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Switching processes in financial markets

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Abstract

For an intriguing variety of switching processes in nature, the underlying complex system abruptly changes from one state to another in a highly discontinuous fashion. Financial market fluctuations are characterized by many abrupt switchings creating upward trends and downward trends, on time scales ranging from macroscopic trends persisting for hundreds of days to microscopic trends persisting for a few minutes. The question arises whether these ubiquitous switching processes have quantifiable features independent of the time horizon studied. We find striking scale-free behavior of the transaction volume after each switching. Our findings can be interpreted as being consistent with time-dependent collective behavior of financial market participants. We test the possible universality of our result by performing a parallel analysis of fluctuations in time intervals between transactions. We suggest that the well known catastrophic bubbles that occur on large time scales—such as the most recent financial crisis—may not be outliers but single dramatic representatives caused by the formation of increasing and decreasing trends on time scales varying over nine orders of magnitude from very large down to very small.

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Supporting Information

Supporting Appendix (PDF)

Supporting Information

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