Jasmin Kominek

The Pursuit of Rational Action leads to Herding Behavior – an Example of Reinforcing Dynamics shaped by Organizational Structures and Behavioral Paths in Financial Markets

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The Pursuit of Rational Action Leads to Herding Behavior – An Example of Reinforcing Dynamics Shaped by Organizational Structures and Behavioral Paths in Financial Markets

Jasmin Kominek*
University of Hamburg

Institute of Sociology;

Research Group Climate Change and Security, KlimaCampus Hamburg,

University of Hamburg, Bundesstrasse 53, # 018, D-20146 Hamburg, Germany;

Jasmin.Kominek@zmaw.de

http://clisec.zmaw.de/Jasmin-Kominek.1116.0.html

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Abstract

In their award winning study, Beunza and Stark analyze traders who use reflexive modeling to increase the rational basis of their decisions. In this process, they gather information, create financial models and then check their own results against specially aggregated market data of actions of competitors and other market participants. If simulation results and observational data do not match, they go back to gathering information, explain the dissonance and adjust their models accordingly. While locally each step of decision-making and action still seems rational to the involved actors, the overall decision-making process tends to resemble herding instead. An explanation for this phenomenon provided in this study is based on path dependency theory.

Keywords: reflexive modeling, path dependency, herding, decision-making,

behavioral economics, arbitrage trading

Introduction

In their award winning empirical research paper, Beunza and Stark assess the decision behavior in a New York trading office (Beunza & Stark, 2003; 2004; 2010; Stark, 2009). Combining ethnographical and historical research, they discover that merger traders not only approach trading options in a rational way using financial models instead of gut feelings. Also, traders are aware of the limitations of their models and their still bounded rationality, which persists despite enhanced computer data mining systems. This is why they apply a way of reflexive modeling behavior: Before actually using their just composed models for trading, and thus relying on their own computed probabilities, they cross-check their results with an average implied probability calculated from current market data. Mismatches then prompt further searches for information to explain or interpret this 'dissonance' and to expand the models to match the simulation results with the analyzed market data.

Beunza and Stark (2010) conclude from their studies that this way of reflexive modeling does not support the thesis of herding behavior of the traders, as they do not leave their rational position and blindly follow others. Instead, they use the position of others to further increase their own information basis to overcome their limitations or cognitive lock-in and to increase the rationality of approaching a trading option instead of abolishing it. Furthermore, their studies do not support the 'Black Swan' explanation, which implies that traders only rely on their financial models while being unaware of their limited information basis. However, Beunza and Stark (2003, 2004) point out that the traders are perfectly aware of model limitations and all the time make use of this awareness to improve their decisions. Nonetheless, trading 'disasters' do happen, but a different approach is necessary to explain them. Beunza and Stark (2010) refer to this explanation as 'systemic risk' which rather is a resonance effect because it is not the lack of information represented in the models nor blind irrationality but more a weighting of information due to social and historical data and dependency that causes resonance and feedback effects. If neglected or applied in the wrong way, they can lead to great losses for arbitrage traders.

In the following analysis of Beunza and Stark's main findings, a different argument is provided that allows another than a merely 'systemic' explanation. It is shown that, if intensely applied, reflexive modeling in particular can lead to a decision process that resembles an 'intelligent herding behavior'. In general, 'herding behavior' means that statistically analyzed trading results are likely to show phenomena similar to herding. ‘Intelligent’ in that context refers to the fact that in the background of this macro phenomenon of herding there is not a blind irrationality but a local rational behavior instead (Beunza and Stark, 2010).

One possible explanation for this existence of ‘intelligent herding’ in the described way is path dependency. If an ideal type path dependent agent is considered, actions appear to be locally rational to the actors involved in this particular decision process, as they can be rationally explained. However, the overall action decisions may actually be reached by the actors following routines and other external decision instances instead of independently optimizing their own decision criteria.

This explanation is particularly interesting because the resulting advice to reduce risk of trading disasters differs from the advice based on other explanations: if normal herding was the observed cause, the resulting advice would be an increase in rationality. In contrast, if path dependency and thus the ‘intelligent herding’ is the cause of the trading disaster, the advice is to reduce path dependency. In the latter case an increase in the ‘rationality basis’ of made trading decisions is actually likely to worsen the situation because an additional local pursuit of rationality probably implies a further increase in the ‘reflexivity’ of modeling and thus strengthens the overall herding behavior.

In the following part, first the concept of path dependency will be presented. The concept of ‘intelligent herding’ is then placed in the context of path dependency in the subsequent section. Finally, the results of this assessment are discussed and initial conclusions are drawn.

From Path Dependency Theory to the Ideal Type Path Dependent

The History of Path Dependency Theory

The notion of path dependency that is currently used in the social sciences dates back to David (1985) and Arthur (1989). While Liebowitz and Margolis (1995) still argue whether or not the development of the QWERTY-keyboard (David 1985; Liebowitz & Margolis 1990) is an example of path dependency, it is still commonly associated with this concept (c.f.

Mahoney 2000; Pierson 2000; Beyer 2005; Page 2006; Sydow, Schreyögg, & Koch 2005; 2009).

The QWERTY-keyboard is named after the beginning of the topmost row of letters, which in the past and present usually consist of the letters ‘QWERTYUIOP’. In his historical studies David (1985) points out that the final decision for that placing of letters was due to the fact that salesmen should have been able to quickly type the brand name ‘type writer’ of the first typewriter production line. And it can be observed that although these arguments and additional ones like preventing type bars from clashing and jamming might have passed away over time the keyboard in use still stays the same:

> “The agents engaged in production and purchase decisions in today's keyboard market are not the prisoners of custom, conspiracy, or state control. But while they are, as we now say, perfectly "free to choose," their behavior, nevertheless, is held fast in the grip of events long forgotten and shaped by circumstances in which neither they nor their interests figured.” (David 1985: 333)

Thus what is described and notated as the phenomenon of path dependency is action which stays alike along observable paths. If there were rational reasons in first place they might pass away over time and the dependency of action forming a path can be described in a broad sense as ‘history matters’.

Path dependent processes as ‘self-reinforcing processes’ with the tendency for a lock-in

Further research about what makes agents stick to paths with their actions focuses on discovering and explaining mechanisms that affect the path reinforcing action processes. One example which Arthur formalizes for the attempt to predict which of two technologies would win on a market is the process of increasing returns. In a more general sense and considering self-reinforcing processes, Arthur (1994: 112) demonstrates that the following four aspects are fundamental components of path dependency:

- Large set up or fixed costs coincide with the advantage of falling unit costs with increased output.

- Learning effects improve products or lower their production costs as their prevalence increases.
- Coordination effects yield certain advantages to those who arrange themselves with other economic agents who take similar action.
- Expectations are self-reinforcing where increased prevalence on the market enhances the consumers' beliefs in further prevalence.

Based on this approach, Sydow, Schreyögg and Koch (2005; 2009) apply the notation of path dependent processes in organization studies. These path dependent processes are self-reinforcing processes with a tendency for a lock-in, which they visualize in a three-phase-model. In the model, the critical juncture (based on Collier & Collier 1991) marks the step from a contingent first phase to mechanism-forming actions in a second phase. In a subsequent third phase of the path dependent process, the lock-in allows only incremental further changes at most.

How does Path Dependency Affect Agents?

Intensity estimations of societal path dependency

It is still debated how intense societal path dependency is. While Pierson (2000) states that basically every institution is path dependent, which would mean that there would be a thorough net of path dependent structures throughout society, Alexander (2001) argues that at least for political institutions an economic understanding of path dependency can not be applied because the rationality concept of economics cannot be transferred. In contrast, Kominek (2009) demonstrates that each institutionalization consists of self-reinforcing processes at least in elementary ways, as the process result in an institutional lock-in.

Towards the ideal type path dependent

Consider a path that is observable on the macro level. Now you can ask what happens on the micro level and how individual actors are influenced by it (c.f. Kominek 2011). According to the least-effort-principle in social psychology (c.f. e.g. Chaiken & Trope 1999; Moskowitz, Skurnik, & Galinsky 1999), when there are two possible ways in a decision-process that could result in the same action, the brain takes the one that requires less effort to complete the action.

If agents repeat their action when following a path, it is easier to more and more create a routine process instead of optimizing the decision-criteria again and again that only result in the same action anyway. Thus, by applying the least-effort-principle the decision processes of the considered agents shifts more and more towards routine actions. If suddenly there is a shift away from the routine situations, one way to act is to simply apply the same routine again. This can be inefficient. However, this inefficiency is often considered as one characteristic of path dependent processes (c.f. Liebowitz & Margolis 1990). So if an actor is used to merely apply routines in his decision processes, the development of a new routine is necessary to match a new and unforeseen situation.

An easier and perhaps more promising alternative for an actor to determining the routine himself is to adapt a routine from an external decision instance by applying a comparable example. However, even easier than adapting a whole routine would be to just adapt an action draft for those particular actions that the actor needs to match the new situation. Therefore, an 'ideal type path dependent' can be described as an actor affected by path dependency who tends to resemble or follow routines or external decision instances such as formal hierarchies or personal hierarchies like friends when deciding on his actions (c.f. Kominek 2011).

An Example: Merger Arbitrage Traders in a New York Trading Office

There are different empirical and historical studies that show that certain single processes are self-reinforcing with the tendency for a lock-in or already locked-in when observed, and are thus path dependent (e.g. Roedenbeck 2008; Lüttel 2009).

Apart from these studies, the example analyzed in the following section cannot prove that path dependency is the actual root of reasoning behind the arbitrage traders' actions. Instead, it is shown that highly mathematical and assumably rational processes can mask herding behavior. Furthermore, they can lead to agents proceeding with increasing financial bubbles, irrespective of whether this behavior is conscious or not. Such actions are justifiable with rational behavior (Brunsson 1982; 1995) and mathematical computer based models and calculations. One possible explanation for such a discrepancy between locally (individually) considered rational behavior and institutionalized herding behavior, as observed from a slightly more external perspective, is path dependency.

Arbitrage Traders

Beunza and Stark (2010: 16) state:

> "Arbitrage constitutes an ideal site to examine models and systemic risk because arbitrage played a central role in many recent financial crises. These include the market crash of 1987, the crisis of Long Term Capital in 1998, and the hedge fund "mini-crash" of August 2007."

While their study concentrates on merger arbitrage, which is a special form of arbitrage, the standard arbitrage is defined by Miyazaki (2007: 397) in the following way:

> "Arbitrage is ideally risk-free or low-risk trading that aims to capitalize on differences in price between what in theory are economically equivalent assets by buying low and selling high. Typically, arbitrage entails the simultaneous buying and selling of a single security at two different geographical locations or of two economically related securities, such as a basket of stocks traded in the cash market and futures contracts on those stocks, when there is a significant price difference between them."

Apart from this basic understanding of arbitrage strategies that result in convergence trades, Beunza and Stark (2010) describe merger arbitrage as an "event-driven" strategy. "It boils down to informed speculation about a specific event – the completion of a corporate merger." (Beunza & Stark 2010: 16). Unlike in basic arbitrage trading, merger arbitrage traders do not focus on two different prices for the same product in order to buy at the cheaper price on one market just to sell at the higher price on the other market and thus to earn the arbitrage amount. Instead, they operate with probabilities, which they compute in different ways and which are based on financial market data, company information, or basically all information that the trader or the computer data mining system associates with the merger:

> "Analogies, we conclude from our observations, help arbitrageurs anticipate possible merger obstacles. Like categories, analogies allow them to glean the future from the past. "We look for patterns," Max explains, "precedent, similar deals, either hostile or friendly, degree of product overlap, and earnings variability. We look at all the ways to slice the factors that weigh into the merger."" (Beunza & Stark 2010: 24)

And adding "As Max concludes, 'drawing parallels and linkages and saying 'this reminds me of that' is at the heart of what we do.'" (Beunza & Stark 2010: 24).

The challenge of merger arbitrage Beunza and Stark (2010: 22f) describe as "successfully estimating a probability":

> "The basic principle of modern arbitrage is to exploit mispricings across markets. These situations arise when two different regimes of value coexist in ambiguity (Beunza and Stark 2004), and merger arbitrage is no exception. In the case of mergers, the ambiguity arises from the fact that a company is being bought. The acquiring firm typically buys the target company at a price well above its market capitalization, leading to two possible valuations: if the merger is completed, the price of the company will rise up to its merger value; if it is not, the price will drop back to the level before the merger announcement or lower. Arbitrageurs exploit the ambiguity as to which of the two will apply by speculating on the probability of merger completion. To the arbitrageurs, therefore, profiting from mergers boils down to successfully estimating a probability."

A Non-Reflexive Modeling Decision Process

To redraw and visualize the merger arbitrage trader's decision-making process first schematic types will be described. They later can be combined and adjusted to the observed process.

At first, a plain non-reflexive modeling version is shown in Figure 1. It consists of three steps. In the first step, actors gather information, then they create or adjust models, and in the third step they finally conduct the trade (in one way or another), if the process is completed.

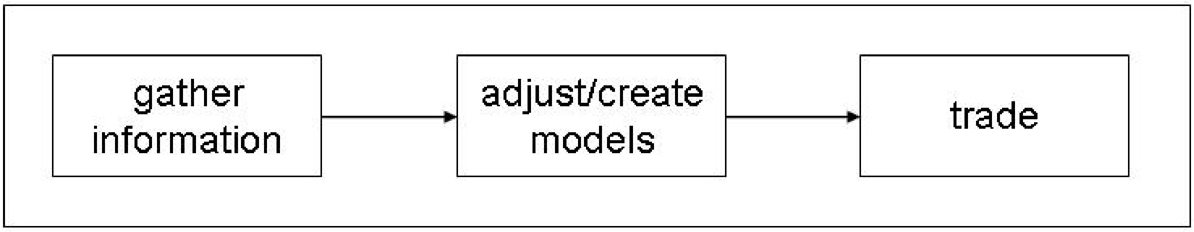

Figure 1: A non-reflexive modeling decision process.

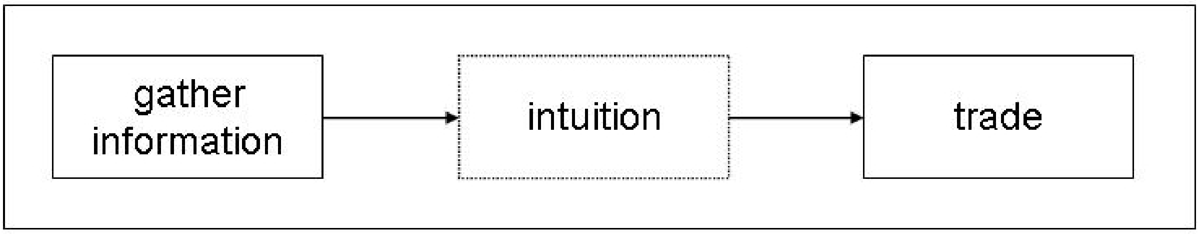

Figure 2: An intuitive decision process.

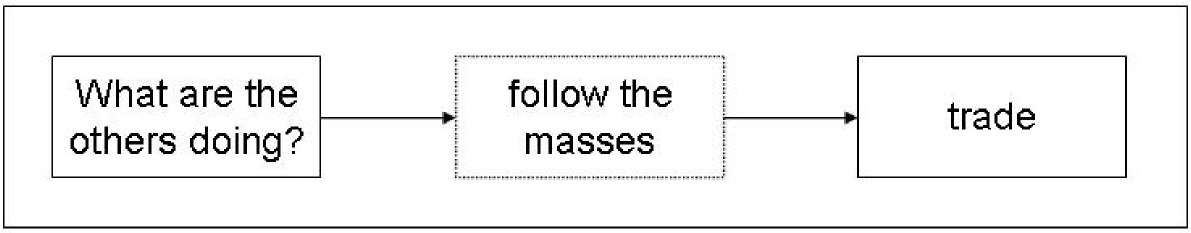

Figure 3: Herding (or 'intelligent-herding' if the central action is not simply 'follow the masses' but: 'go where you think the others will go' instead).

Other possible decision-making processes include for example an intuitive process (Fig. 2). In this scheme, the trade in the third step is based on intuition during the second step instead of the application of models. A third option consists of herding, where the information gathered in the first step reflects what the others are doing and the processing of this information in the second step tells the actor to follow the mass (Fig. 3). These decision-making processes also can be combined (Fig. 4). This combined strategy is based on a first step that identifies what the others are doing. From this, the actor can either conclude in the second step to follow the masses or to do the opposite or perhaps even to follow his own intuition.

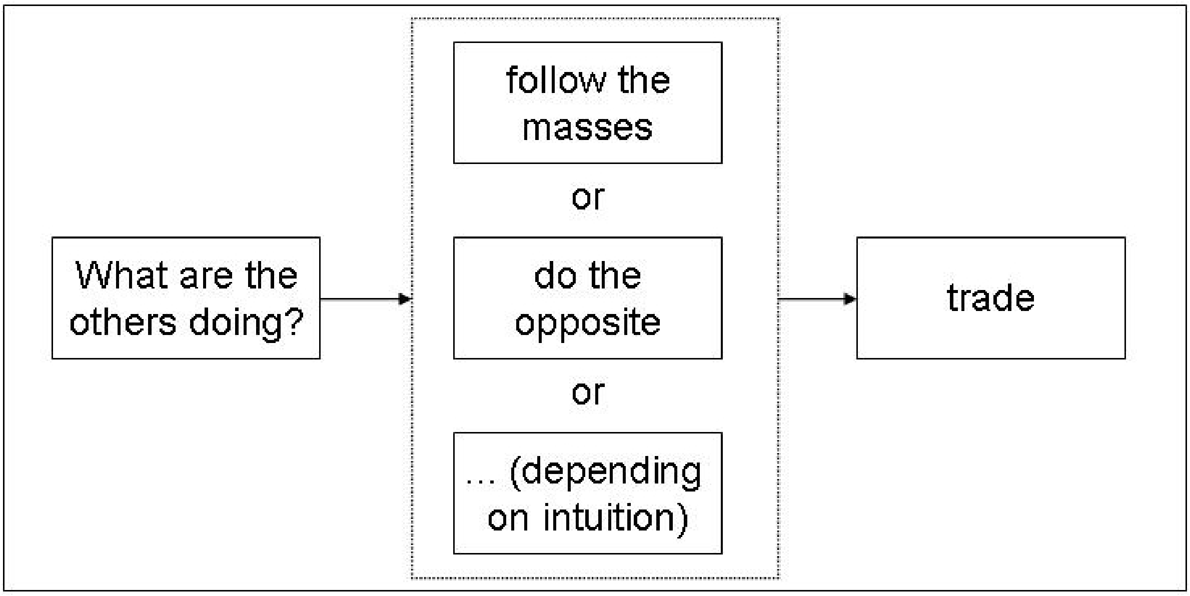

Figure 4: Combination of herding and an intuitive decision process.

If comparing two traders with the same second step action, the trader with the better information gathered during the first step is likely to outperform the other one. Therefore, it appears to be sensible to observe what the competitors are doing in order to be aware of possible additional information that could keep the actor from being the loser in the end. Thus, it is rational to include a reflexive component in the decision process, in which the own results are cross checked against the actions of competitors on the market. As Beunza and Stark (2010: 4) state:

> “In our view, a satisfactory explanation needs to focus on the interdependence between the social and the calculative. That is, we take as our starting point the observation that financial actors go back and forth between models, their understanding about what is being traded, and their ability to figure out what their competitors are doing.”

A Reflexive Modeling Decision Process

Beunza and Stark (2010: 6f) highlight the key aspects of the reflexive modeling decision process of merger arbitrage traders they observed in their studies:

> "The core finding from these observations is that traders cast a skeptical eye on their own models by exploiting the fact that *other* traders, equipped with their own models, have also taken positions on the merger. In effect, arbitrageurs back out from the stock prices of the merging companies, thus getting at the "implied probability" of the merger – that is, at the aggregate probability that other arbitrageurs attribute to the merger. This practice gives arbitrageurs the opportunity to check their own estimates. Gaps, disparities, differences, and mismatches produced positive friction that stimulates re-search. The lack of them gives traders greater confidence that their views are correct."

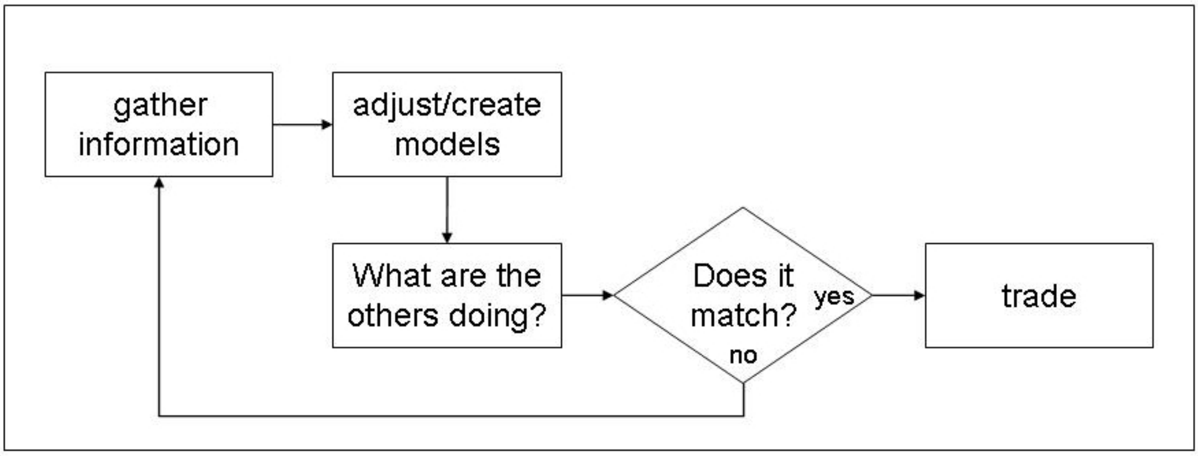

Figure 5: A reflexive modeling decision process (in the order of consideration).

These observations can be visualized by expanding the decision schemes presented in the first figures. In Figure 5, a reflexive modeling decision process is shown that reflects the traders' behavior in first gathering information, then creating or adjusting mathematical models, and finally checking the competitors' actions using aggregated plots or through personal contacts. If the implied probability that actors gain from the information about what the others are doing matches what they computed from their own information before, they can reach a profound trading decision. Otherwise, they go back to gathering additional information to find explanations for the dissonance between their model results and the observed actions of other actors in the market.

> "A trader's ability to mobilize prices for greater precaution hinges on the encounter between the probability of the merger (estimated at the desk) and implied probability (derived from the spreadplot). This comparison provides an invaluable advantage: it signals to traders the extent of their deviation from the market, warns against missing information, motivates additional search, prompts them to activate their business contacts, and provides the necessary confidence to expand their positions." (Beunza & Stark 2010: 35f)

While the reflexive modeling decision process in Figure 5 is outlined in a chronological way along the arrows, it also can be viewed slightly differently, indicating the position 'what are the others doing' as an influential aspect that deviates from the initially gathered information. Thus, it serves as a separate source for checking whether the actors need to gather more information or whether their models are already sufficient for trading (Fig. 6).

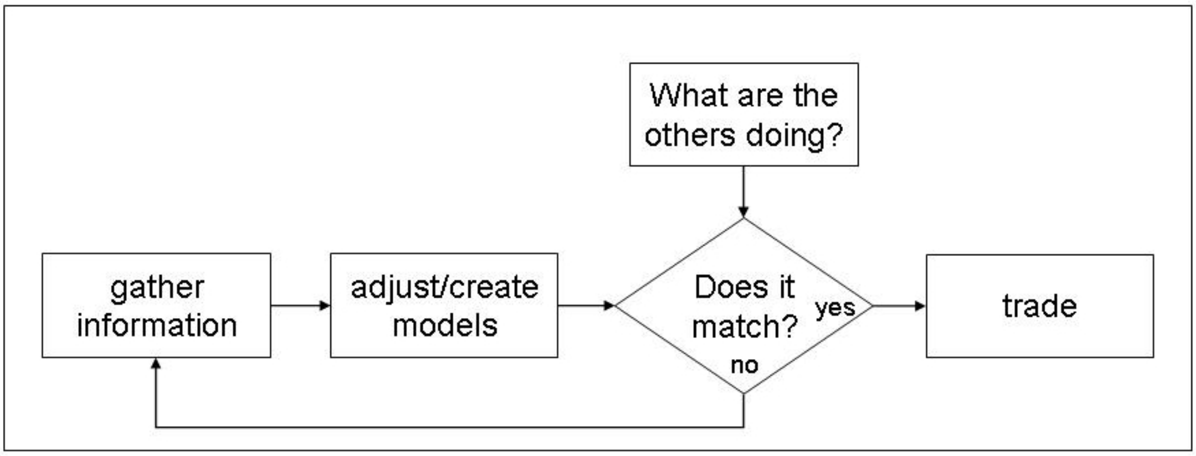

Figure 6: A reflexive modeling decision process (in the order of influence).

But this implies that in each reflexivity step in the process of reflexive modeling the merger traders adjust their models to what the others are doing.

> "Our analysis so far has established that the arbitrageurs deploy sophisticated quantitative tools. But as we shall see, no matter how sophisticated their tools, arbitrageurs are acutely aware that their models are fallible. Traders confront their own fallibility by distancing themselves from the categories and procedures that guided them to an initial position." …
>
> "Traders, we found out, gain cognitive distance from their categories by exploiting the fact that *other* arbitrageurs have also taken positions on this trade." (Beunza & Stark 2010: 27)
>
> … "The spreadplot reduces that cognitive complexity by representing the *aggregate* of the expectations of other traders." (p.28)

So the question arises: to what extent do the actors' own models and any confidential information influence their trades and how much do actions of other actors influence the merger traders' final decisions (Figure 7)?

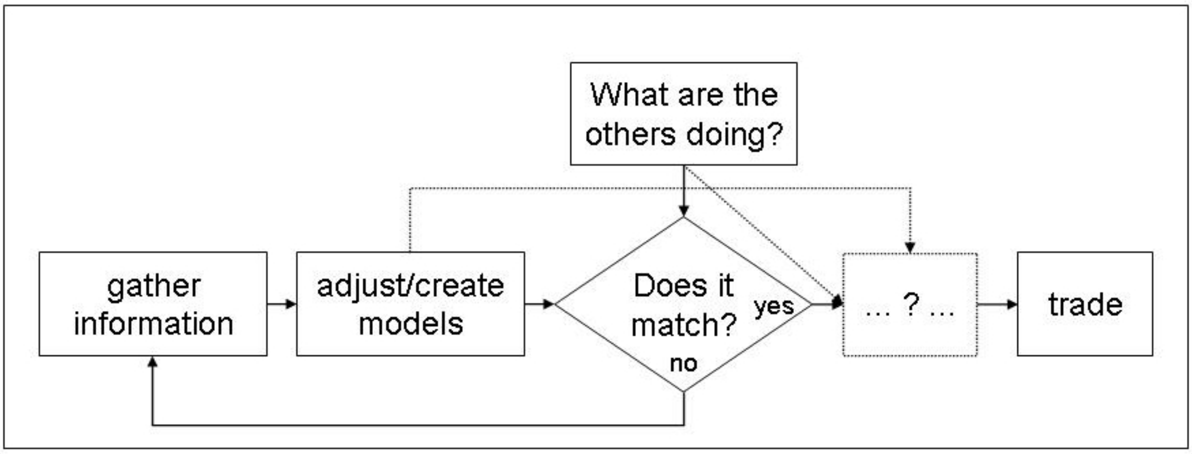

Figure 7: The question is how the actual decision is finally reached and by what aspects/mechanisms it is influenced.

> "The opportunity that Max saw, then, was not the result of privileged information. As Max said, "right now, the data is all on the Internet, even the SEC filings." Being widely available, information does not confer any advantage. To him, it resulted from

> his desks' distinct interpretation of publicly available data. … Because arbitrageurs use models to check their positions against the rest of the market, the diffusion of reflexive modeling creates cognitive interdependence between otherwise independent rivals." (Beunza & Stark 2010: 38)

Thus, if the specialty is the weighting and the interpretation of available data, the critical part that makes the difference in present day trading is not the information itself but the models that weight it and that in a reflexive process are adjusted to how the other actors weight the information (Fig. 8).

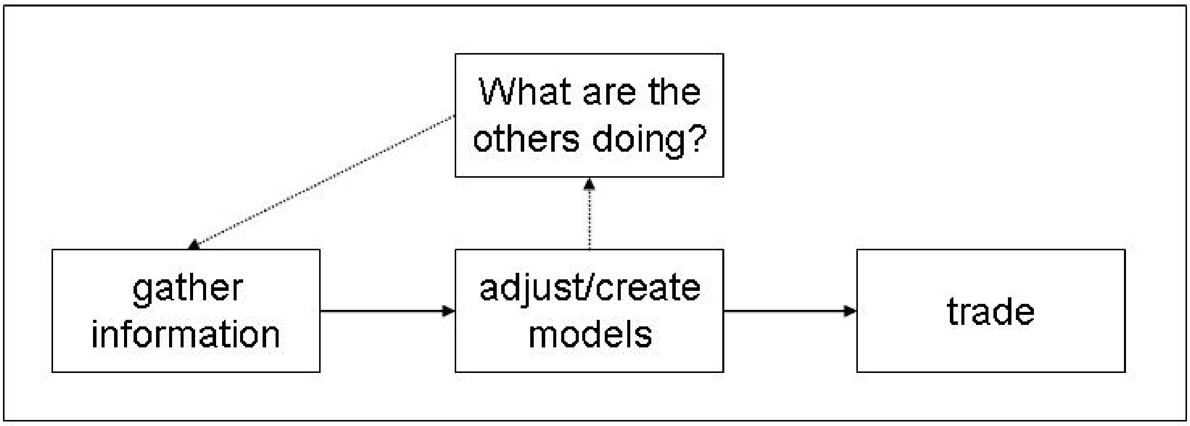

Figure 8: Is the actual trading process more like a basically non-reflexive process, in which only from time to time a reality-check is used to decide whether the models applied area already of sufficient quality or whether more information is needed?

> "The persistently wide spread, in short, was an ambiguous signal: it could be signalling incorrect modeling or a profit opportunity. … Max and his colleagues responded to the discordant spread by plunging into a search for possible merger obstacles that they might not have anticipated. "Are we missing something," Max asked to the traders. … Having observed the dissonance between their own probability estimates and the implied probability, the traders went back to search for missing information." (Beunza & Stark 2010: 32f)

Still there also is an intuitive component implemented in the interpretation of the match or mismatch of information left to the specific traders in their decision-making process.

> "… Knowledge of the spread stimulated the arbitrageurs to search *more*. … The material tools allow traders to come up with more sophisticated answers than traditional investors precisely by inducing skepticism about the tools. Arbitrageurs, in this sense, are persistent but skeptical users of calculative devices." (Beunza & Stark 2010: 33)

The traders' limit to their skepticism is either a perfect match with what the spreadplot tells them about the other traders' actions or that their own intuition tells them that the model is sufficiently close and all necessary information is weighted and used appropriately. Thus, their own skepticism about their models may lead the traders through an intense reflexivity to a considerable adjustment to the competitors' actions, leaving just enough space for an intuitive component (the box with the question mark in Figure 9) before the actual trade is made (Fig. 9).

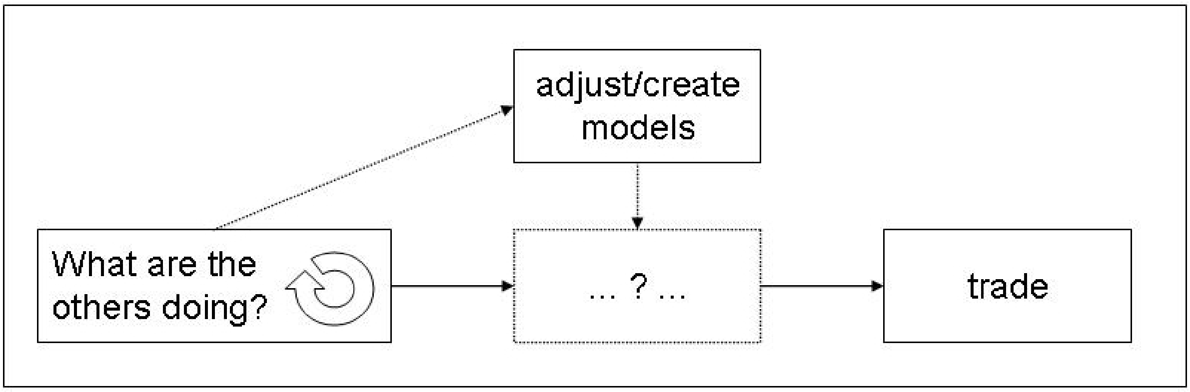

Figure 9: Traders follow their models but also create their models to mirror what the others are doing. Therefore, they follow the others' actions, which is the definition of herding.

A comparison of Figure 9 with the Figures 2 to 4 indicates that it is obviously a slightly more complicated but basically intuitive or herding decision-making process, depending on how the actual decision is then reached at the position of the question mark.

> "To clarify the precise mechanism that led to these losses, we interviewed the senior merger trader and the manager of the trading room. The latter made clear that the bank was reacting to the spreadplot. It increased its position, making things worse for itself. According to Bob, Max traded it … everyone's database lacked a field, and the field was "European regulatory denial." … I encouraged him [Max] to increase his size … you have confidence, all of your fields are fine… so instead of four million, I said six million. In other words, the desk lost six million because it increased its exposure to the trade, and the increased exposure was a reaction to the spreadplot." (Beunza & Stark 2010: 41f)

Due to the previous distinction how the own models of the traders are used and to which extent the information on the other traders' actions, which are mainly derived from the spreadplot analysis that is mentioned in the above citation, influences the actual trading decision, it is obvious that in the observed example, leading to a strongly negative result for the trading room, the weighting resembles more Figure 9 than Figure 8. And thus the decision process in that case can be considered 'intelligent' herding behavior.

The self-reinforcing mechanism behind the decision-making process

> "Our analysis, however, suggests that GE-Honeywell was neither a Black Swan nor an information cascade. It was, we contend, an unintended consequence of reflexive modeling. … Our interviews suggest that the size and magnitude of the disaster was an outcome of a subsequent move: the traders' reaction to the initial confidence. It was the social activity, coupled to the model that produced such losses." (Beunza & Stark 2010: 40f)

Self-reinforcing mechanism prior to each trading decision

> "First, the arbitrageurs at International Securities independently underestimated the risk of regulatory opposition (their competitors did too). Second, when the arbitrageurs checked the spreadplot to confront their estimates against the rest of the market, they found confirmation: the spread was narrow, and was not moving with

> news of Monti. Thus reinforced, the traders then engaged in a third move: they increased their exposure. The combined result of these three steps is that the overconfidence of the different arbitrage funds reinforced each other, via the spreadplot. The spreadplot is thus the source of cognitive interdependence. Were it not for this device and the practice of reflexive modeling, trading losses would have been far less profound and widespread." (Beunza & Stark 2010: 42)

The positive feedback process, Beunza and Stark extract from their observations, reinforces the conformation for one trading position. The aggregated position of other traders affirms the one of each single trader (Figure 5) to even increase the investment amount (Figure 2). This increase of single trader's activity again can be monitored on an aggregated level in financial market data. And the increase in the collective confidence reassures single arbitrage traders again (c.f. Figure 9). This positive feedback process occurs although and because of the highly rational approach of merger arbitrage traders, represented and applied in their models.

Coupled self-reinforcing of the pursuit of rationality and the usage of reflexivity

> "In our interviews, the traders confirmed that arbitrage disasters are caused by the use of the spreadplot. Disasters start when numerous arbitrage funds overlook a potential cause of merger failure. Or as Max puts it, "when there is a first impression and people don't have a basis for handicapping it properly." This initial oversight is then compounded by the fact that each fund erroneously takes the others' lack of visible concern (i.e., the absence of a spike the spreadplot) as reassurance that the merger will be completed. The added confidence leads each fund to increase its position, compounding the losses when the merger is canceled." (Beunza & Stark 2010: 42)

Even events where high reflexivity has lead to collectively wrong decisions and great losses increase the awareness of bounded rationality and the pursuit to compensate lacks. The pursuit of rationality increases the merger arbitrage traders' tendency to cross check their models with market data such as in comparing results to spreadplots. This behavior can be described as an increasing tendency to use reflexivity in their decision-making processes.

Trades that turned out positive in the end after performing a reflexive decision-making process would confirm the profitability of the reflexive modeling and increase the tendency to use it for the preparation of the next trade. And even events that have produced negative outcomes for the merger traders would reinforce the habit of using reflexivity as just described. Thus, the pursuit of rationality increases the awareness of bounded rationality that reinforces the use of reflexivity and directly (in a positive feedback) or indirectly (coupled with a loop of bounded rationality awareness) reinforces itself (c.f. Figure 10).

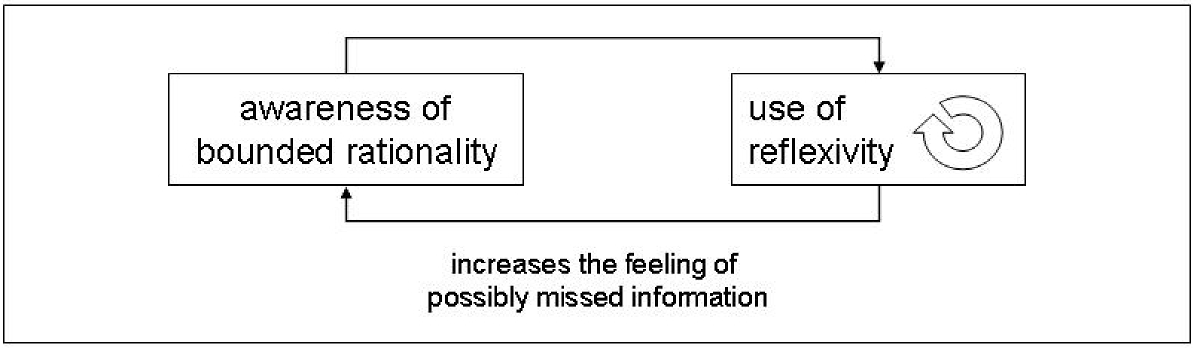

Figure 10: The awareness of bounded rationality increases the use of reflexivity that gets self-reinforced: directly, in a positive feedback; or indirectly, coupled with a loop of bounded rationality awareness.

In this self-reinforcing process both the awareness of bounded rationality (feeling limited) and the use of reflexivity are coupled reinforced. The result is a large use of model reflexivity due to a high awareness of bounded rationality and vice versa.

For each trade again the decision-making process is likely to become increasingly reflexive due to the awareness of bounded rationality or a positive feedback. Therefore, the reflexive decision-making process more and more becomes a routine (least-effort-principle (c.f. e.g. Chaiken & Trope 1999; Moskowitz, Skurnik, & Galinsky 1999).

The merger arbitrage trader’s decision-making behavior thus tends to lock-in in a dominantly reflexive decision-making, in which decisions are made upon the aggregated decisions of other traders (the masses) and in which the amount of each single trade is decided upon intuitively.

Conclusion

Concluding from their empirical studies, Beunza and Stark (2010: 15f) state that "Financial models, we contend, create a distinct form of interdependence that needs to be understood. Once traders rely on anonymous competitors for crucial insight, a novel mechanism of social influence exists. What potential pitfalls does it pose?"

In this paper it is shown that one of the possible pitfalls of merger arbitrage trading is that intensely applied reflexive modeling shapes traders' decision-making processes to resemble one of an ideal type path dependent. Such a trader tends to follow external decision instances instead of independently optimizing his own decision criteria. Thus, the observed reflexive modeling behavior can be used to explain the discrepancy between regularly statistically observed herding phenomena (c.f. Scharfstein & Stein 2001) and the intense use of financial models for trading, such as the ones provided by economics or computer tools created as in the merger arbitrage example observed by Beunza and Stark (2003; 2004; 2010; Stark 2009) and further analyzed in this paper.

> "Our analysis locates the root of the disaster in the reflexive processes we documented in the ethnographic first half of our study. … This can lead them to expand their positions and make them suffer widespread, potentially catastrophic losses in the event that the merger is cancelled." (Beunza & Stark 2010: 7)

From the empirical findings of Beunza and Stark (2003, 2004, 2010) it can be analytically deduced that an increasing pursuit of rationality leads to increasing herding. An increase in a pursuit of rational decision-making in the awareness of bounded rationality leads to an increase in reflexivity to cross check the results. With every mismatch the pursuit of rationality gets reinforced. And with every match, the action behavior more and more resembles herding. Therefore, in this presented work, a concrete example has been given of a self-reinforcing process, where an increase in locally rational behavior in a locally fixed organizational environment directly leads to herding that usually is observed and described as an entirely different organizational structure.

The combination of path dependency theory as presented in this paper with assessments of overall decision-making processes including the observation of reflexive components, and what that reflexive process framing actually results in, can help to understand and improve future decisions.

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