Power Laws Phenomena versus Stochastic Models

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This paper investigates the effectiveness of Gaussian, ARCH (1), GARCH (1, 1) and Power Law Models in US S&P500 stock index using daily data. The data demonstrate several distinct behavioural characteristic, particularly the increased volatility period during 1998 to 2001.

Power Laws appear to describe the large fluctuations and characterisation of stock price changes. Surprisingly, these power laws models also show significant correlations for different types and sizes of market and for different periods and sub-periods of market. The results show the robustness of power-law analysis, with the power-law exponent move within the value of 3.9.

As for the stochastic processes such as Gaussian, ARCH (1), GARCH (1, 1), the results show the random walk prediction successfully describe the stock movements for small price fluctuations but fail to handle large price fluctuations. The power law tests prove superior to the stochastic tests when stock price fluctuations are non-normal.