Dottorato di Ricerca in Fisica

UNIVERSITÀ DI PAVIA
Dipartimento di Fisica

COLLOQUIA DI DOTTORATO, A.A. 2023/2024

Dipartimento di Fisica, A101

Giovedì 15 Febbraio 2024 ore 16:00

Statistical Mechanics Applications to Financial Risk Management

Fabio Caccioli

(University College London)

The seminar will discuss the application of ideas borrowed from statistical mechanics in addressing two problems in finance.

In the first part, we discuss how it is possible to tackle portfolio optimisation using tools borrowed from the physics of disordered systems, and we show that a phase transition takes place when the ratio between the number of assets in the portfolio and the length of the time series used to estimate risk approaches a critical value: When time series become too short compared to the dimension of the portfolio, the in-sample estimated risk vanishes, while the out-of-sample risk remains finite. This leads to a diverging estimation error and large sample to sample fluctuations.

The second part of the talk examines the propagation of shocks between financial institutions, an important aspect of systemic risk. Banks interact in a network of interbank exposures, such as interbank loans. If an institution defaults, its creditors will suffer a loss, which may lead some to default in turn, and cause subsequent losses to their creditors, and so on. We will discuss how the problem of modeling cascades of defaults can be understood in terms of the emergence of a giant component of vulnerable nodes in a network of interbank exposures.

The seminar is in presence up to the maximum occupancy of the lecture hall.