f X ¥ in 🖂 🦲

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





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.



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)

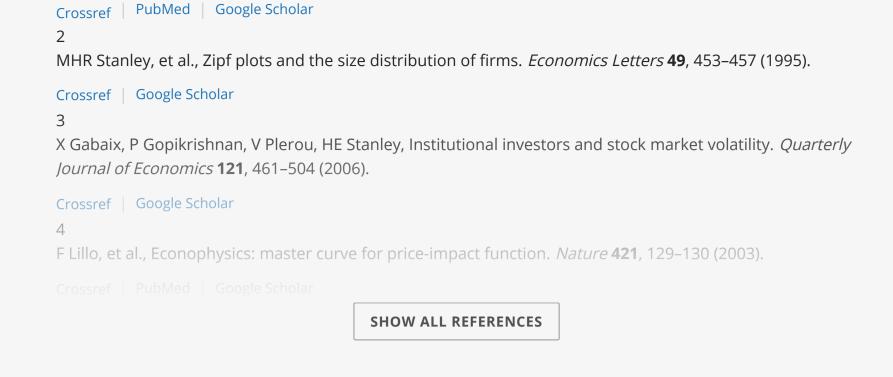
Supporting Information

➡ DOWNLOAD 3.35 MB









VIEW FULL TEXT DOWNLOAD PDF

Further reading in this issue

RESEARCH ARTICLE | APRIL 25, 2011 | 🤗

Fossil evidence for serpentinization 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



RESEARCH ARTICLE AUGUST 4, 2025

The entities enabling scientific fraud at scale

RESEARCH ARTICLE DECEMBER 30, 2013

Bodily maps of emotions

are large, resilient, and growing rapidly

Numerous recent scientific and journalistic investigations demonstrate that systematic scientific fraud is a growing threa... Reese A. K. Richardson, Spencer S. Hong, [...] Luís A. Nunes Amaral

Emotions coordinate our behavior and physiological states

during survival-salient events and pleasurable interactions. Ev... Lauri Nummenmaa, Enrico Glerean, [...] Jari K. Hietanen

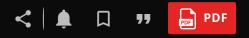
RESEARCH ARTICLE | MAY 27, 2025 | 👌

Self-reproduction as an autonomous process of growth and reorganization in fully abiotic, artificial and synthetic cells

Self-reproduction is one of the most fundamental features of



NOW READING: Switching processes in financial markets



Sign up for the PNAS Highlights newsletter

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

name@example.com

SUBSCRIBE >



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



BROWSE	INFORMATION
CURRENT ISSUE	ABOUT
PNAS NEXUS	SUSTAINABLE DEVELOPMENT GOALS
SPECIAL FEATURES	EDITORIAL BOARD
LIST OF ISSUES	AUTHORS
TOPICS, COLLECTIONS, AND ARTICLE TYPES	REVIEWERS
PNAS IN THE NEWS	SUBSCRIBERS
FRONT MATTER	LIBRARIANS
OURNAL CLUB	PRESS
MULTIMEDIA	COZZARELLI PRIZE
PODCASTS	PNAS UPDATES

Copyright © 2025 National Academy of Sciences. All rights reserved. | Online ISSN 1091-6490 PNAS is a partner of CHORUS, CLOCKSS, COPE, CrossRef, ORCID, and Research4Life.

Contact | Site Map | Terms & Privacy Policy | Accessibility