

# Switching processes in financial markets

Tobias Preis , Johannes J. Schneider, and H. Eugene Stanley [Authors Info & Affiliations](#)

April 26, 2011 | 108 (19) 7674-7678 | <https://doi.org/10.1073/pnas.1019484108>

**PDF/EPUB**

## 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.

## Continue Reading

**VIEW PDF** **FULL TEXT**

## Acknowledgments.

The authors thank K. Binder, S. V. Buldyrev, C. De Grandi, S. Havlin, D. Helbing, U. Krey, H.-G. Matuttis, M. G. Mazza, I. Morgenstern, W. Paul, R. H. R. Stanley, T. Vicsek, G. M. Viswanathan, and L. Yelash for discussions. T.P. also thanks the Gutenberg Academy for financial support. This work was partially supported by the German Research Foundation Grants SCHN 1073/1-1 (to J.J.S.) and PR 1305/1-1 (to T.P.) and by the National Science Foundation (NSF) and Office of Naval Research (ONR), and the Defense Threat Reduction Agency (DTRA).

## Supporting Information

Supporting Appendix (PDF)

Supporting Information

**DOWNLOAD** | 3.35 MB

## References

2

MHR Stanley, et al., Zipf plots and the size distribution of firms. *Economics Letters* **49**, 453–457 (1995).

3

X Gabaix, P Gopikrishnan, V Plerou, HE Stanley, Institutional investors and stock market volatility. *Quarterly Journal of Economics* **121**, 461–504 (2006).

4

F Lillo, et al., Econophysics: master curve for price-impact function. *Nature* **421**, 129–130 (2003).

SHOW ALL REFERENCES

[VIEW FULL TEXT](#) | [DOWNLOAD PDF](#)

# Further reading in this issue

RESEARCH ARTICLE | APRIL 25, 2011 |

## Fossil evidence for serpentization fluids fueling chemosynthetic assemblages

Franck Lartaud, Crispin T. S. Little, [...] Nadine Le Bris

RESEARCH ARTICLE | APRIL 25, 2011 |

## Cardiolipin-based respiratory complex activation in bacteria

Rodrigo Arias-Cartin, Stéphane Grimaldi, [...] Axel Magalon

RESEARCH ARTICLE | APRIL 25, 2011 |

## Cytokine signaling through the JAK/STAT pathway is required for long-term memory in *Drosophila*

Tijana Copf, Valérie Goguel, [...] Thomas Preat

# Trending

RESEARCH ARTICLE | DECEMBER 30, 2013 |

## Bodily maps of emotions

Emotions coordinate our behavior and physiological states during survival-salient events and pleasurable interactions. Ev...  
Lauri Nummenmaa, Enrico Glerean, [...] Jari K. Hietanen

RESEARCH ARTICLE | MAY 19, 2025 |

## X and Y gene dosage effects are primary contributors to human sexual dimorphism: The case of height

Human stature is one of many physical phenotypes that vary between the sexes. On average, adult males are taller than...  
Alexander S. F. Berry, Brenda M. Finucane, [...] Matthew T. Oetjens

RESEARCH ARTICLE | JUNE 11, 2018 |

## Neural network retuning and neural predictors of learning success associated with cello training

# Sign up for the PNAS Highlights newsletter

*Get in-depth science stories sent to your inbox twice a month.*

*name@example.com*

SUBSCRIBE ›

**PNAS**

Proceedings of the  
National Academy of Sciences  
of the United States of America



## BROWSE

CURRENT ISSUE

*PNAS NEXUS*

SPECIAL FEATURES

LIST OF ISSUES

COLLECTED PAPERS

PNAS IN THE NEWS

FRONT MATTER

JOURNAL CLUB

MULTIMEDIA

PODCASTS

## INFORMATION

ABOUT

SUSTAINABLE DEVELOPMENT GOALS

EDITORIAL BOARD

AUTHORS

REVIEWERS

SUBSCRIBERS

LIBRARIANS

PRESS

COZZARELLI PRIZE

PNAS UPDATES