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ESSAYS ON INVESTOR  
BEHAVIOR AND  
TRADING ACTIVITY

FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION,  
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*PETRI KYRÖLÄINEN*

**ESSAYS ON INVESTOR BEHAVIOR  
AND TRADING ACTIVITY**

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### ***Abstract***

This thesis investigates a set of equity market phenomena associated with investors' trading activity, using a comprehensive Finnish Central Securities Depository (FCSD) database that records practically all trades by Finnish investors. This database enables us to classify a large number of heterogeneous investors using both economic and institutional characteristics.

The first essay classifies investors by trading activity. It analyzes trading styles of active and passive investors during the boom in technology stocks 1997-2000. We find that the herding tendency of active investors grew monotonically, year by year. Particularly large active investors used momentum and growth strategies. Moreover, buy pressures of active investors were positively related to contemporaneous daily returns. Passive investors, on the other hand, herd very strongly and their trading exhibited a contrarian style throughout the sample period.

The second essay focuses on the relation between day trading of individual investors and intraday stock price volatility. I find a strong positive relation between the individual investors' day trades and volatility for actively day traded stocks. This finding suggests that day trading tends to increase volatility and/or day traders tend to become more active on the days of high volatility.

The third essay tests the theoretical proposition of Amihud and Mendelson (1986) that investors hold assets with higher bid-ask spreads for longer periods. We measure holding periods of individual investors directly and find that they are positively related to spreads. The models control for a variety of other stock characteristics (e.g. value vs. growth orientation) and investors' attributes (e.g. gender) affecting holding periods.

The fourth essay studies how both individual and institutional investors with different levels of capital gains and losses react to earnings announcements. I find that both sign and magnitude of capital gains affect individual investors' abnormal trading volumes. Individual investors are less prone to sell when they are carrying losses rather than gains. Furthermore, they react less to earnings announcements when capital gains or losses are large (over 20%). Taken together these findings provide support for prospect theory. Institutional investors appear to be less affected by psychological factors underlying prospect theory.

*Keywords: bid-ask spread, day trading, momentum trading, prospect theory, trading activity, volatility*



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No empirical thesis can ever produce novel and credible findings without good data. I would like to thank people in the Finnish Central Securities Depository for providing us with the investors' trading database used in this thesis. This database has been absolutely indispensable, since it was used for every single essay of the thesis. I am also grateful for Dr. Markku Vieru for letting me use his extensive earnings announcement sample. In addition, he provided very useful comments on the accounting issues when I was preparing the fourth essay.

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Oulu, February 2007

Petri Kyröläinen



## **List of the original articles**

The thesis includes the following separate studies.

- I Kyröläinen P & Perttunen J (2004) Investors' Activity and Trading Behavior. *ICFAI Journal of Behavioral Finance* 1: 31-59.
- II Kyröläinen P (2007) Day Trading and Stock Price Volatility. Manuscript.
- III Kyröläinen P & Perttunen J (2007) Do Individual Investors Care about Transaction Costs? Bid-ask Spreads and Holding Periods for Common Stocks. Manuscript.
- IV Kyröläinen P (2007) Capital Gains and Investors' Reactions to Earnings Announcements. Manuscript.

The thesis contains two articles co-authored with Professor Jukka Perttunen, who contributed to these articles by processing the FCSDB database into analyzable form and participating in the empirical research design. Petri Kyröläinen contributed by planning the research questions, designing and implementing empirical tests, and writing the essays.



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# 1 Introduction

## 1.1 Background

Traditional neoclassical finance theory assumes a single representative investor who rationally sets asset prices. This rationality in the beliefs of the representative investor implies that markets are efficient in the sense that actual asset values coincide with their fundamental values. Furthermore, the lack of investor heterogeneity in the neoclassical framework implies no trading. The famous examples of the models built on the concept of rational representative investor are portfolio theory by Markowitz (1952) the capital asset pricing model by Sharpe (1964) and Lintner (1965), and capital structure theory by Modigliani and Miller (1958). In the late 1970s, however, asymmetric information models were introduced to the finance literature. These models typically contain two types of investors: informed and uninformed investors (or noise traders). The early examples of these models are Grossman (1976) and Holmström (1979). Although asymmetric information models provided some challenge for traditional finance theory, the neoclassical model with its representative investor remained, in the language of Kuhn (1970), as the dominant paradigm.

The mid-80s witnessed the gradual rise of the new paradigm – behavioral finance – in this young branch of science. The theoretical and experimental premises of behavioral finance were already laid down in the psychology literature in the 70s by Kahneman and Tversky (1972, 1973, 1979). The most prominent early behavioral finance applications included the work of Shefrin and Statman (1985), who applied the prospect theory of Kahneman and Tversky to explain the so-called disposition effect. Behavioral finance is characterized by investors' limited ability to analyze information and systematic biases in their decision making. By the end of the millennium behavioral finance gathered more momentum: various theoretical models and multiple empirical papers were published in the leading finance journals. Behavioral finance was already competing for the status of leading paradigm in finance on par with neoclassical paradigm. But how about the representative investor? Did the behavioral finance literature recognize differences in behaviour and institutional characters of different types of investors? Mostly it did not. The leading theoretical models of behavioral finance such as Daniel, Hirshleifer and

Subrahmanyam (1998) and Barberis, Shleifer and Vishny (1998) were built on the traditional premise of a representative investor. Empirical behavioral finance literature did not fare much better. In the absence of more comprehensive data sets, usually only a single investor group was analyzed at a time, such as a sample of mutual funds, or trades by the clients of a single brokerage firm. Although these studies made huge contributions to the knowledge of how investors actually behave, they lacked the overall picture of market dynamics when various investor groups behave in potentially different fashion.

## 1.2 Purpose of the dissertation

The purpose of this dissertation is to analyse a set of important equity market phenomena that are related to investors' trading activity. The thesis consists of four empirical essays. These essays seek to answer the following research questions: How are the activity characteristics of investors related to trading strategies? Did active or passive investors use destabilizing trading strategies during the boom in technology stocks? How is trading activity related to the volatility of stock prices? How is trading activity associated with transaction costs? Do capital gain positions affect selling activity following earnings announcements? Each essay makes its unique contributions which we describe more specifically in the review section of the essays.

We search contribution from extensive data covering practically all trades by Finnish investors. These data allow us to classify a wide range of heterogeneous investors using both institutional and economic characteristics. Two of the essays use an economic characterization as a basis for an investor classification. These classification criteria are: trading activity and level of capital gains. In addition, we also apply more traditional criteria, by sorting market participants as individual investors and institutional investors. Our aim is to apply these investor classes to analyze various market phenomena, such as trading strategies and price impacts of active and passive investors during the boom in technology stocks at the turn of the millennium, relation between day trading and stock price volatility, impact of bid-ask spreads on the market equilibrium in terms of investment horizon, and information usage and trading strategies by investors with different levels of capital gains around earnings announcements.

We find a number of interesting empirical results. The first essay documents that active investors followed momentum and growth strategies during the boom in technology stocks. Herding of passive investors was very strong but remained constant during the sample period. Herding of active investors, on the other hand, show an increasing trend towards the peak of the technology stock bubble. The second essay finds that the day trading of individual investors is strongly associated with intraday volatility of stock prices. The third essay documents a strong positive relation between bid-ask spreads and individual investors' holding periods. The fourth essay finds that individual investors holding large capital losses are less inclined to sell following earnings announcements than individuals in other capital gain classes. Furthermore, investors with the price of a holding close to the assumed reference point – the purchase price of a stock – appear to be more sensitive to corporate news than are those investors carrying a stock with a price further from the reference point.

The rest of the thesis is organized as follows. Section 2.1 explains from the methodological perspective why understanding investor behavior is an important endeavor. Section 2.2 characterizes the traditional neoclassical investor as a benchmark to which deviations in investor behavior can be compared. Sections 2.3 and 2.4 present theoretical background and earlier evidence related to momentum trading and herding and explain how they may be related to asset pricing bubbles. These trading patterns are then analyzed in the first empirical essay of this thesis in the context of the technology stock boom. Section 2.5 describes the prospect theory and mental accounting framework, which provide theoretical background for the essay studying the relation between capital gains and reaction to earnings announcements. Section 2.6 explains how investment horizons relate to transaction costs and volatility of stock prices, providing a background for the second and third essays. Section 3 briefly reviews the empirical essays. Finally, the original essays are presented at the end of the thesis.

## **2 Investor behavior**

### **2.1 Should assumptions of theory be tested?**

The purpose of this section is to explain why it is important to examine investor behavior. A large body of behavioral finance literature, including part of this thesis, tests how investors behave. Postulates on investor behavior, on the other hand, are key ingredients in the models which seek to predict price dynamics. This type of research can, therefore, be seen as testing the assumptions of the theory. There have been (and to some degree continue to be) rather large differences in opinion between neoclassical and behavioral economists on whether the assumptions of theory should be tested. The methodological principles of traditional neoclassical economists are to a large extent drawn from Friedman (1979). He argues that the main purpose of a theory is to serve as an instrument to produce testable empirical predictions. According to Friedman, the assumptions of a theory are largely irrelevant.

Why then bother testing assumptions? While it is intrinsically interesting for many economists to explain a puzzling phenomenon, mere explanation is probably not the main reason why behavioral economists seek to test the assumptions of a theory. The main reason is that observed investor behavior can be used to build behavioral models with a better predictive power for phenomena such as price dynamics or trading activity. Such views are also reflected in Blaug (1992), who finishes his extensive analysis of the methodology of economics as follows: “However, what is clear is that the direct investigation of rational action, the attempt to test the urgency of the assumption of rationality, should not be dismissed out of hand as “ultraempiricism”. This much we do learn from the methodology of economics. So long as tests of the accuracy of predictions remain ambiguous – that is to say, forever – it will remain important also to test the descriptive accuracy of assumptions and to take the results of these tests seriously.”



## 2.2 The representative neoclassical investor

This section characterizes a representative neoclassical investor. His behavior can be viewed as a benchmark to which the actual behavior of different investor classes can be compared. The representative neoclassical investor is a rational decision maker. Her behavior derives from the three main tenets. First, the neoclassical investor uses Bayes' rule to update his expectations based on the combination of prior and new information. Bayes rule states that if A and B are two events then

$$P(B|A) = P(A|B)P(B) / P(A), \quad (1)$$

where  $P()$  denotes probability. The essence of the Bayesian approach is to provide a mathematical rule explaining how the investor should change her existing beliefs in the light of new evidence. The behavioral finance literature has found that actual decision-makers violate Bayes' rule, for example, by relying on representative heuristics. Representativeness leads decision makers to adjust their posterior estimates too conservatively in the face of new information (Kahneman and Tversky 1972). Representativeness, in turn, can lead to both momentum and contrarian trading patterns among investors (Shefrin 2005).

Second, the neoclassical representative investor bases his decision-making on expected utility maximization. The theory of expected utility was established by von Neumann and Morgenstern (1944). Assuming that investors maximize expected utility may be a good ingredient of normative theory because it is based on rational decision-making. Kahneman and Tversky (1979) describe expected utility theory as consisting of three tenets: expectation, asset integration, and risk aversion. The overall expected utility of an investment consists of the probability weighted expected utility of outcomes in different states. Denoting the investment as  $(x_1, p_1; \dots; x_n, p_n)$ , where  $x_i$  stands for outcome  $x$  in state  $i$  and  $p_i$  for probability of state  $i$ , we can compute the expected utility of an investment as follows:

$$U(x_1, p_1; \dots; x_n, p_n) = p_1 u(x_1) + \dots + p_n u(x_n). \quad (2)$$

The expected value maximizing investor chooses to invest in the security if the utility resulting from integrating the security with one's existing assets exceeds the utility of those assets alone. The domain of the utility is final wealth rather than gains and losses. Thus, the asset integration condition implies that an investment is acceptable at asset position  $w$  iff:

$$U(w + x_1, p_1; \dots; w + x_n, p_n) > u(w). \quad (3)$$

In addition to the expected utility theory and asset integration, most of the neoclassical models assume risk aversion, implying a concave utility function. An investor who is risk averse will not accept a fair game which yields an expected return of zero. However, actual investors may evaluate gains and losses relative to the reference point, in the

process violating the principles of rational choice postulated in the expected utility theory (see Kahneman and Tversky 1979, and Shefrin and Statman 1985).

The combination of rational beliefs and expected utility maximization imply that the neoclassical representative investor has correct beliefs on the fundamental value of an asset which are also fully reflected in asset prices. This in turn leads to the efficient market hypothesis (EMH), which states that asset prices fully reflect all available information (Fama 1991).

Finally, the neoclassical investor is, by definition, an independent decision-maker. He does not herd by taking into account other investors' trading decisions. Actual investors, however, seem not to trade independently of one another. The imitating behavior of investors has a potentially significant effect on asset pricing. However, it can be perfectly rational for an investor to base her decisions partly on the behavior of others.

### **2.3 Herding and bubbles**

The purpose of this section is to review earlier theoretical and empirical literature related to herding on stock markets and to explain how it may create asset pricing bubbles. This section is vitally important in providing the basis for the first empirical essay which studies herding in the context of the technology stock boom of the late 90s. In this thesis herding refers to equity investors' tendency to mimic each other's trading decisions. The importance of herding stems from its potential role in destabilizing asset markets. Using a formal theoretical model, Avery and Zemsky (1998) show that herding can result in asset pricing bubbles when investors are subject to multiple dimensions of uncertainty with respect to the fundamental value of an asset. At the turn of the millennium technology stock prices rose to unprecedented heights. The consensus opinion of finance scholars is that this was an instance of an asset pricing bubble.

The exact definition of the bubble is elusive, however. For example, Kindleberger (1978) defines a bubble as "an upward price movement over an extended range that then implodes", whereas Shleifer (2000) describes a bubble as follows: "prices go up and up without much news just because noise traders are chasing a trend". Siegel (2003) proposes an operational definition of a bubble as any time the realised asset return is more than two standard deviations from its expected return, and argues that the prices of Internet stocks around the turn of the millennium almost certainly were a bubble.

There are various channels through which an investor can observe other investors' trading decisions. Among the possible observation channels are direct observation, word-of-mouth communication, media, limit-order-book, prices, and insiders' reported trades.

The questionnaire evidence of Shiller and Pound (1989) shows that word-of-mouth communication is reported to be important for the trading of both individual and institutional investors. More recently, Hong, Kubik and Stein (2004) provide further evidence showing that social interaction between people affects decisions about equity market participation. Consistent with the word-of-mouth communication hypothesis, Hong, Kubik and Stein (2005) find that a mutual fund manager is more likely to hold a particular stock if other managers who are located in the same city are also holding that same stock.

It has become common for famous investors, such as George Soros and Warren Buffet, to announce their investment decisions on TV or in other media. This announcement may trigger other investors to follow in suit, vindicating the original investment strategy.

The asymmetric information literature on trading recognizes that prices convey a lot of information on other investors' trading. Rational investors take this information into account in addition to their private information when making their trading decisions. The presence of noise traders implies, however, that prices may be less than fully revealing, making the learning process more difficult. With this line of thought, momentum trading strategy can be seen as a form of herding. Furthermore, a limit order book conveys additional information on the orders made by other investors such as size of order, limit price and identity of broker.

The security market law may also require investors to report holdings exceeding a certain percentage of the total equity base of a company. Seyhun (1986) finds, however, that although insiders themselves make abnormal trading profits, it is not profitable to follow their trades. This may be due to relatively fast price adjustment to private information conveyed by the trades of insiders.

Herding may be either rational or irrational. Most of the theoretical finance literature focuses on rational herding. Bikchandani and Sharma (2001) classify rational herding further into three subcategories: informational-based herding, reputation-based herding, and compensation-based herding. One of the first informational-based herding models was built by Banerjee (1992). He analyzes a sequential decision-making model in which each decision-maker takes into account the decisions made by the previous investors before taking her own decision. He finds a unique Nash equilibrium that is characterised by fairly extensive herding. In various circumstances, depending on the decisions of the first few agents, a decision-maker located later in the sequence rejects her private information and decides to mimic others' actions. In this case, the decision maker joins a so-called informational cascade, in which accumulation of information stops altogether.

A more recent model of information-based herding was constructed by Avery and Zemsky (1998). The advantage of this model is that, in contrast to earlier models, it allows flexible prices and potential asset pricing effects of herding. The authors consider multiple uncertainty dimensions and their effects on information cascades, herding and price dynamics. The first dimension of uncertainty is value uncertainty, which refers to uncertainty about the fixed fundamental value of the stock. This is the dimension of uncertainty that most of the traditional models of herding incorporate. With this single dimension of uncertainty, informational cascades and herding do not occur. Due to a steady flow of information, prices are always fully revealing and converge on the fundamental values. Stock prices, therefore, reflect all available information. Traditional herding models, in contrast, assume fixed prices which, of course, do not reveal any information, resulting in herding.

The second dimension of uncertainty in the model by Avery and Zemsky (1998) is event uncertainty. In event uncertainty the market is uncertain whether an information revealing event has taken place by changing the initial expected value of an asset. It is reasonable to assume that some shocks to a fundamental value of an asset are not initially publicly known. The market may, for example, speculate whether there will be major corporate restructuring events, such as mergers and acquisitions coming up. An investor could learn before the public announcement from a contact working for a company that

an acquisition is in the air. In this case, an investor not only has information on the value uncertainty, i.e. whether the acquisition is good for the company, but also in regard whether there has been a shock to the fundamental value of the asset.

With the addition of event uncertainty, herding takes place if the information content in the history of past trades is greater than the investor's private information. Herding, however, does not distort asset prices under these conditions. Although herding tends to block the flow of information about the new asset value, rational investors take this into account in their trading decisions (Avery and Zemsky 1998).

Do prices always provide good signals about the private information contained in other investors' trades? The real equity markets consist of a mixture of investors with different levels of sophistication (for the Finnish evidence see Grinblatt & Keloharju 2001). For example, individual investors are typically found to make inferior investment decisions compared to professional market participants, such as financial institutions. Therefore, there seems to be great deal of heterogeneity in the information processing abilities between different investors. Some of the investors may be very accurate in their analysis of the effect of an information event, say an acquisition, on an expected value of a stock. Other investors, on the other hand, may lack the necessary complimentary information to make accurate inferences on asset valuation. Avery and Zemsky (1998) argue that for the market as a whole, some information events have a high proportion of well-informed investors, while others have only few. If the market participants are uncertain *ex ante* about a mixture of investors, they face a third dimension of uncertainty called composition uncertainty.

Composition uncertainty complicates the learning process from trading history, particularly in the presence of herding. A sequence of identical trading decisions arises naturally in a market with well-informed traders, because the investors tend to have the same private signal. On the other hand, the same sequence of trading decisions could be attributable to herding of preceding traders. It could be relatively difficult for market participants to distinguish between these two alternatives. Avery and Zemsky (1998) show that composition uncertainty induced herding may create bubbles in asset prices.

Measuring herding empirically has proved challenging. Besides some special contexts or experimental settings, it is difficult to separate imitating behavior from clustering of trades. The empirical herding literature for the most part, therefore, uses herding as a synonym for systematic or clustered trading. Herding measures are, therefore, at best noisy proxies for imitative behavior. When herding is defined in a more general sense of clustered trading, specific forms of systematic trading patterns deriving from past returns, capital gain and loss position, and attention can also be interpreted as herding. However, when it comes to drawing conclusions on asset pricing, it is the overall clustering that is the primary concern.

Various empirical measures have been proposed to detect herding. The most widely used herding measure is that invented by Lakonishok, Shleifer and Vishny (1992). This measure seeks to detect whether more investors are trading on either the buy or sell side of the market than would be expected if investors traded independently. The first essay of this thesis uses this measure to examine trading patterns of active vs. passive investors during the technology stock boom.

Previous empirical herding studies document the varying strength of herding tendencies in different investor classes. The first finding is that herding tends to be

stronger among individual rather than institutional investors. In addition, institutional herding in small capitalization stocks is stronger than herding in large capitalization stocks. For example, Lakonishok, Shleifer and Vishny (1992) use quarterly data on the trades of the U.S. pension funds between 1985 and 1989. They find only weak evidence of herding among small-cap stocks, but none among large-cap stocks. Grinblatt, Titman and Wermers (1995), and Wermers (1999) study the herding of U.S. mutual funds using quarterly data, and also find that fund managers tend to trade relatively independently of each other. Consistent with pension funds, mutual funds also tend to herd mainly in small stocks. In contrast to these studies, Barber, Odean and Zhu (2003) find very strong herding among individual investors at a large U.S. broker.

A number of papers study herding in the context of the economic crisis of late 90s in emerging markets. Choe, Kho and Stulz (1999), and Kim and Wei (2002), for example, report very strong herding among foreign investors on the Korean Stock Exchange. These two studies, however, disagree on whether herding increased or decreased after the outbreak of the crisis. Some of the high herding tendency in these studies may be attributable to the daily data frequency, which is much higher than the quarterly frequency used in the studies analyzed above.

## **2.4 Momentum and contrarian trading**

This section focuses on a specific type of herding – momentum trading – the trading pattern which we study empirically in the first essay of the thesis. An investor who follows the momentum strategy buys stocks that have outperformed other stocks in the past and sells stocks with a relatively poor past performance. These stocks are often called respectively “winners” and “losers”. A contrarian trader does the opposite – she buys past losers and sells past winners. Depending on the circumstances, momentum strategies can either enhance or impair market efficiency. On the other hand, momentum strategies are the potential source of overreaction anomalies such as asset pricing bubbles (see De Long, Shleifer, Summers and Waldmann 1990). On the other hand, momentum strategies may improve the efficiency of markets that would otherwise underreact. An example of such an underreaction anomaly is the post-earnings announcement drift. The drift refers to the phenomenon in which, after earnings news, returns continue to drift in the direction of the earnings surprise, that is, good (bad) news tend to be followed by positive (negative) abnormal returns (Bernard and Thomas 1989). Therefore, the context in which momentum trading is studied is crucial. Some papers also study momentum and contrarian trading in order to relate them to the performance of investors’ trading strategies.

A number of explanations are proposed for the tendency of some investors to momentum trade. The reasons why investors momentum trade include: representativeness, extrapolative expectations, underreaction to information, agency problems, constraints on investing in small capitalization stocks, the use of stop-loss orders. Likewise multiple reasons such as representativeness, overconfidence, portfolio rebalancing, and limit orders may result in contrarian trading.

The representative heuristic is the central behavioral bias that may lead to both momentum and contrarian trading on asset markets (see Shefrin 2005). Kahneman and Tversky (1972) define representativeness as follows: “A subject who relies on representativeness evaluates the probability of an uncertain event, or a sample, by the degree to which it is: (i) similar in essential properties to its parent population; and (ii) reflects the salient features of the process by which it is generated.” Therefore, subjects who suffer from representativeness systematically violate Bayes rule for evaluating probabilities. Via its effect on probabilities, the representative heuristic also affects prediction. Kahneman and Tversky (1973), in their classic experiment, find that representativeness leads subjects to form stereotypes of the college students in predicting the grade point average. This in turn results in insufficient regression to the mean in the predictions and to the too heavy weight on the input information i.e. on the counselors’ descriptions of the student. Not even monetary incentives have banished representative heuristics in experimental settings (Grether 1980). Representativeness is also present in the predictions of both individual and professional investors (De Bondt 1993).

Investors may fall prey to the hot hands fallacy because of representativeness (Shefrin 2005). The hot hands phenomenon got its name from basketball fields. Basketball coaches and players typically believe that when the player is “hot”, meaning he has not missed a basket many times in the early part of the game, then he is more likely to perform better than average in the rest of the game. Representativeness leads to the hot hands fallacy when investors think that the recent history of the phenomenon is representative of the underlying statistical process. The case of the basketball run of good performance is seen to represent the underlying form. Likewise, on the asset markets, investors who suffer from the hot hands fallacy are likely to believe that a strong history of past returns is representative of an upward trending underlying return process. This belief makes investors predict strong returns after strong past returns. The resulting trading strategy is then likely to be the momentum strategy.

Representativeness may also induce people to believe in “the law of small numbers” or “the gambler’s fallacy” (Shefrin 2005). An investor who suffers from the gambler’s fallacy is likely to be biased towards predicting reversals in stock prices. This in turn may lead him to contrarian trading. The law of small numbers that is synonymous with the gamblers fallacy involves people to assume that small samples feature the same general properties as the parent population. Applied to the stock market context, an investor may think that the process generating prices is a random walk, which could actually be true. At the same time, however, he also thinks that the short sequence of stock prices should have the same properties as the underlying process has. This way the short sample would be more representative of the assumed true process. Consequently, following the high returns, an investor is likely to predict low returns and vice versa even in a timeframe of days. An investor prone to the gambler’s fallacy, therefore, predicts more but shorter runs compared to the true underlying process that is generating the sample sequence.

Given the importance of momentum and contrarian strategies for the asset pricing, it is not surprising that a number of papers study how past returns affect investor behavior. The previous papers investigate the number of different investor classes that are trading in different markets, using a diverse set of methodologies, data frequencies and data periods. Perhaps the most scrutinized investor group is the U.S. institutional investors.

There has been some disagreement on whether these institutions are momentum traders (see Sias 2007).

A number of papers study the momentum trading of U.S. institutions. Sias (2007) analyzes a set of relatively recently published papers, and finds that four of the 11 conclude that institutions do not momentum trade<sup>1</sup>, five find relatively weak evidence of momentum trading<sup>2</sup>, and two find strong evidence of institutional momentum trading<sup>3</sup>. Sias also finds that differences in results arise primarily from differences in the methods used to detect momentum trading. The first important factor is whether the methodology uses equal or value weighting across stocks. Value-weighted measures tend to be dominated by a few large stocks. The second factor is whether the paper focuses on the average demand or aggregate demand. Essentially, this is a question of whether equal- or value-weighting is used across institutions. Third, some measures of momentum trading disagree even in the direction of the demand. Consider a case in which an institution buys heavily several stocks, for example, in order to increase the overall equity weight in the portfolio. In this case, it is conceivable that an institution buys additional shares of a stock but decreases the security's portfolio weight. Fourth, correlation between current capitalization and both past returns and the absolute value measures of demand may cause additional problems.

The primary goal of most of the momentum studies is to examine whether momentum strategies destabilize asset prices. With this goal in mind the theoretically soundest method is to use equal weighting across stocks and value-weighting across investors. Once the methodological differences are taken into account, Sias (2007) finds that the U.S. mutual funds engage in strong momentum trading. In addition, very recent evidence from Griffin, Harris and Topaloglu (2003) finds evidence that is consistent of U.S. institutional investors being momentum traders in daily and intradaily frequencies. In contrast to institutional investors, direct evidence on the trading patterns of U.S. individual investors shows them to be contrarian traders (Barber, Odean and Zhu 2003).

Besides the U.S. stock markets, momentum and contrarian trading is studied on many other markets, too. Finland is a particularly fruitful country to conduct such studies, because the comprehensive and direct trading records of all investors are available. The previous Finnish evidence shows that foreign investors as a group tend to be momentum investors. Domestic investors, both households and institutions, are instead contrarian traders (Grinblatt and Keloharju 2000). This is consistent with the evidence documented above, because the large U.S. institutional investors tend to be the dominant foreign investor group in Finland.

There are also many papers investigating how past returns affect trading patterns of investors in emerging markets (see for example Choe, Kho and Stulz 1999; Griffin, Nardari and Stulz 2004). This interest stems from the crisis and large swings faced by these markets in recent decades. Most of these studies conclude that foreign investors in

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<sup>1</sup> These studies are Falkenstein (1996), Gompers and Metrick (2001), Badrinath and Wahal (2002), and Gibson and Safieddine (2002).

<sup>2</sup> These studies are Lakonishok, Shleifer and Vishny (1992), Grinblatt, Titman and Wermers (1995), Wermers (1999), Nofsinger and Sias (1999), and Cai and Zheng (2004).

<sup>3</sup> These studies are Chen, Hong and Stein (2002), and Bennett, Sias and Starks (2003).

emerging markets are momentum traders, whereas domestic investors are contrarian orientated.

This thesis seeks to contribute to the literature analyzed above by investigating whether investors' trading activity is related to momentum and contrarian trading. It is often argued that short-term active investors tend to follow momentum strategies, with more passive investors relying on the contrarian strategies.

## **2.5 Prospect theory and mental accounting**

The purpose of this section is to provide both theoretical and empirical background for the fourth essay of the thesis, which investigates the relation between capital gain positions and investors' reactions to earnings announcements. Prospect theory refined by the multiple mental accounts framework challenges the rational expected utility theory as a positive theory of choice under uncertainty. The prospect theory was originally conceived by Kahneman and Tversky (1979) and later resulted in Daniel Kahneman being awarded the Nobel Prize for Economics. Prospect theory distinguishes two phases in the choice process: the early phase of framing (or editing) and the subsequent phase of evaluation.

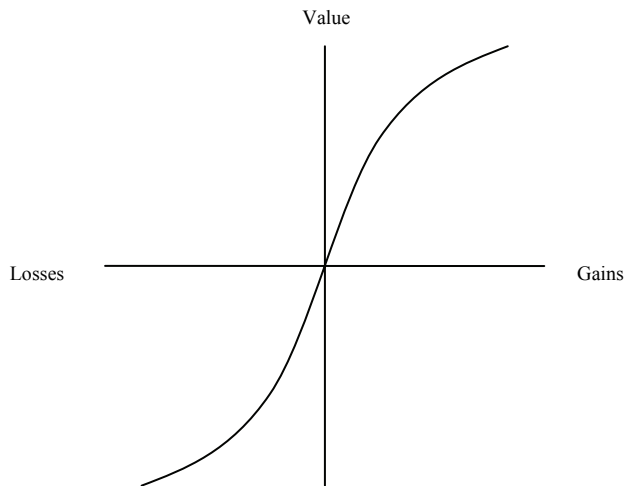
An important aspect of the framing process is that people tend to perceive outcomes as gains and losses, rather than as final states of wealth. Gains and losses are defined relative to some neutral reference point. The reference point is found in experimental studies usually to correspond to the current asset position. When it comes to investments in stocks the natural reference point is the purchase price of stock. Indeed, most of the empirical studies motivated by the prospect theory find that the purchase price of stock appears to be one of the reference points used by an investor (see for example Odean 1998 and Grinblatt and Keloharju 2001). However, it is possible that an investor is affected by some additional reference points. For example, the maximum stock prices in the recent return history are found to affect investors' trading decisions.

The mental accounting framework of Thaler (1980) provides important additional elements for the framing theory when there are multiple investments to be evaluated. The essential idea is that decision-makers tend to sort different gambles into separate accounts, and then assess each account by ignoring possible interactions. When it comes to equity market investments, an account is usually considered to be an individual stock. When an investor purchases a stock he opens a mental account and closes it at the time of selling. An investor holding more than one stock in his portfolio has multiple mental accounts open simultaneously.

In principle, framing can be broader or narrower. An investor applying a broad framing could analyze gains and losses in total wealth level. Intermediate and narrow framing, instead, refer to the process whereby an investor defines gains and losses with regard to isolated components of wealth. Intermediate framing may take place on the level of a stock portfolio, whereas the narrow framing is usually defined at level of individual securities. The vast majority of empirical studies implicitly assume narrow framing.



The most central element of the prospect theory is the S-shaped value function depicted in Figure 1.



**Fig. 1. Prospect theory value function**

The value function is defined in terms of changes in wealth rather than final states. The shape of the function is concave in the region of gains and convex in the loss region, reflecting risk aversion in the domain of gains and risk seeking in the domain of losses. An interesting property of the value function is that it is steepest at the reference point. This implies that a given change in gains or losses has a smaller effect on the value experienced by an investor when the distance to the reference point is large.

The third element of the prospect theory is the weighting function: The value of each outcome is multiplied by a decision weight. Decision weights measure the impact of events on the desirability of an investment. They are not probabilities and typically do not add up to unity. Kahneman and Tversky (1979) call this property subcertainty. Decision weights are generally regressive with respect to true probabilities, implying that preferences are less sensitive to variations in probability than the rational benchmark would suggest.

Shefrin and Statman (1985) apply the prospect theory and mental accounting framework to explain the disposition effect: Investors' tendency to sell winners too early and hold losers too long. Consider a fair game investment opportunity, meaning that the expected return on an investment is zero. An investor could hold a stock for example with a 50% chance of both positive and negative return of an equal amount during the next period. Assume the stock is currently trading below the purchase price, implying that an investor is holding a paper loss. Because the prospect theory value function is convex in the domain of losses, implying risk loving behavior, an investor is not willing to realize his loss but continues to hold a stock for another period. An investor holding capital gain, instead, is making a decision in the concave region of the value function and does not

accept a fair game investment opportunity. In contrast to the investor carrying capital loss, he realizes his paper gain.

Shefrin and Statman (1985) themselves were first to detect a disposition effect in a real market setting using data from stock markets. Subsequently, Odean (1998) confirms the disposition effect using more extensive and sophisticated data from the individual clients of a major U.S. brokerage house. The Finnish evidence on the disposition effect is provided by Grinblatt and Keloharju (2001), who find that individual investors are more prone to the disposition effect than their institutional counterparts. In addition, they find that the disposition effect is primarily driven by large losses. In the tax-free environment, Shapira and Venezia (2001) provide evidence of the Israeli professional investors behaving in disposition fashion. Moreover, Frazzini (2006) documents the disposition effect among the U.S. mutual funds. Besides equity markets, the evidence on disposition effect is found on real estate markets (Genesove and Mayer 2001), futures markets (Locke and Mann 2000) and among market makers on the Chicago Board of Trade (Coval and Shumway 2005).

However, an investor's frame of mind tends to be opposite at the end of the year for tax reasons. Odean (1998) finds that the clients of a large U.S. brokerage house tend to realize losses mainly toward the end of the year. Finnish investors also realize losses more than gains during the last eight days of the year (Grinblatt and Keloharju 2001). Moreover, they tend to repurchase the same stocks recently sold (Grinblatt and Keloharju 2004).

A growing number of studies suggests that the disposition effect may affect volumes and prices of stocks. Kaustia (2004) finds that trading volume increases when price surpasses the offer price of the initial public offering (IPO). Statman, Thorley and Vorkink (2006) establish a positive relation between individual stock turnover and lagged returns. They interpret this finding to be consistent with the disposition effect. The main idea is that investors tend to sell their winners following the stock run-up, but hold their losers after their stock has gone down.

The combination of loss aversion and mental accounting may explain various return anomalies, such as excess volatility and value premium of individual stock returns (Barberis and Huang 2001), aggregate excess volatility and equity premium (Bernartzi and Thaler 1995; Barberis, Huang and Santos 2001), and momentum (Grinblatt and Han 2005). Very recently, Frazzini (2006) has proposed that the disposition effect induces underreaction to news, generating the post-earnings announcement drift.

## **2.6 Investment horizons, bid-ask spreads and volatility**

The purpose of this section is to describe how investment horizons may be related to bid-ask spreads and volatility of stock prices. These phenomena are studied empirically in the second and third essays of the thesis. Trading activity and associated investment horizons have a great deal of variation across investor population in equity markets. At the most active end of the spectrum are investors with investment horizons of less than a day. These investors are often called day traders. If an investor buys and sells the same stock on the same day he is said to be a day trader. Day trading of individual investors became

popular in Finland during the boom period in technology stocks at the end of the 1990s (Linnainmaa 2003). It is typically concentrated on growth stocks with relatively speculative characteristics. In the less active segment of the investor population are those institutional institutions which follow passive index-tracking strategies. Trading by these investors is mainly due to portfolio rebalancing or tax considerations. Closer to the passive end of the investor spectrum, are buy-and-hold investors, who buy a stock and then “forget” it for a relatively long period in the passive portfolio. At the most passive end lie the strategic investments by government with expected holding periods of decades.

Casual observation suggests trading strategies of active and passive investors to be different. Our hypothesis is that active investors tend to invest in past “winner” and/or growth stocks that are considered hot in the short term. This is consistent with the phrase of short-term technical traders which goes as follows: “Trend is your friend”. Passive investors instead are hypothesized to invest in neglected “loser” and/or value stocks that have relatively high fundamental value compared to the market valuation. The prime example of such a combination of contrarian investment style and long holding periods is Warren Buffet. Differences in trading strategies could derive from the fact that different trading strategies related to past returns are profitable in different investment horizons (see for example Jegadeesh and Titman 2001).

There may also be differences between active and passive investors in an effort to collect, analyze, and act upon information. This in turn can have implications for the relative weight given by private information vs. information conveyed by trades of other investors. We conjecture that passive investors do not expend as much resources on analyzing the company data as their active counterparts do, but instead choose to follow investors with more private information, resulting in stronger herding tendency.

Liquidity and associated transaction costs are important determinants of which stocks investors with varying expected holding periods should invest in. This thesis focuses particularly on the relation between bid-ask spreads and holding periods. Amihud and Mendelson (1986) derive a theoretical proposition which states that: “Assets with higher spreads are allocated in equilibrium to portfolios with longer expected holding periods”. The previous empirical evidence of Atkins and Dyl (1997) is consistent with this hypothesis: The authors find a positive relation between the bid-ask spread and volume-based proxy for realized holding period. This thesis seeks to extend their analysis by measuring actual holding periods of Finnish individual investors and analyzing the relation between spreads and holding periods.

Investors’ trading activity is often associated with price impacts in general and volatility of stock prices particular. Chan and Lakonishok (1995) find that less patient asset managers with higher turnover rates incur larger price impacts. There exists a rich body of empirical literature analyzing the relation between trading activity and volatility (see Karpoff 1987 for a review). The volume-volatility relation was first presented by Crouch (1970a, 1970b), who found positive correlations between the absolute values of daily price changes and daily volumes on equity markets for both market indices and individual stocks. The volume-volatility relation is also documented in the futures markets for raw materials (Clark 1973), treasury bills (Tauchen & Pitts 1983), and foreign currency (Grammatikos and Saunders 1986). More recently, Jones, Kaul and Lipson

(1994) find that stock price volatility is more strongly associated with number of trades than with volume.

The traditional explanations for the volume-volatility relation are a mixture of distribution hypothesis (Epps and Epps 1976; Tauchen and Pitts 1983; Harris 1986), asymmetric information (Kyle 1985; Admati and Pfleider 1988) and differences in opinion (Varian 1985; Harris and Raviv 1993). In the mixture of distributions models, a mixing variable, typically the number of information arrivals, drives the volume-volatility relation. In the asymmetric information models, informed investors trade on their private information. When informed investors trade more, volatility increases because of the generation of private information. In the differences in opinion models both trading activity and volatility are correlated with the arrival of information creating the volume-volatility relation.

More recently, the noise trading based explanations of volatility have become more popular (see for example De Long, Shleifer, Summers and Waldmann 1990; Campbell and Kyle 1993; Jackson 2003). However, it was already Black (1986, p. 533), who stated as follows: “Anything that changes the amount or character of noise trading will change the volatility of price”. In this thesis we argue that day trading of individual investors may provide a natural laboratory for examining the influence of noise trading on some of the stock prices. This is because the performance of active investors in general and day traders in particular has been relatively poor (Barber and Odean 2000; Barber, Lee, Liu and Odean 2004; Linnainmaa 2003). One possible explanation for why individual investors engage in irrational day trading may be their overconfidence, which is found to increase trading activity and impair performance (Odean 1998; Barber and Odean 2001; Perttunen and Tyynelä 2003).

This thesis investigates the relation between day trading and volatility. Barber and Odean (2001) and Campbell, Lettau, Malkiel and Xu (2001) point to day trading as a potential source of increased idiosyncratic stock price volatility. Day traders may destabilize the market because of their buy and sell pressures near the opening and closing of the market (Linnainmaa 2003), or because they tend to perceive similar signals from the technical indicators. On the other hand, day traders may stabilize stock prices because they increase market depth by providing additional liquidity.

## **3 Review of the essays**

### **3.1 Essay 1: Investors' activity and trading behavior**

The first essay analyzes the trading behavior of active vs. passive investors during the boom period in technology stocks between 1997 and 2000. Traditionally, investor behavior studies classify investors using some non-behavioral characterization such as individual vs. institutional investors, foreign vs. domestic investors, or local vs. non-local investors. This paper instead uses the behavioral characterization of investors based on trading activity. Stock market trading activity increased considerably during the last years of the millennium coinciding with the unprecedented bubble in stock prices.

The main contribution of this study is to show how trading activity relates to trading strategies such as herding, momentum trading and growth investing in the context of the technology stock boom. The essay first seeks to answer the following research questions: Do active and passive investors herd in their trading decisions? Is there a difference between investor classes in the strength of the herding? Does herding exhibit any systematic pattern over time?

We measure herding using the index developed by Lakonishok, Shleifer and Vishny (1992). This index considers herding taking place when a larger number of investors are trading on one side of the market than would be expected if they were to trade randomly. We find that both active and passive investors tend to herd in their trading decisions. The absolute level of passive investors' herding is much higher than that of active investors. There is, however, an interesting trend present in the herding of active investors: their herding increases monotonically year on year. This is consistent with the hypothesis that active investors' increased herding contributed to the bubble.

The essay then proceeds by analyzing how trading activity relates to momentum and contrarian strategies. The focus in this essay is on the cross-sectional momentum trading, implying that winners and losers are defined in relation to the returns of other stocks rather than their own return history. This research design seeks to answer the question which investors, active or passive, tended to primarily buy stocks which were subject to the most severe bubbles.

Using the volume-based measures of investors' trade pressure, we find that active investors are momentum traders over all past return horizons. Symmetrically, passive investors tend to follow contrarian investment strategies. The results of active investors, however, are sensitive to whether volume or number of traders is used to construct trade pressure measures. Applying the measure based on the number of traders eliminates the momentum trading tendency. Since the volume-based measure puts relatively more weight on the large trades, these findings suggest that active investors conducting large trades are particularly prone to momentum trading strategies. This finding is consistent with the intuition that momentum strategies are considered shorter-term strategies than contrarian strategies.

The third aspect of investor behavior that we analyze in this paper is growth and value strategies. The stocks with book-to-market ratio lying in the lowest quarter of the sample stocks are defined to be growth stocks, whereas the top quarter consists of value stocks. The motivation for the growth vs. value sorting is that the bubble was particularly severe among growth stocks. We find that active investors tended to systematically buy growth stocks during the boom period. Active investors' growth investment appetite turned towards value stocks during the year 2000, coinciding with the bursting of the bubble.

Finally, we analyze the returns around investors' trade pressures. Most importantly, contemporaneous daily returns are positively associated with buy pressures of active investors, suggesting that active investors either move prices or/and engage in intraday momentum trading. Overall, our results suggest that active investors did contribute to the bubble in IT stocks.

### **3.2 Essay 2: Day trading and stock price volatility**

The second essay analyzes the relation between day trading and intraday volatility of stock prices. The main contribution of this essay is to show that day trading of individual investors and intraday volatility of stock prices are positively related for a set of most heavily day traded stocks. Idiosyncratic volatility matters for underdiversified portfolios. Unreported work with the Finnish data shows that portfolios of individual investors are strikingly focused. A large number of individual investors hold only a single stock.

The focus of this essay is on the relation between the day trading of individual investors and intraday volatility of stock prices. Based on the earlier literature, it is reasonable to assume that day trading of individual investors is a good proxy for noise trading, because individual investors tend to perform worse than other investor classes on the market (Grinblatt and Keloharju 2000) and active trading seems to impair their performance (Odean 1999). Because day trading became popular among Finnish investors during the boom in IT stocks at the end of the decade, I choose to focus on the research period from 1999-2003. The top ten stocks ranked by the fraction of individual investors' day trades of total number of trades are analyzed. The paper also uses financial and non-financial firms as control groups.

It is not obvious *ex ante* whether day trading should be positively or negatively related to volatility. Day trading increases market depth by providing additional liquidity and, therefore, potentially decreasing the volatility (Barber and Odean 2001). On the other

hand, day trading tends to create buy pressures at the beginning of the trading session, and selling pressures near the closing of the market (Linnainmaa 2003). Moreover, trading strategies used by day traders may induce them to herd via past prices (Barber and Odean 2001). The efficient market hypothesis suggests that noise trading does not affect prices. If noise trading by individual investors is a good proxy for noise trading, the EMH would predict no relation between day trading and volatility. If the relation between day trading and volatility is mainly driven by noise trading rather than the information based reasons, I would expect the relation to be stronger with individual rather than institutional investors. I must also be cautious in interpreting the results, because there could be a causality issue present. It could be that high volatility days induce day trading rather than vice versa.

I measure intraday volatility using the daily log range. The range is the difference between maximum and minimum prices during the day. I use various explanatory variables for controlling the previously documented regularities in volatility. As was discussed above, perhaps the most widely documented empirical regularity in volatility is the positive volume-volatility relation. Both share trading volume and total number of trades are used to control for the volume-volatility relation. The regression results also show a positive volume-volatility relation with our sample of Finnish stocks. Consistent with Jones, Kaul and Lipson (1994), this relation is somewhat stronger when the number of transactions instead of trading volume is used as a measure of trading activity.

This essay focuses on the relation between decomposed day trading volume and volatility. I decompose the day trading volume of a given investor class into number of day trades and average size of day trade. The main contribution of this essay is to document a strong positive relation between the number of individual investors' day trades and volatility even after controlling for the volume-volatility relation. This result is found to be consistent across subperiods and individual stocks. However, the relation between the day trading of institutional investors and volatility seems to be much weaker.

### **3.3 Essay 3: Do individual investors care about transaction costs?**

#### **Bid-ask spreads and holding periods for common stocks**

This essay tests the theoretical proposition of Amihud and Mendelson (1986) that assets with higher spreads are allocated in equilibrium to portfolios with longer expected holding periods. The proposition is fairly intuitive, since the more frequently an investor trades the higher cumulative transaction costs he faces, resulting in a relative disadvantage over less frequent traders for investing in stocks with high transaction costs. This proposition was previously tested by Atkins and Dyl (1997), who find a positive relation between bid-ask spreads and volume-based aggregate holding period measure.

The main contribution of this essay is to measure the actual holding periods of individual investors, rather than using an aggregate market proxy for holding periods, and to show how these holding periods relate to bid-ask spreads. The transaction data used in this study covers all trades of Finnish investors in the period 1996-2003. Instrumental variables regression techniques are used to control for possible endogeneity between bid-ask spreads and holding periods. The lagged spread is used as an instrument for the

current spread. In addition, we control for a host of additional stock characteristics (such as firm size, return volatility, value/growth orientation) and investor attributes (such as fraction of female owners and experience) that may be related to holding periods.

We find a positive relation between holding periods and spreads which provides support for the clientele hypothesis of Amihud and Mendelson (1986). Therefore, it seems that individual investors are rational enough in taking transaction costs into account in their investment decisions. In addition, we find a negative relation between holding periods and volatility, which may suggest that speculative trading contributes to the volatility of stock prices. Firm size and value orientation seem to be positively related to holding periods. Finally, we find that the share of female owners and investment experience are positively associated with holding periods, suggesting that overconfidence makes holding periods shorter.

### **3.4 Essay 4: Capital gains and investors' reactions to earnings announcements**

This essay analyzes how investors with different levels of capital gains react to earnings announcements. The combination of prospect theory and mental accounting framework suggests that both the sign and magnitude of capital gains should affect investor behavior. The first hypothesis states that an earnings announcement triggers more abnormal selling in the investor classes holding capital gains rather than losses. This hypothesis is motivated by the study of Frazzini (2006), which suggests that the disposition effect may result in underreaction to earnings announcement.

The second hypothesis proposes that earnings announcements trigger more abnormal selling in those investor classes that are holding *small* gains or losses rather than *large* gains or losses. This hypothesis derives from the prospect theory value function which is steepest at the reference point. When an investor is further away from the reference point (purchase price of a stock), changes in the level of wealth have smaller effects on the perceived utility. This property of the value function suggests that an investor carrying either small gains or losses has a relatively strong emotional desire to pay attention to and use the earnings announcement information.

To test these hypotheses, I first classify investors either as individual investors or institutions. In the next phase, within both investor categories separately, I classify investors into one of the four capital gain classes. The capital gain and loss classes are as follows: large losses (over 20%), small losses (0-20%), small gains (0-20%), and large gains (over 20%). In addition, I also use return volatility adjusted cut-off points. Capital gains are measured at the end of the earnings announcement day. Three alternative methods to compute the purchase price of a stock are used. These methods are the first-in-first-out (FIFO), last-in-first-out (LIFO), and mean-in-first-out (MIFO). Since the results are found to be insensitive to the choice of accounting method we report only those results obtained using the MIFO principle. I use the same Finnish Central Securities database as in the other essays to compute abnormal selling volumes around the earnings announcements. The research period is 1997-2003.



The abnormal selling around earnings announcement is measured against the normal volume benchmark. The normal volume is computed separately for each event and investor class as a daily mean sell volume over the estimation period, which in turn is defined to be -60 to -4 days before the event.

I find that abnormal selling following earnings announcement tends to be higher when individual investors are holding capital gains rather than losses. This finding confirms the disposition effect in the context of earnings announcement. Furthermore, individual investors carrying large rather than small gains/losses react less to earnings announcement. The highest abnormal trading volume is found in the small gain category, which is exactly what we expect under the prospect theory. The behavior of institutional investors, however, seems to be less affected by the psychological premises underlying the prospect theory.

## References

- Admati A & Pfleider P (1988) A theory of intraday patterns: volume and price variability. *Review of Financial Studies* 1: 3-40.
- Amihud Y & Mendelson H (1986) Asset pricing and the bid-ask spread. *Journal of Financial Economics* 17: 223-249.
- Atkins A B & Dyl E A (1997) Transaction costs and holding periods for common stocks. *Journal of Finance* 52: 309-325.
- Avery C & Zemsky P (1998) Multidimensional uncertainty and herd behaviour in financial markets. *American Economic Review* 88: 724-748.
- Badrinath S & Wahal S (2002) Momentum trading by institutions. *Journal of Finance* 57: 2449-2478.
- Banerjee A V (1992) A simple model of herd behavior. *Quarterly Journal of Economics* 107: 797-817.
- Barber B M, Lee Y T, Liu Y J & Odean (2004) Do individual day traders make money? Evidence from Taiwan. Unpublished working paper.
- Barber B M, Odean T & Zhu N (2003) Systematic noise. Working paper.
- Barber B M & Odean T (2001) Boys will be boys: Gender, overconfidence, and common stock investment. *Quarterly Journal of Economics* 116: 261-292.
- Barber B M & Odean T (2000) Trading is hazardous to your wealth: The common stock investment performance of individual investors. *Journal of Finance* 55: 773-806.
- Barberis N & Huang M (2001) Mental accounting, loss aversion, and individual stock returns. *Journal of Finance* 56: 1247-1292.
- Barberis N, Huang M & Santos T (2001) Prospect theory and asset prices. *Quarterly Journal of Economics* 116: 1-53.
- Barberis N, Shleifer A & Vishny R (1998) A model of investor sentiment. *Journal of Financial Economics* 49: 307-343.
- Bernard V & Thomas J K (1989) Post-earnings announcement drift: delayed price response or risk premium? *Journal of Accounting Research* 27: 1-36.
- Bernartzi S & Thaler R (1995) Myopic loss aversion and the equity premium puzzle. *Quarterly Journal of Economics* 110: 73-92.
- Bennett J, Sias R & Starks L (2003) Greener pastures and the impact of dynamic institutional preferences. *Review of Financial Studies* 16: 1203-1239.
- Bernard V & Thomas J K (1990) Evidence that stock prices do not fully reflect the implications of current earnings for future earnings. *Journal of Accounting and Economics* 13: 305-341.

- Bikhchandani S & Sharma S (2001) Herd behavior in financial markets. *IMF Staff Papers* 47: 279-310.
- Black F (1986) Noise. *Journal of Finance* 41: 529-543.
- Blaug M (1992) *The Methodology of Economics or How Economists Explain*, 2. ed., Cambridge University Press.
- Cai F & Zheng L (2004) Institutional trading and stock returns. *Financial Research Letters* 1: 178-189.
- Campbell J Y & Kyle A S (1993) Smart money, noise trading and stock price behavior. *Review of Economic Studies* 60: 1-34.
- Chan L K C & Lakonishok (1995) The behavior of stock prices around institutional trades. *Journal of Finance* 50: 1147-1174.
- Chen J, Hong H & Stein J (2002) Breadth of ownership and stock returns. *Journal of Financial Economics* 66: 171-205.
- Choe H, Kho B C & Stulz R M (1999) Do foreign investors destabilize stock markets? The Korean experience in 1997. *Journal of Financial Economics* 54: 227-264.
- Clark P K (1973) A subordinated stochastic process model with finite variance for speculative prices. *Econometrica* 41, 135-155.
- Coval J & Shumway T (2005) Do behavioral biases affect prices? *Journal of Finance* 60: 1-34.
- Crouch R L (1970a) A nonlinear test of the random-walk hypothesis. *American Economic Review* 60: 199-202.
- Crouch R L (1970b) The volume of transactions and price changes on the New York Stock Exchange. *Financial Analyst Journal* 26: 104-109.
- Daniel K, Hirshleifer D & Subrahmanyam A (1998) A theory of overconfidence, self-attribution, and security market under- and overreaction. *Journal of Finance* 53: 1839-1886.
- De Bondt W (1993) Betting on trends: Intuitive forecasts of financial risk and return. *International Journal of Forecasting* 9: 355-371.
- De Long J B, Shleifer A, Summers L & Waldmann R (1990) Positive feedback investment strategies and destabilizing rational speculation. *Journal of Finance* 45: 375-395.
- De Long J B, Shleifer A, Summers L & Waldmann R (1990) Noise trader risk in financial markets. *Journal of Political Economy* 98: 703-738.
- Epps T & Epps M (1976) The stochastic dependence of security price changes and transaction volumes: Implications for the mixture-of-distribution hypothesis. *Econometrica* 44: 305-321.
- Falkestein E (1996) Preferences for stock characteristics as revealed by mutual fund portfolio holdings. *Journal of Finance* 51: 111-135.
- Fama E (1970) Efficient capital markets: A review of theory and empirical work. *Journal of Finance* 25: 383-417.
- Fama E (1991) Efficient capital markets II. *Journal of Finance* 46: 1575-1617.
- Frazzini A (2006) The disposition effect and underreaction to news. *Journal of Finance* 61: 2017-2046.
- Friedman M (1979) *Essays in Positive Economics*. University of Chicago Press.
- Genesove D & Mayer C (2001) Loss aversion and seller behavior: Evidence from the housing market. *Quarterly Journal of Economics* 116: 1233-1260.
- Gibson S & Safieddine A (2003) Does smart money move markets? *Journal of Portfolio Management* 29: 66-77.
- Gompers P & Metrick A (2001) Institutional investors and equity prices. *Quarterly Journal of Economics* 116, 229-260.
- Grammatikos T & Saunders A (1986) Futures price variability: A test of maturity and volume effects. *Journal of Business* 59: 319-330.
- Grether D (1980) Bayes rule as a descriptive model: The representativeness heuristic. *Quarterly Journal of Economics* 95, 537-557.

- Griffin J M, Harris J & Topaloglu S (2003) The dynamics of institutional and individual trading. *Journal of Finance* 58: 2285-2320.
- Griffin J M, Nardari F & Stulz R M (2004) Daily cross-border equity flows: pushed or pulled? *Review of Economics and Statistics* 86: 642-657.
- Grinblatt M & Han B (2005) Prospect theory, mental accounting, and momentum. *Journal of Financial Economics* 78: 311-339.
- Grinblatt M & Keloharju M (2000) The investment behavior and performance of various investor types: A study of Finland's unique data set. *Journal of Financial Economics* 55: 43-67.
- Grinblatt M & Keloharju M (2001) What makes investors trade? *Journal of Finance* 56: 589-616.
- Grinblatt M & Keloharju M (2004) Tax-loss trading and wash sales. *Journal of Financial Economics* 71: 51-76.
- Grinblatt M, Titman S & Wermers (1995) Momentum investment strategies, portfolio performance, and herding: a study of mutual fund behavior. *American Economic Review* 85: 1088-1105.
- Grossman S J (1976) On the efficiency of competitive stock markets where traders have diverse information. *Journal of Finance* 31: 573-585.
- Harris M & Raviv A (1993) Differences of opinion make a horse race. *Review of Financial Studies* 6: 473-506.
- Harris L (1986) Cross-security tests of the mixture of distributions hypothesis. *Journal of Financial and Quantitative Analysis* 21: 39-46.
- Hong H, Kubik J & Stein J C (2004) Social interaction and stock-market participation. *Journal of Finance* 59: 137-163.
- Hong H, Kubik J & Stein J C (2005) Thy neighbor's portfolio: word-of-mouth effects in the holdings and trades of money managers. *Journal of Finance* 60: 2801-2824.
- Holmström B (1979) Moral hazard and observability. *Bell Journal of Economics* 10: 74-91.
- Jackson A (2003) Noise trader risk exists...but the noise traders are not who you think they are. London Business School working paper.
- Jegadeesh N and Titman S (2001) Profitability of momentum strategies: An evaluation of alternative explanations. *Journal of Finance* 56: 699-720.
- Jones C M, Kaul G & Lipson M L (1994) Transactions, volume, and volatility. *Review of Financial Studies* 7: 631-651.
- Kahneman D & Tversky A (1972) Subjective probability: A judgement of representativeness. *Cognitive Psychology* 3: 430-454.
- Kahneman D & Tversky A (1973) On the psychology of prediction. *Psychological Review* 80, 237-251.
- Kahneman D & Tversky A (1979) Prospect theory: An analysis of decision under risk. *Econometrica* 47: 263-291.
- Karpoff J M (1987) The relation between price changes and trading volume: A survey. *Journal of Financial and Quantitative Analysis* 22: 109-126.
- Kaustia M (2004) Market-wide impact of the disposition effect: Evidence from IPO trading volume. *Journal of Financial Markets* 7: 207-235.
- Kim W & Wei S-J (2002) Foreign portfolio investors before and during a crisis. *Journal of International Economics* 56: 77-96.
- Kindleberger C (1978) *Manias, Panics, and Crashes*. New York: Basic Books.
- Kuhn T S (1970). *The Structure of Scientific Revolutions*, 2. ed, University of Chicago Press.
- Kyle A (1985) Continuous auctions and insider trading. *Econometrica* 53: 1315-1335.
- Lakonishok J, Shleifer A & Vishny R (1992) The impact of institutional trading on stock prices. *Journal of Financial Economics* 32: 23-43.
- Linnainmaa J (2003) Anatomy of day traders. UCLA working paper.
- Lintner J (1965) The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics* 47: 13-37.

- Locke P R & Mann S C (2005) Professional trader discipline and trade disposition. *Journal of Financial Economics* 76: 401-444.
- Markowitz H M (1952) Portfolio selection. *Journal of Finance* 7: 77-91.
- Modigliani F & Miller M H (1958) The cost of capital, corporation finance, and the theory of investment. *American Economic Review* 48: 261-297.
- Nofsinger J & Sias R (1999) Herding and feedback trading by institutional and individual investors. *Journal of Finance* 54: 581-622.
- Odean T (1998) Volume, volatility, price, and profit when all traders are above average. *Journal of Finance* 53: 1887-1934.
- Odean T (1998) Are investors reluctant to realize their losses? *Journal of Finance* 53: 1775-1798.
- Perttunen J & Tynnelä M (2003) Trading behaviour of Finnish households: activity, performance and overconfidence. *Finnish Journal of Business* 52: 157-178.
- Seyhun H N (1986) Insiders' profits, costs of trading, and market efficiency. *Journal of Financial Economics* 16: 189-212.
- Shapira Z & Venezia I (2001) Patterns of behavior of professionally managed and independent investors. *Journal of Banking and Finance* 25: 1573-1587.
- Sharpe W F (1964) Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance* 19: 425-442.
- Shefrin H (2005) *A Behavioral Approach to Asset Pricing*. Elsevier Academic Press.
- Shefrin H & Statman M (1985) The disposition to sell winners too early and ride losers too long: Theory and evidence. *Journal of Finance* 40: 777-790.
- Shiller R J & Pound J (1989) Survey evidence on the diffusion of interest and information among investors. *Journal of Economic Behavior and Organization* 12: 46-66.
- Shleifer A (2000) *Inefficient Markets: An Introduction to Behavioral Finance*. Oxford University Press.
- Sias R W (2007) Reconcilable differences: Momentum trading by institutions. *Financial Review* 42: 1-22.
- Siegel J J (2003) What is an asset price bubble? An operational definition. *European Financial Management* 9: 11-24.
- Statman M S, Thorley S & Vorkink K (2006) Investor overconfidence and trading volume. *Review of Financial Studies* 19: 1531-1565.
- Tauchen G & Pitts M (1983) The price variability-volume relationship on speculative markets. *Econometrica* 51: 485-505.
- Thaler R (1980) Toward a positive theory of consumer choice. *Journal of Economic Behavior and Organization* 1: 39-60.
- Varian H (1985) Divergence of opinion in complete markets: a note. *Journal of Finance* 40: 309-317.
- von Neumann J & Morgenstern O (1944) *Theory of Games and Economic Behavior*. Princeton University Press.
- Wermers R (1999) Mutual fund herding and the impact on stock prices. *Journal of Finance* 54: 581-622.



## **Original articles**

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