LUNDS UNIVERSITET
Ekonomihögskolan

Department of Economics

NEKN05 Master Thesis

August 2012

Herd Behavior in Stock Markets

A Nordic Study

Supervisors:

Hossein Asgharian

Erik Wengström

Author:

Emma Lindhe

Abstract

In this paper, the investment behavior among market participants in four Nordic countries (Denmark, Finland, Norway and Sweden) is studied, more specifically with regard to their propensity to exhibit herd behavior. The approach of Chiang and Zheng (2010) is applied to detect market-wide herding during the time period 2001-2012. Significant evidence of local market-wide herding is found in Finland during both up-and down going market days. No evidence of local market-wide herding is found in Denmark, Norway or Sweden. Evidence of herding in Finland is found in the bear market of 2001 and the bull market of 2004 when the sample is divided into sub periods. In addition, significant evidence of herding across national borders is found. Evidence suggests that both Finland and Sweden herd around the US market. All Nordic countries are found to herd around the European market. This could indicate that geographical distance influence herding across national borders. This is further supported by the significant evidence that all the countries in this study herd around each other.

Keywords: *Traditional finance, Behavioral finance, Herd behavior, Market-wide approach, Cross-sectional absolute deviation*

Table of contents

1. Introduction

This chapter gives the reader a brief introduction to herd behavior in financial markets. The purpose and limitations of this paper is also described.

Individuals are known to be influenced by others in their decision making. When deciding which restaurant to make reservations at or which school to attend people frequently imitate the actions of their predecessors. Restaurants with a greater number of guests or schools with more students tend to appear more appealing to the observer. This is generally referred to as herd behavior. The same reasoning can be applicable to the financial markets. Investors frequently follow the direction of the market or the advice of financial gurus. Understanding the behavior of investors in financial markets is essential.

There are two polar views of investment behavior of market participants in financial markets, loosely speaking the traditional and the behavioral finance views. The traditional framework for finance is largely built on the efficient market hypothesis (EMH) and its applications. Fama (1970, p. 383) defined a market as efficient if prices always fully reflect all available information. It is based on assumptions about investor rationality and arbitrage. The contrasting view, i.e. behavioral finance, is mainly focused on investor psychology and limits to arbitrage (Barberis and Thaler, 2003, p. 1053-1054). The field of behavioral finance is said to have developed in response to a host of anomalies that cannot be explained by traditional financial models. In the aftermath of several stock crashes investor psychology has been recognized as important influence in financial markets. Recent studies have primarily focused on the fact that individuals tend to imitate the actions of others (De Bondt et al, 2008, p. 9). In fact, economists as well as practitioners believe that there is extensive herding among investors in financial markets (Devenow and Welch, 1996, p. 603).

The existence of investor herds is one frequently used explanation for the volatility of stock returns (Christie and Huang, 1995, p 31). Investors are considered to be part of a herd if they are conscious of and influenced by the actions of others' (Bikhchandani and Sharma, 2001, p 280). Herding in financial markets is of significant interest for both economists and practitioners. Economists are interested in the behavioral effect on stock prices. The potential effect on their return and risk characteristics have consequences for asset pricing models. Practitioners instead are interested in herding among investors since it might create profitable trading opportunities. The influence of investor herds has the power to drive prices away from their fundamental values. (Tan et al, 2007, p. 61-62)

Herding among market participants in stock markets has been widely studied in recent years. The empirical research have mainly focused on the US and Asian markets. No evidence of herding in the US stock market is found by Christie and Huang (1995). This is consistent with the results presented by Chang et al (2000). However, they find significant evidence of herding in South Korea and Taiwan during periods of large market movements. In their study of the Chinese stock market Demirer and Kutan (2006) find no evidence of herding while two other studies of the Chinese stock market (Tan et al, 2008; Chiang et al (2010)) find significance evidence of investor herds. Chiang and Zheng (2010) contributes to the research on herd behavior in that they find evidence suggesting that the US is an significant influence in local market herding. In fact, they find evidence that most of the countries in their study herd around the US market. Some studies have focused on herding in the European markets. Tessaromatis and Thomas (2009) find partial evidence of herding in the Athen stock market. In addition, Chiang and Zheng (2010) find evidence of herding in several advanced European countries. Similarly, Khan et al (2011) find evidence of herding in four European countries. However, they find no evidence of herding during periods of market stress. Two studies have been performed on the Nordic area. To my knowledge, except for the work of Saastamoinen (2008) who find partial evidence of herding in the Finnish stock market and Ohlson (2010) who find evidence of herding in the Swedish stock market no additional studies of herding in the Nordic area has been performed.

Motivated by the important implications of herding behavior for both economists and practitioners, the mixed results of previous studies and the lack of research on the Nordic area the purpose of this paper is to examine if herd behavior is present in four Nordic stock markets. The approach is market-wide herding. This means that investors in financial markets ignore the individual characteristics of stocks and instead herd on the performance of the market (Henker et al, 2006, p. 197). To conduct the study the approach of Chiang and Zheng (2010) is applied. Herding is measured by examining the relationship between stock return dispersions and the corresponding equally weighted market return. Under the assumption that the traditional framework holds the relationship is expected to be linear. This means that the dispersions are an increasing function of the market return. Investor herds however imply a non-linear relationship. This means that stock return dispersions will decrease or at least increase at a less-than –proportional rate with the market return. The motivation for this particular approach is that it has been used to find significant evidence of herding in advanced countries. In addition, the approach recognizes the significance of foreign influence on local herd behavior and this is further investigated in this paper.

This study is limited to four Nordic countries, namely, Denmark, Finland, Norway and Sweden. The time period of investigation range from 2001-01-02 to 2011-12-30 for all countries. This time period is of particular interest because it captures the burst of the dot.com bubble of the 2000s and the global financial crisis of 2008. This allows the investigation of herding during periods of large market movements originally suggested by Christie and Huang (1995). This is performed by dividing the time periods into sub periods of one year respectively. In addition, the testing of herding is limited to market-wide herding. The advantage is that it is fairly easy to measure. The disadvantage however is that it does not reveal information about why investors herd, i.e. the information the decisions to follow the herd is based on.

This paper differs from previous studies in the following ways. First, prior studies have mainly focused on the US- and Asian markets. In this study, the Nordic area is under investigation. Significant evidence of herding is found in Finland during both up-and down-market days. This is consistent with Chiang and Zheng (2010) who find evidence of herding in several advanced countries. No evidence of herding is found in Denmark, Norway or Sweden. This is inconsistent with the work of Ohlson (2010) who find evidence of herding in Sweden. Evidence of herding in Finland is found during the bear market of 2001 and the bull market of 2004 when dividing the sample into sub periods. This is consistent with the beliefs of Christie and Huang (1995). Second, this paper investigates if the Nordic countries herd around the US- and European markets. Although Chiang and Zheng (2010) investigate the influence of the US, their paper does not include the Nordic area. In addition, to my knowledge no previous studies has examined if the Nordic countries herd around Europe. The empirical evidence in this study suggest that Finland and Sweden herd around the US market. This further supports the conclusions of Chiang and Zheng (2010). Evidence of herding around the European market is found for all Nordic countries in the study. This could indicate that geographical distance influence herding across national borders. Third, this paper investigates if the countries herd around their Nordic neighbors. Significant evidence of countries herding around their Nordic neighbors is found.

This paper proceeds as follows. Chapter 2 describes the two polar views of investment behavior in financial markets, namely traditional finance and behavioral finance. In addition, the theoretical framework of herding and its implications for financial markets is introduced. The previous empirical research of herding is discussed in chapter 3. Previous models to detect herd behavior and the model used in this study, i.e. the methodology of this paper is presented in chapter 4. In chapter 5 the data employed in this study is described. The empirical results and analysis is found in chapter 6 and the conclusion in chapter 7.

2. Theoretical Background

This chapter aims at giving the reader an overview of the different views of financial theory and their implications. In addition, the aim is to give the reader an understanding of the concept of herd behavior and its implications for the financial market.

2.1 Traditional -versus Behavioral Finance

There are two polar views of investment behavior of market participant in financial markets, loosely speaking the traditional and the behavioral finance views. In the traditional framework for finance the efficient market hypothesis (EMH) and its implications is a major cornerstone. In fact the field of academic finance was largely built on the basis of the EMH (Shleifer, 2000, p. 1). In an efficient market prices always “fully reflect” all available information. Investors therefore cannot use 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, p. 383) The EMH is based on arguments about investor rationality and arbitrage. First, investors in financial markets are assumed to be rational. However, even if some investors are not rational, prices will not be affected because their trades are random and cancel each other out. Finally, if investors are irrational in similar ways, arbitrageurs will eliminate their impact on prices. The empirical evidence researchers found in the 1960s and 1970s was consistent with the EMH. Thus, it became both a theoretical and empirical success. (Shleifer, 2000, p. 1-2)

In the 1980s however, several empirical findings that were not consistent with efficient market theory was discovered (Shefrin, 2000, p. 8). For example, the efficiency of security prices have been challenged by among others Nicholson (1968) and Basu (1977) who suggests that stocks with high price-to-earnings ratios (PE) are overvalued and stocks with low PE ratios are undervalued (De Bondt, 2008, p. 10). Calendar effects have also been documented, Keim (1983) among others found evidence that daily abnormal return distributions in January have large means relative to the remaining eleven months; this is generally known as the January effect. Additional evidence was provided by Reinganum (1983).

In response to the anomalies found and the difficulty of traditional financial models based on the EMH to explain these anomalies a new field of finance emerged, namely behavioral finance. The field is defined as finance from a broader social science viewpoint which includes both sociology and psychology. Nowadays, it is one of the most important research fields and challenges a lot of the EMH. (Shiller, 2003, p. 83)

According to Barberis and Thaler (2003, p. 1053-1054) the field of behavioral finance rests on two building blocks: *limits to arbitrage* and *psychology.* They assume that real world arbitrage is accompanied by both risks and costs. As a result, a mispricing in the financial market may remain unchallenged. This stands in sharp contrast to the EMH which relies heavily on the ability of arbitrageurs to eliminate mispricing in the financial market. The second building block, psychology, studies how/why investors make investment decisions. In the aftermath of several stock crises, to name a few, the stock market crash of 1997, the Asian crisis of 1997, the dot-com bubble of 2000s and the financial crisis of 2008 investors psychology has been recognized as an important influence in the financial market (De Bondt et al., 2008, p. 7). In addition, there are empirical puzzles that are not easily understood based on the traditional EMH models. For example, numerous financial phenomena demonstrate fragility and/or waves. The consensus among investors in financial markets appears to be low, localized but not based on private information. This implies that independent decision-making across all investors is not a reasonable assumption. In addition, numerous influential investors emphasize that their decisions are greatly influenced by other investors. (Devenow and Welch, 1996, p. 605) Behavioral finance suggests that investor psychology may offer a possible explanation for the previous stock crashes and empirical puzzles not easily understood by the EMH. In fact, nowadays the tendency of individuals to mimic the actions of other’s, i.e. herding, is of particular interest (De Bondt et al, 2008, p. 9).

2.2 Herd Behavior in Financial Markets

The empirical finding that stock prices display more volatility than expected returns or fundamentals raises concerns about the overall efficiency of stock markets (Lux, 1995, p. 881). According to Christie and Huang (1995, p. 31) the influence of investor herds in the financial market is a frequently used explanation. In the aftermath of several financial crises there has been an increased interest in the existence of herd behavior. It is frequently argued that financial crises are a result of widespread herding among market participants (Chari and Kehole, 2004, p.128). In fact, both economists and practitioners believe that extensive herding among investors in financial markets takes place (Devenow and Welch, 1996, p. 603).

The literature on herding behavior has offered several definitions of the concept. In his influential article Banerjee (1992, p. 798) defines herding as "*everyone doing what everyone else is doing, even when their private information suggests doing something quite different*." This is a general form of herding and can be applied to various situations in everyday life. In the field of behavioral finance, herd behavior is frequently used to describe correlations in trades as a result of interactions between market participants (Chiang and Zheng, 2010, p. 1911). In their paper, Bikhchandani and Sharma (2001, p. 280) argue that investors can be considered to be part of a herd if they are conscious of and influenced by the actions of other's. The authors state that an investor is herding if the information of other agents investing in a product causes the investor to change his/her decision from not investing to investing in the product. The opposite scenario when the investor already made an investment without knowledge of other investors' decisions and changes his/her mind when learning that others have decided not to make that investment is also a case of herding. In this paper we will adopt the definition of Hwang and Salmon (2004, p. 585) "*Herding arises when investors decide to imitate the observed decisions of others or movements in the market rather than follow their own beliefs and information*".

Herding among investors can be divided into intentional herding and spurious herding. The former is the result of the intent by market participants to imitate the actions of other's. Intentional herding may lead to inefficient market outcomes. Spurious herding on the other hand is a situation where groups face similar information sets and decision problems. This in turn makes them make similar decision. Thus, this is an efficient outcome. Although it is important to distinguish between intentional herding and spurious-herding in theory it may be difficult in practice. The reason is that there are many factors that influence an investment decision. (Bikhchandani and Sharma, 2001, p. 281)

Some authors suggest that there are different views of herd behavior in financial markets. In fact, according to Devenow and Welch (1996, p. 604) there are two contradictory views of herding, namely the rational and the non-rational views. The former focuses on externalities, assuming that optimal decision making is being misleading by incentive issues or information difficulties (Scharfstein and Stein, 1990; Banerjee, 1992; Bikhchandani et al, 1998; Avery and Zemsky, 1998). The three most important reasons for rational herding are imperfect information, concern for reputation and compensation structures (Bikhchandani and Sharma, 2001, p. 283).

First, herding behavior caused by imperfect information is known as informational cascades. Cascades are the most general explanation of herding. They might help to explain some observed empirical phenomena's. For example, when firms decide to invest in R& D in a specific area or when analysts decide to recommend a particular stock. (Devenow and Welch, p. 609-610) Informational cascades are fragile. There are numerous types of shocks that could disrupt an informational cascade; examples include the entrance of individuals with better or new information, new public information etc. (Bikhchandani et al, 1998, p. 157).

In their paper, Bikhchandani and Sharma (2001, p. 280) presents an illustrative example of how an informational cascade might form. In their example there are 100 investors. They are in the process of deciding whether to invest in an emerging market or not. Each individual evaluate the investment on their own. Thus, the investors' views of the profitability of the investment may differ from the others'. The authors assume that 80 individuals believe that the investment is not profitable whereas 20 individuals think it is. Each investor knows their valuation of the profitability of the investment but not the valuation of the other investors. In a situation where these people discussed their knowledge with each other they would decide not to invest in the emerging market. However, no one share their information or valuation of the investment. Assume that the first investors are among the 20 individuals who believe that the investment is a profitable idea. They will invest in the emerging market. This may cause several of the 80 investors who do not believe it is a good investment to change their mind. As a result most of the 100 investors may choose to take part in the investment. In this situation, the individuals are influenced by each other and this may lead to a bad investment decision. When the unprofitability of the investment is revealed these investors will leave the market.

The example above and several other models of cascades (Bikhchandani et al, 1992 and Welch, 1992) assume a fixed price. This however is not realistic for investor herd in the stock markets. Thus, in an article by Avery and Zemsky (1998) this assumption is relaxed. Herd behavior is found to be impossible in their general model because of the price mechanism. However, when including more complex information structures herd behavior is shown to be possible.

Second, herding based on reputational concerns has been modeled by for example Scharfstein and Stein (1990). They demonstrate that it can be rational for a manager to mimic the investment decisions of others. According to their model managers are either smart or dumb. This means that they obtain informative (true) signals or uninformative (noise) signals concerning an investment decision. The signals of the smart managers are assumed to be correlated whereas the signals of the dumb managers are not. Nevertheless, the managers in the model does not know if they are smart or dumb and the result of an investment decision will not be visible until all managers have invested in the product. As the result of a bad investment decision is conveyed it reveals the managers poor quality only if the other managers did not make the same investment. In the situation where the other managers also made a bad investment decision they could perhaps suggest that it was due to a poor investment climate. The consequence is that if enough dumb managers herd on a bad decision, even smart managers might herd instead of taking the risk with an investment they believe to be superior. This is to avoid being the only manager investing into a product that might turn out to be a bad decision.

Another discussion of reputational herding is provided by Trueman (1994). He suggests that reputational herding can be found among analysts forecasts. According to the author, analysts have a tendency to report forecasts similar to those previously released by other analysts. Herding behavior is found to be undertaken in order to favorably affect investors' assessment of the analyst's forecasting ability.

Scharfstein and Stein (1990, p. 465) provides an illustrative example of where reputational herding had important implications, namely the stock market. More specifically, the pre October 1987 bull market. At that time, the agreement among professional money managers was that the price level was too high. In their view the market was more likely to go down than up. In spite of this, few money managers were willing to sell their holdings. The reason for this was that in the likely event of a market decline they would have comfort in numbers and if the market did continue to rise they did not want to risk being considered as lone fools.

The third and final form of rational herding is based on compensation structures. Situations were investment manager's compensation depends on how their performance in comparison to other professional managers there is an incentive for the agent to herd (Bikhchandani and Sharma, 2001, p. 292).

The non-rational view of herd behavior focuses on investor psychology and assumes that investors behave like imitators, ignoring all rational analysis and following others blindly (Devenow and Welch, 1996, p. 604). An intuitive example may be the potential behavior among investors in the stock market. Assume, in face of a large stock market decline that investors' react instantaneously and sell their stocks to avoid losses because investors do. This is a situation where the investors ignore all rational analysis and react in panic. This can be found in situations of bank panics and other financial phenomena as well. In the literature there are few models of irrational herding (Devenow and Welch, 1996, p. 611).

In this paper, the focus of the empirical study is simply the presence of market wide-herd behavior. This type of herding among investors arises when investors ignore the individual characteristics of the stock and instead follow the performance of the market (Henker et al. 2006, p. 197). The market-wide herding approach does not distinguish between rational or irrational herding. Although, it is a major part of the theoretical framework and for the understanding of herding behavior in financial market it is difficult to test empirically. However, in their paper Hirshleifer and Teoh (2003, p. 57) suggests that herding is a combination between rational-and irrational behavior among investors in financial markets.

This type of herd behavior among investors is assumed to be more likely during periods of relatively large market movements. The relationship between dispersions and the market return is used as a measurement of herding. According to the model in this paper rational asset pricing models assumes that during periods of relatively large market movements investors will rely on their own private information, which is diverse. This will imply a linear relationship between dispersions and the equally weighted market return. This means that the dispersions will increase at a proportional rate with the market return. In contrast, investor herds emerge when individuals ignore their private information and instead follow the performance of the market. Thus, the presence of investor herds implies a non-linear relationship. This means that the dispersions will decrease or at least increase at a less-than-proportional rate with the market return. (Chiang and Zheng, 2010, 1913). Thus, a negative relationship between dispersions and the market return will indicate the presence of investor herds.

Herding in financial markets is of interest to both economists and practitioners. Economists are interested in herding because of the behavioral effect on stock prices. It might affect their return and risk characteristics and as a result has consequences for asset pricing models. Practitioners instead are interested in herding among investors since it might create profitable trading opportunities. The influence of investor herds has the power to drive prices away from their fundamental values. (Tan et al, 2007, p. 61-62) Furthermore, due to herding in the market investors need a larger number of securities that create a lower degree of correlation to reach the same degree of diversification (Chiang and Zheng, 2010, p. 1911).

3. Previous Empirical Research

This section presents previous empirical research on herding in stock markets. In recent years herd behavior among market participants has been widely studied. Though, the results of the empirical research are mixed.

According to Chiang and Zheng (2010, p. 1911) the empirical investigation of herd behavior in markets are divided into two parts. First, co -movement behavior based on the measure of dynamic correlations is studied. Forbes and Rigobon (2002) study three financial crises, namely, the U.S. stock market crash in 1987, the Mexican peso devaluation in 1994 and the Asian financial crises in 1997. The objective of their study is to examine the presence of contagion and interdependence during these crises. Contagion, as defined by the authors, is a situation where a shock to a country is followed by a substantial increase in cross-market correlation. The situation is referred to as interdependence if countries display sustained high levels of market correlation. No evidence of contagion during crises is found. Though, evidence of interdependence is found, both during crises and more stable periods. The findings of Baur and Fry (2004) are consistent with the results of Forbes and Rigobon (2002). Thus, they find that interdependence is of more significance than contagion during the Asian crisis. In contrast, Corsetti et al (2005) provides partial evidence of contagion in their study of the Hong Kong stock market crisis in October 1997. They find evidence of contagion from the Hong Kong stock market to both emerging and industrial countries. Further research on the Asian crisis is provided by Boyer et al (2006). They suggest that emerging market stocks can be separated into two categories, those who are available for purchase by foreigners (accessible) and those who are not (inaccessible). Their results indicate that there is a larger co-movement during high volatility periods. This is particularly noticeable for accessible stock returns. This implies that crises spread through international investors. An additional study on the Asian crisis is Chiang et al (2007). The main focus in the study is contagion and herd behavior. High correlation coefficients in all markets are perceived as indicating herd behavior. They detect two phases of the crisis. The first phase is characterized by increasing correlation in stock returns. The second phase is characterized by consistently higher correlation between stock returns. A possible explanation is according to the authors; in the first phase of the crises the main focus of investors are on local country information, hence contagion is a fact. However, as the crisis becomes public news the investor decisions tend to converge due to herd behavior, which in turn creates higher correlations. Similar to the results of Corsetti et al (2005) who finds evidence of contagion from the Hong Kong stock market to both emerging and industrial countries Billio and Caporin (2010) find some evidence of contagion between the US and the Asian markets in their empirical study.

Second, the cross-sectional dispersion in stock returns or in response to large market movements is a measurement for herd behavior and the empirical approach of this paper. This is also referred to as market-wide herding (Hwang and Salmon, 2004, p 587). The pioneers in the field Christie and Huang (1995) investigates the US stock market and suggest that herding among investors is more likely during periods of market stress. The cross-sectional standard deviation of equity returns is used as a measurement for dispersion. They assume that a decrease in dispersions during market stress indicates the presence of herding. No evidence of herding in the US stock market is found. In their paper Chang et al (2000) suggests a similar but less stringent method to detect herding in the market. They investigate the US and Asian markets and use the cross-sectional absolute deviation as a measurement for dispersion. Significant evidence of herding is found in Taiwan and South Korea, both emerging countries. Partial evidence of herding is found in Japan. In fact, herding is found in down-market days. The authors find no evidence of herding in the US and Hong Kong market. This is consistent with the evidence of Christie and Huang (1995). Asymmetry of dispersions as a function of the aggregate market return is found across all markets, there is less increase in dispersion during down-market days.

The methodology of Christie and Huang (1995) and Chang et al (2000) is widely accepted as a measurement for herding and several studies have applied their methods or modified versions. Large amounts of studies on herding are focused on the Asian markets. Demirer and Kutan (2000) find no evidence of herding behavior in the Chinese equity market. Contrasting evidence is found in the Chinese market by Tan et al (2008). They examine herding in both Shanghai and Shenzhen dual-listed A-share and B-share stocks. A-shares are dominated by domestic individual investors and B-shares mainly consist of foreign institutional investors. They find evidence of herding among Shanghai A-share and B-share stocks. Interestingly, herding among Shanghai A-share investors is found to be more prevalent during rising market conditions. Further evidence of herding in the Chinese equity market is presented by Chiang et al (2010). Similar to Tan et al (2008) they examine herding in both Shanghai and Shenzhen A-and B-share markets. According to their results herding is found in A-share markets. They find that herding behavior is prevalent during both up-and down-markets for A-share investors. However, they also find evidence of herding behavior in B-share markets only in down-markets. This is inconsistent with the results of Tan et al (2008). In addition to previous studies the authors apply a quantile regression analysis to estimate the herding equation. Supporting evidence for herding is found in both A-share and B-share investors in the lower quantile regression. Lao and Singh (2011) find evidence of herding in both Chinese and Indian stock markets. The level of herding is found to depend on market conditions. In the Chinese market, herding behavior is found to be greater when the market is falling and the trading volume is low which is consistent with e.g. Chiang et al. (2010). For India the results show that herding is more prevalent during up market conditions. Evidence of herding in the Taiwanese market is found by Demirer et al (2010) with the methodology of Christie and Huang (1995) and Chang et al (2000). They find significant evidence of herding, especially during periods of large market movements which is consistent with the results of e.g. Chang et al (2000). In addition, apply a method that will be discussed later, by Hwang and Salmon (2004).

In addition, empirical studies of herding in stock markets other than the Asian have been performed. Henker et al (2006) turn their focus towards the Australian equity markets. They examine the presence of intra-day and daily herding. No evidence of herding is found in the Australian equity market. The Athens stock market is examined for herd behavior during the time period 1985-2004 by Tessaromatis and Thomas (2009). They find no evidence of herding during the whole time period. However, when the authors divide the sample into the sub-period 1998-2004 evidence of herding behavior is found in the Athen stock market. The time period under investigation is according to the authors characterized as period of significance market advances followed by correction. Furthermore, by testing for herding within individual years they reveal that in almost half the years investment behavior is found to be consistent with herd behavior. This indicates that herding or non-herding is not a permanent behavior among investors. Saastamoinen (2008) study the Helsinki stock exchange in Finland. In addition to the methodology proposed by Christie and Huang (1995) and Chang et al (2000) a quantile regression is performed. There is no evidence of herding among market participants is found during an average trading day. Evidence of herding in the Helsinki stock exchange is found during up-doing market days. Similar evidence is found by Ohlson (2010). In his thesis with data from the OMX Stockholm stock exchange in Sweden he finds evidence of herding in up-going market days during the time period 1998-2008. Furthermore, dividing the sample into sub periods shows evidence of herding in the bullish market of 2005 & 2007. This is consistent with the belief of Christie and Huang (1995).

Additional research of herding is performed by Chiang and Zheng (2010) who examine the global stock markets. They modify the methodology proposed by Chang et al (2000). They examine 18 different countries divided into three categories; advanced markets; Latin American markets and Asian markets. Consistent with previous research, no evidence of herd behavior is found in the US stock market. However, they find significant evidence of herding in all the other advanced countries in the study and the Asian markets. Notably, the authors find no evidence of herding behavior in the Latin American markets. An important contribution to previous research is the identification of the significance of the US market in examining local market herding. Their empirical results indicate that the majority of countries in the study are in fact herding around the US market. This finding suggests that local herding may be influenced by foreign market influences. Consistent with the belief of Christie and Huang (1995) herding is found during periods of large market movements. Similar to the evidence of Tan et al (2008) asymmetry of herding is found in Asian markets during rising conditions.

Another measurement for herding is proposed by Hwang and Salmon (2004). Their method is based on beta dispersion and differs from the methodology of previous studies. Contrary to the evidence presented in previous studies (e.g. Chang et al (2000); Chiang and Zheng (2010)) evidence of herding behavior is found in the US equity market. In addition, they find evidence of herding in the UK and South Korean markets. According to their empirical evidence herding towards the market shows significant persistence and movements independently from and given market conditions. The authors find results indicating that herding is less prevalent during periods of market stress. This is contrary to the belief of Christie and Huang (1995) and Chang et al (2000). Applying the methodology by Hwang and Salmon (2004) a study of herding behavior is examined in four European countries. Khan et al (2011) find evidence of herd behavior in France, Germany, Italy and the UK. Interestingly, the authors find no evidence of herding during periods of market crisis and turmoil.

4. Methodology

This section presents the approach of this paper as well as two pioneering models to detect herding behavior in the financial market. In addition, the model to detect market-wide herd behavior, i.e. the chosen method of this paper is presented.

4.1 The Market-wide Approach

The approach of this paper is to detect market-wide herding. This form of herding arises when investors in the market ignore the individual characteristics of stocks and instead follow the performance of the market (Henker et al. 2006, p. 197). The advantage of this particular method is that it is fairly simple. However, the disadvantage is that the beliefs or information the decisions of individual investors to follow the performance on the market are based on.

4.2 Prior Models to Detect Market-wide Herding

The pioneering methods to detect market-wide herding were presented by Christie and Huang (1995) and Chang et al (2000), henceforth referred to as CH and CCK. In their paper, CH suggests that a suitable measure of the market impact of investor herds is dispersion. As it measures the average proximity of individual returns to the market return. Dispersions are bounded from below zero. When individual returns differ from the market return the level of dispersions increase. Thus, market-wide herding would indicate a decrease in dispersions. The cross-sectional standard deviation is used as a measurement of dispersion (CSSD). In addition, the authors suggest that individuals are more likely to follow the performance of the market during periods of large market movements. This means that investors will base their investment decisions only on the performance of the market. 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 were dispersions are assumed to increase during periods of large market movements. The authors also present a measurement for the cross-sectional absolute deviation (CSAD).

In their paper, CCK extends the work of CH and presents a modified and less stringent method to detect market-wide herding. They assume, as CH, that rational asset pricing models suggest an increase in dispersion during periods of market stress. In addition, they argue that rational asset pricing models would predict the relation between dispersions in individual assets and the market return to be linear. This means that the dispersions are an increasing function of the market return. As a measurement of dispersion the authors use CSAD which they base on the conditional version of the CAPM (Capital Asset Pricing Model). Hence, the presence of herd behavior in the market would not only imply a decrease in dispersions but also a non-linear relation between the dispersions and the market return. This means that the dispersions will decrease or at least increase at a less-than-proportional rate with the market return. In contrast to CH the method of CCK is able to detect herding during more normal conditions in addition to periods of market stress.

4.3 The Model to Detect Market-wide Herding

The empirical approach of this paper is based on the work of Chang and Zheng (2010), henceforth referred to as CZ. In their test for herding they modify the method of CCK. They assume, as CCK, that herding in the market place would imply a non-linear relationship between dispersions of individual asset returns and the return on the market portfolio. They use CSAD as a measurement of dispersion. This means that the cross-sectional absolute deviation will decrease or at least increase at a less-than proportional rate with the market return. CZ uses a measurement of CSAD proposed by CH since it does not require the estimation of beta. According to the authors, this avoids the potential specification error related to a single-factor CAPM. Thus, CSAD is measured as:

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N}\left|R_{i,t} - R_{m,t}\right| \qquad (1)$$

Where N is the number of industries in the sample, $R_{i,t}$ is the observed stock return of industry i at time t, and $R_{m,t}$ is the cross-sectional average stock of N returns in the portfolio at time t.

In order to detect market-wide herding the following regression is estimated for each country.

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2\left|R_{m,t}\right| + \gamma_3 R^2{}_{m,t} + \varepsilon_t \qquad (2)$$

Where $R_{m,t}$ is the cross-sectional average stock of N returns in the portfolio at time t and $|R_{m,t}|$ is the absolute term. $CSAD_t$ is the measure for return dispersion. One addition to the method of CCK is that the equation includes an additional $R_{m,t}$ on the right-hand side of equation 2 to take care of asymmetric investor behavior during different market conditions. As mentioned previously herd behavior is assumed to be more likely to occur during periods of relatively large market movements. This will be implied by a non-linear relationship between CSAD and the equally weighted market return. Therefore, a non-linear the term $R^2{}_{m,t}$ is included in the model. The presence of investor herds will imply that CSAD decrease or at least increase at less-than-proportional rate with the market return. Thus, market-wide herding is consistent with a negative and statistically significant value of the coefficient of $R^2{}_{m,t}$, i.e. γ_3.

Large amounts of studies have found evidence of asymmetry in herding behavior between up- and down-market days (e.g. Tan et al, 2008; Ohlson, 2010). This motivates this empirical study to include a test of herding behavior during different market conditions. The following empirical specification by Chiang and Zheng (2010) is applied and estimated for each country:

$$CSAD_t = \gamma_0 + \gamma_1(1-D)R_{m,t} + \gamma_2 DR_{m,t} + \gamma_3(1-D)R^2{}_{m,t} + \gamma_4 DR^2{}_{m,t} + \varepsilon_t \qquad (3)$$

D= 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.

In recent years, there has been significant debate regarding financial integration among countries. How assets and market move together is widely discussed (Lucey, 2008, p. 291). This is recognized by CZ, who argues that no previous efforts have been made to examine herding across national borders. According to the authors, this is likely to yield two disadvantages. Firstly, it may cause a bias in the OLS estimate since important variables are omitted. Secondly, the empirical evidence from a couple of countries only reveals local herd behavior. Thus, they assume that the method of CCK is appropriate for a closed system with no foreign influences. Denmark, Finland, Norway and Sweden are all small open economies which suggest that they would be subject to foreign influence. Therefore, the analysis of herding around foreign markets is included in this study.

CZ suggests that the US is an important global factor and modify their model to capture this influence. This study follows this direction and test if the Nordic countries herd around the US using the following empirical specification. The following regression is estimated for each country:

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R^2{}_{m,t} + \gamma_4 CSAD_{us,t} + \gamma_5 R^2{}_{us,m,t} + \varepsilon_t \qquad (4)$$

Where $R_{m,t}$ is the cross-sectional average stock of N returns in the portfolio at time t and $|R_{m,t}|$ is the absolute term. $CSAD_t$ is the measure for return dispersion. The difference compared to equation 2 is that $CSAD_{us,t}$ and $R^2{}_{us,m,t}$ is included and represents the dispersions and squared market return for the US. A negative and statistically significant γ_3 indicates market-wide herd behavior. In addition, a negative and statistically significant γ_5 would indicate that the country herd around the US market. A positive and highly statistically significant $\gamma_{4,}$ would imply that the US return dispersions have a dominant influence on the market.

In addition to the work of CZ this paper assumes that Europe could possible exhibit great influence in the Nordic. Thus, the following regression is estimated for each country:

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R^2{}_{m,t} + \gamma_4 CSAD_{eu,t} + \gamma_5 R^2{}_{eu,m,t} + \varepsilon_t \qquad (5)$$

Where $R_{m,t}$ is the cross-sectional average stock of N returns in the portfolio at time t and $|R_{m,t}|$ is the absolute term. $CSAD_t$ is the measure for return dispersion. The difference is that $CSAD_{eu,t}$ and $R^2{}_{eu,m,t}$ is included and represents the dispersion and squared market return for Europe. A negative and statistically significant γ_3 is still consistent with market-wide herd behavior. In addition, a negative and statistically significant γ_5 would suggest that the Nordic country herd around the European market. A positive and highly statistically significant γ_4 would imply that the European return dispersions have a dominant influence on the market.

If evidence suggests that the Nordic countries herd around the European market rather than the US it could perhaps suggest that the geographical distance could be contributing factor to herding across the borders. To test if this is a valid suggestion this study also test if the Nordic countries herd around each other. Hence, if the Nordic countries herd around each other it would further suggest that perhaps geographical distance is an important factor. Equations 6 to 9 are used to estimate if the Nordic countries herd around Sweden, Norway, Finland and Denmark. The equations are estimated for each country in this study:

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R^2{}_{m,t} + \gamma_4 CSAD_{swe,t} + \gamma_5 R^2{}_{swe,m,t} + \varepsilon_t \quad (6)$$

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R^2{}_{m,t} + \gamma_4 CSAD_{nor,t} + \gamma_5 R^2{}_{nor,m,t} + \varepsilon_t \quad (7)$$

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R^2{}_{m,t} + \gamma_4 CSAD_{fin,t} + \gamma_5 R^2{}_{fin,m,t} + \varepsilon_t \quad (8)$$

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R^2{}_{m,t} + \gamma_4 CSAD_{den,t} + \gamma_5 R^2{}_{den,m,t} + \varepsilon_t \quad (9)$$

Where $R_{m,t}$ is the cross-sectional average stock of N returns in the portfolio at time t and $|R_{m,t}|$ is the absolute term. $CSAD_t$ is the measure for return dispersion. The difference is that $CSAD_{,swe,nor,fin,den,t}$ and $R^2{}_{swe,nor,fin,den,m,t}$ is included. A negative and statistically significant γ_3 indicates market-wide herd behavior. In addition, a negative and statistically significant γ_5 would suggest that the country herd around their neighboring markets. A positive and highly statistically significant γ_4 would imply that the Nordic countries (Sweden, Norway, Finland, and Denmark) return dispersions have a dominant influence on the market.

Equation 1, i.e. the cross-sectional absolute deviation is calculated for each country in Excel. The equations 2-9 used to investigate market-wide herding in Denmark, Finland, Norway and Sweden as well as herding across national borders are estimated in Eviews. Due to problems with autocorrelation and heteroskedasticity the Newey-West estimator is used to get HAC consistent covariances for all the regressions.

There are two important reasons why the approach of Chiang and Zheng (2010) is applied in this paper. First, they found evidence of herding in advanced countries with their approach. Second, the approach recognizes that foreign influence is a significant variable in examining local market herd behavior. In the aftermath of several global financial crises it is motivated to further investigate if investors in fact herd across national borders.

5. Data and Descriptive Statistics

This chapter describes the data employed in this study. In addition, descriptive statistics is presented.

5.1 Data

All Data employed in this study is collected from Thomson Reuters Datastream. For each country industry indices composed by Datastream is used. According to Datastream (*Datastream Global Equity Indices, Users guide, p. 1)* a representative sample of stocks covering a minimum of 75 – 80 % of total market capitalization allows market indices to be calculated for each market. Thus, within each market, stocks are allocated to industrial sectors using the Industry Classification Benchmark (ICB) jointly created by Dow Jones and FTSE. Thereafter, sector indices are calculated.

The countries under observation in this study are Denmark (Den), Finland (Fin), Norway (Nor) and Sweden (Swe). Note, industry indices for both the United states (US) and Europe (EU) is also collected since both are part of the empirical investigation, however not the primary focus. For Europe, an index is composed by Datastream is used. Hence, there is a possibility that bigger or more influential countries can affect the index by itself. Nevertheless, to investigate if the Nordic countries herd around the European markets it does not require that we know the significance of each country. The data type selected is total return (RI) and all indices are collected in US dollars. The sample period is 2001-2012 with 2001-01-02 as starting date and 2011-12-30 as end date. Daily data is used in the study. Furthermore, as one part of the investigation the data is divided into sub periods, each year representing one sub period.

Stock return is calculated using daily changes in industry indices. The following formula is applied:

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

Where R_t is the change in industry indices from day t-1 to day t. P_t denotes the industrial stock index.

5.2 Descriptive Statistics

Table 1 - Descriptive statistics of CSAD

Statistics	Den_CSAD	EU_CSAD	Fin_CSAD	Nor_CSAD	Swe_CSAD	US_CSAD
Number of observations	2869	2869	2869	2869	2869	2869
Mean	0,509	0,356	0,631	0,542	0,542	0,407
Maximum	2,330	1,285	2,556	2,627	1,822	2,134
Minimun	0,001	0,001	0,001	0,002	0,002	0,002
Std.Dev	0,245	0,154	0,389	0,289	0,254	0,216
Skewness	1,569	1,566	1,711	1,517	0,907	1,927
Kurtosis	9,593	7,051	6,832	8,241	4,891	10,002
Jarque-Bera	6371,932	3133,300	3155,783	4383,571	820,942	7636,278
Probability	0,000	0,000	0,000	0,000	0,000	0,000
Number of industries, N	31	108	33	32	34	105

This table present descriptive statistics of daily equally weighted cross-sectional absolute deviations (CSADt) for seven countries; Denmark (Den), Europe (EU), Finland (Fin), Norway (Nor), Sweden (Swe) and the US. The stock return dispersion is defined as $CSAD_t = \frac{1}{N}\sum_i^N |R_{i,t} - R_{m,t}|$. The data range from 2/1 -2001 to 30/12-2011.

The descriptive statistics of $CSAD_t$ in industrial stock returns for different markets is presented in table 1. The number of industries in the sample range from 31 to 108. The country with the lowest number of industries is Denmark and Europe is the area with the highest number of industries. This is not surprising considering the fact that both Europe and the US are larger markets compared to the Nordic countries. If we look at the Nordic for example, the number of industries ranges from 31 to 34.

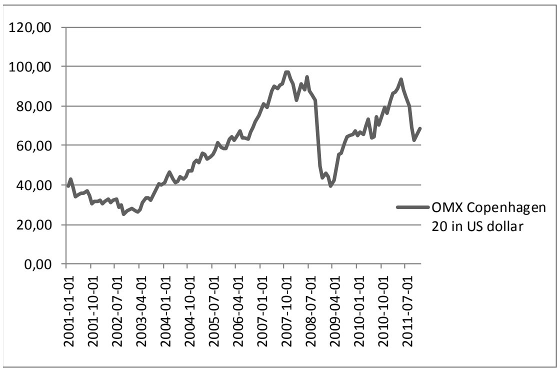
The mean values of the sample differ across the different industries, the highest mean value is found in the data for Finland whereas the lowest mean value is found in the data for Europe. Furthermore, the standard deviation should also be mentioned. The higher mean values indicate that there has been a higher variation in the market across industrial returns. As in the situation with mean values the standard deviation for Finland is the highest whereas Europe has the lowest standard deviation. Higher standard deviation indicates that the market had unusual cross-sectional variations. This could be due to unexpected news or shocks according to Chiang and Zheng (2010, p. 1915)

Furthermore, the skewness for all countries is positive and all has excess kurtosis, that is, a kurtosis above three. Hence, we can reject the null hypothesis of normally distributed stock return dispersions for all countries. Interestingly, Sweden is the country with stock return dispersions closest to be normally distributed

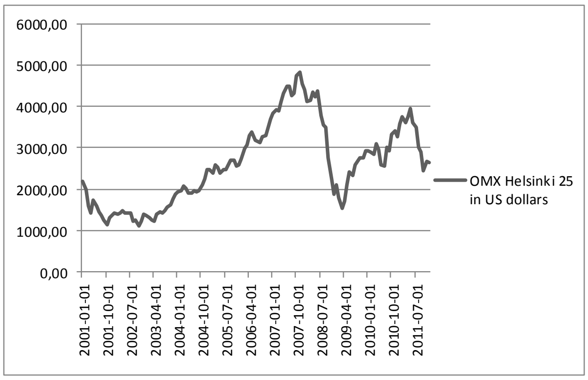
Figure 1: Historical Stock Market Development

This figure presents the historical development of the four stock markets in this study during the time period 2001-2012.

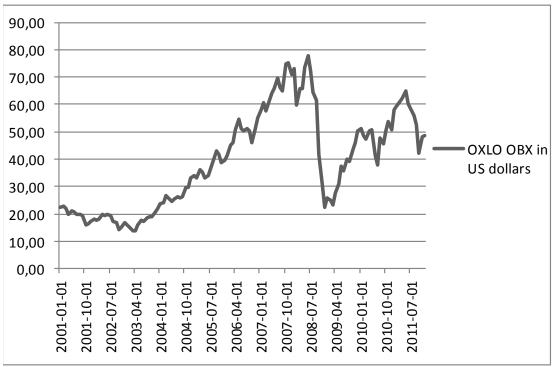
Denmark



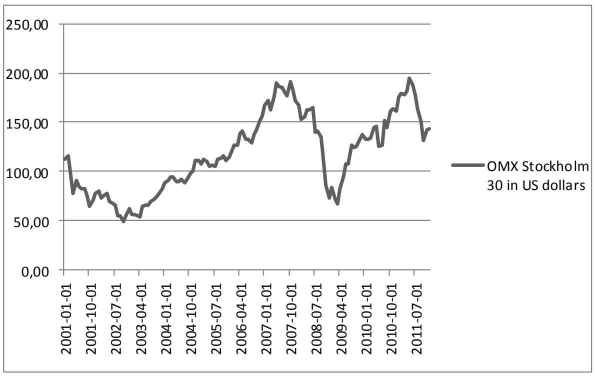
Finland



Norway



Sweden



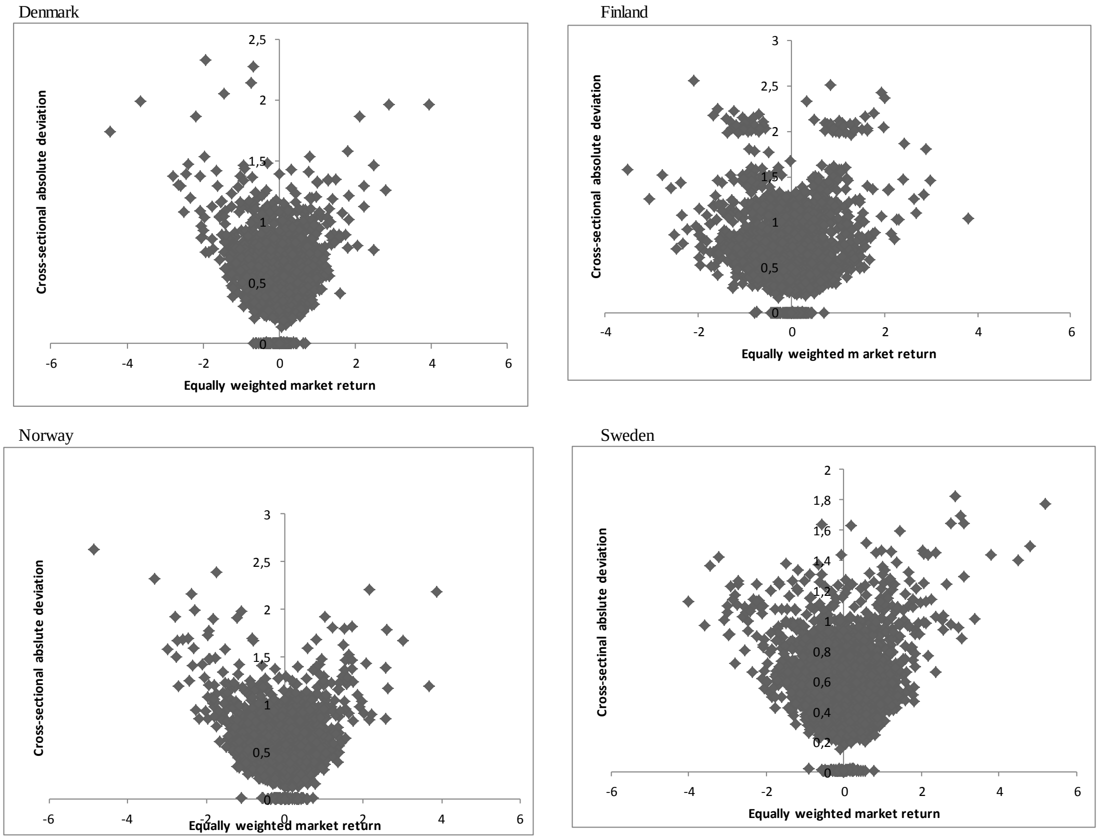
Source: Thomson Reuter Datastream

The time period of this study, i.e. 2001-2012 is interesting to investigate since it includes the burst of the dot.com bubble of 2000s and global financial crisis of 2008. This allows this study to examine if herd behavior is more prevalent during periods of extreme large market movements as suggested by Christie and Huang (1995). An overview of the stock markets during the time period is presented in figure 1 above.

It is evident that all Nordic countries experiences similar fluctuations in the stock market during the chosen time period. Initially, the stock markets are declining, after the burst of dot.com bubble. However, the initial drop of 2001 is not as great as the drop in 2008. In fact, according to figure the Norwegian stock market does not seem to be largely affected by the burst of the dot.com bubble. However, the drop appears to be greater for Finland and Sweden. Between the 2004 and 2007 there appears to be more bullish markets. The market drops greatly in the beginning of 2008, as a result of the global financial countries. In 2009 the stock markets increase and fall again during 2010.

Figure 2- The Relationship Between CSADt and Rmt

Relationship between the daily cross-secitonal abslute deviation (CSADt) and the corresponding equally weighted marekt return (Rmt) for the Nordic countries (2/1/2001-30/12/2011)



In this study, as mentioned the measurement of herding assumes that market-wide herding will be indicated by a non-linear relationship between the individual dispersions and the market return. This means that the dispersions are expected to decrease or at least increase at a less-than-proportional rate with the market return. The cross-sectional absolute deviation is used as a measurement of dispersion. Figure 2 above illustrate the relationship between the cross-sectional absolute deviation and the equally weighted market return for each country in this study.

It is evident from figure 2 above that the relationship between the cross-sectional absolute deviation and the equally weighted market return varies. First, looking at the relationship for Denmark it appears to be linear. This means that the dispersions are an increasing function of the market return. Thus, according to figure 2 the investors in Denmark do not appear to exhibit herd behavior. The relationship for Norway is similar. Hence, relationship appears to be linear. In addition, there appears to be a somewhat linear relationship between the between dispersions and the market return for Sweden. This indicates that neither Denmark, Norway nor Sweden exhibit market wide herd behavior.

However, the relationship between the cross-sectional absolute deviation and the equally weighted market return does not appear linear for Finland. This could indicate that investors herd in the Finnish market. In this study, this indicates herding in the market and is contradictory to rational asset pricing models. Hence, according to the figure above the linear relationship is similar for Denmark and Norway. However, Sweden appears to have a linear relationship as well. Finland on the other hand, appears to have a non-linear relationship between dispersions and the market return. This could indicate market-wide herding.

Although figure 2 presents the relationship between the cross-sectional absolute deviation and the corresponding equally weighted market return it does not present enough evidence to determine whether investors in the Nordic countries herd or not. Thus, additional testing and analysis of the results will be presented in the following chapter.

6. Empirical Results

This chapter presents the results of the estimated regressions. An analysis of the results is also provided.

First, equation 2 is estimated to investigate if market participants in the four Nordic markets in this study, namely Denmark (Den), Finland (Fin), Norway (Nor) and Sweden (Swe) exhibit herd behavior. As mentioned previously, a negative and statistically significant value of the coefficient of $R^2{}_{m,t}$ i.e. γ_3 indicates market-wide herding.

Table 2: Estimation of market-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2.

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,404***	-0,002	0,260***	0,039***	0,27
	(44,188)	(-0,252)	(7,893)	(2,700)	
Fin	0,392***	0,012	0,635***	-0,113***	0,24
	(28,353)	(1,081)	(12,024)	(-5,511)	
Nor	0,402***	-0,012	0,286***	0,048***	0,33
	(36,168)	(1,193)	(9,244)	(3,481)	
Swe	0,416***	0,014	0,245***	0,000	0,26
	(43,487)	(2,488)	(11,730)	(0,005)	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\bar{R}^2$, is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

According to the estimates in table 2 all countries except Sweden have statistically significant values of γ_3. Though, the estimate is negative for Finland. This indicates that during the time period under investigation investors in Finland follow the performance of the market and ignore the individual characteristics of the stocks. Hence, there is significant evidence of market-wide herding in Finland during the entire time frame. This is inconsistent with the evidence of Saastamoinen (2008). He finds no evidence of herding in the Helsinki stock exchange during an average trading day. However, the results could be perceived as consistent with the results of (e.g. Chiang and Zheng, 2010; Hwang and Salmon, 2004; Khan et al, 2010). In fact, they all found evidence of herding in several advanced countries in Europe. Conflicting evidence, i.e. no herding among investors in advanced countries was presented by (e.g. Chiang et al, 2000; Henker et al, 2006).

No evidence of herding is found in Denmark, Norway or Sweden. The fact that there is no evidence of herding in Sweden is in contrast with the evidence presented by Ohlson (2010) in a recent study. However, as mentioned in chapter 3 previous empirical results of herding have been mixed. Some authors have found evidence of herding whereas others have not. This is true for the same country as well; examples include China where Demirer and Kutan (2006) and Tan et al (2008) found conflicting evidence. In addition, the time period under investigation as well as the data used in this research differs from Ohlson (2010). This may account for the differences in the results. In addition, no previous studies of market-wide herding have focused on Denmark or Norway. Thus, the finding that these countries does not exhibit herd behavior is a contribution to the empirical research on herd behavior.

The empirical evidence indicating that one of the four Nordic countries in this study exhibit market-wide herding, i.e. Finland, is an interesting finding. The evidence regarding Finland is inconsistent with rational asset pricing models. The opposite appears to be true for Denmark, Norway and Sweden. According to the empirical results the investors in these countries behave as expected by rational asset pricing models.

However, there is a possibility that they exhibit herding during some of the years and that this does not translate into the whole time period. In fact, Tessaromatis and Thomas (2009) argue that herding or non-herding is not a permanent behavior among investors. They find evidence of herding during some years when dividing their sample into sub periods. Taking this into account this study divides the sample into sub periods as well. The sample is divided into eleven sub periods, each year between 2001 and 2012 represents one sub period.

In addition, this allows this study to investigate if herding is more prevalent during periods of large market movements as suggested by Christie and Huang (1995). Examples of periods of markets stress include the burst of the dot.com bubble of the 2000s and the global financial crisis of 2008. These periods are characterized by bear-market conditions, i.e. large decline in stock prices. Another example might be years leading up to the global financial crisis. These years are characterized by bull-market conditions, i.e. large increases in stock prices. The results are presented in table 3 below.

Table 3: Estimation of market-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2.

	2001	2002	2003	2004	2005	2006
Markets	γ_3	γ_3	γ_3	γ_3	γ_3	γ_3
Denmark	-0,023	0,094	0,894***	-0,097	-0,043	-0,060
	(-0,446)	(0,701)	(3,907)	(-0,741)	(-0,386)	-0,767
Finland	-0,229*	-0,021	0,141	-0,405***	0,012	0,046
	(-1,822)	(-0,214)	(0,624)	(-3,920)	(0,048)	0,859
Norway	0,107**	-0,018	0,232***	-0,059	0,333***	0,241***
	(2,029)	(-0,242)	(3,383)	(-0,570)	(2,949)	3,920
Sweden	-0,029	-0,035	0,116	0,028	-0,118	0,043*
	(-1,078)	(-1,003)	(0,871)	(0,373)	(-1,551)	1,772
	2007	**2008**	**2009**	**2010**	**2012**	
Markets	γ_3	γ_3	γ_3	γ_3	γ_3	
Denmark	0,044	-0,004	-0,093	0,097***	0,230*	
	(1,176)	(-0,181)	(-1,492)	(4,768)	(1,932)	
Finland	0,040	0,021	0,018	0,014	0,039	
	(0,583)	(0,842)	(0,482)	1,024	(1,392)	
Norway	0,060	0,001	-0,024	0,126***	0,111**	
	(0,894)	(0,051)	(-0,959)	(5,759)	(2,133)	
Sweden	0,041	-0,005	0,014	0,031**	0,035*	
	(0,883)	(-0,492)	(0,440)	(2,570)	(1,817)	

The data range from 1/1/2001 to 30/12/2011. The data is divided into sub periods, each subperiod representing one year. The explanatory power $\bar{R}^2$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

The results presented in table 3 indicate that herding among investors still is only prevalent in Finland. Hence, even when dividing the sample into sub periods there is no evidence of herding in Denmark, Norway or Sweden. The evidence of herding in Finland is indicated by the negative and statistically significant value of γ_3. Herding in the Finnish stock market is found in two years, namely 2001 and 2004. Interestingly, in 2001 there was a decline in the Finnish stock market, as discussed in chapter 5. Perhaps due to the burst of the dot.com bubble. During 2004 Finland experienced a more bullish market, which is a rise in the stock market. These results indicate that herd behavior in Finland is more prevalent during periods of large market movements. This is consistent with the belief of Christie and Huang (1995). Furthermore, the evidence of herding during 2004 is highly significant compared to 2001. This could be perceived as Finnish investors being more likely to exhibit herd behavior during bullish market conditions. Noticeably, there is no herding during the recent global financial crisis. Furthermore, the results in table 3 indicates that herding occurs during two years of the time period, this suggests that herding or non-herding is not a permanent behavior. This is consistent with the evidence of Tessaromatis and Thomas (2009).

As mentioned when dividing the sample into sub periods no evidence is found in Denmark, Norway or Sweden. This is consistent with the initial results of this study. This suggests that the investment behavior among Finnish market participants is different compared to their Nordic neighbors. Thus, the Finnish investors behave contradictory to rational asset pricing models whereas the other investors in Denmark, Norway and Sweden instead behave according to rational asset pricing models. The results for Sweden is conflicting compared to Ohlson (2010) who find evidence of herding in Sweden in 2005 and 2007. These periods are characterized by more bullish market conditions. However, it could be perceived as consistent with the empirical evidence of herding in Finland in this study. The empirical results in table 3 suggest that herding in Finland is more prevalent during bullish market conditions. This is indicated by the higher level of significance of the herd behavior in 2004 compared to 2001.

The conflicting evidence of herding behavior in the Nordic area would be interesting to investigate further. Since previous empirical studies have presented conflicting results as well it could be motivated to perform additional tests. Perhaps using a different type of data or different time periods would yield different results. In addition, there are other methods of detecting herd behavior, for example Hwang and Salmon (2004) who might present different results as well. Furthermore, it would be of interest to investigate the financial systems in the Nordic area. Perhaps a thoroughly investigation of the financial systems could reveal possible reasons for the differences in local investor behavior. However, this is not in the scope of this paper.

Large amounts of studies have found evidence of asymmetry in herding behavior between up- and down-market days (e.g. Saastamoinen, 2008; Ohlson, 2010). Motivated by this, this study includes a test of herding behavior during different market conditions. To test for herding during different market conditions equation 3 is estimated and the results are presented in table 4 below. Herding during up-markets would be consistent with a negative and statistically significant value of the coefficient of $(1-D)R^2{}_{m,t}$, i.e. γ_3, and herding in down-markets would be consistent with a negatively and statistically significant value of the coefficient of $DR^2{}_{m,t}$, i.e. γ_4.

Table 4: Herding during up-and down markets

Panel A of this table reports the regression results of CSAD ased on equation 3.

Panel A: Regression estimates						
Market	γ_0	γ_1	γ_2	γ_3	γ_4	adjusted $\overline{R^2}$
Den	0,405***	0,238***	-0,275***	0,054***	0,030*	0,27
	(46,702)	(7,959)	(-6,890)	(2,958)	(1,711)	
Fin	0,391***	0,599***	-0,688***	-0,075***	-0,161***	0,24
	(27,252)	(10,890)	(-10,029)	(-2,951)	(-4,444)	
Nor	0,401***	0,290***	-0,288***	0,037	0,055***	0,33
	(35,502)	(7,818)	(-7,958)	(1,630)	(3,479)	
Swe	0,414***	0,252***	-0,251***	0,005	-0,011	0,26
	(43,330)	(10,793)	(-9,981)	(0,656)	(-1,197)	
Panel B: Wald test of herding coefficients between up and down markets						
Market	γ_3	γ_4	Difference	Chi-square	P-value	
Den	0,054	0,03	0,024	0,916	0,339	
Fin	-0,075	-0,161	0,086**	5,946	0,015	
Nor	0,037	0,055	-0,018	0,579	0,447	
Swe	0,005	-0,011	0,016	2,514	0,113	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\bar{R}^2$ is the adjusted.
Panel B presents the result from the Wald test. The hypothesis is $\gamma_3 = \gamma_4$ which is used to test the equality of the herding coefficient between up and down markets .
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

According to table 4 the results are similar to the results from table 2. Thus, there is no evidence of herding in Denmark, Norway or Sweden. Consistent with previously presented results investors in the Finnish market exhibit herd behavior. The negative and statistically significant values of $\gamma_3$and γ_4 suggest that herding is evident during both up-and down markets.

A Wald test is conducted to investigate whether there is asymmetry in herding behavior as suggested by previous studies. The null hypothesis of no asymmetry is $\gamma_3 = \gamma_4$ and the results are presented in Panel B. Asymmetry of investment behavior in Finland would be consistent with a negative and statistically significant value of the difference between γ_3 and γ_4 . The results suggest that there is no asymmetry in the herding among Finnish investors. This is inconsistent with Ohlson (2010) who suggests that herding is more likely during up-markets. It is also inconsistent with Saastamoinen (2008) who find evidence of herding in up-going market days in Finland. However, in their study Chiang and Zheng (2010) find no asymmetry in herd behavior in the advanced countries in their study. Hence, the results for Finland can be perceived as consistent with the result of Chiang and Zheng (2010).

Interestingly, according to the results of Sweden the value of $\gamma_4$is negative. This could imply herding during down-market conditions; however the estimate is not statistically significant and therefore not consistent with herding. Hence, the results of this regression are in line with the previous results in this study.

This paper does not limit the empirical investigation to local market herd behavior. As discussed previously, the evidence of Chiang and Zheng (2010) suggests that foreign influences impact local herd behavior. This is an additional part of this study.

To tests if Denmark, Finland, Sweden and Norway herd around the US- and the European markets equations 4 and 5 are estimated. The results are presented in table 5 on the following page. A negative and significant value of γ_3 still represents local market herding. In addition, a negative and statistically significant value of γ_5 suggests herding around the foreign market. The positive and statistically significant value of the $\gamma_4$suggests that the foreign return dispersion has a dominate influence in the Nordic country.

Table 5: Estimation of herding around the US and European markets

This table reports the regression results of CSAD based on equations 4 and 5.

Panel A: Herding with the US					Panel B: Herding with Europe			
Markets	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$
Den	0,032***	0,449***	-0,001	0,40	0,066***	0,907***	-0,061**	0,51
	(3,455)	(12,164)	(-0,279)		(4,640)	(21,151)	(-4,494)	
Fin	-0,112***	0,456***	-0,030***	0,28	0,095**	1,048***	-0,213***	0,39
	(-5,635)	(8,990)	(-3,666)		(2,388)	(17,005)	(-5,468)	
Nor	0,037***	0,501***	-0,005	0,44	0,095***	1,048***	-0,213**	0,56
	(3,185)	(11,569)	(-0,804)		(2,388)	(17,005)	(-5,468)	
Swe	-0,008	0,629***	-0,013*	0,46	0,022***	1,201***	-0,062***	0,61
	(-1,479)	(16,279)	(-1,866)		(2,801)	(31,068)	(-5,589)	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\dot{R}^2_i$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

First, look at the regression estimates when the US is introduced as a potential influence on local market herding. One difference compared to the results in table 2 is that Finland is no longer the only country that has a negative value of γ_3. Sweden does show a negative sign of the coefficient as well which could indicate herding in the local market. However, the estimate is only statistically significant for Finland. Thus, when including the US in the regression Finland continues to present evidence of local market-wide herding behavior.

Another finding is that all countries in this study have negative values of γ_5. This could indicate that the Nordic countries are herding around the US market. However, the values are only statistically significant for Sweden and Finland. Thus, the evidence suggest that both Finland and Sweden herd around the US market. This result is consistent with Chiang and Zheng (2010) who recognizes the influence of the US in market-wide herding. Conflicting evidence is found for Denmark and Norway, neither herd around the US market according to the estimates in table 4.

Although Denmark and Norway does not herd around the US market they are influenced by market conditions in the US. This is represented by the positive and statistically significant value of γ_4 . In fact, the estimate is positive and statistically significant across all Nordic countries in this study.

In addition, comparing the explanatory power of this regression compared to the previous regression yields interesting information. The explanatory power, showed by the adjusted $\overline{R^2}$, is higher for this regression across all countries. Hence, the estimates of herding obtain higher explanatory power when foreign influences are included in the regression. This further supports the conclusion of Chiang and Zheng (2010) that including the US market into the regression is of importance.

Second, looking at the regression estimates of herding around Europe in comparison with the results of the US the results are fairly different. Interestingly, all the values of γ_3 are both positive and statistically significant. This indicates that none of the countries in the sample exhibit local market herd behavior. These results are contrasting to the results of the estimations of equation 2 and 3 who presents evidence of herding in the Finnish market. However, all the countries show a negative and statistically significant value of γ_5. This indicates that all four Nordic countries herd around the European market. This is an interesting finding. Previously there has been no evidence of herding in Denmark, Norway or Sweden but they all herd around Europe. Thus, they do in fact herd across national borders. Perhaps these countries do not behave entirely according to rational asset pricing models after all. The finding that all countries herd around the European market but only two around the US market could indicate that geographical distance might influence herding across borders.

Consistent with the previous regression and the work of Chiang and Zheng (2010), all the values of γ_4 are positively and statistically significant. This indicates that the European return dispersion has a dominant influence on the Nordic markets. This further supports the argument by Chiang and Zheng (2010), i.e. that foreign influence in local herding behavior is highly significant. In addition, this regression compared to the regression when the US is incorporated and the initial regression is considerable higher. Hence, including the European market in the regression for the Nordic countries increases the explanatory power. As mentioned previously the fact that all four Nordic countries herd around the European market could suggest that the geographical distance between countries impact herding across borders. This is interesting to investigate further. To test this implication a test is conducted to investigate if the Nordic countries herd around each other. If the Nordic countries herd around each other it could be perceived as supporting evidence of the suggestion that geographical distance in herd behavior is of significance.

To test if Denmark, Finland, Norway and Sweden herd around each other equation 6 to 9 is estimated. The results are presented in table 6 below.

Table 6: Estimation of herding around the Nordic neighbors

This table reports the regression restuls of CSAD based on equations 6-9.

Panel A: Herding around the Swedish market					Panel B: Herding around the Norwegian market				
Market	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$	Market	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$
Den	0,040***	0,472***	-0,012**	0,47	Den	0,040***	0,450***	-0,058***	0,47
	(3,187)	(19,544)	(-2,121)			(2,863)	(19,222)	(-6,763)	
Fin	-0,010	0,655***	-0,090***	0,39	Fin	-0,049*	0,501***	-0,118***	0,34
	(-0,381)	(19,113)	(-5,153)			(-1,892)	(13,533)	(-4,786)	
Nor	0,055***	0,609***	-0,016*	0,56	Swe	0,006	0,532***	-0,066***	0,51
	(4,270)	(26,548)	(-1,854)			(0,760)	(24,369)	(-6,814)	
Panel C: Herding around the Finish market					**Panel D: Herding around the Danish market**				
Market	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$	Market	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$
Den	0,069***	0,190***	-0,060***	0,35	Fin	-0,008	0,464***	-0,145***	0,31
	(4,231)	(10,267)	(-5,853)			(-0,257)	(10,891)	(-3,593)	
Nor	0,066***	0,245***	-0,043***	0,42	Nor	0,059***	0,565***	-0,046**	0,50
	(3,988)	(12,504)	(-2,966)			(3,332)	(15,815)	(-2,025)	
Swe	0,029***	0,273***	-0,075***	0,41	Swe	0,014	0,522***	-0,059***	0,45
	(3,322)	(14,448)	(-6,901)			(1,660)	(18,761)	(-4,740)	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\bar{R}^2$; is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

First, the estimate of herding around the Swedish market yields no negative and statistically significant values of γ_3. Thus, none of the countries in this study exhibit local herd behavior. This is consistent with the results presented in panel B of table 5. In addition, also consistent with panel B of table 5 is that all values of $\gamma_5$are negative and statistically significant across all markets. Thus, Denmark, Finland and Norway herd around the Swedish market. The significance level however differs; Finland has the highest significance level whereas Norway has the lowest significance level of herding around the Swedish market.

Panel B of table 6 shows the regression results when testing if the Nordic countries herd around Norway. The results are similar to panel A of table 6. However, Finland shows evidence of local market herding. All the estimates of $\gamma_5$is negative and statistically

significant. This indicates that Denmark, Finland and Sweden herd around the Norwegian market.
Panel C shows the estimates of herding around the Finnish market. There is highly significant evidence across all countries of herding around Finland. Furthermore, panel D shows herding around Denmark. The evidence of herding around the Danish market is according to table 6 highly statistically significant. This is represented by the negative and statistically significant value of γ_5.

All the estimates of $\gamma_4$is positive and statistically significant. This means that all the Nordic countries in this are influenced by the return dispersions of their Nordic neighbors. The evidence of herding across national borders is consistent with the evidence of table 5 and Chiang and Zheng (2010).

The explanatory power in table 6 varies. The highest explanatory power for the countries exists when we measure if they herd around Sweden. On the other hand, Sweden shows the highest explanatory power when herding around the Norwegian market. The explanatory power of table 6 is similar to panel B of table 5. This suggests that incorporating the role of foreign influence yields a higher explanatory power of the model. As mentioned previously Denmark, Finland, Norway and Sweden are all small open countries. This indicates that as suggested by Chiang and Zheng (2010) their model is more suitable for open systems.

In table 6, all countries are found to herd around their Nordic neighbors. This combined with the evidence that all countries herd around Europe could be perceived as suggesting that geographical distance plays an important role in herding behavior across borders. The additional supporting evidence of herding around foreign markets in this study, originally argued by Chiang and Zheng (2010) and the recognition that perhaps geographical distance exhibit significant influence in herding across borders is a contribution of this paper.

7. Conclusion

In this chapter the concluding remarks is presented as well as suggestions for future research.

In this paper, the investment behavior among market participants in four Nordic countries (Denmark, Finland, Norway and Sweden) is studied, more specifically with regard to their propensity to exhibit herd behavior. The type of herd behavior in focus is market-wide, it arises when investors ignore individual characteristics of stocks and instead follow the performance of the market. The approach of Chiang and Zheng (2010) is used to detect herding in the market. It is based on the assumption that herd behavior in the market is consistent with a non-linear relationship between dispersions (CSAD) and the corresponding equally weighted market return. This means that the dispersions will decrease or at least increase at a less-than-proportional rate with the market return.

There is significant evidence of herding among investors in the Finnish market. This can be perceived as consistent with the results of Chiang and Zheng (2010) who find evidence of herding in several advanced countries. The result is inconsistent with Saastamoinen (2008). In addition, it is inconsistent the views of traditional economic theory and rational asset pricing models. No evidence of herding is found in Denmark, Norway or Sweden. This is inconsistent with the results of Ohlson (2010) who find evidence of herding in Sweden during up-going market days. However it is consistent with the evidence of Chang et al (2000) and rational asset pricing models.

Christie and Huang (1995) suggest that herding is more likely to emerge during periods of large market movements. This implication is tested by dividing the sample into sub periods, one sub period representing one year. Significant evidence of herding is found in Finland during the bear market of 2001 and the bull market of 2004. This is consistent with the beliefs of Christie and Huang (1995). No evidence of herding is found in Denmark, Norway or Sweden during any of the sub periods. These results are inconsistent with the beliefs of Christie and Huang (1995) and the evidence of Ohlson (2010).

There is a host of empirical literature on herding that suggests that there is asymmetry between up-and down-going market days (Tan et al, 2008; Ohlson, 2010). In this study, no evidence of asymmetric herding is found in Finland. The investors in the Finnish market appear to be herding during both up-and down-going market days. This is consistent with the research of Chiang and Zheng (2010) who find no asymmetry in herding among advanced countries. However, it is inconsistent with the recent research of Ohlson (2010).

The importance of foreign influence is recognized by Chiang and Zheng (2010) where they find significant evidence of herding around the US market. In this study, both Finland and Sweden are found to herd around the US market. This yields further empirical support of the suggestion of Chiang and Zheng (2010). In addition, this study tests if the Nordic countries herd around the European market and their Nordic neighbors. To my knowledge, no previous study on herd behavior has made this type of research. The evidence suggests that all the

Nordic countries in this study herd around the European market. In fact, the explanatory power of the model increases greatly when including the European market as an explanatory variable. Perhaps the geographical distance between countries can be an important factor in herding across national borders. This suggestion is tested by examining if the Nordic countries herd around each other. There is significant evidence that all countries herd around their Nordic neighbors. Hence, it supports the suggestion that geographical distance could be an important factor.

This paper has contributed in providing additional research on herding in the Nordic area. No previous studies have focused on Denmark and Norway. Hence, the results that these countries do not herd around the market are a contribution to the empirical research. Furthermore, the evidence and conflicting results compared to Saastamoinen (2008) and Ohlson (2010) is additional proof that studies of herding in financial market sometimes offer conflicting evidence. The evidence supporting the belief of Chiang and Zheng (2010) and the suggestion that geographical distance perhaps influence herding across national borders is also a contribution of this paper.

Suggestions for further research includes studying the financial markets of the Nordic countries to examine if there are differences that could explain why herd behavior is found in Finland but not Denmark, Norway or Sweden. Furthermore, different data and time period perhaps would be suitable to conduct additional test of herding in the Nordic area to investigate whether this yields different results. In addition, the methods of Hwang and Salmon (2004) would be interesting to apply in order to investigate whether they yield different results.

References

Avery, C., & Zemsky, P., 1998, "Multidimensional uncertainty and herd behavior in financial markets", *The American Economic Review,* vol. 88, no. 4, pp. 724.

Banerjee, A.V. 1992, "A simple model of herd behavior", *The Quarterly Journal of Economics,* vol. 108, no. 3, pp. 797

Barberis, N. and R. Thaler, 2003, "A Survey of Behavioral Finance" in Ed. by G.M. Constantinides, M. Harris and Stulz, R., *Handbook of the Economics of Finance* Elsevier.

Basu, S., 1977, "Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A test of the Efficient Market Hypothesis." *Journal of Finance,* Vol. 32, No. 3, pp. 663-682

Baur, D.G. & Fry, R.A. 2009, "Multivariate contagion and interdependence", *Journal of Asian Economics,* vol. 20, no. 4, pp. 353-366

Bikhchandani, S., Hirshleifer, D. & Welch, I. 1998, "Learning from the Behavior of Others: Conformity, Fads, and Informational Cascades", *The Journal of Economic Perspectives,* vol. 12, no. 3, pp. 151-170

Bikhchandani, S. and Sharma, S. (2001), "Herd Behavior in Financial Markets" *IMF Staff Papers* 47(3), 279-310.

Billio, M. & Caporin, M. 2010, "Market linkages, variance spillovers, and correlation stability: Empirical evidence of financial contagion", *Computational Statistics and Data Analysis,* vol. 54, no. 11, pp. 2443-2458

Boyer, B.H., Kumagai, T. & Yuan, K. 2006, "How Do Crises Spread? Evidence from Accessible and Inaccessible Stock Indices", *The Journal of Finance,* vol. 61, no. 2, pp. 957-1003.

Chang, E.C., Cheng, J.W. & Khorana, A. 2000, "An examination of herd behavior in equity markets: An international perspective", *Journal of Banking and Finance,* vol. 24, no. 10, pp. 1651-1679.

Chari, V.V. & Kehoe, P.J. 2004, "Financial crises as herds: overturning the critiques", *Journal of Economic Theory,* vol. 119, no. 1, pp. 128-150.

Chiang, T.C., Jeon, B.N. & Li, H. 2007, "Dynamic correlation analysis of financial contagion: Evidence from Asian markets", *Journal of International Money and Finance,* vol. 26, no. 7, pp. 1206-1228.

Chiang, T.C., Li, J. & Tan, L. 2010, "Empirical investigation of herding behavior in Chinese stock markets: Evidence from quantile regression analysis", *Global Finance Journal,* vol. 21, no. 1, pp. 111-124.

Chiang, T.C. & Zheng, D. 2010, "An empirical analysis of herd behavior in global stock markets", *Journal of Banking and Finance,* vol. 34, no. 8, pp. 1911-1921.

Christie, W.G. & Huang, R.D. 1995, "Following the Pied Piper: Do Individual Returns Herd around the Market?", *Financial Analysts Journal,* vol. 51, no. 4, pp. 31-37.

Corsetti, G., Pericoli, M. & Sbracia, M. 2005, "Some contagion, some interdependence': More pitfalls in tests of financial contagion", *Journal of International Money and Finance,* vol. 24, no. 8, pp. 1177-1199.

Datastream Global Equity Indices, User guide, 2008, no. 5, pp. 1-70

De Bondt, W., Muradoglu, G., Shefrin, H., & Staikouras, S.K., 2008, "Behavioral Finance: Quo Vadis?", *Journal of Applied Finance,* vol. 18, no. 2, pp. 7.

Demirer, R. & Kutan, A.M. 2006, "Does herding behavior exist in Chinese stock markets?", *Journal of International Financial Markets, Institutions & Money,* vol. 16, no. 2, pp. 123-142.

Demirer, R., Kutan, A.M. & Chen, C. 2010, "Do investors herd in emerging stock markets?: Evidence from the Taiwanese market", *Journal of Economic Behavior and Organization,* vol. 76, no. 2, pp. 283-295.

Devenow, A. & Welch, I. 1996, "Rational herding in financial economics", *European Economic Review,* vol. 40, no. 3, pp. 603-615.

Fama, E.F. 1970, "Efficient Capital Markets: A Review of Theory and Empirical Work", *The Journal of Finance,* vol. 25, no. 2, pp. 383-417.

Forbes, K.J. & Rigobon, R. 2002, "No Contagion, Only Interdependence: Measuring Stock Market Comovements", *The Journal of Finance,* vol. 57, no. 5, pp. 2223-2261.

Henker, J., Henker, T., & Mitsios, A., 2006, "Do investors herd intraday in Australian equities?", *International Journal of Managerial Finance,* vol. 2, no. 3, pp. 196-219.

Hirshleifer, D. & Teoh, S. H., 2003, "Herd Behaviour and Cascading in Capital Markets: a Review and Synthesis", *European Financial Management,* vol. 9, no. 1, pp. 25-66.

Hwang, S. & Salmon, M. 2004, "Market stress and herding", *Journal of Empirical Finance,* vol. 11, no. 4, pp. 585-616.

Khan, H., Hassairi, S.A., & Viviani, J.L., 2011, "Herd Behavior and Market Stress: The Case of Four European Countries", *International Business Research,* vol. 4, no. 3, pp. 53.

Kahneman, D. & Tversky, A. 1979, "Prospect Theory: An Analysis of Decision under Risk", *Econometrica,* vol. 47, no. 2, pp. 263-291.

Keim, D.B. 1983, "Size-related anomalies and stock return seasonality: Further empirical evidence", *Journal of Financial Economics,* vol. 12, no. 1, pp. 13-32.

Lucey, B.M. 2008, "International influences on asset markets", *Journal of Multinational Financial Management,* vol. 18, no. 4, pp. 291-292

Lux, T., 1995 “Herd Behavior, Bubbles and Crashes”, *The Economic Journal,* vol. 105, no. 431, pp. 881-896

Nicholson, F., 1968, “Price Ratios in Relation to Investment Results,” *Financial Analysts Journal,* vol. 24, no. 1, pp. 105-109

Ohlson, P., 2010, “Herd Behavior in the Swedish Stock Exchange”, Masters Thesis Jönköping International Business School, pp. 1-36

Reinganum, M.R. 1983, "The anomalous stock market behavior of small firms in January", *Journal of Financial Economics,* vol. 12, no. 1, pp. 89-104.

Saastamoinen, J. (2008). Quantile Regression Analysis of Dispersion of Stock Returns- Evidence of Herd behavior, *Discussion Papers,* No. 57. University of Joensuu, Economics,

Scharfstein, D.S. & Stein, J.C. 1990, "Herd Behavior and Investment", *The American Economic Review,* vol. 80, no. 3, pp. 465-479.

Shefrin, H. 2002, *Beyond greed and fear: understanding behavioral finance and the psychology of investing,* Oxford University Press, Oxford.

Shiller, R.J. 2003, "From Efficient Markets Theory to Behavioral Finance", *The Journal of Economic Perspectives,* vol. 17, no. 1, pp. 83-104.

Shleifer, A. 2000, *Inefficient markets: an introduction to behavioral finance,* Oxford University Press, Oxford.

Tan, L., Chiang, T.C., Mason, J.R. & Nelling, E. 2008, "Herding behavior in Chinese stock markets: An examination of A and B shares", *Pacific-Basin Finance Journal,* vol. 16, no. 1, pp. 61-77.

Tessaromatis, N., & Thomas, V., 2009, "Herding Behavior in the Athens Stock Exchange", *Investment Management and Financial Innovations,* vol. 6, no. 3, pp. 156-164

Trueman, B., 1994, "Analyst Forecast and Herding Behavior, "*Review of Financial Studies,* vol. 7, pp. 97-124

Welch, I., 1992, "Sequential Sales, Learning and Cascades, " *Journal of Finance,* vol. 47, pp. 695-732

APPENDIX A: Industry Indices

Industry Indices	Den	Fin	Nor	Swe	EU	US
Exploration & Production			X	X	X	X
Integrated Oil & Gas		X	X		X	X
Oil Equipment & Services			X		X	X
Pipelines					X	X
Renewable Energy Equipment	X		X		X	X
Alternative Fuels					X	
Commodity Chemicals			X		X	X
Specialty Chemicals	X	X	X		X	X
Forestry					X	X
Aluminum			X		X	X
Nonferrous Metals		X		X	X	X
Iron & Steel		X		X	X	X
Coal					X	X
Diamonds & Gemstones						X
General Mining				X	X	X
Gold Mining					X	X
Platinum & Precious Metals					X	X
Building Materials & Fixtures	X	X	X	X	X	X
Heavy Construction	X	X	X	X	X	X
Aerospace	X			X	X	X
Defense			X		X	X
Containers & Packaging		X			X	X
Diversified Industrials	X	X	X	X	X	X
Electrical Components & Equipment	X	X	X		X	X
Electronic Equipment	X	X	X	X	X	X
Commercial Vehicles & Trucks		X	X	X	X	X
Industrial Machinery	X	X	X	X	X	X
Delivery Services					X	X
Marine Transportation	X	X	X		X	X
Railroads					X	X
Transportation Services	X				X	X
Trucking	X				X	X
Business Support Services		X	X	X	X	X
Business Training & Employment Agencies					X	X
Financial Administration					X	X
Industrial Suppliers	X		X		X	X
Waste & Disposal Services		X			X	X
Automobiles					X	X
Auto Parts				X	X	X

Industry Indices	Den	Fin	Nor	Swe	EU	US
Tires		X			X	X
Brewers	X	X			X	X
Distillers & Vintners					X	X
Soft Drinks					X	X
Framing & Fishing	X		X		X	X
Food Products	X	X	X	X	X	X
Durable Household Products		X		X	X	X
Nondurable Household Products					X	X
Furnishings			X	X	X	X
Home Construction					X	X
Consumer Electronics	X		X		X	X
Recreational Products		X		X	X	X
Toys					X	X
Clothing & Accessories	X				X	X
Footwear					X	X
Personal Products				X	X	X
Tobacco				X	X	X
Healthcare Providers		X		X	X	X
Medical Equipment	X			X	X	X
Medical Suppliers	X	X			X	X
Biotechnology	X			X	X	X
Pharmaceuticals	X	X	X	X	X	X
Drug Retailers					X	X
Food & Wholesalers		X		X	X	X
Apparel Retailers				X	X	X
Broadline Retailers		X	X		X	X
Specialized Consumer Services					X	X
Specialty Retailers			X		X	X
Broadcasting & Entertainment				X	X	X
Media Agencies					X	X
Publishing	X	X	X	X	X	X
Airlines		X	X	X	X	X
Gambling					X	X
Hotels				X	X	X
Recreational Services	X		X		X	X
Restaurants & Bars					X	X
Travel &Tourism	X	X			X	X
Fixed Line Telecommunications	X	X	X	X	X	X
Mobile Telecommunications			X	X	X	X
Conventional Electricity		X	X		X	X
Alternative Energy	X		X		X	X
Gas Distribution					X	X

Industry Indices	Den	Fin	Nor	Swe	EU	US
Multiutilities					X	X
Water					X	X
Banks	X	X	X	X	X	X
Full Line Insurance	X		X		X	X
Insurance Brokers					X	X
Property & Casualty Insurance	X	X			X	X
Reinsurance					X	X
Real Estate Holding & Development	X	X	X	X	X	X
Real Estate Services				X	X	X
Industrial & Office REITs					X	X
Retail REITs					X	X
Residential REITs					X	X
Diversified REITs					X	X
Specialty REITs					X	X
Mortgage REITs					X	X
Hotel & Lodging REITs					X	X
Asset Managers	X				X	X
Consumer Finance					X	X
Specialty Finance	X	X	X	X	X	X
Investment Services Mortgage Finance			X	X	X	X
Investment Companies					X	X
Investment Trusts					X	X
Exchange Traded Funds						X
Computer Services	X	X	X	X	X	X
Internet			X		X	X
Software	X	X	X		X	X
Computer Hardware			X	X	X	X
Electronic Office Equipment					X	X
Semiconductors			X		X	X
Telecommunications Equipment	X	X	X	X	X	X

Appendix B: Tables

Table 7: Estimation ofmarket-wide herding in the Nordic
This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,544***	-0,028	0,313***	-0,023	0,13
	(16,501)	(-0,637)	(2,909)	(-0,446)	
Fin	0,616***	-0,007	0,731***	-0,229*	0,18
	(12,606)	(-0,169)	(4,271)	(-1,822)	
Nor	0,637***	0,090**	0,243***	0,107**	0,26
	(20,209)	(2,296)	(2,911)	(2,029)	
Swe	0,591***	0,026	0,299***	-0,029	0,20
	(20,169)	(1,351)	(4,605)	(-1,078)	

The data range from 2/1/2001 to 31/12/2001. The explanatory power $\dot{R}^2_i$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 8: Estimation ofmarket-wide herding in the Nordic
This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,478***	0,015	0,307***	0,094	0,22
	(20,183)	(0,333)	(2,616)	(0,701)	
Fin	0,359***	-0,023	1,098***	-0,021	0,62
	(10,309)	(-0,388)	(6,501)	(-0,214)	
Nor	0,536***	-0,034	0,488***	-0,018	0,34
	(14,863)	(-0,859)	(4,564)	(-0,242)	
Swe	0,583***	0,025	0,370***	-0,035	0,29
	(16,868)	(1,179)	(4,968)	(-1,003)	

The data range from 1/1/2002 to 31/12/2002. The explanatory power $\dot{R}^2_i$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 9: Estimation ofmarket-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,490***	0,000	-0,306*	0,894***	0,13
	(16,172)	(0,001)	(-1,811)	(3,907)	
Fin	0,263***	-0,175***	1,265***	0,141	0,70
	(5,588)	(-3,821)	(4,520)	(0,624)	
Nor	0,536***	-0,018	0,087	0,232***	0,23
	(16,176)	(-0,503)	(0,737)	(3,383)	
Swe	0,509***	0,007	0,142	0,116	0,12
	(12,398)	(0,243)	(0,873)	(0,871)	

The data range from 1/1/2003 to 31/12/2003. The explanatory power $\dot{R}^2_i$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 10: Estimation ofmarket-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,381***	0,055**	0,141	-0,097	0,03
	(17,689)	(2,401)	(1,171)	(-0,741)	
Fin	0,278***	-0,065*	1,349***	-0,405***	0,38
	(6,480)	(-1,816)	(8,514)	(-3,920)	
Nor	0,400***	-0,056*	0,279**	-0,059	0,13
	(17,155)	(-1,865)	(2,256)	(-0,570)	
Swe	0,392***	0,039	0,135	0,028	0,13
	(18,890)	(1,628)	(1,547)	(0,373)	

The data range from 1/1/2004 to 31/12/2004. The explanatory power $\dot{R}^2_i$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 11: Estimation ofmarket-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,396***	0,048	0,225**	-0,043	0,09
	(24,070)	(1,324)	(2,309)	(-0,386)	
Fin	0,324***	-0,014	0,837***	0,012	0,35
	(8,509)	(-0,303)	(3,791)	(0,048)	
Nor	0,396***	0,046	0,003***	0,333***	0,26
	(21,340)	(1,219)	(0,034)	(2,949)	
Swe	0,369***	0,019	0,147*	-0,118	0,02
	(20,925)	(0,900)	(1,911)	(-1,551)	

The data range from 3/1/2005 to 30/12/2005. The explanatory power $\dot{R}^2$, is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 12: Estimation ofmarket-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,337***	-0,048	0,340***	-0,060	0,24
	(17,560)	(-1,126)	(2,753)	(-0,767)	
Fin	0,381***	-0,015	0,157**	0,046	0,23
	(22,335)	(-0,829)	(2,293)	(0,859)	
Nor	0,378***	-0,006	0,060	0,241***	0,40
	(17,004)	(-0,322)	(0,777)	(3,920)	
Swe	0,392***	0,014	0,107**	0,043*	0,23
	(21,550)	(0,816)	(2,170)	(1,772)	

The data range from 2/1/2006 to 29/12/2006. The explanatory power $\dot{R}^2$, is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 13: Estimation ofmarket-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,343***	0,002	0,208***	0,044	0,23
	(19,447)	(0,136)	(3,514)	(1,176)	
Fin	0,384***	0,043**	0,225**	0,040	0,04
	(14,393)	(2,082)	(2,317)	(0,583)	
Nor	0,307***	-0,005	0,253***	0,060	0,06
	(16,627)	(-0,317)	(3,441)	(0,894)	
Swe	0,363***	0,012	0,150**	0,041	0,24
	(16,354)	(1,036)	(2,227)	(0,883)	

The data range from 1/1/2007 to 31/12/2007. The explanatory power $\dot{R}^2_{;}$ is the adjusted.

The numbers in the paranthesis are t-statistics.

*Statistical signifiance at the 10 % level

**Statistical signifiance at the 5 % level

***Statistical signifiance at the 1 % level

Table 14: Estimation ofmarket-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,451***	0,019	0,392***	-0,004	0,53
	(14,108)	(1,272)	(5,542)	(-0,181)	
Fin	0,599***	0,034**	0,222***	0,021	0,30
	(16,351)	(2,154)	(3,123)	(0,842)	
Nor	0,395***	0,001	0,470***	0,001	0,63
	(13,490)	(0,047)	(6,220)	(0,051)	
Swe	0,524***	0,026**	0,229***	-0,005	0,39
	(15,667)	(2,555)	(4,669)	(-0,492)	

The data range from 1/1/2008 to 31/12/2008. The explanatory power $\dot{R}^2_{;}$ is the adjusted.

The numbers in the paranthesis are t-statistics.

*Statistical signifiance at the 10 % level

**Statistical signifiance at the 5 % level

***Statistical signifiance at the 1 % level

Table 15: Estimation ofmarket-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,406***	0,019	0,477***	-0,093	0,25
	(11,188)	(0,738)	(4,304)	(-1,492)	
Fin	0,497***	0,012	0,231***	0,018	0,26
	(12,715)	(0,734)	(2,738)	(0,482)	
Nor	0,367***	-0,009	0,370***	-0,024	0,36
	(10,829)	(-0,579)	(5,723)	(-0,959)	
Swe	0,425***	0,022	0,217***	0,014	0,36
	(11,813)	(1,551)	(2,721)	(0,440)	

The data range from 1/1/2009 to 31/12/2009. The explanatory power $\dot{R}^2_i$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 16: Estimation ofmarket-wide herding in the Nordic

This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,361***	0,002	0,078	0,097***	0,33
	(20,064)	(0,202)	(1,634)	(4,768)	
Fin	0,359***	0,000	0,139***	0,014	0,22
	(17,811)	(-0,025)	(3,122)	(1,024)	
Nor	0,280***	-0,003	0,117**	0,126***	0,56
	(16,999)	(-0,252)	(2,548)	(5,759)	
Swe	0,324***	0,000	0,099***	0,031**	0,28
	(19,094)	(-0,012)	(2,912)	(2,570)	

The data range from 1/1/2010 to 31/12/2010. The explanatory power $\dot{R}^2_i$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 17: Estimation ofmarket-wide herding in the Nordic
This table reports the regression results of CSAD based on equation 2

Market	γ_0	γ_1	γ_2	γ_3	adjusted $\overline{R^2}$
Den	0,372***	-0,021	-0,019	0,230*	0,42
	(12,271)	(-1,017)	(-0,136)	(1,932)	
Fin	0,363***	0,030**	0,158***	0,039	0,44
	(18,526)	(2,476)	(3,380)	(1,392)	
Nor	0,257***	0,020	0,184**	0,111**	0,49
	(15,067)	(0,947)	(2,532)	(2,133)	
Swe	0,295***	0,010	0,189***	0,035*	0,54
	(17,950)	(1,137)	(4,524)	(1,817)	

The data range from 3/1/2011 to 30/12/2011. The explanatory power $\dot{R}^2_i$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 18: Estimation of herding around the US market
This table reports the regression results of CSAD ased on equation 4

Market	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$
DK	0,255***	0,003	0,174***	0,032***	0,449***	-0,001	0,40
	(17,894)	(0,292)	(8,192)	(3,455)	(12,164)	(-0,279)	
FN	0,239***	0,015	0,585***	-0,112***	0,456***	-0,030***	0,28
	(12,587)	(1,335)	(10,721)	(-5,635)	(8,990)	(-3,666)	
NW	0,236***	-0,009	0,212***	0,037***	0,501***	-0,005	0,44
	(14,814)	(-0,915)	(8,350)	(3,185)	(11,569)	(-0,804)	
SD	0,215***	0,017***	0,155***	-0,008	0,629***	-0,0113*	0,46
	(15,027)	(3,314)	(9,840)	(-1,479)	(16,279)	(-1,866)	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\dot{R}^2_i$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 19: Estimation of herding around the European market

This table reports the regression results of CSAD ased on equation 5

Market	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$
DK	0,131***	0,006	0,156***	0,066***	0,907***	-0,061***	0,51
	(9,068)	(0,804)	(8,139)	(4,640)	(21,151)	(-4,494)	
FN	0,104***	0,005	0,417***	0,095**	1,048***	-0,213***	0,39
	(4,689)	(0,391)	(7,515)	(2,388)	(17,005)	(-5,468)	
NW	0,090***	-0,010	0,145***	0,054***	1,072***	-0,213**	0,56
	(6,516)	(-1,276)	(6,929)	(3,224)	(25,149)	(-5,468)	
SD	0,084***	0,012***	0,075***	0,022***	1,201***	-0,062***	0,61
	(7,019)	(2,588)	(6,009)	(2,801)	(31,068)	(-5,589)	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\dot{R}_{,}^{2}$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 20: Estimation of herding around the Swedish market

This table reports the regression results of CSAD based on equation 6

Region	Market	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$
Nordic	DK	0,185***	-0,005	0,175***	0,040***	0,472***	-0,012**	0,47
		(14,115)	(-0,612)	(7,631)	(3,187)	(19,544)	(-2,121)	
	FN	0,100***	0,013	0,515***	-0,010	0,655***	-0,090***	0,39
		(5,213)	(1,174)	(10,157)	(-0,381)	(19,113)	(-5,153)	
	NW	0,126***	-0,017*	0,175***	0,055***	0,609***	-0,016*	0,56
		(9,929)	(-2,211)	(8,351)	(4,270)	(26,548)	(-1,854)	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\dot{R}_{,}^{2}$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 21: Estimation of herding around the Norwegian market

This table reports the regression results of CSAD based on equation 7

Region	Market	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$
Nordic	DK	0,197***	0,002	0,218***	0,040***	0,451***	-0,058***	0,47
		(16,560)	(0,227)	(9,272)	(2,863)	(19,222)	(-6,763)	
	FN	0,177***	0,007	0,550***	-0,049*	0,501***	-0,118***	0,34
		(8,368)	(0,597)	(10,037)	(-1,892)	(13,533)	(-4,786)	
	SD	0,186***	0,015***	0,171***	0,006	0,532***	-0,066***	0,51
		(16,982)	(2,954)	(10,611)	(0,760)	(24,369)	(-6,814)	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\dot{R}^2_{;}$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 22: Estimation of herding around the Finnish market

This table reports the regression results of CSAD based on equation 8

Region	Market	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$
Nordic	DK	0,298***	0,000	0,264***	0,069***	0,190***	-0,060***	0,35
		(21,659)	(0,009)	(7,857)	(4,231)	(10,267)	(-5,852)	
	NW	0,267***	-0,012	0,262***	0,066***	0,245***	-0,043***	0,42
		(17,892)	(-1,293)	(9,284)	(3,988)	(12,504)	(-2,966)	
	SD	0,273***	0,009	0,214***	0,029***	0,273***	-0,075***	0,41
		(21,183)	(1,516)	(10,815)	(3,322)	(14,448)	(-6,901)	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\dot{R}^2_{;}$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level

Table 23: Estimation of herding around the Danish market

This table reports the regression results of CSAD based on equation 9

Region	Market	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5	adjusted $\overline{R^2}$
Nordic	FN	0,204***	0,003	0,526***	-0,008	0,464***	-0,145***	0,32
		(9,100)	(0,270)	(9,826)	(-0,257)	(10,891)	(-3,5928)	
	NW	0,163***	-0,011	0,194***	0,059***	0,565***	-0,046**	0,50
		(9,913)	(-1,312)	(8,424)	(3,332)	(15,815)	(-2,025)	
	SD	0,203***	0,012*	0,159***	0,014	0,522***	-0,059***	0,45
		(14,682)	(2,225)	(9,300)	(1,660)	(18,761)	(-4,740)	

The data range from 1/1/2001 to 30/12/2011. The explanatory power $\dot{R}^2_{;}$ is the adjusted.
The numbers in the paranthesis are t-statistics.
*Statistical signifiance at the 10 % level
**Statistical signifiance at the 5 % level
***Statistical signifiance at the 1 % level