

Collective behavior in market participants with different time horizons

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Large price movements have been frequently derived endogenously without any definite information out of markets, any negotiation nor any consent among market participants. Recent large price declines of less than -5% during the last decade are concentrated within the two months after the market crash on 8 October 2008. Those heavy price falls occurred in a pessimistic mood for the world economy. Neither is related to specific news that might justify the magnitude of the subsequent drop-off. Instead, news including the words "financial crisis" came out every day. They did not impact stock prices severely alone, but they exacerbated the pessimistic mood prevailing among stock market participants. Such news increased after the Lehman shock preceding the market crash.

Many authors pointed out that the co-movement of stock markets or the correlation among stock returns increased before and after the major market crash such as "Black Monday" in 1987. In the earlier paper [1, 2], we have analyzed the multivariate time-series of stock returns of the constituents of the FTSE100 listed on the London Stock Exchange and also those of the Nikkei 225 Index listed on the Tokyo Stock Exchange for the period from May 2007 to January 2009 to study precursors to the global market crashes in 2008. We reported that a sharp rise in a measure of the collective behavior of stock prices was observed before the market crash. It is natural to think that this phenomenon reflects a collective behavior among market participants.

In stock markets, different types of investing entities with different strategies and different time horizons, e.g., hedge fund, investment trust, pension fund, day trader and program, compete with each other. The interactions among market participants with different time horizon create a nonlinearity, i.e., structure along the time scale axis, so called multifractality. In this paper, we investigate the interaction between different time scale in multivariate time-series of stock returns and orders during the abrupt change of stock price such as crash and rebound. We mainly analyze the order book of the constituents of the Nikkei 225 Index listed on the Tokyo Stock Exchange for the period from May 2007 to January 2009, and clarify the unstabilized process of stock market. We also introduce a mathematical model describing multifractality of stock returns from the view point of the collective behavior among market participants with different time horizons.

References

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