

Econometric Research and Special Studies Department

Herding and financial panics: a role for cognitive psychology?

H.M. Prast

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ABSTRACT

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The purpose of this Research Memorandum is to assess whether concepts from psychological theory may be useful in explaining herding and crises in financial markets. The conclusion is that the theory of cognitive dissonance, which assumes that the human brain seeks and processes information in a biased way, seems to be able to explain both phenomena. A possible policy implication is, that intensive and careful information dissemination may be important both for socially optimal investor behaviour and in creating financial stability.

Key words: herding, financial crises, psychology, information processing, cognitive dissonance

JEL codes: D 83, E 44, F 30, G 14

SAMENVATTING

Kuddegedrag en financiële crises: een rol voor cognitieve psychologie?

H.M. Prast

Het doel van dit onderzoeksrapport is na te gaan, in hoeverre concepten ontwikkeld in de psychologische theorie behulpzaam kunnen zijn bij het verklaren van kuddegedrag door beleggers en van crises op financiële markten. De conclusie is, dat de theorie van de cognitieve dissonantie, die ervan uitgaat dat het menselijk brein op een selectieve manier informatie zoekt en verwerkt, in staat lijkt deze beide verschijnselen te verklaren. Een mogelijke beleidsimplicatie van deze benadering is, dat intensieve en zorgvuldige informatievoorziening van belang kan zijn voor zowel het bevorderen van maatschappelijk optimaal beleggergedrag als het creëren van financiële stabiliteit

Trefwoorden: kuddegedrag, financiële crises, psychologie, informatieverwerking, cognitieve dissonantie

JEL codes: D 83, E 44, F 30, G 14

1 INTRODUCTION

During the twentieth century the focus in economic theory has moved away from philosophical, behavioural and psychological aspects toward physics and mathematics. In 1937, Keynes stressed 'animal spirits' as a determinant of investment (Keynes, 1937). The later emphasis on quantification, econometrics and the 'homo economicus' (rational economic agent) has drastically reduced the attention paid to psychological and sociological influences on economic behaviour ¹. Although informational aspects play a crucial role in models explaining economic decision making on a microeconomic level, the focus in economic and finance theory has been on the *availability* of information, not so much on how individuals *gather, process and interpret* it. Other disciplines, notably cognitive psychology, have since long studied how the human mind searches for and processes information. Economics and finance theory have thus far only to a very limited extent used the results from those studies in explaining economic decision making. This may be one of the reasons why economists have had difficulties in explaining and predicting seemingly irrational behaviour, for example during financial panics.

The purpose of this paper is to investigate whether insights from psychology may shed new light on investor behaviour and can provide an explanation for (apparently) irrational phenomena observed in financial markets. Rather than modelling the behaviour of investors in a formal way, this paper aims at suggesting how research in behavioural finance might proceed in explaining herd behaviour. The conclusion of the paper is, that the theory of 'cognitive dissonance' developed by social psychologist Leon Festinger may prove to be useful in explaining investor behaviour both in normal times and during times of financial crisis and investor panics. In particular, it might clarify the behaviour that has become to be labelled 'herding'. The paper is constructed as follows. The next section defines herding and pays attention to recent theoretical explanations of rational herding behaviour in financial markets. Section 3 takes a look at application of psychological concepts to financial market behaviour. Section 4 introduces the theory of cognitive dissonance and discusses its use in explaining investor behaviour in general and herding during financial crises in particular. Section 5 gives concluding remarks and suggestions for further research.

¹ Some lines of research in economics have incorporated psychological and sociological factors in explaining economic behaviour. Thus, in the bounded rationality literature it is assumed that individuals act according to a utility function that is asymmetric in the evaluation of losses and gains ('loss aversion') (for an overview see Kahnemann, D., J.L. Knetsch and R.H. Thaler, 1991). Akerlof (1982, 1997) explicitly uses sociological and psychological concepts. Thus, he assumes that individuals use an external benchmark when evaluating utility.

2 HERDING IN ECONOMIC THEORY

Mathematical finance aims at finding optimal portfolio behaviour and deriving fair prices for financial instruments. The only individual (personality) characteristic that plays a role here is the investor's risk/return appetite. No matter how sophisticated mathematical finance models have become, they have not always been able to explain or predict observed behaviour in financial markets. This became clear with the debacle of the LTCM hedge fund in the United States in the autumn of 1998. The irony was, that the fund benefited greatly from its knowledge about slightly irrational behaviour by investors, whereas its problems were due to the irrational psychological overreaction (flight to safety) of those same investors². This example illustrates, that economics and finance theory should take other determinants of investor behaviour into account. Without considering mathematical finance to be 'out', behavioural finance obviously is 'in' and can be expected to gain in importance in economics and finance theory in the years to come.

Behavioural finance aims at explaining and predicting analyst and investor behaviour from individual utility functions incorporating not only risk aversion, but taking other considerations at the individual level into account. The behavioural finance literature studies a number of phenomena observed in financial markets, one of which is herding. Scharfstein and Stein (1990) define herding as the mimicking of decisions of others, thereby ignoring substantive private information. Note, that according to this definition, individuals who copy the behaviour of others because it would be more costly to gather information themselves are not herding. It is not only the mimicking, but also the ignorance of own information that is crucial³. Herding behaviour is most visible during financial crises, when the direction in which the 'herd' is moving is suddenly reversed. But it may also occur during normal times, when investors, investment analysts and fund managers copy the behaviour of others, disregarding their own perhaps private information.

In their survey of rational herding models, Devenow and Welch (1996) distinguish three strands of literature: reputational models, models with pay-off externalities and cascade-models.

² LTCM's models were based on the empirical finding, that there was a structural preference for the most recent US treasury bonds. Knowing that the overvaluation of these titles would quickly disappear, LTCM could earn a profit by taking large positions. However the Asian crisis in 1997 and the financial distress in Russia in 1998 led to a psychological overreaction by investors that had not been foreseen by the LTCM: a flight to quality and an increase in price of those titles that were, according to the LTCM models, already overvalued.

³ Otherwise, this type of behaviour could be explained by conventional rational expectations theory, in the sense that people gather information up to the point that the marginal cost equals the marginal benefit.

Reputational models focus on the behaviour of the investment analyst or fund manager. Crucial is the assumption, that investment decisions are taken not (or not only) on the basis of expected risk and return, but also with the aim of affecting the analysts future reputation. The investment analyst's reward (future wage) depends on his (ex post) reputation in the eyes of the public (his actual or potential clients). The reputation in its turn is assumed to depend on a performance evaluation which - and this is crucial - is based either on a benchmark or on relative performance. An example of this strand of literature is the model by Scharfstein and Stein (1990). In this model it is assumed that analysts are either smart or dumb, i.e. they are or are not able to distinguish between informative and uninformative signals. There are two possible investment outcomes, high and low, and two signals about the investment project, good and bad. The analyst's type is unobservable to all including himself. The a priori probability that an analyst is smart is common knowledge, as is the a priori probability of a high investment pay-off. This information structure implies, that the signals of smart analysts are correlated whereas those of the dumb ones are not. The investment analyst (or fund manager) uses his choice of investment to maximise his expected posterior reputation of being smart. He calculates the probability of an investment outcome using the common knowledge as well as the private signal he has received. Both the revision (by the public, i.e. the analysts clients) of the analysts reputation and the update of beliefs about the investment outcome by the analysts follow Bayes' rule. The model assumes an exogenously imposed leader. When deciding on his strategy, the leader (the first to act) takes the rational reaction of the follower(s) into account. The result is, that both dumb and smart analysts are likely to herd because it is rational for them to do so: by joining the crowd, they can make believe that they act according to informative signals. The model therefore predicts, that herding increases with the correlation between informative signals. This is conform intuition: the higher the signal correlation, the more likely it is that smart investors make the same choices, hence act as part of a group. This increases the incentive to join the crowd. Herding decreases with the ability of the smart analysts (the precision of the signal they receive), because this makes it more likely that the analysts private information and his revised belief about the investment outcome are consistent. However, herding increases with initial reputation. This may seem counter-intuitive, but is because an analyst with a high reputation (and hence, given the assumptions, a high wage) has much to lose if he individually fails. Or, in the words of Keynes, commenting on investor behaviour: *'Worldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally'* (Keynes, 1936, p. 158)

Scharfstein and Stein assume, that the analyst's reward depends only on his reputation. However, the herding results also applies, although to a lesser degree, if the analyst is interested in both his

reputation and the investment pay-off. This would be the case if the analysts income depends not only on his reputation but also on the investment performance, either because his wage is directly performance-related (bonuses) or because he uses his knowledge for making private investments in line with his advises. In the reputational model, decisions are usually socially sub-optimal, because they are (partly) based on reputational considerations rather than investment quality. In the view of Scharfstein and Stein, the fact that agents use other's actions as informative signals complementing their private information is not the essence of herding. As they see it, herding occurs if *too much* weight is put on others' actions ⁴.

The model has some flaws. The assumption, that the analysts and fund managers do know the average quality of their profession, but not their own ability, is a bit far-fetched. It amounts to assuming, that the used-car dealer in Akerlofs famous 'lemons problem' does not know the quality of the cars he has for sale (Akerlof, 1970). Furthermore, although the reputational approach explains herding behaviour during normal times, it does not endogenously model a reversal of the direction in which the crowd is moving. Finally, it may explain herding behaviour by fund managers and analysts, but not that by private investors, who obviously do not have a reputation to think of but are merely interested in the expected pay-off of their private investment⁵.

Another strand in the herding literature concentrates on herd behaviour as a result of pay-off externalities. In this case, herding occurs because it is optimal to take an action simply because others do take that action as well. Reputational and strategic considerations do not play a role, and neither does the gathering of information about fundamentals. The optimal behaviour during a bank run is a typical example: irrespective of whether a bank is solvent or not, once a run has started - for example because of a rumour that the bank may be insolvent, or because another bank has gone bankrupt - it is optimal for depositors to withdraw their money irrespective of whether (they believe that) the bank is insolvent or not. This is because even a solvent bank that becomes faced with a run will get into liquidity problems (and in the end probably into insolvency, unless the lender of last resort injects massive liquidity into the system) and the depositors who do not run in time lose their money (Diamond and Dybvig, 1983). Obviously,

⁴ A version of the model by Scharfstein and Stein has been tested empirically by Graham (1999) in an application to the announcements by investment newsletters, where Value Line, being the best-known investment newsletter in the United States, acts as the leader. Graham concludes, that his evidence supports the model's predictions. Thus, for example, analysts who are longer in the business (have greater ability) herd less than less-experienced colleagues with the same income level (reputation).

⁵ Unless private investors merely follow analysts' advises; but then this assumption should in its turn have to be motivated.

this type of herding (panicking) could be solved if individuals were able to co-ordinate their actions. However, it is impossible for individuals to credibly commit themselves not to run ⁶.

The pay-off externalities view could explain why a rumour might result in rational herding behaviour. However, it does not make clear why some rumours are believed and others are not.

A third class of rational herding models are the so-called informational cascades (Banerjee, 1992). Here it is assumed, that some or all agents have limited private information and that publicly visible actions by others act as an additional source of information. This may lead to a situation in which the individual rationally ignores his private information or, rather, that the private information is overruled by the information received from the actions of others. In these models it is assumed, that the prior probabilities (about the quality of an investment opportunity, for example) are common knowledge. In addition, an individual may or may not (randomly) receive a signal about the investment quality. This signal does not need to be 'true' in the sense of reflecting the actual quality. Individuals do not know who receives a signal and who doesn't. It is assumed that agents act according to an exogenous ordering, and that the actions chosen by previous agents are public knowledge⁷. Note, that the actions by individuals are not intended to influence the decision by anyone coming after them: there is no strategic interaction. The individuals are assumed to maximise their expected pay-off, which depends on the investment outcome minus a fixed cost of investing. The outcome of this type of model is, that extensive herding may occur - but obviously this result is already embodied in the (quite plausible) assumption that the actions of others are a source of information. The most important contribution of this line of research may be that it explains financial market fragility. Bikchandani *et al.* (1992) show, that in this model convergence of behaviour can be fragile: the group tends to land on a borderline even on the basis of little information, and small changes in information can reverse the direction in which the crowd is moving. Therefore this model may be used to explain financial fragility and sudden panics and flights to safety. Unlike the reputational approach, the

⁶ This is one of the reasons why governments view it as their task to regulate the banking sector. Deposit insurance is introduced to prevent depositors from running, thus preventing systemic risk.

⁷ When the individuals are indifferent between acting according to their own signal and following the others, they follow their own signal.

cascade model explains the behaviour by both professionals (fund managers and analysts) and private investors. A drawback of the model is the exogenous ordering that is necessarily imposed, *i.e.* the assumption that individuals are unable to delay their decision. Also, there is the given and random distribution of signals: there is no possibility for the decision-makers to actively seek information. In this respect, the model is similar to the reputational model by Scharfstein and Stein (1992).

3 PSYCHOLOGY IN FINANCE: EXISTING RESEARCH

The theories of rational herd behaviour described here have in common, that they do not pay attention to the possibility that individuals may gather and interpret information in a biased way. This is a general flaw of economic and finance theory. For, in spite of the crucial role of information in economics and finance theory in general and especially in the theory of herding, economists have paid only slight attention to how people gather and treat information⁸. Other disciplines - notably cognitive psychology - have studied this subject intensively and have developed theories on information seeking and processing that are available to apply in economic and finance theory. Some of these have been already used to explain financial market behaviour. Herring (1999) uses the concept of 'availability heuristic' developed by cognitive psychologists Tversky and Kahnemann (1982) in his analysis of capital allocation by banks. The concept is based on the hypothesis, that an individual 'estimates frequency or probability by the ease with which instances can be brought to mind'. Hence, the subjective probability of an event depends (partly) on recent experience, or in any case the individual behaves as if this is the case. Thus, an automobile driver who has just witnessed an accident drives more carefully, although he knows that the probability of having an accident has not increased. This increase of the subjective probability is temporary: as time goes by, driving behaviour becomes less cautious. If the estimated subjective probability of an event is a declining function of the availability of the memory of that event, it is obvious that the probability of low-frequency incidents falls to a very low level when a long time has gone by since its last occurrence. As disasters happen with an extremely low frequency, the subjective probability can drop to practically zero. This leads to so-called 'disaster myopia'⁹. People then behave as if the probability of such an event is indeed zero. Herring shows, that disaster myopia in bank behaviour may have important implications for financial stability. His assumption is, that a bank allocates its capital according to a subjective probability density function, which is a weighted combination of an objectively verifiable density function, based on historical losses, and a so-called disastrous distribution, namely a uniform density function defined over outcomes from zero to 100% loss. The weight placed on the disastrous distribution is the subjective probability that there will be a draw from this distribution.

⁸ Exceptions include Akerhof (1982), Herring (1999) and Barberis, Shleifer and Vishny (1998) (see section 4).

⁹ Guttentag and Herring (1986) demonstrate that this decline in subjective probability is consistent with Bayesian decision-making, provided that the disaster did happen a very long time ago.

This is impossible to estimate. If disaster myopia applies and there has not been a market crash for a long time, this weight will then be zero. As Herring shows, a decrease in the subjective probability from 0.001 to zero leads to a dramatic reduction of the capital set aside by the bank to cushion itself against shocks (or to maintain its credit rating)¹⁰. The existence of the availability heuristic and of disaster myopia have been verified empirically both in experimental studies (laboratory experiments) and in real world behaviour.

Barberis, Shleifer and Vishny (1998) use another concept introduced by Tversky and Kahnemann, the 'representativeness heuristic', to analyse investor behaviour. This heuristic implies that people have a tendency to see patterns in random events. This may lead to overreaction in the sense that people draw far-reaching conclusions on the basis of only little evidence. The implication of the representativeness heuristic for investor behaviour may be an overreaction of stock prices to news. Barberis *et al* admit that, although this assumption leads to model results that confirm some (but not all) of the empirical evidence, it is not clear why certain types of news are relevant, in the eyes of the investor, than other. They conclude therefore that 'to push this research further, it is important to develop an a priori way of classifying events by their strength and weight' (Barberis *et al* (1998), p. 333). The theory of cognitive dissonance (see below) may prove to be useful in this respect.

Daniel, Hirshleifer and Subrahmanyam (1998) use the psychological concepts of overconfidence and biased self-attribution to explain under- and overreactions of security markets. Overconfidence among investors would imply, that they overestimate their ability to value securities. Biased self-attribution relates to the dynamics of self-confidence: confidence is assumed to grow when public information confirms private information, but does not decline in case of a contradiction between the two. An interesting implication is, that if, as some psychological evidence indicates, experts are more overconfident than inexperienced individuals, aggressive expert trading intimidates other traders and leads to higher returns.

The applications of psychological concepts to financial markets outlined here do not explicitly pay attention to herd behaviour or to explanations of financial crises (reversal of the direction of the herd). The next section suggests possibilities for further research on these phenomena using the psychological theory of cognitive dissonance.

¹⁰ An implication is, that a bank that is not disaster myopic and charges an appropriate credit risk premium for a low probability is driven from the market if other banks and market participants suffer from myopia (Herring, 1999).

4 THE PSYCHOLOGY OF CROWD BEHAVIOUR: THE THEORY OF COGNITIVE DISSONANCE

According to the founding father of psychoanalysis, Sigmund Freud (1959), 'It is the very essence of a panic that it bears no relation to the danger that threatens it'. Mass behaviour is in Freud's view by definition irrational and as the defining characteristics of a crowd Freud mentions invincibility, irresponsibility, impetuosity, contagion, changeability, suggestibility, collective hallucination and intellectual inferiority ¹¹. Still, Freud's theory of repression offers a useful background for the basic idea, that the human mind treats information in a biased way: unpleasant memories are locked away. Or as Freud puts it: *'the essence of repression lies simply in the function of rejecting and keeping something out of consciousness.'* (Freud 1957, vol. 4, p. 86).

Whereas Freud's focus was on psychopathology, he believed that healthy individuals do also, to a certain degree, turn away from unpleasant information. Cognitive psychologists have further studied the way people in general gather and use information and knowledge, and how the memory works. Two concepts that may explain irrational financial market behaviour are the principle of congruity developed by Osgood and Tannenbaum (1955) and the principle of cognitive dissonance formulated by Festinger (1957).

Principle of congruity

Psychologists Osgood and Tannenbaum formulated the principle of congruity, which applies to the way people evaluate new information that has become available to them:

'Changes in evaluation are always in the direction of increased congruity with the existing framework of reference' (Osgood and Tannenbaum, 1955)

The existing framework of reference may be the individual's opinion or belief, which in its turn is likely to be based on information of the past. Thus, if an information source is regarded positively by an individual but produces information that the individual regards negatively (is contrary to his framework of reference), the individual either changes his attitude towards the source of information, or changes his attitude towards the information itself. If this principle would hold in

¹¹ Cited by Chancellor (1999).

reality, it would imply that people treat available information in a biased way. In its most extreme form, they would neglect information completely if it does not fit in with the existing belief. The congruity principle can be regarded as a first step toward Leon Festinger's theory of cognitive dissonance.

The theory of cognitive dissonance

Festinger (1957) defines cognitive dissonance as follows:

'Two cognitive elements are in a dissonant relation if, considering these two alone, the obverse of one element follows from the other'

where cognitive elements may include opinions, information and beliefs. According to Festinger, individuals have the unconscious or subconscious psychological mechanism to diminish the dissonance they perceive.

Thus,

'The presence of dissonance leads to seeking new information which will provide cognition consonant with existing cognitive elements and to avoiding those sources of new information which would be likely to increase the existing dissonance' (Festinger 1957, p. 264)

In Festinger's view, individuals may diminish dissonance in a number of ways¹². Thus, when faced with dissonance, individuals engage in actively seeking out information that confirms their belief and the choices they have made. Also, they tend to avoid information that would suggest they have made the wrong choice. Finally - and here crowd psychology, or herd behaviour, enters the picture - , they may try to find support and comfort in the fact that other people have made the same decisions.

When the dissonance between the existing framework of reference and the new information the individual is exposed to becomes so large that it becomes impossible to reduce it by selective

¹² Using his own words: by changing one or more of the (cognitive) elements involved in the dissonant relation, by adding new cognitive elements that are consonant with already existing cognition and, finally, by decreasing the importance of elements of the dissonant relation itself. From these three 'strategies', the second and third one are the most important for our purpose, as they both have to do with information gathering and information interpretation on an individual basis and with finding social support for the decision that has been taken.

gathering and interpretation of information and by finding social support, the individual switches to the opposite method of dissonance-reduction: instead of trying to find evidence that his opinion is correct, he will now, faced with too much unfavourable information, make an effort to change his belief or opinion¹³. He does so by actively seeking out *dissonance-increasing* information¹⁴. The dissonance then disappears because the large amount of dissonance between the individual's opinion and the information received has enabled him to change his existing belief. The reversal in the biased information-seeking behaviour occurs, when the dissonance perceived by the individual equals the resistance to change his framework of reference (his opinion or belief).

According to Festinger, efforts to reduce dissonance are undertaken more actively, the more the individual benefits from the dissonance reduction. Obviously, this depends on the importance of the decision. Interestingly, Festinger uses an economic decision, namely the purchase of a car, to illustrate his theory. After the purchase, the buyer is likely to expose himself to any information confirming the advantages of this particular type of automobile, whereas he tends to avoid reading advertisements about cars that once were an alternative but that he chose not to purchase. Investment decisions are different in the sense, that asset markets are more liquid. Still, the mechanism that information gathering is biased is likely to be at work in essentially the same way.

Festinger pays special attention to what he calls, in a neutral fashion, mass phenomena. Assume, that for one reason or another, many people suffer from the same cognitive dissonance. According to Festinger,

"Under such circumstances, the striking and dramatic aspects of mass phenomena exist not because something exceptional or unique is brought to the situation, but only because social support is particularly easy to find in the pursuit of dissonance reduction." (Festinger 1957, p. 233-234)

¹³ Examples abound both in the realm of mass psychology and in daily life. Religious fanatics try to reduce the cognitive dissonance between their belief and real-world evidence by attracting new souls to their group. 'Shooting the messenger' is a well-known stereotype reaction, especially at a group level.

¹⁴ Think of the man who initially refuses to deny any signs of his wife's infidelity ('explains them away'), but suddenly, when he feels this becomes too difficult, switches to hiring a private detective determined to find proofs that his wife betrays him.

In this respect, Festinger recognises the role of rumours, especially in situations in which fear is widespread, but evidence-justifying fear is not available.

The theory of cognitive dissonance, when applied to financial markets, would explain 'sequential herding': the phenomenon that investors, analysts and fund managers 'herd' on previous behaviour. Furthermore, the theory predicts that investors, when faced with dissonance, find comfort in the fact that they are part of a group. This may explain crowd behaviour and reinforces the bias in information gathering in situations where many investors have previously made similar decisions. When time goes by, and despite this bias, unfavourable information about payoffs of investments made (bad fundamentals, increased probability of default) may grow in intensity and frequency, up to the point where it cannot be disregarded anymore, not even by an individual who is part of a crowd. Investors start paying attention to it, first gradually, but when the cognitive dissonance between the new (unfavourable) information and the existing (optimistic) mood becomes too large, they start actively seeking information that increases dissonance, enabling them to change their framework of reference (optimistic mood) about the investments made. Obviously, the dissonance is reinforced when the group starts falling apart. This happens when for some investors the dissonance has become too large, but this mere fact - their departure from the crowd - increases the dissonance of the remaining investors, who in their turn will start seeking out dissonance-increasing information. The theory therefore would predict a sudden reversal of the crowd, which once it has started will proceed at a high speed. The timing of the reversal is unpredictable, because although the reversal ultimately depends on the fundamentals, the timing depends on the (subjectively perceived) dissonance and resistance to change of some investors.

The theory of cognitive dissonance does not consider strategic behaviour and reputation building by individuals. However, incorporation of strategic and reputational considerations may reinforce some mechanisms outlined by the theory, with implications for financial markets. This is through the behaviour not of investors, but of analysts and fund managers.

Suppose investment analysts and fund managers take into account that, as a result of the principle of congruity and because of the incentive to reduce dissonance, their clients 'suffer' from a selectivity bias in gathering and interpreting information. Thus, if they are regarded, by their clients, as a reliable source of information (they are part of the 'framework of reference'), they can to a certain degree make mistakes without being 'punished', especially if their decisions seem to

indicate that previous investments were sound. This could induce them to make investment recommendations and choices that are in line with earlier decisions, even if they know that new information would justify a change of direction. Also, they know that the principle of 'shooting the messenger' holds. This may make them reluctant to be the first to 'break the news' to their clients that times are getting worse.

This paper aims merely at suggesting in an informal way how the theory of cognitive dissonance might explain a variety of behavioural patterns in financial markets, especially the herding behaviour during financial panics.

Future research should concentrate on modelling investor behaviour along the lines suggested by the cognitive dissonance theory. Formalisation should pay attention to (some of) the following aspects implied by the theory:

- A measure of dissonance should be constructed, most probably in terms of discrepancy between past investment decisions and new information;
- Efforts of information gathering would have to be modelled as increasing with perceived dissonance;
- A threshold of dissonance would have to be defined, below which information gathering is biased toward news justifying earlier investment decisions, and above which the bias is toward bad news about these investments;
- A critical level of dissonance equal to the resistance to changing the framework of reference should be defined; this level must be equal to or higher than the afore-mentioned threshold level.
- Dissonance-reduction by being part of a crowd would have to be incorporated, for example by assuming that efforts to gather information vary inversely with the size of the crowd.

These aspects, taken together, may explain both crowd behaviour and the fact that the crowd suddenly (in the sense that it does not rationally react to fundamental news and in the sense that it happens very quickly) moves in the opposite direction.

When modelling not only the behaviour of investors but also that of analysts and fund managers, these aspects may need to be supplemented by decision-making of investment analysts and fund managers reflecting reputational considerations, as they are incorporated in the rational herding theory.

In addition to this, studies could be set up analysing investor behaviour in an experimental context, focusing on cognitive dissonance and seeking support in the crowd. A drawback of experimental studies is, of course, that the decisions that the participants must take in this context are by far not as important as real-life (investment) decisions. This is especially relevant as the theory assumes, that dissonance and the behaviour to diminish it increases with the importance of the decision (Festinger 1957, p. 262)¹⁵.

A first look at financial market developments during the Asian crisis indicates, that the facts may well be explained by the theory of cognitive dissonance.

Kaminsky and Schmukler (1999) have studied financial market reactions to news during the Asian crisis. They try to explain the twenty largest one-day swings in stock prices in nine Asian countries during 1997 and 1998. They find, that some of these swings cannot be sufficiently explained by economic or political news. Their evidence indicates that with the deepening of the crisis stock prices overreact more, and that during the crisis episodes investors react more strongly to bad news than to good news. They suggest, that bad news in crisis episodes may increase uncertainty and accentuate herding behaviour, but do not explain what kind of mechanism would be at work here. The theory of cognitive dissonance may provide the answer. For example, the finding of Kaminsky and Schmukler that in crisis episodes investors react more strongly to bad news than to good news, would fit in with the theory of cognitive dissonance. In crisis periods the framework of reference is pessimistic and investors actively seek bad news because this confirms their opinion. Thus, it is not so much the overreaction to bad news, as the overexposure to it (and the underexposure to good news) that would explain the irrational stock price movements. This distinction is important, because the theory of cognitive dissonance can explain *why* people over-expose themselves to bad news in crisis periods.

¹⁵ This may have further implications for financial markets in situations where the population of investors changes, for example because technology and new financial instruments enables the less wealthy to enter the market

5 CONCLUSIONS

In this paper, it is argued, that psychological mechanisms regarding information gathering and interpretation should be taken into account when explaining investor behaviour. Herding and financial panics behaviour can only partly be explained by rational behaviour. Recently, various attempts have been made to incorporate psychological concepts in models explaining certain features of investor behaviour. The theory of cognitive dissonance, developed by Festinger, may prove to be able to explain most empirical evidence. Crowd behaviour (herding), mood swings and investor reactions to news in various circumstances can be explained by this theory. Strategic and reputational considerations, as studied in the rational herding literature, may, combined with individuals' pressure to reduce dissonance, reinforce the mechanisms of overreaction and crowd behaviour.

This paper has presented the theory of cognitive dissonance in an informal way and has argued that it seems to have the ingredients to explain herding behaviour. Further research would have to focus on modelling the investor and analyst behaviour implicit in the theory, possibly complementing it with strategic behaviour, including reputational considerations.

Still, one conclusion can be drawn from the intuitive approach taken in this paper. Even if the theory of cognitive dissonance can explain herding behaviour and investor behaviour during financial panics, it is still impossible to predict its timing, as too many psychological factors influence the mechanism that ultimately leads to a reversal of the direction in which a crowd is moving. This makes it difficult to base policy prescriptions on the theory. An implication may be that policy makers who care for socially optimal investor behaviour and, more importantly perhaps, financial stability, should engage in extensive, timely and careful information dissemination.

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