



## KEY ISSUES REVIEWS


# Physics and financial economics (1776–2014): puzzles, Ising and agent-based models

Didier Sornette

Published 29 May 2014 • © 2014 IOP Publishing Ltd

[Reports on Progress in Physics](#), [Volume 77](#), [Number 6](#)**Citation** Didier Sornette 2014 *Rep. Prog. Phys.* **77** 062001**DOI** 10.1088/0034-4885/77/6/062001

1. Received 2 November 2013
2. Accepted 1 April 2014
3. Published 29 May 2014

[Buy this article in print](#) Journal RSS Sign up for new issue notifications

## Abstract

This short review presents a selected history of the mutual fertilization between physics and economics—from Isaac Newton and Adam Smith to the present. The fundamentally different perspectives embraced in theories developed in financial economics compared with physics are dissected with the examples of the volatility smile and of the excess volatility puzzle. The role of the Ising model of phase transitions to model social and financial systems is reviewed, with the concepts of random utilities and the logit model as the analog of the Boltzmann factor in statistical physics. Recent extensions in terms of quantum decision theory are also covered. A wealth of models are discussed briefly that build on the Ising model and generalize it to account for the many stylized facts of financial markets. A summary of the relevance of the Ising model and its extensions is provided to account for financial bubbles and crashes. The review would be incomplete if it did not cover the dynamical field of agent-based models (ABMs), also known as computational economic models, of which the Ising-type models are just special ABM implementations. We formulate the 'Emerging Intelligence Market Hypothesis' to reconcile the pervasive presence of 'noise traders' with the near efficiency of financial markets. Finally, we note that evolutionary biology, more than physics, is now playing a growing role to inspire models of financial markets.

Export citation and abstract

[BibTeX](#)[RIS](#)**Next** article in issue →



## Access this article

The computer you are using is not registered by an institution with a subscription to this article. Please choose one of the options below.

### Login



Access through your institution

[IOPscience login](#)

Find out more about journal [subscriptions at your site](#).

### Purchase from

[Article Galaxy](#)

[CCC RightFind](#)

Purchase this article from our trusted document delivery partners.

### Rent from



This article is available from [DeepDyve](#).

## Make a recommendation

To gain access to this content, please complete the [Recommendation Form](#) and we will follow up with your librarian or Institution on your behalf.

For corporate researchers we can also follow up directly with your R&D manager, or the information management contact at your company. Institutional subscribers have access to the current volume, plus a 10-year back file (where available).

## You may also like

### JOURNAL ARTICLES

The Ising model coupled to 2d orders

Multifractal analysis of financial markets: a review

Semiconductor of spinons: from Ising band insulator to orthogonal band insulator

A statistical physics perspective on criticality in financial markets

1D Ising model using the Kronecker sum and Kronecker product

Ising spin network states for loop quantum gravity: a toy model for phase transitions



## **IOPSCIENCE**

Journals

Books

IOP Conference Series

About IOPscience

Contact Us

Developing countries access

IOP Publishing open access policy

Accessibility

## **IOP PUBLISHING**

Copyright 2024 IOP Publishing

Terms and Conditions

Disclaimer

Privacy and Cookie Policy


Text and Data mining policy

## PUBLISHING SUPPORT

Authors

Reviewers

Conference Organisers

 **This site uses cookies.** By continuing to use this site you agree to our use of cookies.

