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Master's Thesis

Together Everyone Achieves More? Herding Behavior in the Finnish Stock Market

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ABSTRACT

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This thesis examines whether or not Finnish stock markets has herding behavior. Sample data is from 2004 to 2013. Including total of 2516 market days. Market wide herding, up and down market herding, extreme price movement herding and turnover volume herding are measured in this thesis. Methods used in this thesis are cross-sectional absolute dispersion and cross-sectional standard deviation. This thesis found no signs of herding in the Finnish stock market.

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1 Introduction

One can observe human beings development as a young child and quickly notice how imitation is prominent way of learning new. Within an hour of birth humans start to imitate (Hirshleifer & Teoh, 2003). As a human being develops more, one learns proper and efficient ways to act based on social norms. For an adolescent one of the strongest social norm dictators is peer pressure among age group. Even though, before mentioned imitation and peer pressure are associated with growing up and those are looked upon as childish behavior, these are very much alive in adult behavior in all age group as well. Monetary decisions making is affected by herding and marketers know this, since so often can one notice how product is marketed with slogan "x amount sold worldwide". This is based on our herding instinct. Even without marketing humans tend to act according to perceived popularity e.g. when choosing a restaurant or a movie to watch.

The problem arises in economical context from the view point that every individual has individual needs, individual restrictions fulfilling those needs and different level of knowledge. Utility maximization is hard to come by if decisions (or even desires) are based on someone else's needs. When more and more individuals flock on herd without going through any thought process of doing so, more and more individuals will end up being more unsatisfied than they would have been if they had acted based on their personal desire and needs. This kind of herding is irrational herding.

One has to point out that academic literature recognizes dispersion as well. Most common driver behind dispersion is known or presumed contradictive preferences. If an A and B have contradictive preferences and they both recognize this. Then if they both are faced with choices X and Y, dispersion should occur more often than not. Given, that A (B) can observe decision made by B (A) and A (B) is ex-ante indifference between X and Y.

Herding is any behavior similarity brought about by the interaction of individuals (Hirshleifer & Teoh, 2003). Usually there are two types of herding recognized, rational and irrational. Rational herding is beneficial for individual. Devenow & Welch (1996) recognize payoff externalities as a main driver behind rational herding, such instances include bank runs, liquidity in markets, information acquisition and reputation in principal-agent situations. Yahyazadehfar et al. (1985) claim that herding behavior is a form of regret aversion, since it doesn't feel as bad to fail within a herd compared to taking a road less traveled and face a failure.

Hirshleifer & Teoh (2003) present that seemingly irrational behavior in financial market setting in a context of social learning and behavioral convergence can arise in fully rational environment. They recognize three different types. Firstly, frequent convergence by market participants upon mistaken actions based on small amount of investigation and justifying information. Secondly, the tendency for social outcomes to be fragile and vulnerable on relatively small shocks. Thirdly, behavioral model for market participants to delay decision making for extended periods of time and without clear signal to suddenly act simultaneously.

Hirshleifer & Teoh (2003) recognize sources for herding and dispersing: payoff externalities (like Devenow & Welch, 1996), sanction on deviants (e.g. driving on different side of the road than herd. In this case both the herd and the deviants loose), preference interactions (having same preferences or contradictive), direct communication (e.g. tip given by another person on a stock) and observational influence (e.g. having a hindsight on others decision and forming own decisions after them).

This thesis is concentrated on a question whether or not Finnish stock market has herding behavior in a time frame of beginning of 2004 till the end on 2013. Herd behavior in stock markets create excess volatility and causes scarce resources to be allocated against individuals' and/or societies' best interests. It's like having a situation where no one is really saying out loud nor recognizing in their mind that the emperor actually doesn't have clothes, until some small shock opens everyone's eyes to the truth and causes severe backlash. Conforming to our surrounding is the easy route for our brains to conserve their capacity and just rely on assuming that others did the thinking on our behalf.

2 Behavioral Finance and traditional view

This chapter briefly introduces and compares efficient market hypothesis and behavioral finance.

Academic literature nowadays contains two major views on finance, behavioural finance and traditional finance, latter one being based on efficient market hypothesis by Fama (1970). In an efficient market prices always “fully reflect” all available information. No investor can get abnormal returns using investment strategies to beat the market in the long run. There are three forms of market efficiency; weak, semi-strong and strong.

The weak form of the EMH assumes that prices reflect all historical information. The semi-strong form assumes that prices reflect all publicly available information. The third and final form of the efficient market hypothesis is the strong form where private information is assumed to be reflected in the prices. (Fama, 1970). There are few assumptions that EMH makes. Firstly, investors in financial markets are assumed to be rational. In a case that some investors are not rational, prices will not be affected because their trades are random and cancel each other out. Secondly, if investors are irrational in similar ways, arbitrageurs will eliminate their impact on prices. This was prevalent view for decades in 1960s and 1970s. Anomalies of all sorts started to rise up in academic research in 1980s. In order to explain these anomalies, which many seemed to be irrational in a sense of EMH, new view did emerge, that being called behavioral finance.

Behavioral finance challenges EMH in a context of market participants' rationality. Behavioral finance gained more popularity after Kahneman and Tversky published their paper in 1979 called “Prospect Theory: An Analysis of Decision Under Risk”. Prospect theory states that individuals' value function is concave for gain and convex for losses, unlike utility theory states that it's concave everywhere. Kahneman & Tversky (1979)

present utility theory as invalid descriptive theory. In their paper (1992) they introduced fourfold structure of risk:

- 1) Risk seeking when probabilities are small and options have only positive outcomes.
- 2) Risk aversion when probabilities are high and options have only positive outcomes.
- 3) Risk aversion when probabilities are small and options have only negative outcomes
- 4) Risk seeking when probabilities are high and options only have negative outcomes.

After them many more academics started to pop up in to the spotlight of academical finance field in 1980s e.g. Thaler (1981) and Shiller (1981). Broadly stated behavioral finance combines psychology and neoclassical economics with each other. Hirshleifer (2001) introduces a table 1 where he pinned EMH against behavioral finance.

Table 1 (Hirshleifer 2001)

Objection to Psychological Approach	Objection to Fully Rational Approach
Alleged psychological biases are arbitrary.	Rationality in finance theory requires impossible powers of calculation.
Experiments that generate alleged psychological biases are not meaningful.	The evidence we possess does not support rational behavior.
It is too easy to go theory fishing for psychological biases to match data ex post.	It is too easy to go theory fishing for factor structures and market imperfections to match data ex post.
Rational traders should arbitrage away mispricing.	Irrational traders should arbitrage away efficient pricing
Rational investors will make better decisions and get richer.	Irrational investors will bear more risk and get richer.
Confused investors will learn their way to good decisions.	Accurate investors will learn their way to bad decisions.
Apparent return predictability is spurious, so psychological models of predictability are misguided.	Apparent return predictability is spurious, so rational models of predictability are misguided.

According to Ricciardi & Simon (2000) one of the earliest books considered to be concerning behavioral finance is MacKay's *Extraordinary Popular Delusions And The Madness Of Crowds* published in 1841, it presents various manias which happened until that time. In figure 1 is presentation by Ricciardi & Simon (2000) how behavioral finance combines various fields of sciences

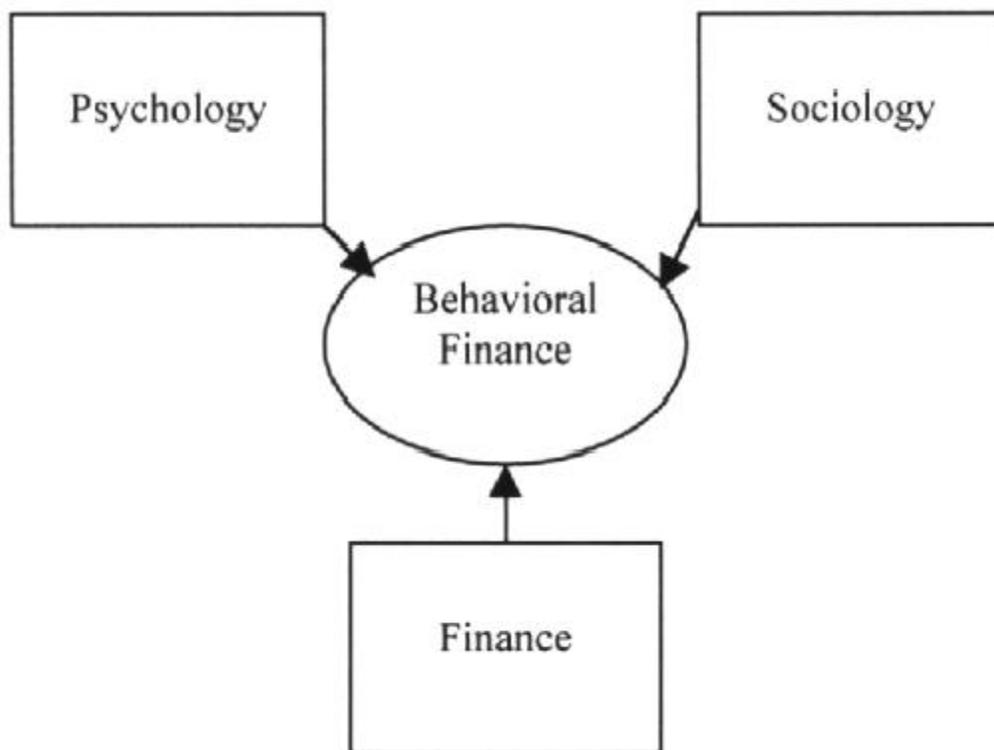


Figure 1 (Ricciardi & Simon, 2000)

One can't clearly state that fully rational investor doesn't exist, but one makes a claim that possibility to find one is closing on 0%. There is a limit on human cognitive capacity, but infinite number of known, unknown, unknown known and unknown unknown variables which affect stock market performance. One keeps the possibility open that there are persons with such a cognitive ability, but Hirshleifer (2001) states "some cognitive tasks are just too hard for any of us". He also argues against popular view that market participants are individuals and their errors are idiosyncratic and therefore should cancel each other out, instead due to evolution people share same heuristics which cause market participants to do same errors. Simon (1956) introduced idea that individuals rather satisfice than optimize, thus, preserve energy used on cognitive functions. This is most probably due to diminishing marginal utility, cognitive limits and relative arduousness for cognitive capacity. Satisficing is a decision-making method recognized by Simon (1956) and he argues that when optimal solution demands cognitive capacity above certain threshold (which is always relative to situation), decision makers rather

satisfice than optimize. In other words, decision makers know that they could have received a better outcome with more effort, but rather saved effort and satisfied.

Truth as a word has strong emotional connotations. Truth as a word is used fairly liberally to refute other claims and back others. Reber & Schwarz (1999) found illusion of truth, which constitutes that ease of processing information is more convincing. In their study a mere visual easiness to read various claims made them considered more truthful. In this sense information channeling and presentation form in stock markets can have an impact how fast and accurately information is absorbed into markets. Therefore, it can cause relevant information get lost from investors radar for long time.

There is a variation on how much an individual is inclined to follow heuristics. Constraints on cognitive resources cause usage of heuristics to make decisions (Hirshleifer, 2001). Stanovich & West (2000) found that cognitive abilities correlate negatively with inclination to use heuristics. There are many biases recognized in stock markets, but one of the most important and easiest to comprehend is the home bias. Introduced by French & Poterba (1991), they also claim that investors are more prone to not just to invest on stocks in their home country, but physical proximity and familiarity also contribute to eagerness to invest. Many people invest big proportion of their net worth into stocks of their employer (in line with home bias), this increases income volatility and in worst case scenario will ruin individuals' economy, like happened with Enron ("401(k) investors sue Enron"). Many workers had big chunk of their net worth invested in their employers stock and when Enron went bankrupt not only did they lose their job, but also their investments. Daniel et al. (2002) suggest that companies should be obligated to issue warnings for their employers about risks involved investing their employers stocks, in a similar fashion that tobacco companies issue warnings on their products. They even suggest possibility for even stronger guidance on stock market by governmental institutions, arguing that individuals are too prone to behavior which has negative external effects on society when it comes to stock market decision making.

Hirshleifer (2001) claims that individuals can learn to be imperfectly rational by having biased self-attribution. Meaning, that positive outcomes are seen as results of individuals own qualities and negative outcomes are pinned on some outside factors, which individuals couldn't affect. This can be possibly reinforced if having lucky streak (when tackling a new task) in the beginning will feed overconfidence and later, when things turn sour possible signal from this is more easily disregarded than if having started with a cold streak. Tversky & Griffin (1992) argue that how over confident individual becomes is also affected by the strength of the signal and weight. Strength meaning how shocking (extreme) the signal is and weight how precise and easy it is to absorb. They argue that feeding the most to overconfidence is a signal, which has low weight and high strength and to underconfidence a signal, which is low in strength and high in weight. Low weight and high strength signal is e.g. news headline "The president has been missing for two days". Its shocking, but not very precise about the events leading to the president being missing and causes of it.

Gigerenzer & Goldstein (1996) pinned probabilistic mental model (PMM) against various rational inference models. They found that PMM was more accurate and faster in inducing answer for various binary questions. Figure 2 is shows how they describe decision making logic flowing in PMM. Their model is called "Take the best". They draw three related vision for their model 1) Inductive inference should be studied in natural environments. 2) Inductive inference is facilitated by using satisficing algorithms. 3) Inductive inferences are based on reference classes events frequencies. Gigerenzer and Goldstein argue that classical rationality based decision making model is too demanding in cognitive sense and even with more time used gives inferior results to probabilistic mental models.

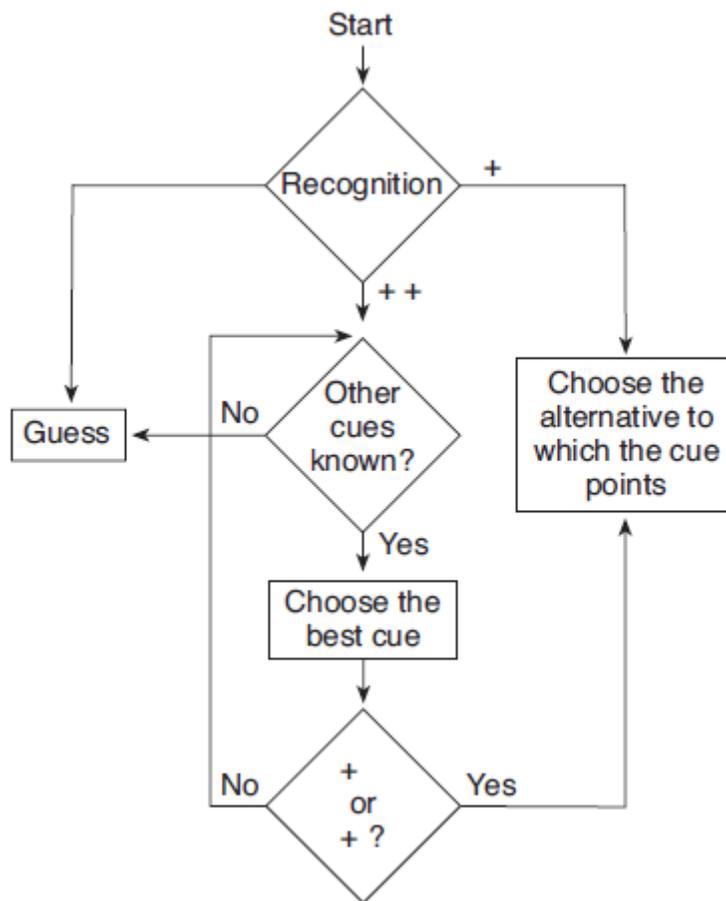


Figure 2 (Gigerenzer & Goldstein, 1996)

Academic research on herd behavior is just a small part of behavioral finance. One tries to give a small glimpse in this thesis on herding in general and a bit more precise on herding in stock markets.

3 Previous literature

This chapter introduces various theories and results from previous literature regarding herding behavior. Previous literature concerning financial market herding behavior can be divided into different sections: herding between markets, herding on a certain market, herding on segmented individuals and general herding theory. This paper gives a glimpse on all of the before mentioned sections in the following 3.1, 3.2, 3.3 and 3.4 sections of this thesis.

3.1 General herding theory

Devenow & Welch (1996) recognize different concentrations on herd behavior research in financial literature; different kind of payoff externalities which make incentives for herding behavior: bank runs, market liquidity and information acquisition. Also, Devenow & Welch (1996) recognize that financial literature has viewed herding behavior in principal-agent setting (herding in order to protect reputation) and on informational cascades.

Kremer & Nautz (2013) recognize unintentional, intentional and spurious herding. They define unintentional herding as “Unintentional herding is mainly fundamental driven and arises because institutions may examine the same factors and receive correlated private information, leading them to arrive at similar conclusions regarding individual stocks”. They define intentional herding as “intentional herding is more sentiment-driven and involves the imitation of other market participants, resulting in simultaneous buying or selling of the same stocks regardless of prior beliefs or information sets. This type of herding can lead to asset prices failing to reflect fundamental information, exacerbation

of volatility, and destabilization of markets, thus having the potential to create, or at least contribute, to bubbles and crashes on financial markets”.

Hirshleifer & Teoh (2003) offer their own taxonomy (figure 3) on reasons and consequences behind herding in figure X is how they see it being build and connected. Rectangles depict observational hierarchy, these are informational sources for herding or dispersing. As for different explanations D is subset of C, C subset of B and B subset of A.

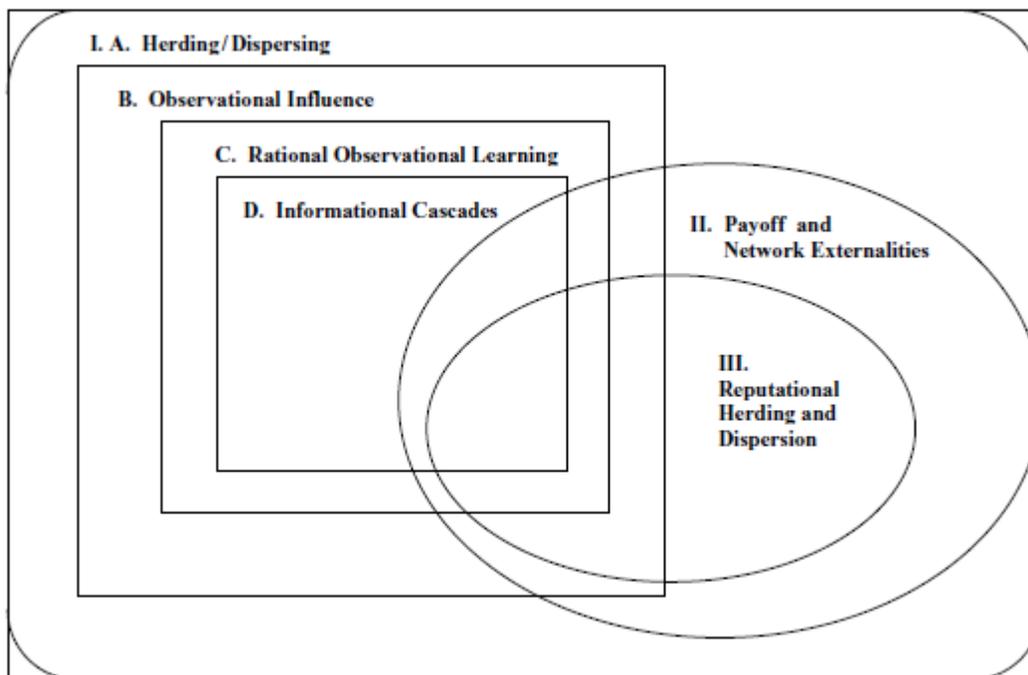


Figure 3 (Hirshleifer & Teoh, 2003)

A “Herding/Dispersing” dispersing can occur instead of herding if presumed preferences are contradictive and vice versa. B “Observational Influence” being dependent on others observed behavior and/or the results of their behavior can be imperfectly rational. C “Rational Observational Learning” using Bayesian inference to reflect behavior of others

and/or the results of their behavior. D “Informational Cascades” private signals don’t matter, only observation from others have effect. In D herding will occur for sure. (Hirshleifer & Teoh, 2003)

In figure 3 numbered round items represent payoff interaction hierarchy. First is the same as A in information hierarchy. In second interaction hierarchy “Payoff and Network Externalities” source for herding or dispersing is that individual’s action affects the payoffs for other taking that same action. In a third subset “Reputational Herding and Dispersion” source for herding or dispersing is individual’s goal to maintain good reputation in eyes of the observers. (Hirshleifer & Teoh, 2003)

Bikchandani et al. (1992) refute claims that informational cascades, when formed can’t be broken by small shocks and grows more robust as time go by. They argue that informational cascades start easily even on a small amount of information, but are fragile to change to a new cascade. Hirshleifer & Teoh (2003) argue that as public pool of information grows, individuals are less prone to act on their private signals, contributing to information blockages and feeding informational cascades. They present general guidelines for informational cascades and other rational learning theories. 1) Idiosyncrasy, cascades tend to emerge rapidly and information is aggregated poorly 2) Fragility, when cascades form complete blockage of information is prerequisite and sensitivity to small shock (Tulip bulb bubble burst) 3) Simultaneity, heterogeneous preferences and precisions cause exacerbation in having decisions delayed and then suddenly rushing to make them 4) Paradoxicality, more public information and/or more observations don’t necessarily improve accuracy of decision making 5) Path dependence, information arrival sequence and order of moves affect decision making.

Prast (2000) found that role of cognitive psychology in explaining irrational herding has its place. Prast recognizes cognitive dissonance in herding behavior. According to Prast,

psychological mechanism regarding information gathering and interpretation are also affecting financial decisions.

Prechter (2001) claims that limbic system (which together with basal ganglia is responsible for origin of impulsive thought) works faster in emotionally charged situations than neocortex (which is responsible for rational reflection). Prechter argues that herd behavior is very much inbuilt in humans saying “avoid rejection by revealing your sameness”. Even thinking about going against opinion of majority might cause nauseous feeling according to Prechter.

Cipriani & Guarino (2005) found in their experimental study in a laboratory market that herd behavior seldom occurs. They offer explanation, such as reputation protection why herd behavior occurs in real situations at stock market. Also, they found that often participants didn't follow private information given to them and abstained from trading, for real situation this might convert in to informational inefficiency in pricing at stock markets.

Yahyazadehfar et al. (1985) presents (Figure 4) how herding behavior (together with disposition effect, conservatism and cognitive) is intertwined with regret aversion. Disposition effect means that investor are more prone to sell stocks with gains than stock with losses, regardless of losing tax benefits by deducting losses from gain. This was found by Shefrin & Statman (1985). Yahyazadehfar et al. (1985) explains other behavioral models intertwined with regret aversion: Cognitive dissonance is a situation where individual has a belief and is faced with contradictive evidence, but chooses to disregard new evidence in order to avoid regret over mistaken beliefs. Conservatism is a behavioral model where individual sticks to former beliefs against new evidence contradicting former beliefs. Conservatism is connected to omission bias. Omission bias means that individuals don't regret as much omitting making a decision which turns out be right and

they didn't take it rather than making a decision which turns out to be wrong (commission, since it's a change).

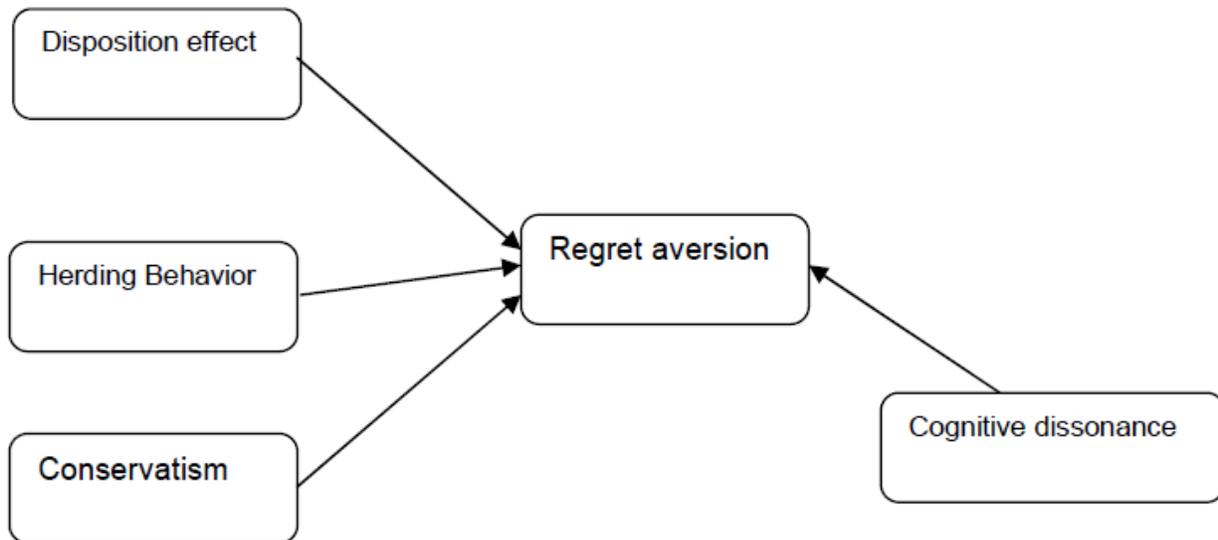


Figure 4 (Yahyazadehfal et al., 1985)

3.2 Herding by segmented individuals

Previous literature has studied if executive in financial markets e.g. analysts and investment managers are prone to herd. Also, individual investors herding behavior has been studied. This thesis presents some papers about these matters.

3.2.1 Executive herding

Scharfstein & Stein (1990) studied reputational herding and found evidence backing it. Managers seem to herd on investment decisions, ignoring substantive private information. According to Scharfstein & Stein (1990) this kind of herding gives them protection in labor markets. The worse opportunities labor market has for managers, the bigger temptation to hide in the herd. Also, authors give an example of company decision making process where managers vote on decision. Those with reputational concerns should vote first in order to avoid herding due to reputational concerns. Conservatism and slow adoption of new innovations in corporate environment is a consequence of reputational herding behavior by managers as decision makers. This is studied by Zwiebel (1995), he argues that majority of managers shy away from dispersing from industry standards in benefit of innovations which stochastically dominate industry standard. He claims that very high and very low ability managers are more adept to disperse. Also, he argues that managers see that changing from industry standards creates variance in how benchmarks are applied to their abilities, which usually means having bad outcomes interpreted more often as incompetence than if same kind of outcomes happened having chosen industry standard.

In their paper Bikhchandani & Sharma (2000) reviewed financial literature concentrated on investment managers herding. They found that most of the literature was concentrated on developed countries and no significant herding on investment managers was found, rather momentum investing via positive-feedback was found.

Earnings forecasts made by analysts are considered to be inseparable part of stock markets. Analysts making the forecasts may be under same kind of conditions that cause them to herd like corporate executives in Zwiebel (1995) and Scharfstein & Stein (1990). Trueman (1994) studied reputational herding in analysts forecasting stock market earnings. He argues that forecasts tend to herd, even though analysts have private information they disregard it and engage in herding. He also argues that the sequence in which forecasts are published have an effect on the following ones, the latest getting

heavier weight in terms of herding. Bernhardt et al. (2006) found contrarian results to Trueman (1994). They claim that analysts anti-herd away from the extant consensus forecast. They also argue that some earlier herding results might be due to poor methodology that shows clustering as herding. Same kind of results as Bernhardt et al. (2006) is reported by Chen & Jiang (2006). They present that analysts are overly biased to rely on their private signal. Overweighting is more prevalent when giving more positive forecasts than prevailing consensus. Overweighting happens also when giving more pessimistic forecasts than prevailing consensus, but less so compared to when giving an overshooting forecasts and underweighting is also found when giving pessimistic forecast. Incentives contribute more to this behavior than behavioral biases. (Chen & Jiang, 2006). According to Naujoks et al. (2009), German analysts anti-herd and over value their private information, moreover, number of analysts following a firm contributes to higher chance of anti-herding. The authors also found that when forecasts are revised two thirds of the time those are revised downwards. Naujoks et al. (2009) also present that small caps had less anti-herding than larger firms. Welch (2000) present that analysts making a positive revision in their forecasts causes following two analysts to make positive revisions more often (in line with Trueman, 1994). He also claims that prevailing analyst consensus is stronger if recent market conditions have been positive, implying that information aggregation is poorer in up-market environment and feeds a bubble.

3.2.2 Investor Herding

Gleason et al. (2004) uses intraday data of Exchange Traded Funds (ETFs) to examine whether market participants herd or not. Their results show that investors do not herd during extreme market movements. Also, they present that reaction to news is weakly asymmetric. Bad news being absorbed to market quicker than good news, which might be a sign of herding in bearish conditions.

Mutual funds tend to exhibit herding behavior with 77% of mutual funds acting as momentum investors according to Grinblatt et al. (1995). In their paper they present that these funds had significantly better returns than other funds. Also, weak evidence on herding with sales and buys between funds was found. Study consists mostly of pension funds was constructed by Lakonishok et al. (1992), they found weak evidence of herding on small cap stocks and stronger signs of positive-feedback trading. Largest stocks, which constitutes 95% of trading done by the funds in their study, have little or no herding at all nor positive-feedback trading. In general having pension fund as investor reduces volatility of a stock (Thomas et al, 2014). Wermers (1999) studied herding by mutual fund manager with twenty year data. He found average level of herding, higher herding levels of herding on small stocks and by growth-oriented funds. Their herding is connected to positive-feedback trading. Little evidence of window dressing sell-side herding was found on mutual funds.

Institutional investor at German stock market exhibit relatively low value of herding, according to Kremer & Nautz (2011). They also present that using dynamic herding measure developed by Richard Sias (2004) they found that trade made by institutions are correlated over time, but are not that because of herding rather than institutions following their own trades. No sign of herding during market stress was found, nor within small cap stocks. (Kremer & Nautz, 2011). Returns over the herding interval and annual changes in institutional ownership have a positive relation. This can mean that institutional investors engage more in intra-year positive momentum investing than other market participants. (Nofsinger & Sias, 1999). Ulku & Weber (2012) identified characteristics trading styles for different groups of investors (e.g. individual and merchant) in Korean Stock Exchange. They found that individual investors trades have a strongly negative correlation with market return, but despite that they are identified as positive feedback trader. They also present that merchants trading has significant forecast ability over the next two market days and exhibit intraday negative feedback trading, possibly due to their role as liquidity suppliers. Private funds are also positive feedback trader in Korean Stock Exchange according to Ulku & Weber (2012). Pound & Shiller (1989) found that word of mouth

investing is present in institutional investors' decision making. Contagion of interest and certain kind of fashion is witnessed outside of financial markets. Therefore, having a financial markets where some individuals would be immune to such a behavior is a leap of faith.

Welch (1992) examines how sequential sales in terms of IPOs causes cascades to form. He argues that sales channels have greater effect on success of IPO than price. Pricing done by issuers can reflect informational cascades, this causes later investors to disregard their private information and follow actions of the early ones.

3.3 Herding between markets

Herding inside just a certain market isn't the only variation of stock market herding. Often various crisis are seen as interest point for contagious herding. Some stock markets seems to herd together. Billio & Caporin (2010) found contagion between Asian and American stock markets. International investors are root of herding between emerging and developed markets. This was found by Boyer et al. (2006), who also they claim that high volatile periods show more herding spreading through institutional investors.

Globalization might increase herding between markets, because it might cause weakening incentives for gathering costly information. Informational cascades can form easier in more globalized world. Globalization may reduce the gains from paying fixed costs for gathering and processing country-specific information. Also, in the presence of variable performance costs, globalization widens the range of portfolios inside of which investors find it optimal to mimic market portfolios. (Calvo & Mendoza, 2000)

According to Chiang et al. (2007) East Asian financial crisis of late 1990s had contagion effect between markets in that region. An earlier study by Forbes & Rigobon (2002) had contradictory results, claiming that no contagion was found, only interdependence. They also found similar results for Mexican peso crisis of 1994 and for 1987 black Monday crash. Corsetti et al. (2005) found that Hong Kong 1997 crisis had contagion effect not only in its region, but more far reaching e.g. French stock market. Chiang & Zheng (2010) studied whether some markets herd with US market. They found that a lot of investors herd not only in their domestic market, but also in US market. Somewhat bizarre was the finding that market participants in Latin American markets herd with the US market, but not in their domestic market.

3.4 Herding on certain markets

Academic financial literature has also studied herding in specific stock markets, without intention to find contagion effects between stock markets.

Fu & Linn (2010) found no herding in general in Chinese stock markets, but asymmetric reaction, during down market days they found a tendency toward herding. Moreover, they argue that in Chinese stock market low turnover stocks converge to market return much more than other stocks. Hwang & Salmon (2001) studied markets in US, UK and South Korea. They found that herding toward the market returns is heavily affected by the Asian and Russian Crises in 1997 and 1998. That being contradictory to common belief that herding is significant when the market is in stress, they found that herding can be more apparent before a crisis when the market is relatively quiet. Once a crisis appears herding toward the market returns becomes much weaker. They found again that when there is a crisis, value becomes more important than growth and size and plays a significant role as a herding objective. Moreover, they also found that size is generally more important than value and growth. Their study also suggests that advanced markets such as the US and

UK show less herd behavior than emerging markets such as the South Korea. Hwang & Salmon (2004) claim that during crisis flight to fundamentals is evidential and herding takes place before crisis. They studied US and South Korean stock markets and found that herding towards the market shows significant movements and persistence independently from and given market conditions as expressed in return volatility and the level of the mean return. Macro factors do not explain the herd behavior. They also found herding toward value in US market. Hwang & Salmon (2007) have concurring results with their previous (2001 and 2004) papers in US, UK and South Korean stock markets. Lindhe (2012) examined herding in Nordic stock markets (FIN, DEN, NOR and SWE). She studied herding inside the market, between each other, with US and European market and herding in up or down market. She found that Finland had significant evidence of herding behavior, other didn't show herding. Finland had also herding behavior when data was divided to sub-periods per calendar year. Herding behavior was found in Finland in years 2001 and 2004, other years didn't show herding behavior. Sweden and Finland were found to herd around US market. All of the Nordic countries were found to herd around European market. Ohlson (2010) examined herding in Swedish stock market. He had contradictive results to Lindhe (2012), he argues that herding behavior was prevalent in Swedish stock market during 2000s. He also claims that institutional investors are behind rising herding behavior. He found that large cap stocks had herding during the most extreme market days. He argues that this also is a sign of institutional investors causing herding, since they disregard small caps and concentrate on large caps. Prosad et al. (2012) studied herding in Indian stock market. They found no herding in general, but herding on up market days, which might be a sign on positive-feedback trading. Demirer & Kutan (2005) studied Chinese stock market during market stress. They found no herding behavior using firm and sector level data. Henker et al. (2006) studied whether the Australian stock market has prevalent herding during intraday trading. They found none of it in general nor in industry sector level. Tan et al. (2008) had an interesting research setup in Chinese stock market, since they researched A-shares (for domestic investors) and B-shares (for foreign investors). They found that both of these share classes show herding in intraday measures. In addition, they found that positive market return, high trading volume and high volatility seem to cause herding behavior. Keasey et

al. (2014) found asymmetric herding behavior during extreme market movements and crisis periods in various European countries.

4 Methodology

The goal of this paper is to detect market-wide herding in Finnish stock market (OMXH). The point is that if rational asset pricing model were used investors should cause dispersion in individual stock returns relative to market return. The bigger the market movement, the more return dispersion between stocks. Methodology in this thesis focuses on cross-sectional correlations of the entire stock market. Henker, et al. (2006) argue that cross-sectional correlations are not used to find single investor behavior, but the whole markets herding behavior. Good thing is that this particular method is that it is quite plain. Empirical results in this thesis have been obtained by using both Chiang & Huang (CH) and Chiang & Zheng (CZ) methods. CH is used to detect herding one, two and three distribution away from the mean, in other words in large market movements. CZ method is used for the whole market for the whole time period and time period sliced into calendar years. Model to detect market herding in negative or positive market days is from CZ. Whether market turnover affects herding employs the model introduced by Mobarek & Molah (2013). Following sub-chapters presents methods used in this thesis to detect herding.

4.1 Previous models for market wide herding

The first method and still in use were introduced by CH (1995). The idea behind Cross-Sectional Standard Deviation (CSSD) is to measure an average proximity of individual returns to the market return. The level of dispersion increases when individuals assets returns differ from market return. According to CH, rational asset pricing models predict that the dispersion will increase with the absolute value of the market return since individual assets differ in their sensitivity to the market return. Equation 1 represents how equity dispersion S is calculated.

Equation 1

$$S = \sqrt{\frac{\sum_{i=1}^n (r_i - \bar{r})^2}{n-1}}$$

In equation 1 r_i is the observed return on firm i and \bar{r} is the cross-sectional average of the n returns in the portfolio. By quantifying the degree to which asset returns tend to rise and fall in concert with the portfolio return, this measure captures the key attribute of herd behavior. Dispersions are predicted to be low when herd behavior is present, but low dispersions by themselves do not in turn guarantee the presence of herding.

Chiang and Huang assume that herding is more prevalent during large price movements. As a result, individual returns will not differ significantly from the market return. This means that the level of dispersions, i.e. CSSD will be lower than during normal market conditions. This is in contrast to rational asset pricing models in which dispersions are assumed to increase during periods of large market movements. Equation 2 is introduced by CH to measure cross sectional standard deviation.

Equation 2

$$\text{CSSD}_t = \sqrt{\frac{\sum_{i=1}^N (R_{i,t} - R_{m,t})^2}{N-1}}$$

In equation 2, $R_{i,t}$ is the observed stock return of asset i at time t and $R_{m,t}$ is the cross-sectional average of the N returns in the aggregate market portfolio at time t . The

dispersion measure quantifies the average proximity of individual returns to the realized average.

Chang et al. (2000) (from now on CCK) introduced another method called Cross-Sectional Absolute Deviation (CSAD). According to CCK these two methods, CSSD and CSAD don't always lead to same conclusions. CSAD is build on the notion (contradictive to CSSD) that market participants ignore their own signals during large market price movements, thus leading to situation where linear and increasing relation between dispersion and market return isn't plausible.

The keyword in both of these is dispersion, less of it implying more of herding. When market is moving, more often than not there should be deviation (more dispersion) between individual stocks in their direction relative to market direction, otherwise it can be a sign of herding (less dispersion than proportionately should be).

4.2 Model for market wide herding

As stated earlier, CCK introduced a new model to measure herding. Their model is presented in equation 3. In this equation $R_{i,t}$ represents industry index and $R_{m,t}$ is the cross-sectional average of the industry indices returns at time t . This thesis uses ten main industry index classes, defined by Industry Classification Benchmark.

Equation 3

$$CSAD_t = \frac{1}{N} \sum_{i=1}^N |R_{i,t} - R_{m,t}|$$

CZ modified CCK's model in order to find asymmetric investor behavior during different market conditions. Their equation is presented in equation 4. According to CZ “ $\gamma_2 + \gamma_1$ captures the relation between return dispersion and market return when $R_m > 0$, while $\gamma_2 + \gamma_1$ shows the relation when $R_{m,t} \leq 0$.”

Equation 4

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R_{m,t}^2 + \varepsilon_t$$

4.3 The model to detect positive and negative market day herding

The model used in this thesis to detect whether negative or positive market days have effect on herding measures is developed by CZ. Many previous studies (e.g. Prosad et. al (2012) and Tan et al. (2008)) have found signs that negative and positive market days exhibit herding in different patterns. The model used is presented in equation 5

Equation 5

$$CSAD_t = \gamma_0 + \gamma_1(1 - D)R_{m,t} + \gamma_2 DR_{m,t} + \gamma_3(1 - D)R_{m,t}^2 + \gamma_4 DR_{m,t}^2 + \varepsilon_t$$

D is a dummy variable that equals one when market return is negative and zero otherwise.

A negative and statistically significant γ_3 would be consistent with herding during up-market days and a negative and statistically significant γ_4 would be consistent with herding during down-market days.

4.4 The model to detect extreme movement herding

For example Caparelli et al. (2004) and Keasey et al. (2014) found that extreme price movements generate herding. In this thesis model to detect if extreme price movement generate herding was introduced by Christie & Huang (1995). The model is presented in equation 6.

Equation 6

$$S_t = \alpha + \beta_1 D_t^L + \beta_2 D_t^U + \epsilon_t$$

According to Christie and Huang (1995) $D_t^L = 1$ if the market return on day t lies in the extreme lower tail of the return distribution and 0 otherwise. $D_t^U = 1$ if the market return on day t lies in the extreme upper tail of the return distribution and 0 otherwise. The α coefficient denotes the average dispersion of the sample excluding the regions covered by the two dummy variables. Rational asset pricing models predict significantly positive coefficients for β_1 and β_2 , and negative estimates of β_1 and β_2 would be consistent with the presence of herd behavior.

4.5 The model to detect market turnover herding

The method used to detect whether daily market turnover has effect on herding is taken from Mobarek & Molah (2013). Equation 7. The daily volume is considered to be high if its higher than previous 30 days moving average.

Equation 7

$$\begin{aligned}
 CSAD_{i,t} = & \alpha + \gamma_1 D^{Vol-High} |R_{m,t}| + \gamma_2 (1 - D^{Vol-High}) |R_{m,t}| \\
 & + \gamma_3 D^{Vol-High} (R_{m,t})^2 + \gamma_4 (1 - D^{Vol-High}) (R_{m,t})^2 + \varepsilon_t
 \end{aligned}$$

According to Mobarek & Molah (2013), $D^{Vol-High}$ is 1 for days with a high trading volume and 0 otherwise. The trading volume on day t is regarded as high if it is greater than the previous 30-day moving average and low if it is lower than the previous 30-day moving average. In the absence of herding effects $\gamma_1 > 0$ and $\gamma_2 > 0$. Herding effects are present if $\gamma_3 < 0$ and $\gamma_4 < 0$, with $\gamma_3 < \gamma_4$ if these effects are more pronounced during days with a high trading volume.

5 Data and descriptive statistics

5.1 Data

Stock market data has been obtained from Nasdaq OMX website (<http://www.nasdaqomxnordic.com/indexes>). This thesis uses data from OMX Helsinki stock market, in other words Finnish stock exchange. Industry indices according to Industry Classification Benchmark (ICB) used in this thesis are: Basic materials, Consumer good, Consumer services, Financials, Health care, Industrials, Oil & Gas, Technology, Telecommunication and Utilities. These ten provide the main classes in ICB and are subsequently divided into many sub classes, which are not used in this thesis. Industry indices are used to calculate CSSD and CSAD by equations 2 and 3. This thesis uses average return of industry indices as a market return. The daily data extends from the 2nd of January 2004 till the 30th of December 2013, except for industry index Oil & Gas, it has values from 30th of December 2005 till the 30th of December 2013. All indices are total return indices, meaning that e.g. dividends, stock splits, mergers etc. are accounted. Daily returns are calculated by using equation 8.

Equation 8

$$R_t = 100 * (\log(P_t) - \log(P_{t-1}))$$

Where R_t is the daily change in industry indices between day t and day $t - 1$. P_t accounts for industry index.

5.2 Descriptive statistics

Table 2 shows descriptive statistics of CSAD measurement.

Table 2

CSAD	
Mean	0,822344
Standard error	0,008294
Median	0,72844
Standard deviaton	0,416022
Kurtosis	7,168675
Skewness	2,026116
Min	0,099948
Max	4,350287
Number of Industries	10
Number of observations	2516

The higher the mean, the more dispersion absolute in absolute term has been prevalent during the sample period. For comparison, Lindhe (2012) documented CSAD mean 0,631 for Finnish stocks in her thesis. Her data set was from beginning of 2001 till the end of 2011. Skewness and kurtosis indicate that return data isn't normally distributed, due to high kurtosis (fat tails) and positive skewness (long tail on right). Standard deviation of CSAD values indicates fairly high cross-sectional variations.

Table 3 shows descriptive statistics of CSSD measurement.

Table 3

CSSD	
Mean	2,438802
Standard error	0,025644
Median	2,145683
Standard deviaton	1,28629
Kurtosis	7,343402
Skewness	2,017459
Min	0,279657
Max	13,8935
Number of Industries	10
Number of observations	2516

Mean is a lot higher than in CSAD table, but that's expected due to nature of CSSD compared to CSAD. What has been written before about CSAD descriptive statistics hold on CSSD as well. No major differences between the two in terms of descriptive statistics.

Figure 5 shows stock market development during the sample period. If looking for market trends one can state that 2004 was fairly neutral followed by bull market period in following years, lasting until late 2007. After that global financial crisis struck having hit bottom in early 2009, after which remaining 2009 and 2010 were bull market periods. The Euro crisis having its effect on stock markets in 2011 and 2012, after which the year 2013 was strong recovery period. In terms of usual stock market fluctuations this ten year period has it all.



Figure 5

Figure 6 shows in XY-scatter plot the relationship between CSAD and market return. As stated earlier dispersion should grow proportionately to market return in order to display herd free market. As can be seen from figure 6, the relationship is non-linear. Decreasing dispersion (in other words CSAD measures closer to 0 on y-axis) or less than proportional growth would indicate herd behavior.

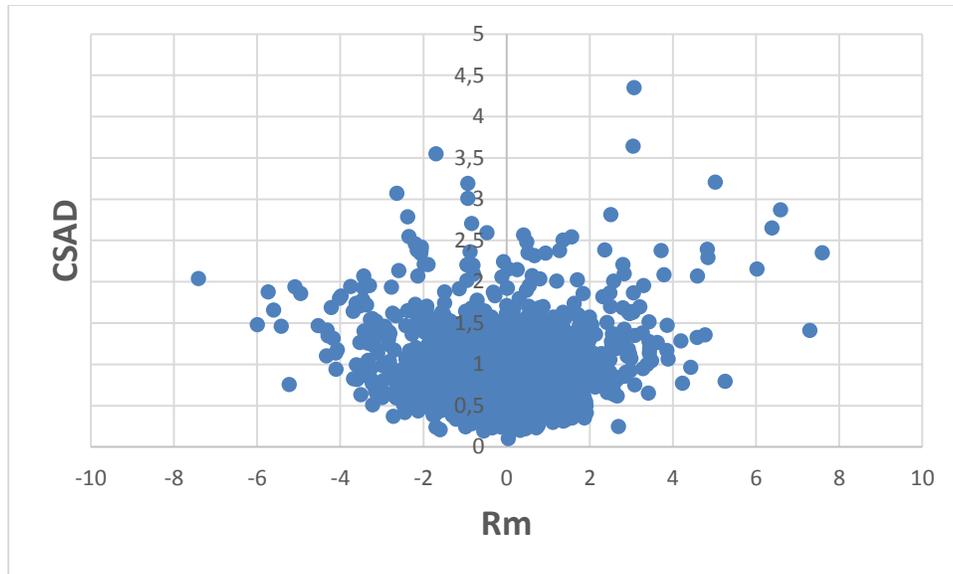


Figure 6

Figure 7 shows in XY-scatter plot the relationship between CSSD and market return. As in case with CSAD, also with CSSD should grow proportionately to market return. Usually CSSD should be higher than CSAD for the same market return. Non-linearity holds in figure 7 as well.

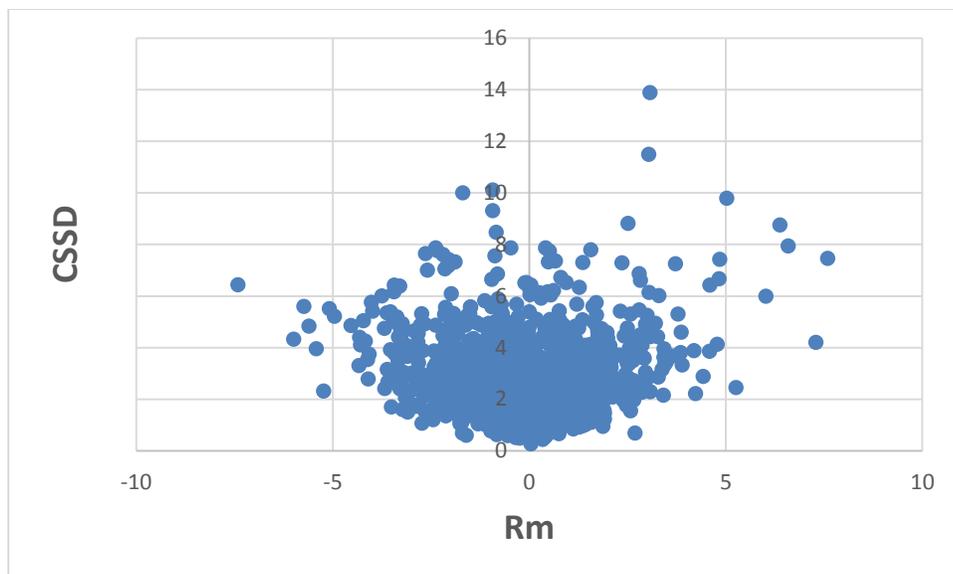


Figure 7

Since looking at the figures in this section isn't very precise tool to measure herding behaviour we use methods presented in section 4 to obtain results presented in the following section 6.

6 Empirical Results

6.1 Whole period

First, the whole data is used to search if herding is present in the whole period (2004 – 2013). This is done by using equation 3. Table 4 shows the results.

Table 4

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	0,006532658	0,000130953	49,88563355	0	
Rm	0,00402117	0,005875595	0,684385229	0,493795075	
Abs	0,177882511	0,018336074	9,701232271	7,17003E-22	
Squared	0,605591176	0,422501797	1,433345802	0,151883485	
Adjusted R Square	0,191038391				

In order for this model to show herding “Squared” coefficient should be negative and statistically significant, but it’s neither. Therefore, no herding is present on period from the beginning of year 2004 to the end 2013. This finding is consistent with Saastamoinen (2008), although it had a period from mid 2002 to early 2007, a period considered being a bull market period in Finnish stock market. Finnish stock market is considered to be a developed market. Herding in developed stock market has been found by Braun 2012 (Japan), Caparelli et al. 2004 (Italy), Chang et al. 2000 (South-Korea, Taiwan and Japan), Chiang & Zheng 2010 (Australia, France, Greece, Hong Kong, Japan, UK, Singapore, South Korea and Taiwan), Hwang & Salmon 2007 (US, UK and SK), Mobarek 2013 (FIN, FR, GER, NOR, SWE, GR, ITA, IRE, POR and ESP), Mobarek & Molah 2013 (FIN, SWE, DEN) and Wang 2008 (AUS, FR, GER, HK, JPN, UK and US). In contrast, herding was not found in developed markets by Christie & Huang 1995 (US) and Chiang & Zheng 2010 (US). One has to point out that herding is not present in all of the markets all the

time and it is affected, for example, by market movement (up or down) and its relative size, trading volume, short position disclosures, herding around other stock market and currency crisis. Also, the strength of herding behaviour varies over time.

6.2 Calendar year periods

The table 4 shows whether the Finnish stock market has herding behaviour per calendar year, from 2004 to 2013. The whole data didn't reveal herding behaviour, but might do that when broken down to shorter periods.

Table 5

	2004	2005	2006	2007	2008
Squared	14,292552	15,78151	2,175838	1,172148	0,367686
Adjusted R Square	0,1784414	0,132878	0,080075	0,051796	0,284885
<i>P-value</i>	0,0759287	0,010127	0,245208	0,608432	0,670734
<i>t Stat</i>	1,7822392	2,591273	1,164838	0,512971	0,425645
	2009	2010	2011	2012	2013
Squared	5,3632746	0,049202	-1,07427	-0,43558	21,1788
Adjusted R Square	0,2019751	0,095924	0,092813	0,062053	0,209989
<i>P-value</i>	0,0113499	0,954778	0,428504	0,898086	1,31E-07
<i>t Stat</i>	2,5508588	0,056765	-0,79305	-0,12821	5,435771

Value of the variable Squared should be negative in order to show herding. Other coefficients don't reveal herding, those are omitted from table 4. None of the calendar years show signs of statistically significant herding. Years 2011 and 2012 show herding, which is not statistically significant, since P-value is way too high.

6.3 Up and down market herding

Some papers have found that whether market is moving up or down might explain herding. From the following table 5 one can see results whether or not positive or negative market days cause herding.

Table 6

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0,00651705	49,83272	0
Rm x (1-D)	0,156829745	7,49611	9,06E-14
Rm x D	-0,213622859	-9,53191	3,51E-21
Sq. x (1-D)	1,51640556	3,012227	0,002619
Sq. x D	-0,760380702	-1,28915	0,197464
Adjusted R Square	0,194236263		

In order to show herding on positive market return explaining variable Sq. x (1-D) should be negative. For negative market return to show herding should variable Sq. x D be negative. Therefore, one can conclude from this table: no herding when positive market days, herding on negative market days, but not statistically significant.

Neither up nor down market days did seem to generate herding behaviour as such. This thesis also examines whether if having a daily return with one, two or three standard deviations away from the mean has effect on herding behaviour.

6.4 Extreme market movements

Christie & Huang (1995) found increase in herding during large price movements, on the other hand, Caparelli et al. (2004) identified that extreme ends market return distribution have signs of herding. Following tables 7, 8 and 9 uses data from 2004 to 2013. Table 7 measures herding between one and two standard deviations away from the mean, table 8 measures herding between two and three standard deviations away from the mean and table 9 measures herding three or more standard deviations away from the mean. Rational asset pricing model predicts positive coefficients for dummy variables, herding is prevalent if both dummy variables are negative.

Table 7

	<i>Coefficients</i>	<i>t stat</i>	<i>P-Value</i>
Intercept	2,343869234	84,6365658	0
D for L	0,636974174	6,891313387	6,96E-12
D for U	0,509516118	5,548559698	3,18E-08
Adjusted R Square	0,027062124		

Table 8

	<i>Coefficients</i>	<i>t stat</i>	<i>P-Value</i>
Intercept	2,371650218	93,44641069	0
D for L	1,297633769	8,100493801	8,45E-16
D for U	1,923951933	10,37881668	9,71E-25
Adjusted R Square	0,062536235		

Table 9

	<i>Coefficients</i>	<i>t stat</i>	<i>P-Value</i>
Intercept	2,402040445	95,67150277	0
D for L	2,097325794	7,285322166	4,27462E-13
D for U	2,92467122	9,890228214	1,18307E-22
Adjusted R Square	0,055517429		

All of the tables show no sign of herding during extreme price movements. Intercept term is bigger in all of the three when dummy variables cover less of the market return. This is because intercept measures average dispersion outside of the dummy variables (meaning, not in the tails, but in the mass). Therefore, the intercept should grow if consistent with rational asset pricing model. Saastamoinen (2008) found that in the Finnish stock market the lower end of return distribution is associated with decreased return dispersions and the higher end of return distribution has higher than proportional rate increase in return dispersions. Caparelli et al. (2004) showed that Italian stock markets had herding associated with large movements on the stock market. CKK found South Korean and Taiwanese market to exhibit herding on small caps on extreme positive and negative market days. Also, CKK shows, that US, Hong Kong and Japan exhibit increasing return dispersion during extreme market movement days, thus proving against herding behaviour in these market on given market conditions. CH found that extreme negative market return days don't disproportionately lower dispersion, but rather increase it in the US market, meaning no herding in 1% and 5% tails.

6.5 Trading volume and herding

This thesis also examines whether the turnover volume has an effect on herding behaviour. Equation 7 was used to calculate these results presented in Table 10.

Table 10

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0,007065393	40,52902	4,9E-254
Rm abs x D	0,229828898	9,043504	3,91E-19
Rm abs x 1-D	0,071770958	2,777201	0,005541
Sq. x D	-0,888380294	-1,47645	0,140001
Sq. x 1-D	2,792590529	4,459337	8,74E-06
Adjusted R Square	0,197963151		

In order to show herding, coefficients Sq. x D and Sq. x 1-D should be both below 0. This clause doesn't fulfil. Turnover has no effect on herding, whether or not it's above or below 30-day moving average on years 2007 to 2013. Mobarek & Molah (2013) found significant herding in times of high volatility in Nordic markets like Denmark and Sweden and in Greece and Ireland among the PIIGS markets. They didn't find any herding effect in times of market volatility in Finland, France, Germany and Norway. In this sense this paper is in line with Mobarek & Molah (2013).

7 Conclusions

Herding behaviour has its benefits (e.g. positive externalities) and its pitfalls (e.g. not acting on individuals needs and desires), but it's part of our everyday life. It would be desirable that stock market having such a huge impact on allocation of resources would be free of herding behaviour.

This thesis employs data from Helsinki Stock Exchange (OMXH) from calendar years 2004 to 2013. It examines whether herding behaviour is present in OMXH during the whole period, any of the calendar years, during negative or positive market days, during extreme market movements (one, two or three standard deviations away from the daily mean) and in addition, whether turnover has an effect on herding. Previous literature has reported contradictive results with each other on all of these in various stock markets.

No sign of herding was found for the whole period nor for the calendar years. Herding can be asymmetric e.g. positive market days and negative market days might have different levels of dispersion. In this thesis no herding was found for positive market days, the results showed some evidence of herding on negative market days, but without statistical significance. Extreme market movements have in some papers shown sign of herding. This thesis tested whether the daily return of one, two or three standard deviations from the mean would show signs of herd behavior. None of these provided any evidence of herding for this sample. Trading volume doesn't show effects on herding, neither low nor high volume.

This thesis use the Chiang & Zheng (2010) methods to detect herding for the whole period, for the sub-periods divided into calendar years and for detecting asymmetric herding for

up and down market, the Christie & Huang (1995) method for extreme market movements and Mobarek & Molah (2013) method for turnover volume has effect on herding.

For further research suggestion; different methodology might be beneficial e.g. from Hwang & Salmon (2007), intraday volatility effect on herding, large cap, mid cap and small cap herding and trying to isolate major shocks to see their effect on herding. It would also be interesting to conduct a study following a research design of Shiller & Pound (1989) on Finnish institutional investors, to see whether word of mouth investing is strong in decision making.

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