Does The Consensus Prevail? Experimental Evidence of Herding

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Abstract:
When a subject chooses to put aside his private information and follows the consensus of analysts, herding takes place in financial markets. Several factors have been supposed to have an impact on this behaviour. Thanks to an experimental setting close to the work of Cote and Sanders (1997), these hypotheses are empirically tested. Subjects are given some fundamental information in a firm and asked for a recommendation -buy or sell-. This personal judgement is then confronted to the consensus of analysts, which is opposed, in order to analyse if subjects are revising their recommendations. In this binary choice setting, herding takes place, and is inversely correlated to perceived individual ability. Moreover, when reputation is at stake, conformist subjects are more prone to follow the consensus. On the other hand, subjects do not seem to be significantly influenced by perceived reliability of the information, *a priori* confidence in the consensus, nor the proportion of the majority in the consensus.

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Key Words: Herding Behaviour, Consensus, Decision Making, Investment Choice, Reputation, Informational Cascade, Experimentation

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Introduction

> *« It seems that designing tests that distinguish between the potential causes of herd behavior is a fertile area for future research »*
>
> Graham (1999, p.262)

Herding behaviour is a frequently cited phenomenon by both money managers and academics to explain booms and craches in financial markets (Denevow and Welch [1996]). Sometimes, agents on the market are presumed to act according others' behaviour. Even though this following behaviour is often analysed by the literature (e.g. Bikhchandani, Hirshleifer and Welch [1992], Scharfstein and Stein [1990], Orléan [1989] or Chamley [2004]), empiric evidence is, however, still really scarce (Welch [2000]).

Since Lakonishok, Shleifer, and Vishny (1992), many works (e.g. Wermers [1999], Wylie [2005]) try to show clusters among individuals, who act together on the market, compared to a « normal » behaviour. These studies are however poorly convincing since they come up against the detection of actual herding behaviour. The fact that individuals acted the same manner is not always the consequence of herding[1] and can only be the same answer to a common constraint or information, just as people open their umbrella because of the rain, and not because other people opened it (Weber [1968, p.23]).

Then, genuine herding behaviour cannot be really isolated without the knowledge of the information set used by each actor. Experimentation appears to be a convenient method to control this information set. Many works, stemming from Anderson and Holt (1997)[2], reveal evidence on informational cascades in very simplified environments. The asset is presented as a state of nature, and information signals are designed by urns holding a proportion of indicators on this state[3]. This probabilistic environment appears, however, rather far from a

[1] For a precise definition, see Hirschleifer and Teoh (2003): "Herding […] is defined to include any behavior similarity […] brought by the interaction of individuals".
[2] And other works of Cipriani and Guarino (2001) or Kübler and Weizsäcker (2005)
[3] For Anderson and Holt (1998), two states are possible: A or B. The state is chosen randomly and is unknown by the subjects. If state A is chosen the urn used contains p balls a et (1-p) balls b. The signal given by the ball is informative: the probability that a ball a corresponds to state A is p.

real financial decision, which involves more complex information. In fact, a probabilistic environment is called into question since, for some authors, it confuses risk and uncertainty[4].

Cote and Sanders (1997) propose an original methodology to avoid this problem. They study the impact of the consensus on subjects' earnings predictions. Individuals have access to an information set and make a prevision of earnings for the following year. After this prevision has been made, a consensus of analysts is submitted to them, and they can revise their prevision. The authors find that the consensus significantly influences the subsequent estimation. This influence is more important when subjects find the consensus credible, and when they have a poor confidence in their own ability.

If these authors analyse herding behaviour in a continuous choice setting, however, the bulk of academic works -including seminal models from Bikhchandani, Hirshleifer and Welch (1992) or Scharfstein and Stein (1990)- are based on a binary signal and dichotomous choice setting. Herding behaviour is not defined as a choice closer to the consensus, but rather, in a much more restrictive manner, when individuals give up their own signal to follow one or more agents, like the consensus of analysts.

The goal of this experimentation is, through an adaptation of Cote and Sanders' (1997) design, to study herding in a simple binary financial choice setting. In this test, reputation, which was not analysed so far, is included. We clearly find empiric evidence of herding behaviour in this framework. Herding is proved to be correlated with the implication of reputation -especially for conformist subjects-, and inversely correlated to subjects' ability. The paper is organized as follows. First section (1) develops some of the major academic reasons explaining herding behaviour tested in this experimentation. Then the methodology is described in section (2), and the main results are presented in section (3).

1 Factors explaining herding behaviour

Several factors have been analysed by the literature in order to explain herding behaviour. Orléan (1999) syntheses these factors through three main causes: informational, normative

[4] Shiller (1984) or Orléan (2005) recall the distinction of Knight (1921): the future in financial markets is radically uncertain, whereas distribution laws are known in probability.

and autoreferential[5] ones. However, these causes are still theoretical, and concrete, empirically testable hypotheses are needed[6].

In their seminal model, Bikhchandani, Hirshleifer and Welch (1992) underline the role of information quest as a major factor of herding. In this framework, an agent imitates the previous ones when he believes that they are better informed than himself. Then, when every agent has the same signal reliability, *p*, if two previous agents acted the same way, the third rationally follows, disregarding his own information and a *cascade* occurs. If reliability is not the same for every agent, an actor having a low precision signal will logically be more inclined to herd.

H1. The less the private signal is perceived as reliable by the agent, the more his tendency to herd is significant

The precision of the private signal could be split into two components: the reliability of the signal itself, and the belief of the actor in his own ability to understand it. An agent could receive a very precise signal and feel *a priori* unable to interpret it properly. Therefore, the confidence of the agent in his own capacities could play an important role in his herding behaviour.

H2. The less the agent has a priori *confidence in his own capacities, the more his tendency to herd is significant*

Cote et Sanders (1997, p.24), note that the perception of other actors' ability is often invocated in social psychology studies. For instance, a major and famous analyst should have more impact on money managers than a younger one. In the same way, if the consensus of analysts is perceived *a priori* to be highly credible, he should have more impact on the decision.

H3. The more the agent has a strong a priori *confidence in the ability of analysts, the more his tendency to herd is significant*

The proportion of analysts making the same recommendation could also have an influence. Kübler and Weizsäcker (2005) show in a study on several experimentations based on

[5] Since the price is viewed as a consensus between agents, following the herd can be interesting because the price is driven up by other's buyings. This needs a feedback mechanism not used in this experiment.
[6] The hypotheses proposed mainly rely on Marsat (2007).

Anderson and Holt's (1998) probabilistic environment, that a positive correlation can be proved between the length of the cascade and its strength. The more an important number of agents have made the same decision, the more the probability the next one makes the same choice is important.

H4. The more the proportion of analysts agree on a recommendation, the more his tendency to herd is significant

Since Scharfstein and Stein (1990), reputation is often cited to explain herding behaviours[7]. The manager acts, not to optimise his decision in an informational manner, but in order to protect his reputation towards others, and to avoid to be judged as incompetent. As a matter of facts, it is difficult to objectively judge the ability of managers on financial markets, insofar as their performance is highly affected by random components. The best way to evaluate their ability could be to compare their actions with the ones of theirs peers, postulating that the majority is correctly informed.

H5. The more the agent tries to protect his reputation, the more his tendency to herd is significant

Social psychology studies, (e.g. Asch [1951], Crutchfield, [1955]) show that some individuals are more prone to follow the majority than others. They exhibit a more conformist personality, and their behaviours are generally close to the group.

H6. The more the agent is proved to be conformist, the more his tendency to herd is significant

Briefly, herding behaviour should be correlated with the perception of analysts' ability, the proportion of analysts who agree on a recommendation, the protection of reputation and individual conformism. On the other hand, a high reliability of the information signal and confidence in individual capacities should be negatively correlated with this behaviour. This paper is an exploration of an actual empirical testing of these factors. Next section describes the methodology used in the experimentation.

[7] See for instance Graham (1999), Avery and Chevalier (1999), Dasgupta and Prat (2006), or Ottaviani and Sorensen (2006)

2 Methodology

Experimentation was introduced in finance by Chamberlin (1948) and Smith (1962). This field is growing rapidly since the early 1990's[8]. Conversely, cognitive psychologists Tversky and Kahneman (1974) have studied the behaviour of subjects in risky environments. Daniel Kahneman and Vernon L. Smith, from both streams, have been awarded with the 2002 Nobel price in Economy.

The main contribution of this methodology is its power to isolate the variables and to enable a *ceteris paribus* study, as in physics or biology. The *in vitro* environment is then, by far, less influenced by multiple and uncontrollable factors. The aim of experimentation is not to substitute the laboratory to field studies, but rather to propose a complementary methodology to better understand the role of some particular factors involved in a phenomenon. Concerning herding behaviour, experimentation seems to be a convenient manner to control the information set of each actor, and to discriminate herding from correlated behaviours. This constraint is not possible *in situ*, on financial markets.

Naturally, the conditions including information set, decision rules, interactions and subjects - students- are highly simplified and do not correspond strictly to real ones. After all, this simplicity is just the transposition of the simplification required by theory which looses, if too complex, its explanatory power (Davis and Holt [1993a]). Then, experimentation is not a genuine replication of reality, but an environment creating a metaphor in order to better understand the base mechanisms which trigger financial behaviours (Poujet [2001, p.58]).

2.1 Experimental design

In order to isolate an actual herding behaviour, subject's initial choice has to be opposed to the one of the majority of the consensus. The pieces of information given to the subjects where selected with a screening using *JCF Quant - Factset* database, which is widely used among portfolio managers. Two different French firms were selected in order to satisfy three criteria:

1. to have ratios (including P/E and Price/book ratios) over or under-valuated compared to the market, as well as to their industry sector[9]

[8] See recent summaries in Davis and Holt (1993 a and b), Kagel and Roth (1995) or Plott and Smith (2006).
[9] Between years 2000 to 2005, "over valuated" firms had a price/book ratio over 3 and a P/E ratio over 50. "under valuated" firms had a P/E ratio under 12 and a price/book ratio under 1.

2. in order not to be recognized by subjects, these companies have been chosen in the mid and small caps. All companies recently breaking the news have been put aside.
3. the "new technology" companies, including information and communication have been isolated, since the recent internet bubble might have induced special behaviours.

The data submitted to subjects are real data from *JCF Quant - Factset* database, with complementary information from annual reports of the companies and an internet free financial data provider[10]. The two French chosen have been called X and Y. No subject recognized them.

2.2 Experimental decisions

The questionnaire was divided into three parts. The first and the third parts correspond to demographic questions as well as measures of indicators concerning the hypotheses. The experimentation, in the second part, was split into three stages.

Stage 1

At the first step, an information set on the firm is submitted: a brief general presentation, industry statistics, evolution of sales, profits and EBIT, balance sheet, income statement as well as major ratios over the last four years. The comparison between firm's ratio and the industry pinpointed an over or under-priced firm from a fundamental point of view. With this information set, subjects are asked to make a buying or selling recommendation and to disclose their confidence in this choice.

Stage 2

At stage 2, new information is submitted to subjects:

1. a consensus of analysts, which was manipulated in order to be opposed to the over or under-pricing revealed at stage 1.
2. a five year financial summary, which *a priori* conveyed no more information than given at first stage[11]. As pinpointed by Cote and Sanders (1997, p.28), this summary is added because the consensus alone may trigger demand effects and hypothesis guessing.

[10] www.boursorama.com

[11] This financial summary reports some of the ratios already present at first stage, some are divided by share. The data about N-4 do not seem to give much more information. An *a posteriori* discussion with subjects showed that this summary was not really used in their second recommendation.

With data of the stage 1 and these new additional data, subjects had to make a second recommendation and indicate their confidence in their choice.

Stage 3

At stage 3, no new information was submitted to subjects. The decision rule is however different, since a constraint of reputation is introduced, according to Scharftein and Stein (1990). If the personal recommendation diverges from the one of the analysts, the portfolio manager will be the only one to support a bad choice, and will be judged incapable by his clients and hierarchy. On the other hand, making a bad decision with the majority enables the manager to "share the blame" with others. With this new constraint, subjects gave a third recommendation, and the confidence he places in this choice.

2.3 Measure of the hypotheses

Parts 1 and 3 of the questionnaire are designed to collect data in order to interpret the results of the experimentation, according to the hypotheses presented.

***A priori* confidence**

The *a priori* perception of the individual ability and the one of other agents should play an important role in the decision. To measure this confidence, diverse scales could have been used. Following Cote and Sanders (1997), the Lichtenstein and Bearden (1989) scale measuring source credibility has been chosen to gauge *a priori* the perception of the confidence of subjects in their own capacities, as well as the confidence they place in financial analysts.

Before any information on the firm, subjects were asked to estimate this confidence on a seven point Likert scale, rating the analysis as (1) dependable, (2) credible, (3) accurate and (4) trustworthy.

Perceived reliability of information

All the subjects had access to the same information at stage 1: whether on firm X or on firm Y. However, all subjects may not have the same perception of this signal. Therefore, the reliability was assessed through a seven point Likert scale, in which subjects rated the information given as (1) precise, (2) easy to interpret, (3) reliable and (4) exhaustive.

Conformism

Conformism is a difficult personality trait to assess *a priori*. The scale coined by Pettigrew[12] (1958) in psychology is widely used and seems the most reliable. On a seven point Likert scale, subjects had to assess their agreement (1: "not agree", 7: "totally agree") with affirmations trying to evaluate their personality when facing other's behaviour.

Proportion of the majority

As opposed as the previous hypotheses which rely on individual characteristics, the proportion of the majority was a manipulated variable. Two modality of this factor were submitted to the subjects. Each firm was presented at stage 2 as being rated by seven analysts. In the *strong majority* case, six recommended the opposed choice compared to a fundamental point of view of stage 1, and one this fundamental choice. In the *weak majority* case, four analysts were opposed to a fundamental choice whereas three were coherent with it.

2.4 Experimental procedure

The experimentation took place with students in finance in February 2006, with the agreement of each academic responsible. In order to avoid any bias, the students were not aware of this experimentation. All the procedure has been followed meticulously in order to preserve the reproduction of this research.

During the presentation of the instructions and the questionnaire, the goal presented was to better understand the information used in an investment decision. This was presented as an important research and had to be filled carefully. After asking for questions, subjects were not allowed to communicate with each other during the time of the experimentation. Before the questionnaire was given, it was underlined that subjects had to respond to the questions sequentially, and that the data were different for two people sitting aside[13]. These instructions were reminded to subjects on the first page of the document. The average time of the experiment was 35 minutes.

2.5 Subjects

Overall, 158 subjects from five different programs have filled this questionnaire. Four documents were not totally completed. The questionnaires in which the first recommendation fits the consensus of the analysts (49) were also set aside because they cannot clearly show a

[12] Five representative items have been selected on this scale

[13] The questionnaires have been distributed in order to alternate X et Y firms as well as the proportion of the consensus (high/low): X1Y1X2Y2X1…

herding behaviour, since these subjects do not rely on fundamentals for their recommendation. On the remaining, 17 were excluded since they were aware of the goal of this experimentation and, knowing the hypotheses, could have therefore disguised their choice.

88 questionnaires have been statistically exploited. The subjects chosen for this experimentation were students in first and second year of Master, with a high level in their finance or accounting speciality. The repartition is detailed in table 1.

< INSERT TABLE 1 ABOUT HERE>

These subjects had from their formation a good knowledge of firm evaluation[14]. Beyond, some of them have an experience of the financial markets: 53 subjects declared having managed a virtual portfolio[15] and 23 had already personally bought real stocks.

There were four different questionnaires, with two firms (X and Y) and two proportion of the consensus (high and low, coded respectively 1 and 2). Overall, the number of each type of questionnaire is reported in the table 2 below.

< INSERT TABLE 2 ABOUT HERE>

2.6 Coding of the variables

Herding behaviour has been coded into two different manners. In order to measure herding, which can be either a buying or a selling recommendation -depending on X and Y-, a variable HERD2 was created, taking two values: 1 if the subject imitates the choice of the consensus at stage 2, and 0 otherwise. HERD3 is identical, concerning the choice with reputation, at stage 3.

To measure more precisely the inclination to herd, three variables called ICONF1, ICONF2 and ICONF3 have been created, corresponding to the confidence of the subject in his recommendation. When his recommendation is opposed to the consensus, ICONF has been coded between –1 to –7 according to the Likert scale of confidence in the decision. On the other hand, when the choice is to follow the consensus, the confidence has been symmetrically coded from 1 to 7. Hence, a subject who is very confident in a herding choice

[14] The acquisition of these techniques and the knowledge of the main ratios have been checked with the professor involved in this formation.
[15] The most cited simulations are *Boursorama* and *Stocktrak*

will be close from 7, whereas a subject very confident in a fundamental decision will be close to –7. This coding enables us to consider both the choice made by the subject and the confidence attributed in this recommendation.

3 Results of the experimentation

All the answers have been checked twice and exploited with SPSS 12.0. Descriptive results are developed first (3.1), before the examination of explicative results (3.2).

3.1 Descriptive results

Impact of the consensus on subjects' perception

Before analysing the choice made by subjects, studying the impact of the consensus on their perception of the firm they had to evaluate is particularly interesting. They were asked to reveal, on a seven point Likert scale, if they thought that the performance of the stocks of the firm -for the next 12 month- would be below, above, or at the same level than the market. Before knowing the consensus, estimations of the firms rely on fundamentals and shows firm X over-priced -performance is presumed to be worse than the market in the future- whereas firm Y is under-priced. The consensus is manipulated in order to be opposed to this estimation: the majority of the analysts recommend buying stocks of X, and selling Y's stocks. This is not without consequences on the perception of subjects.

The performance estimated by subjects after the consensus are by far more close from the mean. The mean of the estimations for firm X rises from 2.86 to 3.60 whereas they fall from 4.61 to 4.46 for Y. The difference of perception is significant ($F(1,86)=14.38$, $p<0.000$). It is interesting to notice that perception for firm Y is less affected than for firm X. This could be explained by the industry, since Y belongs to the automotive industry whereas X leads research and development in the pharmaceutical industry, which can be considered as a more promising industry.

< INSERT FIGURE 1 ABOUT HERE>

Evidence of herding behaviour

There were diverse written reactions to justify the decision. One subject notes: "I'm rational, therefore I follow the analysts". Another one writes: "they are *only* analysts". The consensus had different impacts on the choices made. On 88 subjects, whose personal analysis differs

from the consensus in the first recommendation, 25 choose to put their own opinion aside, and followed the majority of analysts at stage 2. When reputation is introduced at stage 3, most of the subjects who followed the analysts before did not change their choice[16]. 21 subjects who did not herd for informal reasons, however, decided that it was a best choice to follow the consensus to preserve the reputation.

< INSERT FIGURE 2 ABOUT HERE>

Overall, 46 subjects, who initially had a different opinion from the consensus, have chosen to give up this opinion and to follow the analysts. On the other hand, 42 never followed the choice of the consensus and have maintained their own analysis on the two recommendations. In coherence with the perception of the performance, subjects analysing firm X are a little more prone to herd than the ones with firm Y, even if the difference is not significant[17].

Some of the subjects acknowledged the importance of the consensus in their decision: 18 mention it as one of the three most important information pieces, but only 4 times as the most important. Most of them do not mention the consensus, and invocate fundamental information to motivate their choice. Several explanations are possible. The consensus might have led them to search within fundamental data, some information confirming this point of view. Admitting following the analysts may also reveal their incompetence, and was possibly avoided by some of them. In their study, Northcraft and Neale (1987) invited experts to visit a house during 20 minutes and gave them a 10 page document on the house, and the ones in the area. The experts are invited to make an estimation of the price. This estimation proved to be influenced by the prices of others houses mentioned in the document, but, during the experiment, only 8% of the experts acknowledged that this point was one of their three major criteria of evaluation. In the same way, an important part of the influence of the consensus is not spontaneously admitted by the subjects of this experiment[18].

Evolution of the confidence in the decision

The ICONF variables represent the confidence of the subject in his choice. When ICONF is negatively coded, the subject has confidence in a fundamental behaviour, opposed to herding. Every subject has been selected to adopt a fundamental behaviour at stage 1. The introduction

[16] One can notice two subjects who change their mind, and, after following the analysts, decide to come back to a fundamental choice. This might be interpreted as reaction of opposition to group pressure, but involves only two subjects.
[17] A chi-squared test gives for HERD2, $\chi^2=0.256$; df=1 ; $p<0.613$ and for HERD3 $\chi^2=0.729$, df =1 ; $p<0.393$
[18] This could partially call into question some works only based on surveys, see e.g. Lütje (2005).

of the consensus modifies the mean confidence in a fundamental choice, whose means is -4.15 before the consensus (ICONF1), and -1.93 (ICONF2) afterwards.

The median is almost stable between ICONF1 and ICONF2. Subjects who had a high confidence in their fundamental evaluation seem not to be influenced by the consensus. On the other hand, subjects who had doubts on their decision (ICONF between –3 and –1) have been largely more influenced by analysts. The introduction of reputation modifies the average confidence to –0.41, very close from the equilibrium between herding and fundamental behaviours. In this case, however, the median is significantly higher, and some subjects who placed high confidence in their own judgement have consciously decided to put it aside, in order to preserve the reputation of the portfolio manager.

< INSERT FIGURE 3 ABOUT HERE>

The subjects who herd during stage 3 (ICONF3) have generally a low confidence in their third recommendation. Then, it seems that they do not believe that this decision is right, trustworthy, but understand the normative pressure the money manager has to support. Even if they are uncertain of making a "good" decision – i.e. optimal considering the information set-, subjects respond to an exogenous constraint, in order to preserve the reputation of the manager.

3.2 Explicative results

Reliability of the scales

In order to test the hypotheses, several questions in different parts of the document have tried to estimate the following parameters:

- confidence in the personal analysis (Lichtenstein and Bearden, 1989)
- confidence in the analysis of analysts (Lichtenstein and Bearden, 1989)
- perceived reliability of information
- conformism (Pettigrew, 1958)

< INSERT TABLE 3 ABOUT HERE>

The reliability of these scales is measured by Cronbach's alpha, who estimates the internal coherence of the elements of the scale[19]. This alpha has been calculated for each scale as written in the table 3.The scale measuring the confidence, in personal analysis as in the one of analysts, appears rather reliable, with an alpha over 0.85. The two other scales seem to be a little less reliable, but the coefficient are still acceptable for values between 0.62 and 0.92 (Nunally, 1978).

Statistic exploitation and regression models

In order to test the hypotheses, two distinct statistic treatments were used: simple linear regression and variance analysis. When variables were the results of scales, a simple regression model was used to link the confidence of the subject in their recommendation at stage 2 and 3, and the different scales:

$$ICONF2_i = \gamma_0 + \gamma_1.p_i + \gamma_2.\theta_{Bi} + \gamma_3.\theta^*_{Ai} + \gamma_4.c_i$$

$$ICONF3_i = \gamma'_0 + \gamma'_1.p_i + \gamma'_2.\theta_{Bi} + \gamma'_3.\theta^*_{Ai} + \gamma'_4.c_i$$

with

$ICONF2_i$: confidence in the herding recommendation at stage 2 for subject *i*

$ICONF3_i$: confidence in the herding recommendation at stage 3 for subject *i*

p_i : perceived reliability of information for subject *i*

θ_{Bi} : confidence of subject *i* in his own capacities

θ^*_{Ai} : confidence of subject *i* in the ability of financial analysts

c_i : subject's *i* conformism

These variables are measured as the means of the values in the scales previously described.

Hypotheses H4 and H5, whose variables are dichotomous, have been tested through a variance analysis. The proportion of the consensus can by high or low and an ANOVA is able to detect if the differences in the means -for ICONF2 and ICONF3- are significant. Besides, an intra subjects ANOVA, comparing the mean of the responses before (ICONF2) and after (ICONF3) the introduction of reputation, enables us to measure the influence of this constraint on the decision of subjects.

[19] This coefficient, widely used in marketing and psychology, is based on the mean correlation and the number of items of the scale

Test of hypotheses

As mentioned by Trueman (1990), the revision of the recommendation is probably under estimated insofar as changing one's opinion could reveal the weakness of the initial recommendation. If the consensus of analysts had been given within the information set of stage 1, more herding might have been revealed[20]. The tests run and the results are listed in table 4. The regressions explain respectively 8.1% and 11.8% of the variance of ICONF2 and ICONF3[21]. The coefficients obtained are:

$$ICONF2 = -0.18 - 0.16p - 0.99\theta_B + 0.32\theta_A^* + 0.44c$$

$$ICONF3 = 2.06 - 0.01p - 1.02\theta_B - 0.04\theta_A^* + 0.65c$$

< INSERT TABLE 4 ABOUT HERE>

The signs are coherent with the hypotheses (excepted for the variable θ^*_A in *ICONF3* regression). However, only three coefficients are statistically significant according to the t-test: those concerning the *a priori* confidence on the personal capacities in both regressions, and the conformism variable in the second one.

Herding behaviour and *a priori* confidence

The main statistically significant factor is the *a priori* confidence of the subjects in their own ability[22]. The perception of their capacity to analyse a firm proves to have an influence coherent with H2: the more the individual has confidence in his ability, the less he has a tendency to herd. This relation is true for both informational imitation (t=-2.23, p<0.03 pour ICONF2) and reputational one (t=-2.37, p<0.02 pour ICONF3). A subject very confident in his capacities is less concerned by the consensus of analysts, whatever the nature of the group pressure.

This *a priori* confidence is very close from two other factors: interest for financial markets and having already bought stocks. An ANOVA pinpoints that herding behaviour is also negatively correlated with experience of the market[23]. Subjects who already bought stocks

[20] But the interpretation would have been difficult, since one cannot know on which information the subjects used. In order to avoid this bias, two groups could be studied: one with and one without the consensus.

[21] As a comparison, Cote and Sanders (1997) explain 12% of the observed variance

[22] We must pinpoint that the confidence studied is an *a priori* confidence, which does not rely on the information set given to the subject. In fact, most of the models consider the confidence within the signal, exogenous to the agent, and not to individual intrinsic ability: the less informed actors herd the most. In the frame of this experimentation, there is no real informational asymmetry and the confidence measured is the one they attribute to their own capacities, independently of the information received.

[23] F(1,86)=7.887, p<0.006 for ICONF2, F(1,86)= 5,386, p<0.023 for ICONF3

were less influenced by the informational dimension of analysts (stage 2). Reputation (stage 3) has more impact on their decision, even if most of them still prefer a fundamental choice. Moreover, a study of the correlation between ICONF2 and the interest[24] shows that the more the subjects are interested in financial markets, the less they are inclined to herd at stage 2, for informational reasons. Informational, as reputational herding, are therefore not only the result of the environment on the individual, but also linked to the own characteristics of the actors.

The impact of *a priori* confidence seems to support the approaches based on the experience of actors, such as Chevalier and Ellison (1999) who show that youngest money managers make generally less risky decisions and bear more conventional portfolios. The less experienced agents, who less believe in their own ability, avoid to make a decision revealing their incompetence, and to be the only one to afford it.

The role of reputation

One of the main contributions of this work is to test reputation, along with information, as a factor of herding. This constraint reinforces significantly the tendency to herd ($F(1,87)=14.32$, $p<0.01$). The decision is then not only based on the most profitable decision, but also on the pressure of clients and hierarchy on the manager. This change of optimisation clearly shows that non financial constraints can also have an impact on investment decisions, and therefore on prices. Recently, Dasgupta and Prat (2005) or Ottaviani and Sorensen (2006) expose the theoretical arguments of this hypothesis which is supported by the results of this experimentation.

The reputation concerns subjects who are less confident in their capacities, and conformist people according to Pettigrew's scale (1958). Indeed, reputation seems to have more influence on conformist subjects, more sensitive to normative pressure than others: H6 is validated by the data ($t=1.66$) with a 10%[25] significance concerning a reputational herding. When the consensus is only a source of information, conformist subjects are less sensitive to it.

More generally, one can observe a positive correlation ($r=0.269$; $n=87$; $p<0.012$) between the perceived importance of managers' competences assessment and ICONF3. Then, the more

[24]The correlation is –0.299 (resp. –0.081) between interest for financial markets and ICONF2 (ICONF3), with a signification of 0.01 (n.s.) for n=88 (id.).
[25] in reality, with more precision, $p<0.10054310$

this estimation is viewed as crucial, the more the subject will have a tendency to herd. Reputation could to be considered as a continuous variable, according to the importance devoted to it by the subject. This experimental result is coherent with the study of Lütje (2005), who finds that German money managers who believe that herding can benefit to their career adopt more easily this behaviour, or at least assert more easily following the trend.

Other hypotheses

Hypotheses H1 on the perceived reliability of the signal, H3 on the *a priori* confidence on the ability of analysts, and H4 on the proportion of analysts are not statistically significant. On information reliability, the coherence of the items of the scale may be too low. The internal coherence of the scale (Cronbach's alpha) is however even poorer concerning conformism, who reveals a 10% significance in the regression.

(i) Confidence in the ability of analysts

The scale measuring the confidence of subjects in the ability of analysts (H3) proves to be poorly convincing. Several explanations can explain it. First of all, subjects, students, may have trouble to really assess the capacities of real analysts, because of their lack of knowledge on these last. Besides, the scale used is identical to the one used to estimate the confidence in their own ability –in order to ensure homogenous answers-. A blurring effect from the first scale is possible and may have fostered dependant answers. To avoid these problems, this questionnaire could be submitted to populations more close to analysts. Otherwise, finding another relevant scale might enable us in future works to measure more precisely this hypothesis.

(ii) Reliability of information

The reliability of the information signal (H1) is more or less comparable for all the subjects, for society X and Y, whenever subjects herd or not. This seems to be coherent with the identical information received by subjects and reinforces the idea that information by itself is not the only factor of herding, but also the confidence of the actor in himself. The influence of actual reliability of information is however not really tested by this experimentation which focuses on perceived reliability. Further work could focus on actual reliability of the signal, needing a clear and concrete definition of information signal, especially involving qualitative indicators. The number of convergent information could be used, with a weight for each of

them. The research in this field seems to be promising, and more realistic than in probabilistic environments.

(iii) Proportion in the consensus

The results of this experimentation on the proportion in the consensus (H4) seem to support the conclusions of Kübler and Weizsäcker (2005) who find a positive relation between the preceding number of individuals who made a choice and the probability that a new actor adopts this choice. If the difference found is not significant, the results are coherent with the hypothesis: when the proportion of analysts is 6 versus 1 (rather than 4 versus 3) to be opposed to subject's evaluation, he proves to be slightly more influenced. The percentage of herding behaviour rises to 34% for HERD2 and 56% for HERD3 versus respectively 23% and 45% with the lower proportion in the consensus. More data may enable us to validate this hypothesis.

(iv) Herding and autoreferentiality

Without a price mechanism, autoreferential herding (Orléan [1999]), stemming in the speculation of other's behaviours, was not tested in this experiment. One subject admits however being influenced: "The propositions of analysts -rumours and information from acknowledged brokers- may greatly influence the decisions of investors." Following analysts is then natural insofar as they have an impact on the market and will launch a trend. The belief in a price, result of the aggregation of individual behaviours, leads this subject to herd rationally. Further works, studying more precisely this feedback relationship between subjects and prices[26], could enable us to better understand the speculative anticipations of actors.

Conclusion

The first goal of this research was to bring some evidence of herding behaviour in a precise experimental framework, involving analysts. Yes, herding behaviour actually exists in the binary setting of this experimentation. Having to recommend to buy or sell a stock, subjects were largely influenced by the consensus of analysts opposed to their initial choice. In this experimentation, half of them gave up their own interpretation of financial data to follow the consensus, which then often prevails over subject's personal opinion. This result, which

[26] The trend, which may reveal speculative dynamics, is the most cited missing information (10 over 88) by subjects.

seems unprecedented in this field, provides a clear understanding of the impact of herding in investment decisions, and shows that, in some cases, people take their decision according to others' behaviour and put aside their own -even explicit- financial information, which is therefore not incorporated into prices. These micro results might have implications in macro anomalies like financial bubbles or trends in the stock market, and more generally when prices appear exaggerated compared to fundamental data.

Besides, the aim of this paper was to examine and measure some of the forces that lead to follow the consensus. Beyond the only informative reason, the most significant and surprising result is the impact of reputation in the decisions of subjects. They did not always herd because they considered the consensus as really true, but also because of the pressure on manager's reputation. Some of them did alter their choice just as a protection against the risk of being deviant, even if this risk is still hypothetical and does not affect them directly. This result is consistent with the study of Chevalier and Ellison (1999) and one could better figure out the major impact of social judgement on real portfolio managers, whose career is really affected by the pressure of their clients and hierarchy.

This simple experiment is a first attempt to study informational and reputational factors together, and provides clear evidence that self confidence of the subject in his ability is probably the main counterweight to herding, whatever its origin. Conversely, operators that have some doubts about their competences face two kinds of pressure to herd, in order to avoid (i) making a bad decision (ii) making it alone. This paper is a primary step in the empirical analysis of herding in a binary decision setting, and future work could attempt to cope with speculative behaviours -that anticipate the behaviours of others actors in their decision-, test the role of real reliability of the data provided, examine the impact of the culture of the subjects in the outcome, or interview directly portfolio managers and collect *in vivo* interesting field data on the origin of herding behaviours.

Appendix A: tables

Program[27]	Nb	%
Master 1- Finance	28	31.8%
Master 1 - MSTCF 2	24	27.3%
Master 2 - C.C.A.	13	14.8%
Master 2 - M. F.	8	9.1%
Master 2 - ESC 3 F.M.	15	17.0%
Gender	**Nb**	**%**
Male	51	58.0%
Female	37	42.0%

Table 1. Subject's characteristics

Type of questionnaire	Nb	%
X1	19	21.6%
X2	23	26.1%
Y1	22	25.0%
Y2	24	27.3%
Total	88	100.0%

Table 2. Types of questionnaires

	Cronbach's alpha	Number of items
Confidence in personal analysis	0,906	4
Confidence in the analysis of analysts	0,852	4
Perceived reliability of the information	0,701	4
Conformism	0,660	5

Table 3. Cronbach's alpha for the measure of scales

[27] MSTCF : Maitrise de Sciences et Techniques Comptables et Financières, C.C.A : Comptabilité Conseil Audit, M.F : Marchés Financier, F.M. : Finance de Marché

				ICONF2				ICONF3			
Hypotheses	**Type of measure**	**Test used**	**Expected sign**	**Result**		**Signification**		**Result**		**Signification**	
H1. The less the private signal is perceived as reliable by the agent, the more his tendency to herd is significant	Likert Scale	Linear Regression	-	t=	-0,3235	p<	0,7471	t=	-0,0279	p<	0,9778
H2. The less the agent has *a priori* confidence in his own capacities, the more his tendency to herd is significant	Likert Scale	Linear Regression	-	**t=**	**-2,2279**	**p<**	**0,0286**	**t=**	**-2,3669**	**p<**	**0,0203**
H3. The more the agent has a strong a priori confidence in the ability of analysts, the more his tendency to herd is significant	Likert Scale	Linear Regression	+	t=	0,7402	p<	0,4613	t=	-0,0951	p<	0,9244
H4. The more the proportion of analysts agree on a recommendation, the more his tendency to herd is significant	Comparison between the two groups of consensus : high/low	inter-subjects ANOVA		F(1,86)=	0,6840	p<	0,4105	F(1,86)=	1,3916	p<	0,2414
H5. The more the agent tries to protect his reputation, the more his tendency to herd is significant	Comparison between the second and the third recommendation	intra-subjects ANOVA						**F(1,87)=**	**14,3166**	**p<**	**0,0003**
H6. The more the agent is proved to be conformist, the more his tendency to herd is significant	Likert Scale	Linear Regression	+	t=	1,0943	p<	0,2770	**t=**	**1,6609**	**p<**	**0,1005**

Table 4. Test of the hypotheses

Appendix B: figures

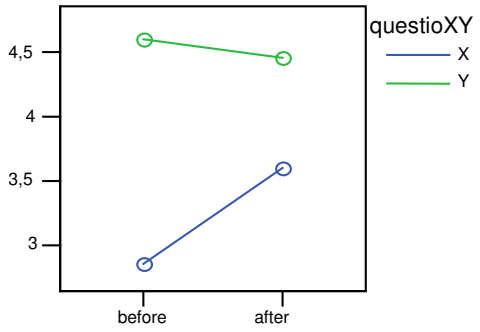

Figure 1. Means of the estimations of the performance before and after the consensus

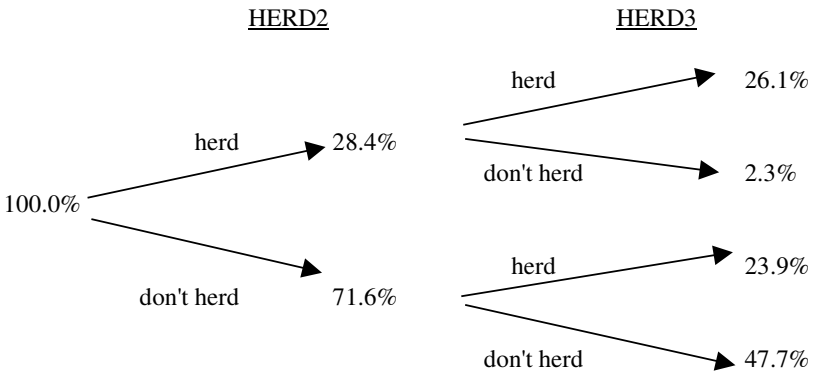

Figure 2. Observation of herding behaviour for recommendations at stage 2 and 3

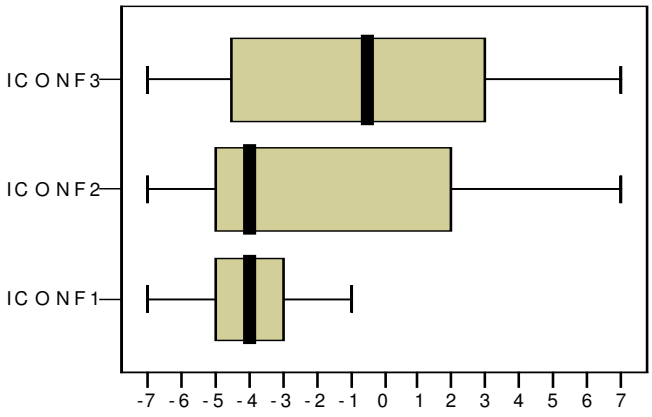

Figure 3. ICONF variables description

References

Anderson, L., Holt, C., 1997, "Information Cascades in the Laboratory", *American Economic Review*, vol.87, pp.847-862.

Asch S., 1951, "Effects of group pressure upon the modification and distortion of judgements", in Guetnow, H. (ed.) *Group, leadership and men*, Pittsburg, Carnegie Press, pp.177-190

Avery, C., Chevalier, J., 1999, "Herding over the career", *Economics Letters*, vol.63, pp.327–333

Bikhchandani, S., Hirshleifer, D., Welch, I., 1992, "A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades", *Journal of Political Economy*, vol. 100, pp. 992-1026

Chamberlin, E., 1948, "An Experimental Imperfect Market", *Journal of Political Economy*, vol.56, p.95-108

Chamley, C., 2004, *Rational Herd: Economic Models of Rational Herding*, Cambridge University Press, 402p.

Chevalier, J., Ellison, G., 1999, "Career concerns of mutual fund managers", *Quarterly Journal of Economics*, vol. 114, pp.389–432

Cipriani, M., Guarino A., 2001, "Herd Behaviour and Contagion in a Laboratory Financial Market", *Working Paper*, New York University

Cote, J., Sanders, D., "Herding Behavior: Explanation and Implications", *Behaviorial Research in Accounting*, vol.9, pp.20-45

Crutchfield, R., 1955, "Conformity and Character", The American Psychologist, vol.10, pp.191-98

Dasgupta, A., Prat, A., 2006, "Financial Equilibrium with Career Concerns", *Theoretical Economics*, vol. 1, issue 1, pages 67-93

Davis, D., Holt C., 1993a, "Experimental Economics: Methods, Problems, and Promise", *Estudios Economicos*, n°8, vol.2 , pp.179-212.

Davis, D., Holt, C., 1993b, *Experimental Economics*, Princeton University Press, Priceton

Dejong D.V., Forsythe R., Uecker W.C., 1988, "A Note on the Use of Businessmen as Subjects in Sealed Offer Markets", *Journal of Economic Behaviour and Organization*, n°9, p.87-100.

Devenow, A., Welch, I., 1996, "Rational Herding in Financial Economics", *European Economic Review*, vol.40, pp.603-615

Graham, J., 1999, "Herding among investment newsletters: theory and evidence", *Journal of Finance*, vol. 54, pp.231–268.

Hirschleifer, D., Teoh, S., 2003, "Herd Behavior and Cascading in Capital Markets : a Review and Synthesis", European Financial Management, n°9, vol.1, pp.25-66.

Kagel, J., Roth, A., 1995, *Handbook of Experimental Economics*, Princeton University Press, Princeton

Knight, F.H., 1921, *Risk, Uncertainty, and Profit*, Boston/ N.Y., Houghton Mifflin Company

Kübler D., Weizsäcker G., 2005, "Are Longer Cascades More Stable?", *Journal of the European Economic Association*, Vol. 3, pp. 330-339

Lakonishok, J., Shleifer, A., Vishny, R. W., 1992, "The Impact of Institutional Trading on Stock Prices", *Journal of Financial Economics*, vol.32, pp.23-43

Lichtenstein, D., Bearden, W., 1989, "Contextual influences on perceptions of merchant-supplied reference prices", *Journal of Consumer Research*, vol.16, pp.55-66

Lütje, T., 2005, "To Be Good or To Be Better: Asset Managers' Attitudes Towards Herding", Deutsche Asset Management & University of Hannover, Germany

Marsat, S., 2007, "Information, reputation and imitative choice: A simple Bayesian model", *European Journal of Economic and Social Systems*, forthcoming

Northcraft, G., Neale, M., 1987, "Experts, Amateurs, and Real Estate: An Anchoring and Adjustment Perspective on Property Pricing Decisions", *Organizational Behaviour and Human Decision Process*, n° 39, vol. 84

Nunally J., 1978, *Psychometric theory*, 2ème Edition, McGraw Hill, New York.

Orléan, A., 1999, « Le pouvoir de la finance », Odile Jacob, Paris, 275p.

Orléan, A., 2005, "Réflexions sur l'hypothèse d'objectivité de la valeur fondamentale dans la théorie financière moderne", in *Croyances, représentations collectives et convention en finance*, Bourghelle, D., Brandouy, O., Gillet R., Orléan A., Economica, Paris, 182p. , pp.19-42

Ottaviani, M., Sorensen, P., 2006, "The Strategy of Professional Forecasting", *Journal of Financial Economics*, vol. 81, n°2, p.441-466

Pettigrew, T., 1958, "Personality and Sociocultural Factors in Intergroup Attitudes: A Cross-National Comparison", *Journal of Conflict Resolution*, vol. 2, pp.29-42.

Plott, C, Smith, V., 2006, *Handbook of Experimental Economics Results*, Elsevier, Londres, à paraître

Poujet, S., 2001, « Finance de marché expérimentale: une revue de la littérature », *Finance*, vol.22, n°1

Scharfstein, D., Stein, J., 1990, "Herd Behaviour and Investment", *American Economic Review*, vol. 80, n°3, pp.465-479

Shiller, Robert J., 1984, "Stock Prices and Social Dynamics", *Brookings Papers on Economic Activity*, vol.2, pp.457-510

Smith, V., Suchanek G., Williams A., 1988, "Bubbles, Crashes, And Endogeneous Expectations In Experimental Spot Asset Markets", *Econometrica*, n°56, vol.5, p.1119-51.

Smith, V., 1962, "An Experimental Study of Competitive Market Behaviour", *Journal of Political Economy*, vol.70, pp.111-37

Trueman, B., 1990, "Reputation and Performance among Security Analysts", *Journal of Finance*, vol.47, pp.1181-36

Tversky, A., Kahneman, D., 1974, "Judgement under Uncertaincy: Heuristics and Biaises", *Science*, vol.185, pp.1124-31

Weber, M., 1968, *Economy and Society*, Totowa, N.J., Bedminster

Welch, I., 2000, "Herding among Security Analysts", *Journal of Financial Economics*, vol.58, pp.369-396

Wermers, R., 1999, "Mutual Fund Herding and the Impact on Stock Prices", *Journal of Finance*, vol. 54, n°2, pp.581-622

Wylie, S., 2005, "Fund Manager Herding: a Test of the Accuracy of Empirical Results Using UK Data", *Journal of Business*, vol.78, n°1, pp.381-403