Meta-Communication and Market Dynamics. Reflexive Interactions of Financial Markets and the Mass Media

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Abstract

A widely held belief in financial economics suggests that stock prices always adequately reflect all available information. Price movements away from fundamentals are assumed to occur only infrequently, if at all. „False“ prices are supposed to be corrected by the counter-actions of „rational“ investors reestablishing equilibrium. However, empirical evidence of widespread irrationality among investors as well as theoretical insights into the properties of complex systems suggest that this view is too static. In fact, it can be shown that under certain conditions dynamic disequilibria have a considerable probability of being „locked in“. The mass media play no mean role in this: By conditioning trend-following behavior and fostering coordination among large numbers of investors, the media can help bring about such destabilizing moves. Media attention can induce positive feedback by increasing the level of excess noise in the market while decreasing the number of perceived behavioral options. Meta-communication thus generated is a prime source of instability in financial markets.

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A sensation seems to be in the making. **"**Within a year, if all goes well, the first cancer patient will be injected with two new drugs that can eradicate any type of cancer, with no obvious side effects and no drug resistance – in mice."[1] This breathtaking news is reported by the *New York Times* on the front page of its Sunday issue. Renowned cancer experts, among them a Nobel Prize Laureate, are said to be "electrified" by the results. Whereas existing drugs were only able to slow down growth, the new substances are said to lead to the complete eradication of tumours. The company that holds the licence for the active substances is mentioned as well: Entremed. The stock price of the small biotechnology company reacts immediately. It increases by 600 per cent.

The news is spectacular and exciting. But it is not new. The *New York Times* itself had reported about the new therapy of tumours in animals in an article half a year earlier.[2] The first text already contains all ingredients of the sensational cover story: the ground-breaking research result; enthusiastic comments from experts; and the name of the licensee: Entremed. *CNN* and *CNBC* also cover the story. These reports are based on research results published in *Nature* magazine - the original source about the successful elimination of malignant melanomes in mice.[3] In brief: The information which is presented in the spectacular *Times* cover story half a year later is, strictly speaking, old hat.

All the more surprising is the sudden and immense increase of the Entremed stock. 600 per cent. The *New York Times* is obviously surprised about the effect of its own coverage and nervously backs out.[4] Financial economists are amazed by the stock price reaction to the non-event as well.[5] For, economically speaking, the cover story is news without an information content: The facts have long been known to the market. According to the efficient market

hypothesis, which says that all available information is always completely reflected in prices, the *re*-publication of the story should not have provoked any significant price reactions. Journalistic re-runs should remain ineffective.

But what happens in this case is exactly the opposite. The Entremed stock reacts twice: To the publication of the original news. And, much more violently, to the prominently placed re-run of the research report on the *Times* cover. 600 per cent, one of the biggest price gains ever. But it is not just that: The stocks of a number of other biotechnology companies are infected by the euphoria and experience strong price increases as well – although nothing new is published about them at the time.[6] The stocks of a whole branch of industry rise, as it seems, because some newspaper journalists have re-packaged already known research results a second time.

1. Introduction

Conventional financial market research assumes that price movements away from fundamental values are rather rare and, if they occur, that they are often quickly corrected. Stock prices thus always adequately reflect all available information. According to this model, the mass media do not play a substantial role in price formation. Rather, they are important as a transmission channel in which news is passed on to market participants as quickly as possible. In fact, this approach sees the mass media as a factor which contributes to the *increase* of market efficiency: By providing information relevant for stock prices more and more quickly for a continously broadening audience, they accelerate the process of finding the "correct price".

In order for this to happen, one prerequisite is indispensable: Information that the media offers about the real economic situation has to be as accurate as possible. This means that the contribution of the mass media to market efficiency decisively depends on the question whether they can paint, naively speaking, an "undistorted" picture of economic activity. If they cannot, it is very well conceivable that media impact leads to unusual effects which are in no way related to fundamental values. However, the findings of communication research are legion which show that the media may play a lot of different roles, but definitely not this one: the role of providers of reality "as it is". Thus,

as long as the media are ignored as an autonomous factor which conditions market reactions, a decisive piece of a very complex puzzle is left out.

The media structure contents by selecting and evaluating; the weighting of information in the media, however, never corresponds to the distribution of information in reality. The media produce explanations by establishing logical links and causal relations; these interpretations, though, are only more or less adequate to reality. The media enrich information by adding new elements such as "emotion" or "suspense"; through this process, however, the character of the information is altered. The media can even create their own events where nothing would happen otherwise – or they can encourage others to do so. In short: The media select, they interpret, they emotionalize and they create facts.

As generators of attention, the media are prone to condition selective awareness: The media not only reduce reality by lowering information density. They focus reality by accumulating information where "actually" none exists. The goal behind this is to win public attention, to control it and to keep it as long as possible. Ideally (from the point of view of the media), feedback loops are generated in which selected events increase attention, which, on the other hand, serves as a proof for the importance of the news, whose visibility then is increased even further. These mechanisms cannot only be found in the entertainment sector; they can also be encountered in the information media, the general news media, as well as in the business media.

One thing is for certain, and that is that the media are far from being the neutral transmitters of news, as suggested in the abstract world of efficient markets. The news stream of the mass media definitely does not follow a random pattern. This does not necessarily and systematically lead to non-random prices: As empirical evidence of the effects of news on stock prices demonstrates, price reactions triggered by media reports are nothing unusual, but most of the time, they do not occur systematically. In principle, however, there is the possibility that the media, due to their function of generating selective awareness and selective behavior, induce and reinforce specific market reactions which develop into dynamic interactions afterwards.

In the following, the results of psychological studies, results of empirical media research, and of empirical financial economics as well as recent theoretical work on complex systems are consulted in order to gain an insight into the dynamics of markets under growing media presence. The underlying idea is that financial markets are dynamic systems whose behavior can change in interaction with environmental conditions and due to internal mechanisms, and which thus do not permanently show the same stable processes. Our assumption is that the interpenetration of markets and the media has brought about major changes. The following questions are to be settled: Do dynamic interactions between markets and the media exist? And if yes, which?

2. Feedback: The Media as "Learning-Lab"

One precondition for the emergence of systematic price movements is the establishment of feedback between stock prices and investors: Investment decisions in this case are not orientated to fundamentals, but to price developments in the past. If the media functioned as a link supporting such processes, considerable dynamic interactions would be conceivable. Shiller (2002) argues that it is possibly feedback processes that underlie many of the daily price fluctuations which are so difficult to explain.[7] In the short, medium or long term, on a smaller as well as on a larger scale, according to Shiller, feedback does not seem to be unusual in speculative markets.

Do the media have the potential to generate such a feedback? The results of media effects research clearly indicate it. Nobody disputes that the media mark out the limits of discourse and influence patterns of perception by setting the public agenda. The news, especially television news, define the thematic grounds on which the majority of the audience moves.[8] Media accounts thus have an immediate influence on the relative attention which individual topics gain in the public awareness. By emphasizing certain contents and suppressing others, the media do not only have an impact on what preoccupies people's minds, but also on *how* they judge these things.[9] The manner how news present the world rubs off on the perceptions of the audience.

Such consequences of the consumption of media constructions of reality can be measured in spot checks. Cumulatively, they condense into patterns of

perception which are strongly conditioned by media representations: Regular media consumption can have the effect of cultivating attitudes and opinions which come closer and closer to the media version of reality.[10] These perceptions, on the other hand, can constitute the basis for future patterns of behavior. Conditioning the perceptions of large numbers of individuals could thus cumulatively generate a kind of homogenous mass behavior.[11] The overrepresentation of certain media contents increases the probability of behavioral dispositions condensing into certain patterns. In a word: The mass media are a motor of social feedback. Potentially a very strong one.

There are more and more theoretical, experimental and empirical findings indicating feedback induced by the media in the financial markets: Merton (1987) demands that the "evolution of institutions and information technologies" be taken into account in order to adequately describe the long-term dynamics of the financial markets.[12] For an investor could only buy a stock if he knew it. But the attention of investors is not distributed equally across the market. The media therefore play a key role: „A newspaper or other mass media story about the firm or its industry", Merton says, "that reaches a large number of investors who are not currently shareholders, could induce some of this number to incur the set-up costs and follow the firm."[13] In brief: The media draw potential investors into the market.

Merton makes the attempt to explain the changes in market dynamics within the framework of conventional models of rational investor behavior. For this purpose, however, he starts from the – hardly realistic – assumption that media accounts of companies and industries are always caused by changes in fundamental factors. He is wise to point out that the expansion of the influence of mass media specifically supports models of *irrational* investor behavior. "In such models", according to Merton, "media coverage, public relations and other forms of investment marketing could play an important causal role in creating and sustaining speculative bubbles and fads among investors."[14]

Psychological studies examined how such speculative dynamics can be generated. Experiments carried out by Andreassen and Kraus (1988) indicate that test persons in simulated stock markets tend to extrapolate trends from past price changes if they believe to have noticed them.[15] Andreassen (1990)

provides evidence for the fact that business news do have a corresponding influence on investor behavior in real markets: More importance is attached to current information in comparison to more dated information. The specific way of presenting news, for example emphasizing them through techniques of dramatizing or emotionalizing, seems to activate decision-making rules which bring about a preference for this information.[16]

More recent empirical findings by Barber and Odean (2002) complement these psychological results. They show that stock selection on the part of investors takes place in a structured way: Stocks which generate special attention, due to high turnovers, strong price fluctuations or media coverage, are given priority. The decision-making problem, to choose a single stock from an immense number of existing company values, is solved by simple heuristics: Investors buy stocks which stand out. Barber and Odean come to the conclusion: "Just as publicity may help firms to sell their goods to the public, it may also help them to sell their stock."[17] In short: There is hardly any doubt that the media structure the decision-making process of many market participants.[18]

But structure in which way? Andreassen points out that the news media in general tend to provide explanations which are in accord with the reported events: "[…] the media must focus on prominent recent changes. To then explain why these changes have occurred, the media must search for information consistent with these changes, and selectively present favorable information about the company after positive price movements and unfavorable information after negative price movements. Such reports would be expected to increase the salience of the price change information by increasing the extent to which investors believe that the price changes are meaningful, important, and systematically different from zero."[19]

A typical stock market report looks like this: Stock X increased because... Index Y crashed due to... Prices Z continue to rise after... Most of these explanations are post-hoc rationalizations. Correlations which do not really exist are established. Reasons are constructed which can be interchanged arbitrarily. The explanations, as it seems, are quite obvious, even if they are far-fetched. In a nutshell: An artificial logic is created, based on a simplistic understanding of the markets, which implies: that there are simple explanations for most

price movements; that price movements follow rules which then lead to systematic patterns; and of course: that the news disseminated by the media decisively contribute to the emergence of price movements.

Andreassen (1987) demonstrates which effects explanations for stock market movements usually provided by the media have on investors' behavior: In the light of the explanations in media coverage, current price changes do not appear as temporary random products, but rather as the results of trends. The media thus shift investors' attention and motivate them to extrapolate the price movement and to follow the trend. In absence of such a media stimulus, according to Andreassen, this reaction fails to materialize. This permits the assumption that with larger parts of the public getting into the reach of the business media, the number of feedback-traders, that means of investors who follow a homogenizing impulse, continues to increase. [20]

The random character of price movements and their complexity is no adequate subject for news. They are "explained away" in the media until a picture of the markets emerges which systematically deviates from real market processes. The media thus structure the decision-making horizon of the market participants following them: by foccussing the audience's attention through selectivity and publicity; and by underlying random processes with a logic which gives the impression of trends (but which in fact follows the rules of journalistic strategies of presentation). It is highly probable that this kind of coverage reinforces the latent tendency of investors to see trends where there are none. And to behave accordingly.

Shiller (2000) considers that the relationship of markets and the media is a very complex one: "News stories rarely have a simple, predictable effect on the market."[21] In many ways, Shiller says, media effects are even overestimated. But the media can set the basis for certain market movements and provide their triggers. According to Shiller, "cascade effects" can be generated by attention which generates even more attention: The news present price changes and reinforce their "actual" weight by cumulating attention. This again leads to increased attention and potentially stronger price movements – a feedback mechanism which can provoke extreme price movements.

The bottom line is that growing media influence seems to create the conditions for an increasingly strong herd instinct among market participants. Hirshleifer and Teoh (2003) point out that under certain circumstances, a homogenization of the decisions of many investors is observable. By watching the behavior of other investors and imitating it afterwards, chain reactions can be set off among market participants. According to the authors, imitating role models present in the media plays a role as well. The infection with emotions such as panic or euphoria also is a common phenomenon in practice. As a huge "learning lab", the mass media are predestined to encourage such accumulations of behavior.

3. News Structures: "Use Value" and "Narrative Imparative"

The media follow the laws of competitive publicity – including the business media: Use value and sound information are announced. In reality, however, the tools of the attention industry are being applied: What is offered is suspense and action, stars and starlets, hopes and dreams, phantasies of redemption. And promises: Simple recipes for accumulating great wealth are booming. Behind the surface structure of the announced information, there are deep structures which evoke affective reactions among the audience. In times of fierce competition, the media are eager to increase customer loyalty by establishing an emotional feedback in order to gain competitive advantages.[22]

Mullainathan and Shleifer (2002) develop a model which indicates what kind of media deep structures these could be. It turns out that under the conditions of a competitive system, an ideological orientation of the media is not only not a problem, but it is even desirable: If the positions of various media compete, these differing perspectives result in a broader picture. What is different, however, is the effect of what the authors call "spin": the deliberate attempt to make news as conspicious as possible in order to catch the audience's attention. The goal of the media to outdo each other, the authors say, has the effect that the stories reinforce each other – and thus continuously narrow the perspective. The keener the competition between the media, the more pronounced the homogenization and exaggeration of the contents.[23]

The competition between the media – and this includes the business media – turns into a fight for public attention. Or, as the media theorist Georg Franck remarks: "It is like being in a beer tent. If everybody speaks loudly, you have to shout in order to make yourself heard."[24] Growing competition induces the press to produce a massive amount of headlines to sell more copies. A rather strident tone prevails on TV, sometimes verging on hysteria. This overstimulation tends to reinforce itself, permanent mutual excitement becomes the predominant principle of communication. The stimulation of the public replaces the simulation of reality as a guiding principle of a lot of media.[25]

The consequences can be felt in the choice of contents as well as in the style of their presentation: The new business media concentrate on bringing out the "action" of the financial markets. No matter whether investors buy or sell, permanent price fluctuations are the focus of attention. The markets are presented as a game of chance or a ride on the roller-coaster. Charts show the price movements of the past which are interpreted as trends. Stock recommendations and stock price forecasts are intended to help interpret the future and to make profitable investment decisions. "News to use" is the motto of this novel kind of business coverage. The relevance of the news is derived from the implied utility.[26]

The aesthetics of presentation follow the logic of the competition for attention as well: The make-up of many business magazines is consciously designed to trigger an emotional reaction. Even news television increasingly tends to follow the path of emotionalizing. Presenting affectively charged material, bringing out the human interest components, highlighting the personality aspect – the rivalry between the media favors a climate in which the exaggeration of contents and the calculation of effects are pursued systematically. As a result, this leads to a permanent balancing act between the promise of trustworthiness and the temptation of effect.[27]

What differentiates the business media from one another is the presentation and the design – sensationalism, storytelling, superlatives – rather than their ideological profile. Both liberal and conservative media operate within the same discursive limits: a market ideology which considers the liberalization of the financial system as inevitable and desirable and the involvement of larger and larger shares of the population in the stock market as a sign of progress.[28]

The central question of the business media is when to invest and how much. And not, if at all. A relativization of this macro-story from an ideological perspective does not take place.

It is not only in times of an economic boom that the tone of many business media is characterized by permanent optimism. There are economic reasons for this as well: The business media depend on a positive market environment. Particularly the success of publications oriented towards the capital market strongly correlates with market sentiments. In rising markets, circulation and ratings rise, in falling markets, they fall.[29] Therefore positive scenarios of the future are desirable. Pessimistic prognoses are not seen fit to achieve this goal. This is obvious when looking at the ratio of buy and sell recommendations: Very rarely, articles recommend to sell investment securities. The large majority of stock evaluations are buy recommendations.[30]

"There was enormous pressure to report positively about what was going on at the stock market", a journalist of a financial magazine admitted during the stock market boom.[31] And even during the downturn, the coverage highlighted the positive aspects.[32] An explanation could be: The more people feel attracted by the markets, the higher the profits of financial service providers. As a consequence, their budgets for advertisements in the business media grow. One central aspect, however, is thus neglected: The risks of the stock markets are ignored. In many media reports, authors overlook that the chances to obtain the expected yield are bought by taking serious risks.[33] This certainly does not contribute to an increased risk awareness among investors.

James Surowiecki (2001), author for the *New Yorker* magazine, describes the changes in market dynamics in times of omnipresent business coverage: „A market is best at setting prices when the people in it make their decisions on their own. Its collective wisdom arises out of the cumulative effect of millions of independent decisions. You don't get that wisdom in a world dominated by CNBC-style coverage. In that world, every decision becomes dependent. And, in certain circumstances […] you end up with a mob instead of a market."[34]

Similarly, Bernstein (2001) is critical of the expected benefit of the swelling stream of information: "Some television stations now post reporters on

trading floors at exchanges, and they report investment information measured in minutes. Such reporting is very similar to the poor reporters who must give hurricane reports from the waterfront. […] In both cases, the reporters tend to report eye-catching but probably worthless information. Yes, there are high winds and strong surf during a hurricane. Yes, stock trading becomes more frantic when unexpected news is announced."[35] Moreover, Bernstein points out that a lot of economic news events are pseudo-events. Many of the seemingly surprising positive company news, for example, were carefully engineered beforehand.

Robert Shillers (2000) observations on the coverage during the stock market boom point in the same direction: "Many news stories in fact seem to have been written under a deadline to produce something – *anything* – to go along with the numbers from the market. […] Sometimes the article is so completely devoid of genuine thought about the reasons for the bull market and the context for considering its outlook that it is hard to believe that the writer was other than cynical in his or her approach."[36] There are thus many signs indicating that the news structures of business coverage are not very beneficial to rational, critical, sensible, differentiated and diversified investor behavior.

4. Media Manias: The "CNBC-Effect"

The structure of news contents would be of limited interest if is was not transferred to the behavior of investors. But the opposite is true: The media do have the potential to provoke market moves. As the following example illustrates: On Friday, 30 June 2000, the stocks of MACC Private Equities, a small investment company, suddenly rise by 80 per cent. The trading volume of the stock comes to 300 per cent of the usual level. Apparently, what is behind all this is a mistake of the TV channel *CNBC*: Shortly before, *CNBC* had brought a positive report about Applied Micro Circuits, a semi-conductor manufacturer, with an insertion of its ticker symbol – which is AMCC. However, what appeared on the screen was MACC. The employees of the finance channel had transposed two letters of the ticker symbol.[37]

Nowhere else are autonomous media effects more obvious that in case of fictitious news which do not have any real economic content at all. For exam-

ple in case of manipulations of information in order to influence and deceive market participants: Price swings after the deliberate publication of false information show that news *per se* can be followed by substantial price movements, which are not immediately corrected by the market. In such cases of "invented" information, it turns out that investor reactions occur in the financial markets which represent a mere function of media publicity. A price reaction to the substance of the news is not possible, for there is no such substance.

A well-known example is the case of Emulex: The stock of the Californian maker of network products was under strong selling pressure after a fake report with a negative content had circulated on the internet: It claimed that the CEO had resigned and that the company would soon publish a profit revision. The stock price fell by more than 50 per cent in only a few minutes, a decrease in the market capitalization of about two billion Dollars. In other words: The fake piece of news, which had been disseminated with the intention to manipulate, had a strong effect on the stock price of the company concerned – although (or perhaps even because) it was fundamentally fictitious. The law enforcement authorities were convinced by the impact of the false report: When the author was identified, he was sentenced to serve a long imprisonment.[38]

In another case, a swindler managed to make stock prices of a company soar by publishing a false report. The stocks of Pairgain Technologies had steadily lost in market value before one day, the price suddenly rocketed. For a short period of time, the stock rose from 8,50 to more than 11 Dollars, a temporary increase in value of more than 30 per cent.[39] In the market, rumors had circulated that Pairgain was to be taken over for twice as much as its actual market value. Little later, it turned out that the story was completely fictitious and had been disseminated through an internet message board. In this case, the courts were convinced of the effect of the false information as well. After his arrest, the perpetrator was sentenced to pay a high fine.[40]

Media effects can not always be isolated in such an accurate way. For example, the average price movements following stock recommendations, which can also be considered media non-events, are often much less pronounced than in case of the described manipulation of information. Nevertheless, the publicity effect proves that market participants are prompted by the recommendations of stock market commentators to buy stocks. Temporary signifi-

cant price increases and an often strong increase in trading volume of the stocks commented on are the result. The tips disseminated by the media generate a temporary pricing pressure because certain investors reach for the recommended stocks. Since most of these price reactions are not sustained, it is fair to assume that it is not the information content of the news that plays the decisive role, but rather autonomous media effects.

With the expansion of the media system, particularly the spread of television providers specializing in business topics, such media effects should have reached a new dimension. Busse and Green (2001) state that news about analysts' reports broadcast on *CNBC* can evoke significant price reactions. Obviously, television viewers carry out transactions on the basis of these reports: The trading volume of the stocks mentioned on TV doubles in the first minutes after the program. Significant trading gains also seem possible – if people act very rapidly: The effect subsides after 15 seconds. Investors who hesitate longer have to expect a loss, because a partial price reversal sets in, which is an indicator of an overreaction.[41]

While Busse's and Green's sample seems to show a mixture of the information and the publicity effect, Meschke (2002) hardly finds any traces of a genuine information content in the interviews with company managers, broadcast regularly on *CNBC*: The interviews with the CEOs are non-events, since no news are published which would not have been known to the market before. But these non-events do not remain without consequences: The attention generated in the television programs results in a short-term increase in prices and a sharply increased trading activity of the stocks concerned. Meschke finds average excess returns of 1,65 per cent on the event day with trading volumes being 169 per cent above the norm.

But the price gains do not last long. The price increase is followed by a loss: Within ten days after the interviews, prices go down by 2.78 per cent on average, i.e. below the level of the event day. Meschke draws the following conclusion: "The presence of the CEOs on *CNBC* generates a temporary pressure to buy through enthusiastic investors."[42] To put it differently: Rationally deliberating agents of the model of efficient markets are not at work here, but rather so-called noise-traders: Investors who react to information which does not exist. This means that under certain circumstances, substantial reactions of

large numbers of market participants seem to appear which cannot be explained by the content of new information.

Following an old saying by McLuhan, the medium actually seems to be the message in case of these reactions. These occurences are very meaningful for understanding the dynamics of markets and the media since they are a matter of price movements which are causally related to the mass media – and therefore demonstrate an autonomous role of the media. However, it would be an oversimplification to be satisfied with the attempt to isolate such manifest short-term media effects: Firstly, these effects mostly occur sporadically, which makes it difficult to deduce any general statements about "laws" without overcharging them with auxiliary hypotheses.[43] Secondly, the complex systemic interactions between markets and the media would not even be considered when concentrating on isolated effects.

5. Meta-Communication: Media-induced Dynamic Interactions

Are overreactions to media reports solely the result of rash reactions of naive traders who are under a misapprehension and follow vacuous information? Or is there a change in market dynamics? The evidence suggests the latter. Dynamic price trends are elicited by different types of investors who interact with one another: growing numbers of noise traders, whose attention is drawn to the markets by the media, and who act on the basis of "used" news; and growing numbers of momentum traders who act reflectively and try to make a profit from the price movements generated by the noise traders. This would explain the observation of Fischer Black (1986) that rational and irrational traders are often difficult to distinguish.[44]

Shleifer and Summers (1990) argue that the demand pattern of investors who follow pseudo-information such as stock recommendations, is hardly rational.[45] They say that noise traders are often subject to homogenous group behavior, which could have the effect that they gain a significant influence on the aggregate level. Despite their "actually" incorrect behavior, they could be successful temporarily as a group. This, on the other hand, brings imitators on to the scene and further increases their influence in the market.[46] The price movements thus provoked, the authors say, are not always corrected by ra-

tional investors (arbitrageurs): either because price fluctuations elicited by irrational traders increase the risk too much and prevent counter-action; or because it pays off to swim with the tide and to intensify price dynamics.[47]

If rational investors follow the latter strategy, it is temporarily impossible to distinguish between noise traders and "information holders" because they behave identically. In fact, it is conceivable that a kind of "professionalization" takes place even among noise traders, in the sense that they learn with time that they do not possess any real information and focus exclusively on anticipating the reactions of the bulk of their colleagues. The "rational" momentum traders do not behave differently anyway. The prerequisites for a reflexive behavior of investors, which ignores fundamentals and is oriented at the behavior of others, is enormously reinforced by the feedback mechanism of the media.[48] From this point of view, the media have, above all, one function: They are a device which facilitates strategically calculated coordination.

This kind of self-reflexiveness can have various reasons: the tendency, supported by the media, to extrapolate trends; the gradual realization on the part of the noise traders that the information available to them has already been used at the time of the publication; but also the increasing self-reference of the journalists: Self-referentiality has become firmly established in the media as a strategic ritual. Similar to the stock market gurus, who warn of other gurus, the media increasingly comment on current developments with reference to or even warnings of the coverage of other media. The participation of the journalists in the generation of many events is often explicitly pointed out.[49]

Choosing themselves as theme for the media has the primary function of immunizing themselves against criticism of their view of reality. This choice makes it possible to simulate a distance from the things they report about. Among internet commentators in particular, this kind of pseudo-enlightenment has become very popular: The greatest "noise critics" are also the greatest "noise makers".[50] One cannot rule out the possibility that this builds up a critical attitude towards the news among the audience. Without doubt, the media-induced artificial character of the coverage comes to the fore – a possible precondition of a self-reflexive behavior on the part of the market participants, which we shall call meta-communication in this context.

Morris and Shin (2001) also suppose that the growing influence of the media results in a strategically calculated behavior of the market partici-

pants, which takes media effects into account – with potentially dangerous consequences: "The very fact that the news reaches a large audience also tells the recipient that many others have also just learned this piece of news."[51] According to the authors, this could lead to an anticipating kind of behavior which is not geared to economic factors, but to the expected reactions of other investors. By trying to beat their competitors, investors provoke the anticipated reactions – and reinforce them. This can then lead to considerable overreactions.

Under such circumstances, it is not necessarily irrational from the point of view of individual market participants to chase after excessive prices: If one assumes that rising prises produce positive news, and that these tend to favor rising prices in return, it is not unreasonable to predict a continuation of such a trend. The whole world is watching and knows that the whole world is watching. What results from this logic is a noticeable homogenization of investor behavior. The noise disseminated by the media leads to repeated overreactions among investors, which can increase the noise in return and thus evoke further overreactions. One consequence could be the formation of price bubbles and finally crashes. All in all, the partly rational behavior of individual investors generates an irrational collective result.[52]

From the point of view of game theory, this process can be characterized as a Prisoner's Dilemma. Joshi, Parker and Bedau (1998) show that technical strategies (i.e. trend following methods) have a competitive advantage over fundamental strategies: Technical strategies dominate, no matter which method or strategy of analysis the other market participants pursue. From an individual perspective, it would therefore be rational to integrate a technical component, which possibly has the effect that in subsequent "rounds of the game", technical strategies are preferred in the selection.[53] As soon as the majority of market participants relies on technical strategies, however, the result for every single actor deteriorates. As soon as it is pursued by the group, the individually rational behavior collectively produces a suboptimal result.[54]

The explanation for this seemingly paradoxical finding is the following: The more traders extrapolate trends, the more frequently positive feedback and self-fulfilling prophecies occur. If more and more actors follow a trend, noise and price bubbles are the consequence. Volatility increases, which makes

it increasingly difficult to give accurate forecasts. On average, the result for all market participants gets worse. This process therefore shows the structure of an iterated n-person game with one dominant strategy, that produces a collectively dissatisfying result: the typical structure of a prisoner's dilemma.[55]

A more recent theroretical approach points into the same direction: noise in the process of price formation; attempts of investors to derive a benefit from it; the dominance of trend following strategies; generation of positive feedback; and a suboptimal result for all: These are typical features of financial systems as they have recently been modeled through analogies from physics and mathematical biology.[56] Such complex adaptive systems are characterized by the fact that they do not automatically head for an equilibrium, but temporarily become more imbalanced. Slight changes accumulate into complex interactions which can cause the whole system to "collapse" – which results in the boom-crash-cycles that are so typical in the financial markets.[57]

In these models, particular attention is given to the role of the perceptions of market participants: The perceptions of market participants depend on the perceptions they expect from other market participants, who, on the other hand, take into account the perceptions of still other market participants: a self-referential and indeterminate, and above all, as Brian Arthur (1995) points out: an instable process.[58] The investors' expectations depend on the supposed expectations of other investors, and their expectations again depend on expectations they assume other investors to have.[59] In the Rorschach image of chaotic price information, a slight hint of a pattern is enough to set off a self-reinforcing trend. Such hints are permanently provided by the professional pattern seekers from the mass media.

6. Crash: Media and Market Panics

The development and bursting of the internet bubble provides the most impressive example so far for speculative excesses going along with the medialization of the markets. Stock price variance, trading turnovers, market capitalization or permanent media presence: In practically every important category, internet companies established new records. At the end of the nineties, they made up close to 20 per cent of the volume of stocks traded each day – at a

time when the sector as a whole incurred losses.[60] At one point in time, even the re-naming of companies which then somehow sounded like internet companies evoked enormous price movements. Ofek and Richardson (2002) are therefore justified in speaking of "bizarre behavior of internet prices". The investors definitely were too optimistic in their expectations for the future.

Between 1998 and 2000, the internet sector generated a return of more than 1,000 per cent[61] – a spectacular price increase that did not only seem to be fundamentally unsecured after the collapse of the stocks: A number of market observers already described the prices as unjustified during the euphoric boom period.[62] But why did an early price adjustment by sceptical actors not take place? Ofek and Richardson provide evidence indicating that the pessimists (who later turned out to be the realists) were "run over" by the optimists. According to the authors, private investors, among them many novices in the stock market, believed the internet "hype" and marched into the same direction in huge numbers.

Without any doubt, several factors play an important role: a novel kind of technology, whose potential could not be clearly estimated; an inflation of forecasts coming from many analysts, not least motivated by interconnections between investment banks and their clients; limited possibilities to sell securities short, the reason why pessimistic price assessments could not assert themselves; generally exaggerated expectations concerning long-term stock returns. But the media – finance newspapers, investor magazines and particularly news channels such as *CNBC* and *n-tv* – served as a multiplier: They spread the "virus" – the Internet story – globally, according to the overall sound of the coverage, in a positive or even euphoric tone. The good news was disseminated rapidly – until it was taken up by the whole media system.[63]

The idea of the cyber-economy made for a strong storyline and caused plenty of attention. And it brought the media breathtaking accruals in advertising. As an empirically weak, but suggestive macro-story, the fiction of the digital knowledge economy provided a projection screen for many effective micro-stories: from the emancipation of the individual due to mobile technology, to wealth for all in the stock exchange, or the revolution of economic activity via the internet. Small wonder that many investors yielded to the temptation: Obviously, the internet story was highly "infective" when it came across an

appropriately pre-conditioned "carrier". The media hype was the *sine qua non* of the boom and subsequent crash of the "new economy".

This does not imply that the price decline was a phenomenon of irrational novices jumping like lemmings over the cliff of the stock market. Schuster (2001) gives several examples proving that not only uninformed small investors followed the trend of the growth stocks.[64] To mention only one particular case: According to press reports, George Soros did not become strongly involved in technology securities until 1999, shortly before the end of the boom, and therefore suffered heavy losses after the crash. Examples like this refute the popular opinion that the internet euphoria was solely the result of aberrant behavior of irrational private investors. The exaggerations were also brought about by big investors hoping to benefit from price increases – who stirred the euphoria even more.[65]

Ofek and Richardson (2002) pass a similar judgement: "[…] there is no doubt that very sophisticated investors, and highly regarded managers of companies, invested considerable capital in the internet sector. These investments alone suggest that a story based on an influx of irrational, retail investors is probably too simplistic."[66] Most signs suggest that the internet bubble was a textbook case of speculative mania: a dynamic process in which unusual price movements arouse investors' attention and positive feedback leads to self-reinforcement. The media multiplied the stories which provided reasons for the enormous price fluctuations and animated investors to follow the trend.

In his classic account of the history of market panics, economic historian Charles Kindleberger (1978) presents a model of such financial crises. Speculative excesses, Kindleberger says, take place following a remarkably stable pattern: At first an event changes economic perspectives. Novel profit opportunities appear and are used by market participants. The chance turns into a boom: New investments lead to increases in income, which stimulate further investment. The boom leads to excess: Irrational motives dominate the behavior of a growing number of investors, asset prices continue to go up.[67]

Until the market enters a manic phase: Now, euphoria and the desire to speculate become the guiding principles of investment decisions. The mass pursuit of returns results in a mass flight from reality. "A larger and larger

group of people", according to Kindleberger, "seeks to become rich without a real understanding of the processes involved."[68] But at a certain point, some insiders opt out and take their profits. Tentatively at first, then more and more clearly, doubts arise as to the longevity of the profit scheme. When the realization sets in that the market has exaggerated, a wave of retreat sets in. Disillusionment turns into aversion, aversion results in panic.[69]

Robert Shiller (2000) supposes that the mass media have played a role in the generation of financial manias since their invention: "The history of speculative bubbles begins roughly with the advent of newspapers. One can assume that, although the record of these early newspapers is mostly lost, they regularly reported on the first bubble of any consequence, the Dutch tulip mania of the 1630s. Although the news media […] present themselves as detached observers of market events, they are themselves an integral part of these events. Significant market events generally occur only if there is similar thinking among large groups of people, and the news media are essential vehicles for the spread of ideas."[70] And that is not all: The media also disseminate emotions – and reinforce them.[71]

They thus lay the groundwork for the appearance of speculative manias and market panics. They arouse investors' interest and stir up their enthusiasm for the stock exchange. In boom times, they bring breathless stories about the upswing, which are followed by in no way less breathless stories about the coming economic crisis. The pressure to sell the same material hour after hour leads to sensationalism and exaggerations, particularly in financial television. And to the overrating of individual topics: In the media spotlight, only few occurences are highlighted as news events. The effect is an amazing standardization of media contents. Public attention is narrowed as a consequence. A homogenous kind of mass behavior thus becomes highly probable.

Two factors play an important role in the origin of financial euphoria, both of them are reinforced by the media: overrating future gains and the "envy effect". Countless stock recommendations and stock price forecasts, the self-confident air of finance commentators as well as the optimistic tone of the coverage easily convey the impression that profits can be programmed. Most of the time, past gains are projected into the future, a fact that encourages trend following behavior. Frequently, profit prospects are assumed which are at the

at the upper limit of a realistic scale of expectations. Often, they go much further.

The envy factor is also increased by the media: Reports about easy money foster emulation. Kindleberger comments: "There is nothing so disturbing to one's well-being and judgment as to see a friend get rich."[72] In times of periodic stock market booms, it seems that the whole neighborhood is rolling in money. Hardly anybody talks about the losers at the markets. The supposed profits of others are an incentive to try one's luck – and to follow the stimulus of the masses. Both factors, the overrating of future profits and the envy effect increase the probability of irrational behavior. This public pressure has become tremendously heavier with the expansion of the business media.

7. Summary and Conclusions

The expansion of the business media has caused a change in the dynamics of investor behavior. The density as well as the frequency of news have increased significantly. Global information channels have aroused the attention of many people, who become active in the markets in ever growing numbers. A lot of these novices receive their "basic training" in investment issues via the media, even via such an improbable candidate as television. „[…] television news", Shanto Iyyengar and Donald Kinder (1987) write, „is in fact an educator virtually without peer."[73] The representations of the markets in the media do not only influence what people think about, but also how they do this.

The influence of the news media increases the probability that trend following behavior sets in among investors: They attract attention to short-term price changes and provide explanations which afterwards evoke an impression of logic – logic that meets the demand of the media for conclusive stories. Random or chaotic price movements are "explained away" systematically. Under the impression of such stylized stories, investors tend to update developments of the past and to extrapolate trends. The strong selectivity of the media, increasing with growing competitive pressure, supports a homogenization of the contents. This provides the basis for the tendency that the behavior of increasing numbers of investors condenses into few alternatives.

The media can thus generate positive feedback in the market: they focus attention on current price changes and reinforce the latent tendency of investors to project them into the future – and provoke overreactions in doing so. This is how price fluctuations can reinforce themselves: The media focus public attention on some particularly striking price movements, which are then further increased by the reactions of the public. Only small numbers of noise traders are necessary for such a feedback process to occur: In anticipation of media-induced feedback, the incentive is high enough even for informed investors to implement a trend-following strategy – and in this way contribute to the realization of the price movements that have been forecast.

The selective awareness of investors and the selective awareness of the media reinforce each other and favor mutual overreactions. Good news lead to increased optimism and serve as an incentive to buy more. Good prices, in return, lead to good news, which tend to favor good prices. Price increases are followed by buy recommendations, and vice versa. The positive market trend and the positive media trend mutually reinforce each other, the prevailing optimism results in expectations for the future painted in the most glowing colors. The emergence of stock market euphoria is thereby encouraged. This process is dynamic, it is self-referential and above all: it is inherently unstable.

These dynamic interactions necessarily reach a point of culmination, when the market trend and the opinion trend decouple: The media continue to pursue their strategy of optimism, but the prices deviate from their highs. Initially, this divergence is often very small: The market lives on contradictory signals, that fit various patterns of interpretation and can often be read in a positive as well as in a negative way. The market emits increasingly ambiguous signals, which the media, however, tend to interpret in an unambiguous way. If the contradiction becomes too obvious, a change of tone occurs: The constant optimism is followed by scepticism and then, step by step, turns into negativism.

Bad news only reinforce the upcoming pessimism and are used as an opportunity for more and more sales. Bad prices then cause bad news in return, which tend to favor bad prices. The negative market trend and the negative media trend mutually reinforce each other, the prevailing pessimism results in overly gloomy expectations for the future. The resulting chain reactions foster

the generation of panic under certain circumstances. Until market trends and media trends are decoupled again – and the cycle of panic and euphoria starts all over again.

The picture that emerges is thus very complex: Market participants stand in a reflexive relationship, since their decisions are mutually interdependent. The expected reactions of others are taken into account, and their anticipation can result in a self-reinforcement of these reactions. Dynamic disequilibria are a real possibility if perceptions and price movements mutually reinforce each other. The effect can be a change in the fundamental values, which has repercussions on perceptions and prices. The media act as a catalyst of these dynamic processes because they contribute to the structuring and coordination of decision making processes and thereby accelerate and intensify feedback effects. They thus constitute a possibly destabilizing element, since they support the continuation and reinforcement of states of disequilibrium, or maybe even trigger them.

Endnotes

[1] "Hope in the Lab. A Special Report. A Cautious Awe Greets Drugs That Eradicate Tumors in Mice." In: *The New York Times*, 05/03/1998.

[2] "Tests on Mice Block a Defense by Cancer." In: *The New York Times*, 11/27/1997.

[3] Boehm, Folkman, Browder and O'Reilly (1997); Kerbel (1997).

[4] "In Excitement Over Cancer Drugs, A Caution Over Premature Hopes." In: *The New York Times*, 05/05/1998; "Investing It. Focus on Biotechnology. A Cautionary Tale." In: *The New York Times*, 05/10/1998; "Investing It. Focus on Biotechnology. Feeling a Bit Like a Laboratory Mouse?" In: *The New York Times*, 05/10/1998.

[5] Huberman and Regev (2001).

[6] Huberman and Regev (2001), 392.

[7] Shiller (2002), 17.

[8] Iyengar and Kinder (1987), 21, 26, 33.

[9] Iyengar and Kinder coined the term *priming* for this phenomenon. With this concept they refer to the media influencing the criteria which are invoked to judge political candidates. Iyengar and Kinder (1987), 63-112.

[10] Exemplarily Gerbner (1998) and Gerbner, Gross, Morgan and Signorielli (1994).

[11] Cf. Schuster (1995), 48-64.

[12] Merton (1987), 486. Merton rightly points out that conventional models of price formation assume that public information is disseminated completely and immediately and then implemented by investors without any delay. Merton judges that this constitutes a very "simple information structure", which often does not depict news events in a sufficiently realistic way.

[13] Merton (1987), 500.

[14] Merton (1987), 503f.

[15] Andreassen and Kraus (1988) quoted in Shiller (2002).

[16] Andreassen (1990), 154.

[17] Barber and Odean (2002), 24. Barber and Odean see differences in the behavior of private and institutional investors: "Our argument […] does not apply with equal force to institutional investors." Their assumption is that private investors are more susceptible to conspicious signals. Barber and Odean (2002), 2.

[18] The studies carried out by Andreassen as well as those by Barber and Odean therefore support the result of cognitive psychology, indicating that subjects preferably rely on information which is particularly easy to retrieve due to repetition or proximity in time. Fischhoff, Slovic and Lichtenstein (1980), 127 write: "People solve problems, including the determination of their own values, with what comes to mind. The more detailed, exacting, and creative their inferential process, the more likely

they are to think of all they know about the problem. The briefer that process becomes, the more they will be controlled by the relative accessibility of various considerations."

[19] Andreassen (1990), 165; similarly Pearce and Roley (1985), 49

[20] Cf. Bloomfield and Hales (2001).

[21] Shiller (2000), 71.

[22] In the US, the expansion of the business media already started during the 1970s. For almost three decades, the extent of business coverage has constantly increased, both in the general news media and in the area of special publications. The stock market boom setting in after 1982 supported this trend. Between 1988 and 1998, the number of business magazines in the US alone increased from 358 to 694. In Europe, the expansion of business coverage set in only later, but reached comparable levels during the 1990s. In the highly competitive communication market of the 90s, finance and business media became one of the fastest growing sectors. For a detailed account see Schuster (2001), 35-53 and Parker (1997).

[23] The group mentality of journalists reinforces the tendency to homogeneity. The choice of topics and the way they are treated follow professional routines and the impulses of the group – rather than any "objective" necessities.

[24] Franck (1998), 170.

[25] Iyengar and Kinder (1987) point out that the liveliness of the presentations *per se* does not evoke stronger media effects. The main effect comes from the fact that public attention is structured by the selection of contents and their prioritizing. Iyengar and Kinder (1987), 34-42.

[26] "German business magazines have long been going through a phase of emphasizing utility", the specialist journal *journalist* already stated some time ago. "Tips und Tricks." In: *journalist*, 3/1997. "Our viewers aren't actually viewers", a former Senior Vice President of *CNBC* explains. "They're users. Other networks ask, 'What's of interest?' We ask, 'What's actionable about a piece of information?'" Quoted in "The Revolution Will Be Televised (on CNBC)." In: *Fast Company*, June 2000.

[27] For details see Schuster (2001), 81-95.

[28] Cf. Schuster (2001) passim as well as Madrick (1999 and 2001) and Parker (1999).

[29] Czarnitzki and Stadtmann (2000).

[30] This has got two reasons: Firstly, positive assessments also prevail among jounalists' sources, the analysts. Secondly, the media believe that they can arouse the interest of larger target groups for their product with the help of purchase reports. Their justification is the arithmetics of public demand: A sell recommendation only addresses a minority of viewers and readers, the owners of the stock that is evaluated. A buy recommendation, on the other hand, addresses the majority of the audience, everyone who does not own the stock.

[31] "Anlegermagazine leiden unter Auflagenschwund." In: *Süddeutsche Zeitung*, 01/26/2001. For details concerning the positive bias of investment and financial media see Schuster (2001), 95-102.

[32] Wolf (2001), 70, 74, 76, 80. Wolf demonstrates in an analysis of coverage of the German Nemax Index that the financial media unvariedly pursued their policy of disseminating stock recommendations during the phase of the stock market downturn. 60 per cent of overall coverage was allotted to investment tips and price forecasts. "The results prove that [...] coverage was predominantly optimistic and that 'positivism' in financial coverage was confirmed." Wolf (2001), 84, 112.

[33] In investment practice, the question at which risk a certain return is bought plays a crucial role. For many finance media, this has been a question of minor importance during the stock market boom, and continues to be one. For example in popular hitlists of stocks and funds: When fixing the performance, attention is focused on investment return. How this comes about remains a secondary issue.

[34] Surowiecki (2001).

[35] Bernstein (2001), XIV.

[36] Shiller (2000), 74

[37] Meschke (2002), 2; Bernstein (2001), 18.

[38] Cf. Bank (2001); Benning (2000); "Guilty Plea is Set in Internet Hoax Case Involving Emulex." In: *The New York Times*, 12/29/2000; "On Hair-Trigger Wall Street, A Stock Plunges on Fake News." In: *The New York Times*, 08/26/2000.

[39] "Fake News Account On Web Site Sends Stock Price Soaring." In: *The New York Times*, 04/08/1999; "Fake Story Shows Net Perils." In: *Cnnfn.com*, 04/08/1999. For a detailed account see Schuster (2001), 192-194.

[40] "Pairgain Worker Sentenced in Fraud Case." In: *The New York Times*, 08/31/1999; "PairGain Web Hoax: Hoke Grounded." In: *Zdnet.com*, 08/30/1999; "Arrest Made in PairGain Stock Scam." In: *Zdnet.com*, 04/15/1999.

[41] Busse and Green (2001), 19 write: "The profitability of the trade declines as the report approaches, and then steeply declines after the event […]. Beyond 15 seconds average returns are no longer statistically significant, and beyond 25 seconds average returns are negative."

[42] Meschke (2002), 4. Meschke points out that during the study period from 1999 to 2001, CEOs of technology companies quoted in the Nasdaq index very frequently appeared as guests on *CNBC*. The journalists obviously preferred the stock market segment which scored the highest price gains at the time.

[43] Depending on the study period and the selection of the sample, this would only lead to the "waves" well known in media effect research: Alternating periods in which experts tend to agree on the existence of "strong" and then again of "weak" media effects.

[44] Black (1986), 532 writes: "There will always be a lot of ambiguity about who is an information trader and who is a noise trader." Cf. De Long, Shleifer, Summers and Waldmann (1989).

[45] Shleifer and Summers (1990), 23. For details see Cutler et al. (1991 and 1990); De Long et al. (1989, 1990 and 1991).

[46] For a long time, economic theory started from the assumption that irrational investors quickly disappear from the market because they systematically lose capital to rational opponents. Exemplarily Friedman (1953). De Long et al. (1991), on the other hand, point out that noise traders possibly obtain higher returns than rational investors under certain circumstances, since they take higher risks and realize profits for this (unconsciously taken) risk. This is why they might even dominate the market.

[47] It is thus incorrect, as Black (1986), 532 states, that "as the amount of noise trading increases, it will become more profitable for people to trade on information." Black starts from the fact that with increasing noise, rational investors increasingly make aggressive attempts to move prices into the direction of the fundamental values. He points out himself, though, that the information lead "does not guarantee a profit." On the one hand, the risk becomes higher with increasing noise and increasing size of the speculative positions. On the other hand, information traders cannot be sure either if they perhaps only react to noise as well. Black does not consider the possibility that information holders also consciously and deliberately react to noise.

[48] Farmer (2002) points out that not only trend following strategies, but also fundamental strategies may induce positive autocorrelations and excessive volatility.

[49] The distance from the events and the proximity to sources of primary information play a decisive role: The greater the distance between the medium and the site of the event and the worse its access to the actors, the stronger the tendency to pursue a self-referential kind of communication strategy: Comments are not only made on the events – for there is hardly any contact with them – but also and predominantly on the way other media deal with the events.

[50] Exemplarily: Richard McCaffery, "The Market's Missing Ingredient."
In: *www.fool.com* 08/10/2001.

[51] Morris and Shin (2001), 2.

[52] Morris and Shin (2001), 5 write: "The heightened sensitivities of the market could magnify any noise in the public information to such a large extent that public information ends up by causing more harm than good."

[53] Brian Arthur (1995), 24 writes: "Trend expectations in sufficient density in the population of expectations are mutually reinforcing."

[54] For an introduction into the Prisoner's Dilemma cf. Axelrod (1984) as well as Rapoport and Chammah (1965). For an overview of evolutionary game theory
cf. Lindgren (1997) and Friedman (1991).

[55] Moreover, the principle applies (regardless of the payoff-structure of different strategies towards each other) that the expected profit of a strategy is diminished with growing numbers of users.

[56] An excess of "anomalies" in the context of the efficient market theory incited various researchers to make attempts to come closer to the actual financial markets in their models. They rightly state that conventional finance theory relies too much on

on simplistic and unrealistic assumptions – primarily the axiom of "rational agents" and a concept of equilibrium derived from Newtonian physics. The core of studies on complex systems consists in adapting biological theories and their principles of selection in order to deduce rules of economic selection. The objective is to improve the representation of dynamic interactions in markets which appear as exceptions to the rule in models of efficient markets. For an introduction cf. Mauboussin (2002); Farmer and Lo (1999); Arthur et al. (1997); Holland (1995); Blume and Easley (1992); Anderson et al. (1988).

[57] Mauboussin (2002) considers the four following characteristics to be typical for these systems: aggregation, adaption of behavioral rules, non-linearity and feedback.

[58] Also cf. Arthur (1988 and 1997).

[59] In his theory of reflexivity, George Soros focused on interactions of perceptions and *prices*. Soros (1987, 1994, 1998) repeatedly points out that economic factors and views of market participants are mutually dependent. "Reflexivity", according to Soros, "is, in effect, a two-way feedback mechanism in which reality helps shape the participants' thinking and the participants' thinking helps shape reality […]." Soros (1994). Consequently, this is an indeterminate process which does not automatically head for a state of equilibrium. Price perceptions of market participants are not mere reflections of real economic values; they can provoke changes in these values, which then result in dynamic disequilibria. According to Soros, this is the main difference of his theory and the model of efficient markets, since real economic values are assumed as given in the latter, which means that they are not influenced by the perceptions of market participants.

[60] Ofek and Richardson (2002), passim.

[61] Figure in Ofek and Richardson (2001).

[62] Exemplarily Thaler (1999), 13.

[63] For details see Madrick (2001), passim as well as Schuster (2001), 19-53.

[64] Schuster (20001), 67f.

[65] Cf. ",Macro' Investors Era May Be Over: Soros Out of the Game." In: *National Post*, 06/27/2000. Soros is of the opinion that it can be a successful speculative strategy to imitate noise traders (or better: to be ahead of them) and not to build up a counterposition until shortly before the trend reversal. Cf. Soros (1987) as well as Shleifer and Summers (1990), 28.

[66] Barber and Odean (2002) provide evidence showing that private investors are particularly strongly influenced by conspicuous news in their investment decisions. Institutional investors are less susceptible in this regard. This leads to the conclusion that systematic price movements are more often provoked by the former. Ofek and Richardson (2001) argue accordingly for the case of the internet bubble. The economist Paul Krugman, on the other hand, is of the opinion that the herd instinct is more pronounced among professional fund managers than among private investors. Personal communication, 01/19/2001 and Krugman (1997).

[67] Also cf. Galbraith (1954). For the counterposition, which seriously questions the existence of price bubbles cf. Garber (1989 and 2001). For the current discussion about speculative mania in the financial markets, its effects on the real economy and possible political counter-measures cf. Hunter, Kaufman and Pomerleano (2003).

[68] Kindleberger (1978), 16.

[69] Galbraith (1954) describes the bursting of a bubble as follows: At first, the bubble is defended by those who profit from it, critics are ignored or discredited. Then, the programmed collapse takes its course: Business outlooks and price forecasts are systematically missed. Many promises, especially those dating from the phase of euphoria, turn out to be lies. Many people lose their money, financial devastation is the consequence. But the shock is only short-lived, the markets have no memory. The reasons for the crash are not discussed, the disaster quickly sinks into oblivion. And speculation starts all over again.

[70] Shiller (2000), 71.

[71] The biologist Richard Dawkins (1976) developed a concept of self-replicating ideas which he calls "memes" in his book *The Selfish Gene*. According to Dawkins, "memes" lead a life of their own, they spread like a virus and sometimes cause mass infections. Memes are passed on from one person to the next through imitation. This theory of thought infections, which are also and particularly spread by the media, gave cause to the assumption that memetic infections play a role in the financial markets. This theory is somewhat tautological and should probably only be considered as a graphic metaphor. As such, however, it is quite interesting heuristically, since it focusses attention on processes of mass dissemination of irrational ideas and ways of behavior, such as mass hysteria and panic. Cf. Dawkins (1976 and 1999); Frank (1999); Lynch (1996).

[72] Kindleberger (1978), 15.

[73] Iyengar and Kinder (1987), 2.

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