *p* with those expected from simulations and find good agreement.