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Herding, contrarianism and delay in financial market trading

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ABSTRACT

Herding and contrarian behaviour are often-cited features of real-world financial markets. Theoretical models of continuous trading that study herding and contrarianism, however, usually do not allow traders to choose when to trade or to trade more than once. We present a large-scale experiment to explore these features within a tightly controlled laboratory environment. Herding and contrarianism are more pronounced than in comparable studies that do not allow traders to time their decisions. Traders with extreme information tend to trade earliest, followed by those with information conducive to contrarianism, while those with the theoretical potential to herd delay the most. A sizeable fraction of trades is clustered in time.

1. Introduction

During the 2008 Financial Crisis stock markets displayed extraordinary fluctuations. From September to mid-November 2008, there were eight days when the Dow Jones Industrial Average changed by more than 5% in absolute terms (from close to close). Since World War II there have been only 16 other days where the day-to-day change exceeded 5% in absolute value. Moreover, although we perceive the time of the 2008 crisis as a time of market decline, there were two days when the Dow rose by more than 10%. Intra-day fluctuations were even more pronounced: on 14 days the maximum and minimum prices levels between two days were more than 10% apart. Such extreme price fluctuations are possible only if there are substantial changes in behaviour (from buying to selling or the reverse). Such behaviour and the resulting price volatility are often claimed to be inconsistent with rationally motivated trading and informationally efficient prices. Commentators invariably attribute dramatic swings to investors' animal instincts, which to most economists, is a deeply unsatisfying explanation. "Rational herding theory", on the other hand, provides new theoretical insights that show that seemingly erratic, switching back-and-forth behaviour can be driven by rational, information-based motives.

Herding theory was pioneered by Welch (1992), Bikhchandani et al. (1992) and Banerjee (1992) who highlight that rationality is no defence against the randomness of herd behaviour.[1] Put simply, a few early incorrect decisions, through a process of rational observation and inference, can have serious ramifications for all who follow.[2] A loose application of

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[1] The first published paper on the breakdown of informational learning by rational agents is Welch (1992); it is also the first application of herding theory to a financial market setting.

[2] Consider a setting in which agents receive an informative but noisy signal about which of two states is better. Suppose state A is truly worse than state B. Then it is possible that the first two agents happen to draw incorrect signals, and thereby opt for A. For agent 3, under a natural indifference

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herding theory to financial market trading might suggest that early movements by visible traders can provide a catalyst for momentum trading, induce discontinuous price jumps in one direction or the other, and potentially leave share prices far from their fundamental value.

The early work on rational herding was not designed, however, for security market trading since it did not admit prices that react to actions, whereas one key feature of financial markets is that (efficient) market prices adjust after trades, with prices dropping after sales and rising after buys. Furthermore, those models that do admit moving prices restrict agents to act in a strict, exogenous sequence—they cannot decide when to trade. Finally, the latter models also restrict traders to act only once. In one of the largest laboratory experimental studies of its type (with around 2000 trades spread over six treatments) we bring together all of these features: a model of financial trading with asymmetric information across traders, the potential for rational herding and rational contrarianism, the ability to time trades, and the ability to trade more than once.

To understand our contribution it is important to understand the history of the literature. It was first thought that when prices can adjust to actions information based herding was either not possible or economically irrelevant. A path-breaking paper by Avery and Zemsky (1998) introduced efficient prices to a sequential herding context, but showed that in a simple financial market-trading setting with two values herding is not possible because the market price always separates people with good and bad information so that the former always buy and the latter always sell. Experimental work has confirmed these predictions (Drehmann et al., 2005; Cipriani and Guarino, 2005, 2009). More recently, however, Park and Sabourian (2011) showed that with multiple states herding can arise and they gave conditions on information that must be satisfied to admit rational herding; they also described conditions for rational contrarianism.[3] They showed that (economically meaningful) herding can arise by traders who believe that extreme outcomes (big price rises or falls) are more likely than moderate ones, and that contrarianism can arise by traders who believe that moderate outcomes are more likely. The signals that generate these situations are, respectively, *U-shaped* and *hill-shaped*. An experiment by Park and Sgroi (2009) showed that this expanded theory has bite. We employ the information-based trading framework developed by Park and Sabourian (2011) in our experiment.

Next, in a market-trading environment where learning from others is important, the timing of actions may affect the possibility and extent of herding.[4] First, one of the key features of real-world financial frenzies is the clustering of actions in time, a phenomenon that cannot be examined when timing is not considered. Second, one can imagine that removing yet another friction from sequential trading models may make informational herding a non-issue. Alternatively, one can imagine that herding becomes more pronounced as those with herding signals delay their actions and then rush in eventually. Our experiment can thus shed light on the impact of the endogenous timing of actions on herding. We identify systematic effects caused by information across treatments and participants that are qualitatively in line with theory on the direction of trades, with marginal effects of information that are stronger relative to exogenous timing setups. In particular we see that contrarianism is caused by hill-shaped signals, that herding is caused by U-shaped signals, and that there is a separation of timing of trades across time by which traders with clearly positive and negative information trade systematically before those with U-shaped information. We also identify a new stylized fact in that traders cluster their trading in time, thus complementing clusters in action; there is, however, no evidence that this clustering is information- or herding-driven. In some experimental treatments, we also explore how the ability to trade twice affects behaviour. For lack of a theory these results are much more difficult to interpret. However, behaviour is qualitatively similar to the single trade treatments, except that trading occurs systematically earlier.

Overview. Section 2 provides a formal definition of herding and contrarianism. Section 3 outlines the guiding theoretical framework and develops qualitative hypotheses. Section 4 examines the design of the experiment and lists the different treatments. Section 5 studies the impact of information on the decision of the trade-direction. Section 6 analyses the impact of information on the absolute and relative timing of actions (in particular, on clusters). Section 7 studies the differential implications of the two vs. one trade settings. Section 8 summarizes the key findings and concludes.

(*footnote continued*)
condition, this means disregarding whatever signal she possesses and following the actions of the first two agents. All later agents find themselves in the same position as the third agent and will follow in the same manner even though they realize that it is only the information conveyed in the first two actions that determines behaviour. As the direction of the herd disproportionately depends on the first movers, the ultimate outcome is exposed to a degree of randomness that is not warranted by fundamentals.

[3] Rational contrarianism is often cited as an important force for the mean-reversion of asset prices, see Chordia et al. (2002).

[4] The seminal paper which studies investment timing with multiple agents and a single irreversible action, but *without moving prices*, is Chamley and Gale (1994) and is also explored in Gale (1996). Their key message is that decision makers will act very quickly in response to their information, since waiting only makes sense when additional, new information arises. The first published experiment to consider herding in endogenous-time was Sgroi (2003), a close implementation of Chamley and Gale (1994). This framework was also examined experimentally in Ziegelmeyer et al. (2005). We complement this line of work by explicitly considering prices that adjust after actions. There are also two other related experimental papers and a theoretical paper. Bloomfield et al. (2005) study a financial market in which people can trade repeatedly throughout a trading day. The focus of their study is on the timing behaviour of informed traders and on their choice of limit or market orders depending on the passage of time. They do not employ information that could (theoretically) trigger herding or contrarianism. Ivanov et al. (2009) implement Levin and Peck (2008), which is a model of fixed capital (green-field), non-financial investments, and they develop important insights into the timing behaviour of people's investment choices. Their setting does not, however, consider moving prices. Finally, Smith (2000) studies endogenous timing theoretically in a single trader environment and offers some qualitative predictions as to which sort of information induces rapid decision making.