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The predictive power of zero intelligence in financial markets

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Abstract

Standard models in economics stress the role of intelligent agents who maximize utility. However, there may be situations where constraints imposed by market institutions dominate strategic agent behavior. We use data from the London Stock Exchange to test a simple model in which minimally intelligent agents place orders to trade at random. The model treats the statistical mechanics of order placement, price formation, and the accumulation of revealed supply and demand within the context of the continuous double auction and yields simple laws relating order-arrival rates to statistical properties of the market. We test the validity of these laws in explaining cross-sectional variation for 11 stocks. The model explains 96% of the variance of the gap between the best buying and selling prices (the spread) and 76% of the variance of the price diffusion rate, with only one free parameter. We also study the market impact function, describing the response of quoted prices to the arrival of new orders. The nondimensional coordinates dictated by the model approximately collapse data from different stocks onto a single curve. This work is important from a practical point of view, because it demonstrates the existence of simple laws relating prices to order flows and, in a broader context, suggests there are circumstances where the strategic behavior of agents may be dominated by other considerations.

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