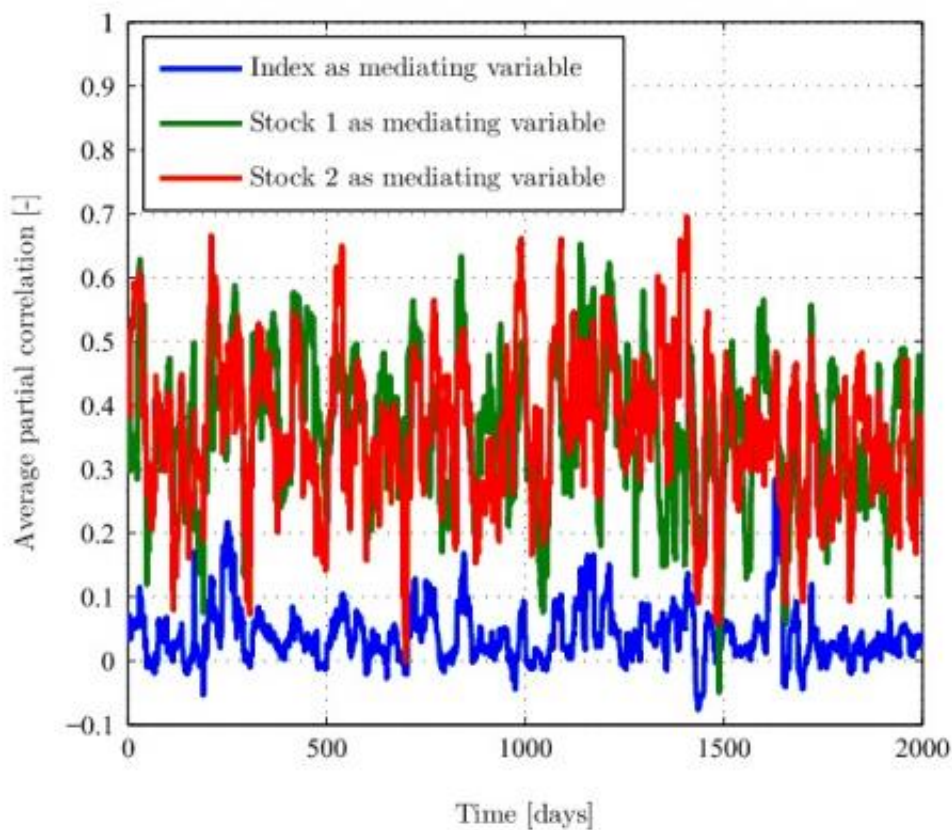


# Herding in the stock market may inspire human-guided trading algorithms

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What explains the correlations often seen between two arbitrarily selected stocks? Collective behavior between stocks is one feature that may be explained by human herding behavior. Herding may also explain some market features that are not well explained by rational factors. Credit: Shapira, et al. ©2014 IOP Publishing Ltd

(Phys.org) —Humans have a strong tendency to belong to a group, an instinct that often manifests in herding behavior. Not limited to humans, herding exists throughout nature, for example in ant colonies, schools of fish, and flocks of birds. But what about the stock market?

Although we may like to believe that our rational side ("*Homo economicus*") dominates when it comes to financial decision-making, a new study shows that herding behavior can explain several features of stock markets that are not explained very well by more rational factors. Understanding the human emotional side to investing could even lead to human-guided trading algorithms and improved market stability.

The researchers, adjunct researcher Yoash Shapira, PhD student Yonatan Berman, and Professor Eshel Ben-Jacob at Tel-Aviv University in Israel, have published a paper on the influence of herding behavior in [stock markets](#) in a recent issue of the *New Journal of Physics*.

"It is important to understand that a big part of the activities in the stock market are not derived from rational thinking and the flow of information, but rather from emotional human behavior," Shapira told *Phys.org*. "This is contrary to the accepted point of view that governs economic theories. Using physical terms, [financial markets](#) are very noisy. We show that most of the 'noise' is due to human emotional factors and has to be analyzed as such."

Usually when researchers model the stock market, they treat it as a network of many investors whose actions are influenced by both external information (such as quarterly reports or world news) and internal information (namely the stock prices, or in other words the trading behavior of other investors).

Although these influences may seem straightforward, the resulting behaviors of the markets are very complex. For one thing, [stock prices](#)

undergo large, rapid, and unpredictable short-term fluctuations. A second noteworthy feature of markets is the strong collective behavior between stocks and between different indexes in different markets.

While previous research has attempted to explain these two features—price fluctuations and collective behavior—as the result of new information, this by itself is not sufficient for two main reasons. First, prices fluctuate much more rapidly than new substantial information is released. Second, the new information is often not clear enough to cause investors to use it to make universal trading decisions.

In an attempt to explain these features, the researchers developed a model of stock market behavior that consists of just two terms: a correlation coefficient that represents the individual tendency to follow the group (herding), and a random term that represents the individual's unpredictable reaction to new external information.

The researchers found that this simple model could capture several features of the market, including short-term price fluctuations, as well as partial long-term correlations of stocks with respect to other stocks and the index. Other known features of real markets that emerged in this model were the Epps effect (the phenomenon that correlations decrease as sampling frequency increases), short-term lagged autocorrelation (the correlation of a stock with itself), and synchronized "bursts" between stocks.

Previously, some of these characteristics (such as the Epps effect) have been thought to originate in factors related to the technical aspects of trading. Others (such as lagged autocorrelation) have not been successfully explained by technical factors.

The fact that all of these features can be explained by a model that at its core is based on herding behavior suggests that the social and emotional

behavior of investors has a significant impact on stock market dynamics. As the researchers explain, understanding why investors make the decisions they do is important when trying to prevent market crashes and improve stability.

"In the future, observed phenomena that do not necessarily conform with conventional financial theory should not be thought of as very intriguing or frightening, if they could be explained by taking into account [human behavior](#) effects," Berman said. "This might reduce panic and prevent false alarms."

Accounting for the human element in financial trading could even have a fundamental impact on how computer algorithms are used in trading. In the past, traders used computers to analyze market activity and provide clues for making investment decisions. Today, "algo trading" has evolved to the point where the algorithm does the investing for humans. A major problem with this trading model is that, if everyone uses similar algorithms, then herding behavior emerges, which leads to market instability.

"One of the things that I can see in the future is, if you show a human being financial information and record their brain response and associated behavior, then you can use this input to guide the computer in making trading decisions," Ben-Jacob said. "So instead of using the computer to guide the human, you can use the human to guide the computer."

Understanding how the brain reacts to stress can also help traders make more rational decisions. As Ben-Jacob explains, most of the time humans behave somewhat—though not completely—rationally. However in times of stress, the brain secretes hormones that change the way it processes reality, changing its response. In stressful times, humans usually follow patterns that are familiar to them, avoid making individual

decisions, and become more herd-like.

Interestingly, there is even some evidence that the female and male brains respond differently to stress, which may provide insight into how to better respond to market fluctuations.

"The female brain under stress tends to see more of the global picture and to think about continuation," Ben-Jacob said. "In some sense, it reacts better in that it does not go into panic as much as the male brain."

In these ways, the merging of psychology and finance may offer unique benefits to understanding and improving stock market dynamics.

**More information:** Yoash Shapira, et al. "Modelling the short term herding behavior of stock markets." *New Journal of Physics*. DOI: [10.1088/1367-2630/16/5/053040](https://doi.org/10.1088/1367-2630/16/5/053040)

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