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Detecting Herd Effect on Nordic stock markets

Evidence from Finland, Sweden, and Denmark

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ABSTRACT:

This master's thesis investigates herding behavior and how it transpires in the Nordic stock markets of Finland, Sweden, and Denmark, over the study period from 2013 to 2023. Herding behavior is characterized as an act when an investor discards their own information and knowledge and follows the market trend. By utilizing daily stock return data from the chosen markets, the thesis applies methodologies from previous herding investigations to detect market-wide herding under different market conditions and time frames.

By utilizing CSAD methodology, the aim is to determine whether investors in the Finnish, Swedish and Danish stock markets exhibit herding behavior and additionally, if the herding behavior varies during different market conditions, such as up- and down-market times.

The findings of this study conclude different herding results across the chosen stock markets. From the Swedish stock market, herding behavior can be detected and from the Finnish and Danish stock markets, no significant evidence of herding behavior is detected. The results suggest that Swedish investors are more affected by market trend, especially during extreme market movements. The no significant evidence of herding behavior from the Finnish and Danish markets, indicates a diverse response from investors under varying market conditions.

The findings of this study provide insights to the prevailing knowledge on herding behavior in the Nordic stock markets. The Finnish and Danish stock markets are developed markets and have higher stock market efficiency, resulting in decreased occurrence of herding behavior. In Sweden, during extreme market movements, the Swedish investors have still had the tendency to exhibit herding behavior.

KEYWORDS: Herding, herding behavior, Behavioral finance, Nordic markets, Cross-sectional absolute deviation

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TIIVISTELMÄ:

Tässä tutkielmassa tarkastellaan laumakäyttäytymistä ja sen ilmenemistä Pohjoismaisilla osakemarkkinoilla Suomessa, Ruotsissa ja Tanskassa tutkimusjaksolla 2013–2023. Laumakäyttäytyminen voidaan määritellä toimintana, jossa yksittäinen sijoittaja hylkää omat tietonsa ja asiantuntemuksensa ja seuraa muiden sijoittajien toimintaa markkinoilla eli markkinoiden yleistä suuntaa. Hyödyntämällä päivittäisiä osaketuottoja kyseisiltä markkinoilta, tutkielmassa pyritään havaitsemaan laumakäyttäytymistä erilaisissa markkinatilanteissa sekä eri ajanjaksoilla.

CSAD-menetelmää hyödyntäen, tutkielman tavoitteena on selvittää, havaitaanko Suomen, Ruotsin ja Tanskan osakemarkkinoilta laumakäyttäytymistä ja lisäksi, vaihteleeko laumakäyttäytyminen eri markkinatilanteiden, kuten nousu- ja laskumarkkinoiden aikana.

Tehdyn tutkielman tulokset paljastavat vaihtelevia laumakäyttäytymisen esiintymisiä tutkituilla osakemarkkinoilla. Ruotsin osakemarkkinoilla on havaittavissa laumakäyttäytymistä, kun taas Suomen ja Tanskan osakemarkkinoilla merkittävää näyttöä laumakäyttäytymisestä ei ole havaittavissa. Tutkimuksen tulokset viittaavat siihen, että Ruotsin osakemarkkinoiden sijoittajat reagoivat herkemmin markkinoiden suunnan muutoksiin. Se, että Suomen ja Tanskan markkinoilta ei ole havaittavissa laumakäyttäytymistä viittaa, että sijoittajat kyseisillä osakemarkkinoilla reagoivat eri tavoin markkinatilanteen muutoksiin.

Tutkimuksen tulokset tarjoavat uutta tietoa Pohjoismaiden osakemarkkinoiden laumakäyttäytymisestä. Suomen ja Tanskan osakemarkkinat ovat kehittyneitä ja kyseisten markkinoiden markkinatehokkuus on korkea, mikä vähentää laumakäyttäytymisen ilmentymistä. Tutkimuksen tulokset viittaavat siihen, että Ruotsissa sijoittajilla on taipumusta laumakäyttäytymiseen muuttuvissa markkinatilanteissa.

KEYWORDS: Laumakäyttäytyminen, behavioristinen rahoitus, Pohjoismaiden osakemarkkinat, Cross-sectional absolute deviation

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Abbreviations

CAPM	Capital Asset Pricing Model
EMH	Efficient Market Hypothesis
SML	Security Market Line
SMB	Small Minus Big
HML	High Minus Low
CSAD	Cross-sectional Absolute Deviation

1 Introduction

The investor behavior in the financial markets is a central and critical field of study, as the investor behavior directly affects market efficiency, asset pricing and is a sense, mostly the market stability. Traditional financial theories, such as the Efficient Market Hypothesis (EMH), presume that the market participants act rationally and process all available information to make unbiased investing decisions. Yet, empirical evidence reveals that psychological and social factors do influence the investing decisions of the market participants, leading to deviations from rational behavior. Herding, a phenomenon where investors follow the actions of others rather than their own information, can significantly affect market conditions, resulting in increased volatility and potential market inefficiencies.

1.1 Purpose of the study

The investigation of this thesis aims to detect and analyze herding behavior in the Nordic stock markets of Finland, Sweden, and Denmark over the chosen period from 2013 to 2023. By utilizing methodologies adapted from previous studies, such as Chiang and Zheng (2010) and Chang, Cheng, and Khorana (2000), the research will investigate the prevalence of herding under different market conditions and during different time frames. The findings of this investigation aim to contribute to the ongoing academic understanding of herding behavior in developed markets, offering new information if and how herding behavior is implicated in the Nordic region.

The investigation of this thesis will focus on identifying market-wide herding under different market conditions. The aim of the investigation is also to detect if herding behavior changes during separate years. By analyzing daily stock return data from the chosen markets, the thesis aims to provide evidence on whether investors in these markets tend to imitate the actions of other investors, herd.

1.2 Contribution to the prevailing literature

Investigations of herding behavior in both emerging and developed stock markets have been conducted, but the research of herding behavior in the Nordic countries is limited. This thesis contributes to the prevailing literature by conducting a focused investigation of herding within the Nordic markets—regions known for their developed and efficient financial systems. Another contribution of the thesis to the prevailing literature is providing findings with the latest data for the Finnish, Swedish and Danish markets. Additionally, the chosen investigation period 2013-2023 includes the starting time of COVID-19 pandemic, which provides additional insight if and how the pandemic affected the herding behavior in the Finnish, Swedish and Danish stock markets.

1.3 Structure of the study

The thesis begins with an introduction to the subject and provides the aims of the study. In chapter 2, the theoretical foundations of traditional finance theories are being presented and discussed how behavioral finance challenges the traditional finance theories. Chapter 3 presents the concept of herding behavior, providing a psychological and theoretical background to explain why and how investors follow the behavior of other market participants. Chapter 4 is a review of previous literature, investigating herding behavior on international markets and especially on Nordic markets. The prior conducted Nordic herding investigations serve as the basis for formulating the hypotheses of this thesis. Chapter 5 presents the methodology used to detect herding behavior in the chosen stock markets. Chapter 6 describes the data and provides descriptive statistics, presenting an overview of the stock return distributions in Finland, Sweden, and Denmark during the investigation period. Chapter 7 represents the empirical findings, demonstrating whether herding behavior is present in the chosen markets and under what conditions. Chapter 8 is the conclusion of the thesis, and it summarizes the findings and suggests areas for future research.

2 Theoretical background on traditional finance

Traditional finance presumes that the participants, meaning individual investors and institutions would be rational and the individual people and institutional investors would make unbiased decisions only by following their self-interests (Baker et al., 2014). The idea of markets participants being rational and only self-interests driven, led to different classical theories of the traditional finance. One of these theories is the classical decision theory, which presumes that investors, as the rational decisions makers, evaluate all the possible outcomes. The optimal choice of the rational investor is driven by finding the highest possible risk adjusted expected return (Baker et al., 2014). That leads to the assumption that rational investors are averse to risk and if taking a risk, there must be a compensation for it (Baker et al., 2014). To add, rational as a definition is not that unambiguous, meaning an investor can rationally decide to act irrationally. The positive trade-off between risk and return serves as the basis for other financial theories that also support the view of traditional finance (Baker et al., 2014). These concepts are Capital Asset Pricing Model (CAPM), Security Market Line (SML), Efficient Market Hypothesis (EMH) and Multifactor models.

2.1 Efficient Market Hypothesis

The history of Efficient Market Hypothesis, referred as EMH, can be separated to three different stages. The first stage of the history of EMH occurred during 1960s with the construction of EMH (Delcey, 2017). Subsequently, in the second stage, the EMH gained widespread knowledge and acceptance after empirical corroboration in the 1970s (Delcey, 2017). The third and final stage in the history of the EMH occurred in the 1980s and it beheld an increase in empirical studies that challenged the EMH (Delcey, 2017). The empirical inquiries that challenged the EMH served as a transition to alternative approaches like Behavioral Finance (Delcey, 2017).

The EMH has been a central theory of finance since the second stage of its history in the 1970s. EMH is both one of the most controversial theories and extensively researched

concepts in the field of finance (Sewell, 2012 p. 164). With the advancements in data quality, quantity, and statistical methodologies in subsequent decades, the issues regarding the validity of the EMH have diminished considerably (Sewell, 2012 p. 1649).

So, not too many generations ago the EMH had widespread acceptance and recognitions among the academic financial economists. A significant contribution for this widespread acceptance is Eugene Fama's (1970) article "Efficient Capital Markets". During that era, there was a prevailing assumption that securities markets exhibited an exceptional efficiency when it comes to reflecting fundamental information about individual stocks and overall market conditions (Burton, 2003). The widely accepted view and belief was that when new information arises, it is clear and obvious that the news spread very quickly and it leads to immediate and comprehensive adjustments in prices, without any delay. In the article "Efficient Capital Markets" Eugene F. Fama himself defines efficient markets in a following way: "A market in which prices always fully reflect available information is called efficient" (Fama 1970; Burton, 2003). The most radical saying of the EMH by Eugene Fama's definition is its dismissal of trading systems, that can beat the expected profits or returns based solely on the information that was currently available (Fama 1970; Shleifer 2000).

The EMH relies on three additional arguments, each argument built on progressively weaker assumptions than the preceding one (Shleifer, 2000). First one of these arguments presumes that investors are rational when it comes to the value of the securities (Shleifer, 2000). The second argument that EMH claims is that some investors are not rational, leading to random investment trades. Therefore, the random trades that the irrational investors do, offsets each other's impact on the securities' prices (Shleifer, 2000). The third and last argument discloses that when irrational investor behavior aligns with each other in financial markets, rational arbitrageurs emerge in the market to counteract the influence of irrational investors on prices (Shleifer, 2000). Assuming that there are no limits to arbitrage.

The above mentioned second argument of the EMH alleges that when investors are being irrational, their trades are random. That resulting in cancellation effect where the trade actions of the irrational investors offset each other, leaving the prices unaffected. This notion imparts that the investor's purchases and trading are weakly correlated with each other (Yalçın, 2010. p. 28). This phenomenom, the so called cancellation, has received critics regarding its validity and occurrence in the real financial markets. If cancellation would exist in the financial markets, there would be no possibility to detetct herding. De Long et al. (1990) states how irrational investors indeed have an impact and affect to the prices of the stocks and do not cancel each other out. De Long (1990) even further explains how the irrational investors create risk in the financial markets, which blocks the willingness of the arbitragers to take a position against the irrational investors in order to make profit, phenomenon known as noise trader risk.

2.2 Versions of Efficient Market Hypothesis

From the EMH arises three distinct versions, each differing in their interpretation of the term "all available information" (Bodie et al., 2014). The first form of EMH is the weak-form hypothesis which discloses that stock prices already incorporate all detectable information from market trading data (Bodie et al., 2014 p. 353-354). Market trading data meaning the history of prices in the past, the volume of the trading or short interest. According to the weak-form of the EMH, analyzing trends is "fruitless" because past stock price data is publicly available and easily accessible to all at no cost (Bodie et al., 2014 p. 353-354). The assertion of the weak-form EMH is that if market trading data contained valuable information for maximizing profit, every investor would have learned to exploit it (Bodie et al., 2014, p. 353-354). As known, buy signal will result to the increase of prices, so the weak-forms signal will ultimately lose its value because it becomes widely known among the investors (Bodie et al., 2014 p. 353-354).

The other version of the EMH is the semistrong-form hypothesis. The semistrong-form hypothesis posits that all information, public and possible to everyone to possess and regarding the prospects of a certain company, should already be reflected to the stock

price (Bodie et al., 2023, p. 346). So, the “all information” includes information that is known to all market participants, demanding that the information is publicly available (Sewell, 2012 p. 164). All information in this concept includes in addition to the past prices also the fundamental data concerning the company’s product line, the quality of the management, patents that the company possesses, forecasts of the company’s future earnings and accounting practices that the company uses (Bodie et al., 2014 p. 353-354). Similar to the weak-form hypothesis, the semi-strong form implies that if investors have access to such information as mentioned above, its reflection in stock prices would be awaited (Bodie et al., 2014, p. 353-354). Bubbles

Last version of the EMH is the strong-form. The strong-form of the hypothesis asserts that stock prices mirror all information that is in any way relevant to the company, even meaning the information that is only available to distinct amount of people for example, company insiders (Bodie et al., 2014 p. 354). Defining inside trading presents a challenge, so the strong form of the hypothesis can be uttermost but the line between private information and inside information can sometimes be hazy (Bodie et al., 2014 p. 354).

One commonality among all the three forms of EMH is their assertion that prices should reflect all available information (Bodie et al., 2014, p. 354). However, this does not guarantee that stock prices will always precisely reflect the information. There are instances when looking back to prices, that stocks may have been overvalued, leading to excessively high prices, or undervalued, resulting in extremely low prices. The fundamental assertion of the EMH is that with all information available at the given time, it is impossible to determine whether current prices will eventually in the long run prove to be too high or too low (Bodie et al., 2023, p. 347). If markets are indeed rational, it is expected that prices can be on average correct (Bodie et al., 2014, p. 354).

However, the EMH, already in its weak-form, struggles to hold true in the real financial markets, as evident by the different anomalies in the stock markets like over- or underreactions to earnings information or the influence of the investor sentiment on

stock prices (Bernard et al., 1994). These mentioned deviations prove that the historical price data is not fully integrated into the market prices, which leads to challenge rationale behind the stronger forms of EMH, if even the first weakest form is not applicable in the real financial markets (Bernard et al, 1994). The occurrence of such inefficiencies in the financial markets questions the reliability of the financial markets to "fully" reflect all available information and spurs the investor to consider other perspectives concerning the efficiency of the markets and explore methods beyond those predicated solely on EMH assumptions.

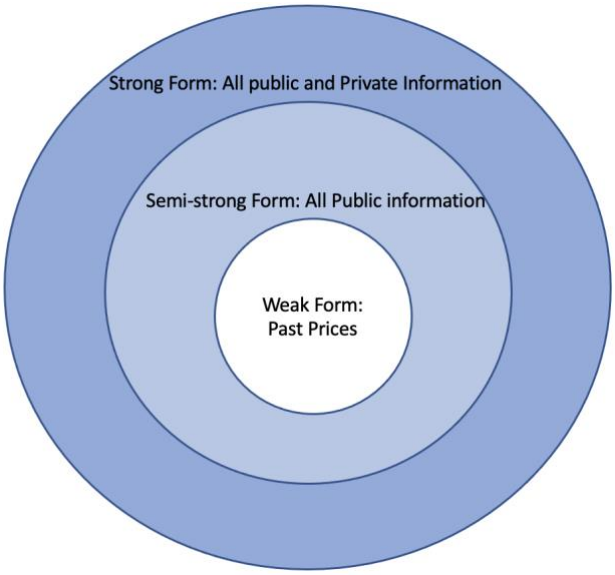

***Figure 1*: Three versions of Efficient Market Hypothesis.**

2.3 Capital Asset Pricing Model and Security Market Line

2.3.1 Background of Capital Asset Pricing Model

A profound question in finance has always been, and still is, how the risk of an investment should affect its expected return (Perold, 2004). The Capital Asset Pricing Model (CAPM) presented the first cohesive framework for answering this enduring question. Harry Markowitz was the one who established the foundation of modern portfolio theory (MPT) in 1952 (Bodie et al., 2023). The CAPM was published by William Sharpe, John Lintner and Jan Mossin 12 years later. The timeframe of publishing CAPM

indicates that the portfolio selection model done by Markowitz 12 years earlier, is not insignificant on the conduction of CAPM (Bodie et al., 2023).

Like EMH, CAPM holds assumptions about the investors and the financial markets. The assumptions about the investors, especially about the investor behavior, allows to presume that investors are alike in the most important ways. Meaning, that investors are rational mean-variance optimizers and further with common time horizon and possess the common set of information (Bodie et al., 2023). The assumptions about the financial markets concern the market setting, claiming that the financial markets are well-functioning and with few impediments when it comes to trading (Bodie et al., 2023). Meaning, that the financial markets would be perfect in multiple senses (Perold, 2004). Transaction costs, short selling restrictions or taxes are nonexistent (Perold, 2004). The same set of information is free and available to every investor and additionally, every investor can borrow or lend money at the risk-free rate (Perold, 2004). Every investor is seen to have the possibility and access to same investment opportunities (Perold, 2004). Even a prompt examination concerning these assumptions exposes that the assumptions are fairly strong and arises suspicion whether the actual theory will tolerate empirical tests (Bodie et al., 2023). The assumptions are comprehensibly simplified and would fulfill in idealized world, but they are necessary to obtain the CAPM in its basic form (Perold, 2004).

The simplified assumptions of CAPM leads to the situations where CAPM fails to perform effectively in the real financial markets. The above-mentioned assumptions of CAPM overlook behavioral biases and financial market imperfections, for example informational asymmetry and varying risk preferences among the investors. To add, empirical study reveals that the CAPM does not adequately measure risk in the case of small-cap and value stocks (Fama & French, 1992). Lastly, different anomalies could not affect the price of an asset based on CAPM, meaning herding behavior would not affect stock pricing. Even though CAPM has been introduced as a foundational model, it can be

stated that in the reality of capturing the many complexities of financial markets, CAPM is inefficient.

2.3.2 Theory of CAPM

Modern Portfolio Theory (MPT) claims that rational investors utilize diversification to optimize their portfolio (Baker et al., 2014). MPT arises from the idea that even though the return of a portfolio is calculated from the average returns of each asset in the portfolio and multiplied by its' weight in the portfolio, for the portfolio's risk calculation, the same logic does not apply (Baker et al., 2014; Markowitz, 1952). The risk of the portfolio is contingent on the correlation between the assets' expected return (Baker et al., 2014; Markowitz, 1952). It is possible to the investors to decrease the risk of the portfolio by increasing the number of stocks in the portfolio, presuming that the stocks are not perfectly correlated with each other. Meaning, there is a possibility for the investor to reduce the portfolio's overall risk by selecting stocks that are correlated with each other as marginally as possible (Baker et al, 2014). So, the risk that an individual stock bears cannot be determined in isolation of the other stocks when an investor is constructing the most optimal portfolio (Baker et al., 2014). Diversification enables the investor to diminish some of the portfolio's risk (Baker et al., 2014). Meaning, there is a risk to which the investor is capable to react and shelter from, called unsystematic risk. Some risks are not diversifiable because the same risks affect the entire stock markets, and that is called the systematic risk (Baker et al., 2014)

The theory of CAPM derives from the idea of unsystematic and systematic risk. Investors who are willing to take risk, should be appropriately compensated, but the compensation can't be given from the unsystematic risk that the investor can avoid by diversification (Baker et al., 2014). CAPM provides an appropriate approach for this exact compensation matter. CAPM effectively measures the link between a certain stock's movement and the volatility of the overall stock market (Baker et al., 2014). CAPM provides a measure of risk of a certain security called beta (β) (Baker et al., 2014). Beta measures the sensitivity of a certain stock's return in comparison to the market. Meaning,

every security possesses its' own specific beta. The beta of the financial markets it 1.0 and the beta of a risk-free asset is 0 since there is no existing risk (Baker et al., 2014). If a stock's beta is higher than 1, it means the stock's returns are more sensitive to the movements of the markets. Consequently, if a stock's beta is less than 1, the stock's returns are less sensitive to the market movements. By utilizing this information, the most common version of CAPM can be derived:

$$\mathrm{E}(r_i) = r_f + \beta_i \left[r_m - r_f\right], \qquad (1)$$

where $\mathrm{E}(r_i)$ is the expected return of an asset i, r_f is the risk-free rate, β_i is the beta of the asset i, r_m is the expected market return, and $\left[r_m - r_f\right]$ is the market risk premium.

2.3.3 The Security Market Line

The expected return of a security and its relationship with beta is a reward-risk equation (Bodie et al., 2023). Like stated before, the beta of a stock is the most applicable measure of its risk because the beta is proportional to the risk that the stock contributes to the optimal risky portfolio (Bodie et al., 2023). An investor described as a risk-averse and mean-variance optimizer, measures optimal risky portfolio's risk by its variance (Bodie et al., 2023). That is, it can be anticipated that the risk premium on an individual asset is dependent on its contribution to the risk of the portfolio (Bodie et al., 2023). The beta measure of a stock indicates the stock's contribution to the variance of the market portfolio. Leading to the argumentation that the required risk premium on a security is a function of beta (Bodie et al., 2023). CAPM affirms this argument by disclosing with even further notions that the security's risk premium is directly proportional to both the beta and the risk premium of the market portfolio (Bodie et al., 2023). Like stated in the CAPM, the risk premium equals $\beta_i \left[r_m - r_f\right]$ (Bodie et al., 2023). The relationship between the expected return and beta can be graphically visualized, and the visualization is the Security Market Line (SML).

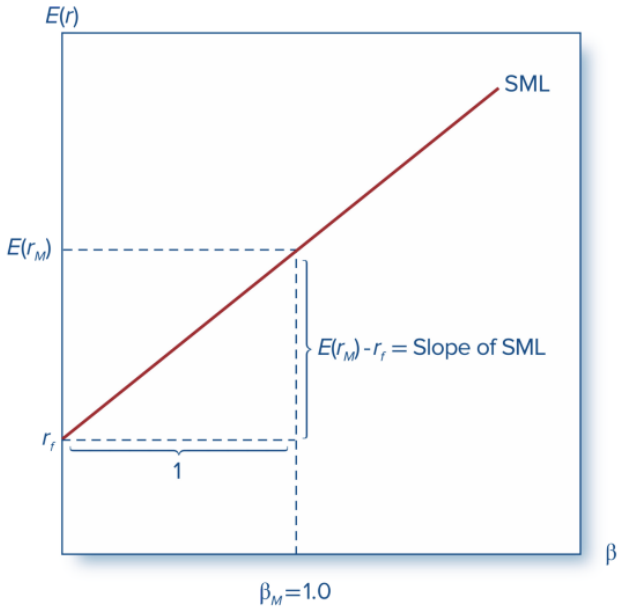

Figure 2: **Security Market Line (Bodie et al., 2023. p. 291)**

The underlying idea of SML is to visualize an individual asset risk premiums as a function of asset risk (Bodie et al., 2023). The significant metric for evaluating risk of individual assets within diversified portfolios is not the assets standard deviation nor the variance, but the assets contribution to the portfolio's variance, that is measured by the asset's beta (Bodie et al., 2023). The SML is valid to utilize for efficient portfolios and individual assets. The SML serves as a benchmark for assessing investment performances. SML provides the expected rate of return investors require as a compensation for the beta risk and time value of money, a positive slope (Bodie et al., 2023). Investors are not willing to endure risk, if they are not getting more payment for it. Since, SML being the graphic illustration of the relationship between expected return and beta, the "fairly priced" assets plot precisely on the SML. In other words, their expected returns correspond proportionally with the level of risk they possess. In the scenario of market equilibrium, all securities are plotted on the SML (Bodie et al., 2023).

2.4 Multifactor models and extensions to CAPM

The theoretical framework of the CAPM has been employed by many researchers to include new additional factors to improve the asset pricing beyond the standard CAPM. Fama and French (1992) introduced one of the most commonly recognized multifactor models, the three-factor model. Fama and French (1992) identified the limitations of CAPM concerning the assessment of the returns of value and small-cap companies. A size of a company and the book-to-market value that a firm has, carries as an effectual explanatory factor to the expected return of a company (Fama & French, 1992).

The Fama and French (1992, 1993) three-factor model extends the standard CAPM by incorporating two new factors, size, and value. Fama and French (1993) conclude that the returns on average on smaller firms are better when comparing to larger firms, when measured by the level of market equity. Additionally, Fama and French (1993) state that companies with higher book-value/market capitalization ratios have found to outperform companies with lower ratio. Meaning, the relationship between the proportion of a company's book-value to the company's market capitalization and to the company's stock performance is positive. The equation of the Fama and French (2015) three-factor model is the following:

$$E(r)_i = r_f + \beta_i\left(r_m - r_f\right) + \beta_{i2}(SMB) + \beta_{i3}(HML) + e_i, \quad (2)$$

where $E(r)_i$ is the expected return of the security, r_f the risk-free rate, β_i beta of the security, $\left(r_m - r_f\right)$ is the market risk premium, β_{i2} is the beta for the size factor Small Minus Big (*SMB*), β_{i3} is the beta for the value factor High Minus Low (*HML*) and lastly e_i is the zero-mean residual.

The *SMB* factor explains how the size of a firm affects the stocks returns. Like stated before, when viewing the past returns, the small-cap companies have better returns when comparing to large-cap companies. To equate the *SMB* factor, the difference

between the stock returns of small and large companies is calculated. To detail, the *HML* factor is incorporated due to the past higher returns among companies with higher BV/MV ratio, value companies, when comparing to companies with lower ratio, the growth companies. The HML factor is equalized with the same manner as SML factor, meaning the difference in returns between high BV/MV ratio companies and low ratio companies.

In addition to the three-factor model, Fama and French (2015) expands the three-factor model to five-factor asset pricing model because of occurring limitations in the three-factor model. Novy-Marx (2013) finds a proxy for expected profitability that is closely associated with average return (Fama & French, 2015). Additionally, a reliable relationship between investing and the average return is found that enhances the criticism towards the three-factor model (Fama & French, 2015; Aharoni, Grundy & Zeng, 2013). The evidence from these studies indicates that significant proportion of the variation in the average returns related to profitability and investments is left unexplained by the three-factor asset pricing model (Fama & French 2015).

That leading to the foundation of the five-factor model with two new factors: investment and profitability. The added profitability is Robust Minus Weak (*RMW*) which represents the contrast in returns between portfolios of stocks with robust and weak profitability, and Conservative Minus Aggressive (*CMA*) describes the difference in returns between portfolios of stocks from low and high investment companies (Fama & French, 2015). The equation for five-factor model is the following (Fama & French, 2015):

$$E(r)_i = r_f + \beta_i\left(r_m - r_f\right) + \beta_{i2}(SMB) + \beta_{i3}(HML) + \beta_{i4}(RMW) + \beta_{i5}(CMA) + e_i$$

where, in addition to equation (2) β_{i4} is the beta for the factor (*RMW*) and β_{i5} is the beta for the factor (*CMA*).

3 Herd Effect

The concept of herd effect has been an intriguing topic of research across different field of studies for a longer period of time, as it shows how individuals abandon their own knowledge and conform to the decisions made in a certain group. A classic study conducted from herding behavior is the Asch conformity experiment, where paid participants were instructed to give incorrect answers to simple questions to see if or how one unpaid individual participant would provide his answers. The one unpaid participant started to conform his answers to the same answers as the paid participants gave, already in the second round of questions, even though he knew he was giving the wrong answers. Solely this experiment reveals the power of herding behavior, where the collective behavior overrules the individuals' decisions. If herding behavior can affect in one room experiment, how can herding behavior affect the financial markets as a whole?

3.1 Psychology behind Herd Effect

The fundamental premise of classical economic theory is that investment decisions are driven by rational thought processes, using all the possible and available information concerning the matter (Scharfstein et al., 1990). However, herd behavior presents an alternative perspective to this matter. Unlike classical economic theory, herd behavior proposes that individual's investment decisions are also affected by group psychology, particularly the decisions of other investors (Scharfstein et al., 1990).

Herding behavior is considered as a form of convergent social behavior (Raafat et al., 2009. p. 420). Herding behavior can be widely defined as the alignment of the thoughts and behaviors of an individual in a group, through the interaction of the group and also without any centralized coordination (Raafat et al., 2009. p. 420). In other words, herding behavior can be explained from the perspective of convergent social behavior in a following way. When an individual is part of a group, they tend to reassess their own thoughts and behaviors based on the prevailing sentiments and actions of the group as a whole. Consequently, the individual may change and adapt their behavior or thoughts

to align with those of the group, even in the absence of centralized coordination. So, herding behavior is a phenomenon where individuals are following a group of people for a specific period of time, even though their individual information and knowledge is telling a different course of action (Rook, 2006. p. 75).

The main elements behind the herd behavior are the fundamental characteristics of our mind (Kameda et al., 2015 p. 5). These characteristics encompass our capacity to adapt and assimilate different social norms (Simon 1990; Kameda et al., 2015. p. 5). Herbet Simon concluded in the year 1990 that the tendency to depend on other people suggestions, recommendations, and information through the platforms of social media, are the main grounds of individuals decision making (Simon 1990; Kameda et al., 2015. p. 5). From a perspective of social psychology of herd behavior, it is perceived that herding phenomenon fosters the development of social norms for individuals and establishes generally shared expectations within specific groups (Kameda et al., 2015. p. 5). These expectations guide individual about what kind of reaction constitutes as normal, acceptable, and good response to a certain situation (Kameda et al., 2015. p. 5). This applies equally in the decisions that individual makes concerning financial decisions for example, to sell or not to sell a certain stock.

The human mind is inherently susceptible to the influence of others' stories and beliefs, which can amend an individual's own beliefs and decisions significantly. A significant influence on individuals' beliefs and decisions has stories and beliefs shared in a certain community that the individual is a part of himself or herself (Kameda et al., 2015. p. 5). The beliefs shared in a certain community that an individual is a part of, furthers and encourages the individual to construe, feel, experience, and react to a certain information in alignment with the others in the community (Kameda et al., 2015. p. 5). Thus, if an individual identifies to the group of "investors", even in board understanding, she or he will be under the significant influence of the other investors and their believes, and individual's own beliefs and information may become overshadowed by herd behavior. The investor will follow the action of the other investors in the believe that it

was the right decision even though subsequently the decision would occur as the wrong one.

The capability of individuals mind to be affected by other people, so called social receptivity of an individual mind, can result in different phenomena and effects that are visible at the general societal level (Kameda et al., 2015. p. 6). That leading to the situation that the individual's social receptivity has a significant impact for example to the amplitudes of financial crises that have occurred in the real financial markets. Under the pressure of social receptivity, individual investors often act in alignment with the behavior of other investors in the financial markets, disregarding their own information and knowledge. These individual actions consequence as "spillover effects," or externalities, among economists, that can result to rapid spread of similar actions throughout society, even across entire countries (Granovetter, 1978; Kameda et al., 2015, p. 6).

Informational cascades are a vivid and veritable example of rational conformity amongst individuals (Kameda et al., 2015. p. 6). An informational cascade arises when an individual has observed and followed the actions of others and follows the consensus, the preceding actions of the others without considering the information and knowledge that the individual has (Kameda et al., 2015. p. 6). In the situation of informational cascades, it is optimal to the individual to follow the consensus rather than make own decisions (Kameda et al., 2015. p. 6). Herding behavior in financial markets is regarded as one of the forms of informational cascades because of its collective nature (Kameda et al., 2015. p. 6).

It has been argued that ultimately, individuals base their choices solely on previous decisions and the consensus, and the so-called rational decision maker is disregarding their own information and knowledge on the matter (Kameda et al., 2015. p. 7). The decision is purely made by the previous acts. The same phenomena proceeds and this repetitive behavior of individuals produces an informational cascade (Kameda et al.,

2015. p. 7). The main problem and challenge of this informational cascade and herding effect is that if the first decisions and the consensus among the individuals can be subsequently misguided and incorrect, meaning the informational cascade can results into faulty result (Banerjee, 1992; Anderson et al., 2008; Kameda et al., 2015 p. 7). This meaning, in the context of real financial markets, during a financial crisis, an individual investor starts relying solely on the act of others and trust that the consensus among other investors is the only right and rational response, the financial crisis can only worsen and accelerate if the consensus was erroneous all along.

Herd behavior was understood and seen at first as an irrational and unconscious occurrence and process of the human mind. However, studies made of the converge in groups made the understanding and notion expand and change (Rook, 2006. p. 84). The expanded and evolved understanding of herd behavior uncovered that the herding behavior stems from the attempts of an individuals to understand and fit to the social reality (Sherif, 1936; Rook, 2006. p. 84). In these studies, it was highlighted that so-called reference group had a significant influence on the individual. Meaning, when uncertain about how to react and behave, individual exploits the reference group and tests their own conception of the social reality trough the reference group and their actions (Festinger 1954; Rook, 2006 p. 84).

Moreover, individuals who possess widely and commonly known higher status or occupation have even more significant impact on the decision-making and behavior of other individuals. The status of the individual in the reference group emphasizes the influence that the reference group has (Festinger 1954; Rook, 2006 p. 84). Put simply, when an individual is uncertain of a particular financial decision, a person that is widely known in the field of finance has a significant impact to the individual's decision. Although, the advice from such a person may be based solely on their own opinion and experience, their status in the field of finance enhances the perceived reliability and truthfulness of the message in the eyes of the individual facing the investment decision.

A reason for individual's herding behavior is also the desire and will to upkeep the social identity they perceive themselves to possess (Hogg et al., 1987; Rook, 2006 p. 85). The will of maintaining the social identity is driven by the urge to feel the belonging to the reference group and avoid standing out of the reference group (Hogg et al., 1987; Rook, 2006 p. 85). The urge of belonging to the reference group leads to the individual monitoring and following constantly the reference group's behavior and that derives and fuels the herding behavior (Martin et al., 2001; Rook, 2006 p. 85). In essence, individuals are willing and inclined to act and behave similarly to the reference group in a certain situation due to the social psychological side of human. For example, if the individual is an investor, the reference group comprises other investors in the same markets. The individual monitors the behavior of the other investors and follows their lead to fulfill the need for belonging within the broader investor community.

3.2 Theoretical background of Herd Effect

Afterwards of different financial crises that have occurred in the real financial market, herd effect has become in a way despised term in the field of finance and financial lexicon (Bikhchandani et al., 2000. p. 279). The behavior of investors and fund managers during the time of financial crises is portrayed as a herding behavior, meaning the investors and fund managers acts collectively like a "herd" (Bikhchandani et al., 2000. p. 279). That referring to how investors and fund managers charge towards even risky ventures even though there is no valid information or appreciation to endorse this decision concerning the risk-reward trading and as soon as the first red flag and sign of trouble occurs, the investors flee immediately to the safer havens (Bikhchandani et al., 2000. p. 279). The concerns surrounding herding behavior and its outcomes are, how it aggravates the volatility, erratic the markets and lastly in bigger picture emphasizes the fragility of the financial markets as a whole (Bikhchandani et al., 2000. p. 280). The question is, what is the cause for those investors, with similar information and maximizing the profit as their goal, to behave uniformly at the same period of time and what theoretical explanations there is for this certain phenomenon (Bikhchandani et al., 2000. p. 280).

Many reasons can rationalize the herding behavior of utility-maximizing investor and why the investor is being affected by the herd effect. Herding behavior can be detected in a way when the investor reverses a planned financial decision just because observing and imitating other investors in the market and their decisions (Bikhchandani et al., 2000. p. 280). One of these reasons why investor follows along is the belief that other investors on the market possess valuable knowledge and information concerning a certain investment, like the return of the investment and the actions they make concerning the investment serve as evidence and reveals the information they possess (Bikhchandani et al., 2000. p. 280). Another reasoning for herding behavior is the individual investor's individual and group characteristics meaning that some individuals have built-in preference and need for conformity of doing the same decisions as others and do not trust their own judgements (Bikhchandani et al., 2000. p. 280).

One of the causes for herd effect is also the informational cascades, specifically the disparities in information among the investors that provokes the herding behavior to transpire (Bikhchandani et al., 2000. p. 280). The decisions and doings of the investors, who are the first ones to make a decision concerning a certain financial decision, are pivotal and lead by example the remaining majority of the other investors who still have the decision ahead. In other words, the first decisions and actions can be crucial for the other investors and emphasize and influence the herd effect. The cause for herding behavior is the intent of the individual to model and monitor the other investors behavior and actions (Bikhchandani et al., 2000. p. 281). Thus, intentional herding takes place when individual investor makes a financial decision purely based on the decisions and actions of the other investors, disregarding their own judgements (Contreras et al., 2022). Meaning, when intentional herding takes place, the individual investor completely overlooks the personal information and does not let that information determine the decision. Intentional herding can occur amongst the individual investors but also amongst the institutional investors (Contreras et al., 2022).

The herding behavior stemming from the intention of the investor to follow other individuals, as stated above, is different from so called spurious herding (Bikhchandani et al., 2000. p. 281). Spurious herding means when individual investors are facing the same situation where a decision must be made and they end up making the same decision as other investors based solely on information, rather than actively monitoring and modeling others' behavior (Bikhchandani et al., 2000. p. 281). An example of spurious herding is for example, when one day in the financial markets the interest rates are higher than before and as a result stocks become now less profitable investment. (Bikhchandani et al., 2000. p. 281). In response to this new information, investors are not interested in the same way holding stocks in their portfolios. Even though, the smaller share of stocks in the portfolio is now decision made by many investors, it is not defined as a herding behavior because investors are not abandoning their previous decisions simply by observing others; instead, they are reacting to a public phenomenon and information in the financial markets regarding interest rates (Bikhchandani et al., 2000. p. 281).

Spurious herding and the subsequent changes in the financial markets are perceived as an efficient outcome whereas the intentional herding is not considered as an efficient phenomenon in the financial markets (Bikhchandani et al., 2000. p. 281). Spurious herding can also occur in cases where there are differences in investment opportunities by the reason of legal restrictions (Contreras et al., 2022). This type of spurious herding can be termed as "fundamentals-driven" because the decisions are advocated by the same facts and environmental conditions for all investors. Meaning, in this context the “fundamentals” refer to the facts and environment surrounding the financial decision. The results and changes in the financial markets, originating from the “fundamentals-driven” spurious herding are considered efficient (Contreras et al., 2022).

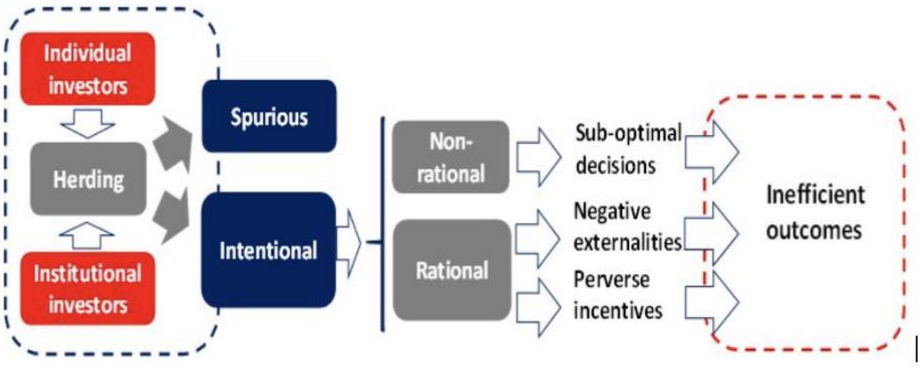

***Figure 3*: Forms of Herding Behavior and their outcomes (Contreras & Contreras, 2022).**

Herd effect can be defined and explained from other points of view as well. Lakonishok, Shleifer and Vishny (1991) described that herd effect stems from the average tendency of individual investors within a group to buy and sell certain stocks simultaneously. Nossinger and Sias (1999) in turn explained herding behavior originating from a group of investors in the same market that are trading at the same period of time and in addition to the same direction. Like Bikchandi and Sharma defined that herding behavior results from the intent of the individual investor to mimic and observe the other investors behavior and decision, Banerjee (1992) also remarks how the herding behavior is caused by the investors volition to do what other investors do, despite having differing own information and knowledge that might lead to dissimilar solutions. Like seen in the figure 4, the modeling and monitoring behavior of individual investors is commonly perceived as irrational decision making of an individual and in that way associated with herding behavior (Contreras et al., 2022).

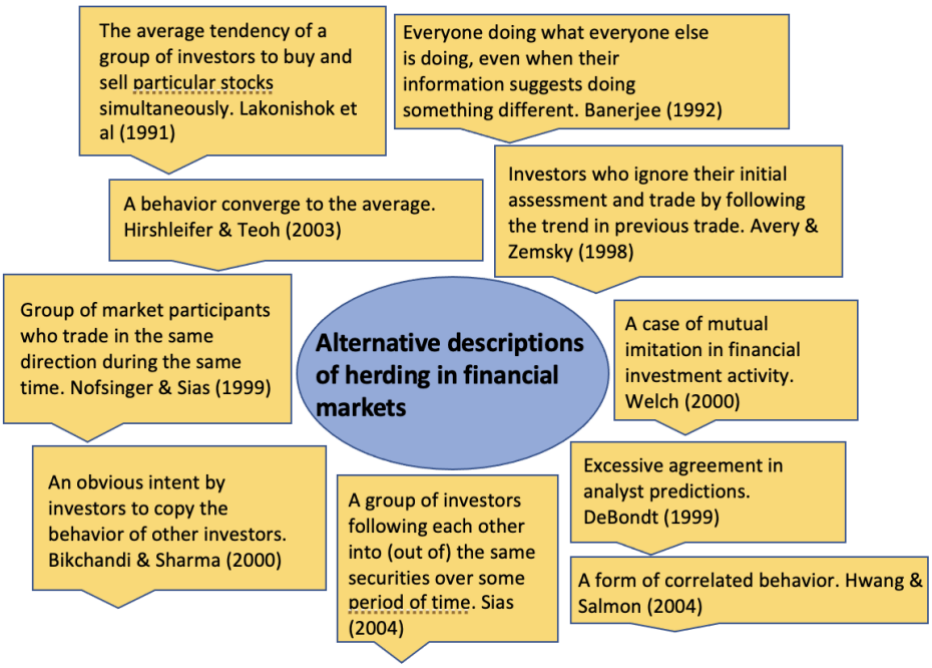

***Figure 4*: Different reasonings for Herd Effect over time (Contreras & Contreras, 2022)**

3.3 Different forms of Herding Behavior

Intentional herding can be divided to non-rational and “rational” herding. In this context, "rational" herding denotes to a deliberate decision by investors that behaving irrationally is more profitable and advantageous. Amongst the financial economists and in the literature of finance, the concept of rational herding has gained recognition, and it has become more known phenomenon (Devenow et al., 1996. p. 605). Contreras and Contreras (2022) bring to awareness in their paper that herding behavior can also be “rational” behavior when the investor's objective is to maximize profits. Meaning, in financial markets the possessed information among investors is imperfect and uneven, leading to the belief that some information may be inaccurate. Consequently, the investor thinks that it can be more profitable to dismiss the own information and only rely on the public information and signals because it is believed to be more precise. In the case of "rational" intentional herding, seven attributes have obtained attention in financial markets and finance literature (Contreras et al., 2022). In essence, there are seven different attributes for individual investor to believe that it is a rational decision to be irrational.

The first of these seven reasons for intentional herding is the informational cascade (Bikhchandani et al., 1992; Contreras et al., 2022). An informational cascade takes place when the individual investor believes it is rational to disregard their private information and instead follow the actions of other investors. Meaning, it is a rational decisions made by the individual investor that the most profitable way to behave in this particural situation is to be irrational. In other words, the individual investor is convinced that it is rational to be irrational. By the definition of Bikhchandani, Hirshleifer and Welch (1992, p. 994.) an informational cascade occurs when for individual investor it is optimal to observe the actions of other investors ahead of him and disregard the own information and follow the behavior of individuals preceding. In this context, the herding behavior is "rational" because the investor is in the believe that other investors facing the same decision are possessing better and more accurate information. The dissimilar decisions of these other investors serve as evidence to convince the individual investor that their decision is correct and optimal for maximizing profits. This kind of phenomena and when it happens to multiple individual investors, accelerates the phenomena and leads to a snowball effect (Bikhchandi et al., 1992; Contreras et al., 2022).

Informational cascades can be either positive or negative (Bikchandi et al., 1992. p. 994.) In a positive informational cascade, all individuals adopt the decision, whereas in a negative informational cascade, all individuals sequentially reject the decision made. As a qonsequence from an informational cascade, the financial markets can struggle with collecting private information in an efficient way and that potentially leading in defects in the prices because of a incorrect respect of a certain fundamental can take place (Cipriani et al., 2008. p. 1). In addition, informational cascades can propagate from a certain financial market to a another market and that leading to a financial "contagion" between the markets (Cipriani et al., 2008. p. 1).

The second rationale, for intentional "rational" herding by Contretas and Contreras (2022) is considered to be the noise inference. The average accuracity of the information

that a investor possess about the financial markets is uncertain amongs the investors. Consequently, an individual investor may rationally, albeit mistakenly, believe that the information possessed by other investors in the financial markets is more accurate and reliable than their own. In this kind of situation where the investor believes other investors information as superior, the investor can be broadly defined as a “noise trader” (Avery et al., 1998. p. 726). A noise trader is a trader who makes decisions and acts for external motives and does not take into account the expected profit in a same way (Avery et al., 1998. p. 726).

A noise trader appreciates greatly the information and consensus amongst the investors on the markets and gives less significance to the fundamental information for example about a certain stock. The higher valuation of the information amongst investors than the fundamental information can lead to an situation where investors overvalue certain stocks solely due to noise inference. When there is no fundamental reasoning for the overvaluation, investors essentially possess information that market makers do not, creating a scenario where noise traders influence market behavior (Avery et al., 1998: Contreras et al., 2022). This kind of noisier inference results the market-makers to change and update their understanding and beliefs in slower phase than the investors, contrary to theoretical expectations (Avery et al., 1998: Contreras et al., 2022).

A certain challenge arises when noise trader gives a high value to the information and consensus amongst the investors on the markets and does not prioritize the fundamental information. The challenge is so called dual burden. The trouble with the dual burden and from the perpective of the noise trader is that there is a uncertainty regarding the correctness and profitability of their financial decisions. In other words, noise traders cannot be certain that the consensus or opinions of other investors they follow are based on competence or lead to the most profitable financial decisions. The dual burdens entail two main concerns: firstly, whether the consensus among market participants or the opinions of other investors are based on competetency and profit maximizing and secondly, whether the financial decisions made are really financially

profitable. The underlying concept of the dual burden is that both burdens solve simultaneously. Thus, when the profitability of financial decisions is confirmed, the potential incompetence within the market consensus is also resolved.

The third attribute and rationale for rational herding behavior by Contreras & Contreras (2022) revolves around differences in costs associated with market analysis. Meaning, the investors who have limited knowledge and competence about investing and financial markets as a whole, tend to monitor and mimic the decisions and doings successful investors and financial professionals. This behavior is considered rational because relying solely on personal knowledge would source higher costs, as it would require extensive research to inform financial decisions. If observing and following the successful and precending investors would create costs, individuals would be inclined to trust and follow their own information but in a case where following the predecessors is free of cost, it emphazises the individual to herd (Khan et al., 2011; Contreras et al., 2022).

Reason number four discloses that intentional herding behavior can be rational for investors with a short-term investment horizon (Contreras et al., 2022). If the investor is only investing for a short period of time, intentional herding behavior can be viewed as a profitable strategy. If other investors on the same market are investing to the same certain stock, it serves as evidence to the investors that the stock is a profitable investment and can maximize the profit even on a short time frame. Consequently, the investor can take leverage on the same information as the other participants on the market about the investment although the time horizon of the investment is short (Contreras et al., 2022).

Lastly, the remaining reasonings. “Rational” herding behavior can be driven also from the pressure of succeeding. Meaning that individuals working in the field of assest manager and financial analysis are under the pressure of herding behavior because of the concerns about their career. Scharfstein and Stein (1990) highlighted how the fear of underperformance and the need to make profitable investment decisions can drive

individuals to engage in herding behavior. Furthermore, the compensation methods in companies or financial institutions can also reinforce the “rational” herding behavior. Maug and Naik (2011) adressed in their paper how in the light of asymmetric information it is possible that compensation arrangements, where the asset managers own payoff is connected to the performance in a good and bad, makes the asset managers distort the investment they made towards the portfolio that the perfomance is compared.

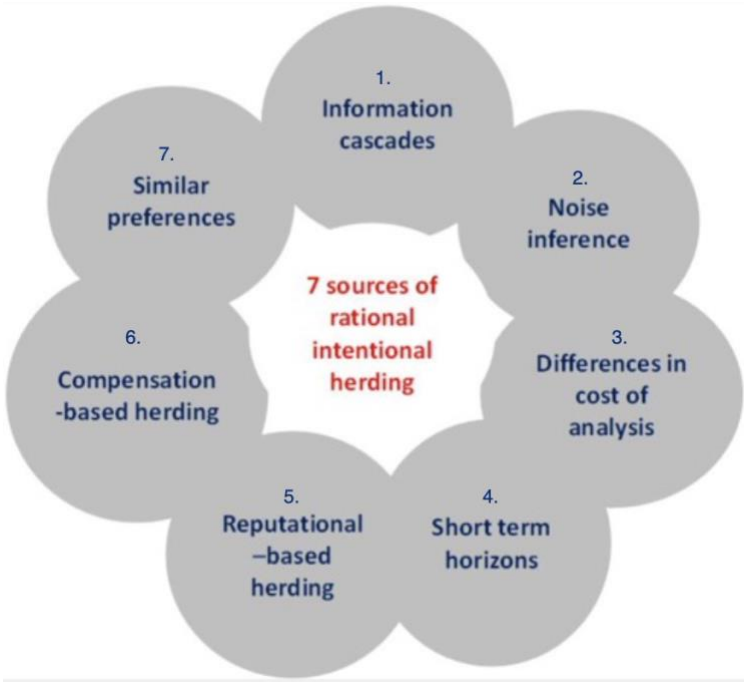

***Figure 5*: Different reasonings for “rational” intentional herding (Contreras & Contreras, 2022).**

There is a consensus among financial economists and it has been proven over time, that intentional herding behavior can indeed be efficient and profitable for individual investors. However, when viewed from the perspective of financial markets as a whole and on a societal level, the outcomes of intentional rational herding are deemed inefficient (Contreras et al., 2022). The mentioned negative and inefficient results are driven from the negative externalities also and not only from the doings of the “rationally” herding investors.

4 Literature review and previous herding studies

The examination of herding behavior in financial markets has garnered considerable attention due to its implications for market efficiency, asset pricing, and investor behavior. The ambiguous results of past research underline the need for clearly defined research settings in new studies related to herding behavior. A thorough review of existing literature and research will be undertaken to establish well-founded hypotheses for the empirical part of this study. This literature review chapter focuses on the empirical evidence of herding behavior from international markets and insights from Nordic stock markets. The papers are reviewed in chronological order. Through this literature review the foundation and framework for understanding the potential impact of herding behavior in Finland, Sweden, and Denmark will be established.

4.1 International herding research

In 1995 Christie and Huang conducted an investigation of herding behavior within the US stock markets from 1925 to 1998. The findings from the study were largely inconclusive. Contrary to their initial hypothesis - that during market turbulence and volatile times, herding behavior would be detected and that the deviations of returns between individual assets and the broader market would be mitigated - the results discovered increase in such deviations under volatile conditions (Christie & Huang, 1995). A surprising finding was that the deviations of returns were more pronounced in bear-markets than in bull-markets, suggesting a decrease in herding when markets were on a downturn (Christie & Huang, 1995). This observation from the study challenges the initial assumption of Christie and Huang (1995) and aligns more closely with the traditional asset pricing theories. Ultimately, Christie and Huang's (1995) study did not uncover substantial evidence of significant herding behavior in the time frame studied. The paper disclosed that any tendencies toward herding were more evident in rising markets, although that finding did not reach statistical significance (Christie & Huang, 1995).

In 2000, Chang, Cheng and Khorana in their study investigated the presence of herding behavior in the stock markets from 1963 to 1997, focusing on both developed and emerging markets across the US, Hong Kong, Japan, South Korea, and Taiwan to determine if there is a difference in herding between these markets. The particularly extended time frame for the investigation offered a comprehensive view of the occurring market behavior. From the investigation Chang et al. (2000) reported no significant herding behavior in the developed markets of the US, Hong Kong, and Japan, aligning with the finding of Christie and Huang (1995). On the contrary, Chang et al. (2000) observed from the investigation significant evidence of herding behavior in the emerging markets of South Korea and Taiwan, consistent across various portfolio sizes and throughout the entire study period. Chang et al. (2000) also discovered that herding was more influenced by macroeconomic news than by detailed, small-scale market information. Meaning, herding behavior is more likely to be detected on emerging markets than on developed markets (Chang et al., 2000). This can be explained by the lack of detailed company-specific news in emerging markets and that leading investors to rely more on broad economic indicators, leading to increased herding behavior by individual investors.

In turn, Hwang and Salmon in 2004 conducted an investigation on herding behavior in the US and South Korean stock markets from 1993 to 2002. The findings that Hwang & Salmon (2004) gathered from the investigation significantly diverged from earlier conducted comprehensive studies for discovering a significant herding in all market conditions throughout the sample period. The significant herding discovery consistent herding behavior in both bull and bear markets, with an unexpected decrease in herding during market downturns (Hwang & Salmon, 2004). The evidence from this study stands in evident contrast to the results and conclusions of the previous papers discussed above (Christie & Huang, 1995; Chang et al., 2000), which discovered significant herding behavior in emerging markets and most predominantly during bull markets. Furthermore, the conducted study found significant evidence of herding in stable market conditions (Hwang & Salomon, 2004). To rationale this finding, Hwang and Salomon

(2004) stated that the large institutional investors that are reallocating capital based on market performance, can account for this phenomenon. To explain the occurring asymmetry of the herding behavior between the bull- and bear-markets, Hwang and Salomon (2004) disclosed that it arises from the investors' reliance on the fundamental values of stocks rather than following the market consensus in the feeling of panic.

In further studies conducted in 2009 and 2012, Hwang and Salmon examined herding behavior during volatile and restless market conditions to underscore their earlier findings, which observed a reduction in investor herding behavior during bear market times. Hwang and Salomon focused on detecting herding during significant economic disruptions, including the 1987 market crash, the 1998 Russian crisis, and the financial crisis of 2008. The investigation revealed a consistent pattern aligning with the previous findings: herding behavior significantly reduces during unsteady and volatile markets, reinforcing the robustness of their initial investigation and supporting the finding that investors do not execute herding solely during declining markets. The comprehensive body of Hwang's and Salmon's work (2004, 2009, 2012) suggests a greater propensity for herding in bull-markets and in periods when markets are characterized as remarkably positive.

Last addition to the literature review is the research conducted by Chiang and Zheng (2010) where they explored herding behavior across global stock markets, analyzing data from 18 countries covering years 1988-2009. The findings of their investigation were significant thus they found evidence of herding in all of the advanced and Asian markets, with the notable exceptions of the US and Hong Kong, where significant herding was not detected. Also, in Latin American markets herding behavior was absent. The research (Chiang & Zheng, 2010) underlined the contagious characteristics of herding amongst investors during market crises, noting that herding can spread from the originating country to neighboring nations, like also mentioned earlier in the chapter three. While the findings of their investigation align to an extent with several past research results (Christie and Huang 1995; Chang et al. 2000; Hwang and Salmon 2004, 2009, 2012), the

results of Chiang and Zheng (2010) diverge from the work of Hwang and Salmon (2004, 2009, 2012) regarding detecting herding in the US market. In turn, when in relation to detecting herding behavior in Japan, Chiang and Zheng (2010) found evidence of herding behavior transpiring in the Japanese stock markets, unlike Chang et al. (2000). Ultimately, the significant findings of Chiang's and Zheng's (2010) investigation of detecting herding behavior contrasts sharply with Christie and Huang's (1995) earlier conclusion of no significant herding in any markets during their study period.

In summary of the international literature and previous research review, it can be stated that the investigation of herding behavior in different stock markets has provided varied results across different studies and market conditions. It can be said that Christie and Huang (1995) initiated this line of research with their inconclusive findings and challenging their own hypothesis by observing increased deviations in returns during volatile periods, especially in bear markets. With their investigation Chang et al. (2000) extended this field of research, detecting significant investor herding behavior in emerging Asian markets, contrary to the developed markets, influenced heavily by macroeconomic news. In turn, Hwang and Salmon (2004) departed from these previous findings by detecting herding behavior consistently across all market conditions. Subsequently, the later studies conducted by Hwang and Salmon (2009, 2012) reinforced the idea of reduced herding during turbulent times. Chiang and Zheng (2010) contributed to the field of herding research by documenting herding across advanced and Asian markets, excluding the US and Hong Kong, and noting the absence of herding in Latin American markets. Collectively, all these conducted investigations provide a complex picture of the investor behavior, indicating that herding behavior may be more nuanced and context-depended than initially understood in theory, and moreover, investor herding behavior is influenced by market maturity, regional factors, the nature of available information and human psychology.

4.2 Nordic stock market herding research

The amount of conducted research papers investigating herding behavior in Nordic stock markets is limited. In this Nordic herding research review chapter also prior conducted master's thesis papers are reviewed and insights from the investigations are utilized to better detect the herding behavior in Nordic stock markets and to understand the potential impact of herding behavior in Finnish, Swedish, and Danish stock markets.

In 2014 Mobarek, Mollah and Keasey examined investor herding behavior across various European stock markets from 2001 to 2012, utilizing the same methodology that Chang et al. (2000) utilized in their investigation. The investigation of Mobarek et al. (2014) included the Nordic countries, meaning Finland, Sweden, Norway, and Denmark. From the research Mobarek et al. (2014) discovered consistent, albeit low, levels of herding in the Finnish stock markets throughout the examined period and under different market conditions. As can be concluded, the 2008 occurred financial crisis is included in the study period. In addition to the Finnish stock markets, the research noted that all Nordic markets generally exhibited low herding levels during market stress (Mobarek et al., 2014). Mobarek et al. (2014) also discovered that herding amongst investors in the Nordic countries was more evident during the Euro crisis compared to the Financial crisis, attributing this difference to bailout payments to Greece, particularly paid by Finland. The findings of the conducted investigation disclosed that herding was prominently detected in the European and particularly in Nordic stock markets on days characterized by low volatility and during bear-market conditions (Mobarek et al., 2014).

Lindhe in 2012 in her master's thesis explored the prevalence and dynamics of investor herding behavior in the Nordic countries - Denmark, Finland, Norway, and Sweden- during the period from 2001 to 2012. Lindhe (2012) conducted the investigation by utilizing the methodology adapted from Chiang and Zheng (2010). Lindhe (2012) with her research aims to determine whether market-wide herding is observable under various market conditions.

The investigation reveals conclusive evidence of market-wide herding in Finland, occurring during both upward and downward market trends, which is in inconsistency with the other Nordic countries where no significant herding behavior was detected (Lindhe, 2012). The findings indicate that Finnish markets may be particularly prone to herding influences during times of significant market volatility (Lindhe, 2012). Furthermore, the conducted investigation reveals that Finnish and Swedish stock markets display significant herding behavior around the US market, with all Nordic countries showing similar tendencies around the European markets (Lindhe, 2012). Like mentioned before, these findings support the perception that herding can occur as a contagion, transcending borders during market crises and influencing neighboring stock markets within the Nordic region. The contagious characteristic of herding argues that geographical proximity and significant external market influences are in critical role in prompting herding behavior across national borders.

Rissanen in his master's thesis research in 2015, explored the phenomenon of herding behavior within the Finnish equity market during the years 1999 to 2014. The main aim of the research was to investigate whether herding influences stock market pricing, leading to potential mispricing or deviations from fundamental values. The findings from the research conducted by Rissanen (2015) discloses that there is no significant mispricing observed through beta dispersion, but stronger evidence of herding is present when analyzing the standard deviation of returns. Also, Rissanen (2015) discovers that investor herding behavior tends to increase during periods of positive market sentiment and decreases during crises. Similarly, to Hwang and Salomon (2004), Rissanen discloses that the detecting of herding behavior during optimistic market times denotes that investors may commit herding based on a collective assessment of rising market potentials instead than panic-driven convergence.

Rouvinen (2018) in turn investigated in his master's thesis herding behavior across the Nordic stock markets, meaning Finland, Sweden, and Denmark, during the period from 2007 to 2018. The findings Rouvinen (2018) discovered were that consistent herding

behavior was not present across any of the Nordic markets over the entire sample period. Yet, when the data was segmented into annual subsamples, signs of herding was detected in Sweden in the year 2013, specifically during market downturns. Like Lindhe (2012) disclosed in her investigation, Rouvinen (2018) also discovered the significant impact of the US and European markets on Nordic stock market behavior. Specifically, when analyzing Finnish and Danish stock markets, the investigation indicates an absence of significant herding across both the overall and annual subsamples, with no distinct patterns emerging on days when the markets were on downturn or rising state (Rouvinen, 2018).

The previous research papers examining herding behavior in Nordic stock markets provides a subtle foundation for the expectations of this master's thesis research. The different research conducted by Mobarek et al. (2014), Lindhe (2012), Rissanen (2015), and Rouvinen (2018) offer insights into the dynamics of herding behavior in Finnish, Swedish, and other Nordic stock markets. Based on these investigations (Mobarek et al., (2014), Lindhe (2012),Rissanen (2015), and Rouvinen (2018)), it can be stated that this research can expect to find varying levels of herding across the Nordic stock markets, influenced heavily by external economic events and market sentiment. These previous investigations suggests that herding behavior is most likely detected during times of market stress and optimism. These insights will frame the examination of this master's thesis research and potentially enable the revealing of herding patterns and define how geographical proximity and significant market events influence herding behavior.

4.3 Hypotheses development

The hypotheses of this thesis are formed by utilizing prior conducted research and the existing literature concerning the investigation of herding behavior. To establish well-founded hypotheses for this thesis, the hypotheses development starts by disputing with the Efficient Market Hypothesis. Meaning, the EMH claims that stock returns and their dispersions are normally distributed. Implicating the absence of different market anomalies, in this case, herding behavior. Leading to the suggestion that the stock return

dispersions do not vary from their expected values because of herding behavior. To investigate is the stock return dispersions normally distributed or not, the null hypothesis is formed:

H0: Stock return dispersions are normally distributed in the Finnish, Swedish, and Danish stock markets during the sample period.

In the case of the null hypothesis being rejected, it can be stated that the prevalence of herding in the Finnish, Swedish and Danish stock markets is possible. Leading to the investigation that does herding actually transpire during the chosen sample period in the chosen stock markets. The aim of the first hypothesis is to investigate if the market-wide herding occurs in each separate stock market during the sample period or is the market-wide herding detected at all in these chosen markets. The first hypothesis is formed in a following way:

H1: Herding can be detected in the Finnish, Swedish and Danish stock markets during entire sample period.

To detect herding fully and detect herding patterns in more detail, the second hypothesis is formed around investigating herding in separate years of the sample period. The goal of investigating herding in separate years is to determine, if international or global economic or financial occurrences influence the transpiring herding in the chosen stock markets. Meaning, the investigation of herding behavior in separate years in the Finnish, Swedish and Danish stock markets reveals if there is a notable difference in herding during different markets times in different years. The second hypothesis is formed in a following way:

H2: Herding varies during the different subperiods in the Finnish, Swedish and Danish stock markets.

As can be concluded from the previous research findings (Mobarek et al., 2014), the detected herding in the stock markets can occur as asymmetrical. In this context, asymmetry refers to the variation in the herding behavior during different market conditions, meaning the up- and down-market days. Already in the original study of Christie and Huang (1995), they examined the herding on different market conditions. It can be stated that investigating the difference of herding during different market conditions is central when examining herding behavior. Thus, the third hypothesis is formed:

H3: Herding occurs differently during up- and down-markets in the Finnish, Swedish and Danish stock markets during the sample period.

5 Methodology

The investigation conducted by Christie & Huang (1995) can be said to be the foundational research to investigate and detect market-wide herding. Subsequently, Chang et al. (2000) conducted an investigation of herding behavior and the used methodologies to detect herding in the later research papers can be said to stem for the investigations of Christie & Huang (1995) and Chang et al. (2000). The examination of this thesis focuses on the market-wide herding in the Finnish, Swedish and Danish stock markets. Meaning, the aim of the investigation is not to detect herding concerning a certain stock or specific industries, but the three separate stock markets of Finland, Sweden and Denmark.

To reveal if market-wide herding transpires in the Finnish, Swedish and Danish stock markets, the investigation is executed by using the same methodology as Chiang and Zheng (2010) utilized in their research. The methodology used by Chiang and Zheng (2010) stems for the approach of Chang et al. (2010) but some alterations have been implemented. In the chosen methodology, the cross-sectional standard deviations are defined in a following way:

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N}\left|R_{i,t} - R_{m,t}\right|, \qquad (4)$$

where $R_{i,t}$ is the return of a stock i on a day t, $R_{m,t}$ is the market return on the day t, and N is the total number of the stocks. Subsequently, when the CSAD values are calculated, the CSAD regression equation by Chiang and Zheng (2010) is outlined in the following way:

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2\left|R_{m,t}\right| + \gamma_3 R_{m,t}^2 + \varepsilon_t \qquad (5)$$

where, additionally to equation (4), γ_0 is the constant coefficient, γ_1 is the coefficient of the market return on day t, γ_2 is the coefficient of the absolute market return on the day t, $|R_{m,t}|$ is the absolute market return on the day t, γ_3 is the coefficient of the squared market return on the day t, $R_{m,t}^2$ is the squared market return on the day t and it also represents the non-linear component in the equation. Lastly, the ε_t is the error term.

In this investigation, the primary interest is the coefficient γ_3 of the non-linear component. That is because, a negative and statistically significant value of this specific coefficient indicates the presence of market-wide herding in the stock markets. The contribution of the equations (4) and (5) to the investigation is to evaluate H1 and H2, which examine the prevalence of herding across the entire sample period and various subsample periods. To assess H2, annual data is incorporated into each equation to investigate herding during specific yearly intervals.

$$CSAD_t = \gamma_0 + \gamma_1(1-D)R_{m,t} + \gamma_2 D|R_{m,t}| + \gamma_3(1-D)R_{m,t}^2 + \gamma_4 D R_{m,t}^2 + \varepsilon_{t,} \quad (6)$$

Like stated before, from the previous conducted investigations, an asymmetry concerning herding behavior during up- and down-market conditions have been discovered (Tan et al., 2008; Chiang and Zheng, 2010). For investigating and detecting the asymmetry concerning the herding, the equation (6) is utilized.

In the equation (6), the variable D, is the dummy variable. In the case of index returns being negative, the dummy variable equals to number one. In turn, if the index returns do not have a negative value, the dummy variable equals to zero. Meaning, γ_3 being negative and statistically significant, it represents that herding occurs on up-market days. Consequently, γ_4 being negative and statistically significant, represents herding occurring in the down-market days.

6 Data and descriptive statistics

6.1 Data

The data used in the thesis is gathered from University of Vaasa's database. The data set consists of the shares of certain companies in the indices of Finland (OMXH25), Sweden (OMXS30) and Denmark (OMXC20). For the investigation, daily prices for all stocks and indices are used. The time frame for the study is from 1.1.2013 until 29.12.2023. The data set includes the shares of 65 different companies in Finland, Sweden, and Denmark. This is because 10 companies were removed from the investigation because of the lack of data in the chosen time frame. All pricing data is in the local currency of the certain market, meaning Finland in EUR, Sweden in SEK, and Denmark in DKK.

6.2 Descriptive statistics

The Table 1 presents the descriptive statistics of the CSAD measure, and the market index returns for the Finnish, Swedish and Danish stock market in the selected time frame. In Finland the mean of CSAD is 0.010 which suggests a relatively low dispersion on average. The maximum value for CSAD in Finland is 0.046 and the minimum 0.000, which indicates a wide range of dispersions in the Finnish stock markets but also noting the minimum value that shows that at times, individual stocks in Finnish stock markets can be nearly identical with the market. The standard deviation for Finland being 0.005, suggests a moderate variability in stock return dispersion over the chosen time.

In Denmark, the mean of CSAD is a little higher by being 0.012, indicating that the average dispersion of individual stock returns around the market return is higher when comparing to Finland. The maximum value of CSAD for Denmark is 0.094 which is significantly higher than Finland. The higher value of Denmark indicates periods of much larger dispersion. Additionally, Denmark also has instances, like Finland, where the CSAD is 0, revealing periods where individual stocks move in perfect alignment with the market.

The standard deviation of CSAD in Denmark is 0.006, slightly higher than in Finland, which tells that there is a greater variability in stock return dispersion.

For Sweden the mean CSAD is 0.009 which tells a slightly lower average dispersion in the stock returns than in Finland and Denmark. For Sweden the maximum CSAD of 0.039 is lower than both in Finland and in Denmark, proposing that Sweden experiences fewer instances of high dispersion. Like in Finland and in Denmark, in Sweden there occurs periods where the CSAD is 0, indicating perfect alignment of individual stock returns with the market. The standard deviation of Sweden 0.004, is the lowest among the three Nordic markets, suggesting that the Swedish markets has the most stable dispersion of stock returns over time. The skewness measure deviates from zero and the kurtosis measure is above three for the CSAD in all markets. Meaning, that all three markets have stock returns which are not normally distributed. The null hypothesis is rejected.

Table 1. Descriptive statistics of cross-sectional absolute deviations and market return

	Finland		Denmark		Sweden	
Statistic	**CSAD**	**R_m**	**CSAD**	**R_m**	**CSAD**	**R_m**
Mean	0,010	0,000	0,012	0,001	0,009	0,000
Median	0,009	0,000	0,011	0,001	0,008	0,000
Maximum	0,046	0,069	0,094	0,094	0,039	0,071
Minimum	0,000	-0,101	0,000	-0,075	0,000	-0,106
Std.deviation	0,005	0,011	0,006	0,011	0,004	0,011
Skewness	1,452	-0,534	2,396	-0,149	1,389	-0,528
Kurtosis	6,144	5,982	18,093	4,174	5,445	6,428
N	2867	2867	2867	2867	2867	2867

This table reports the descriptive statistics of daily cross-sectional absolute deviations (CSAD) and the daily market index returns R_m for the Finnish, Danish, and Swedish stock markets during 1.1.2013-29.12.2023.

Figure 6 illustrates the relationship between the CSAD, and the different stock index returns in Finland, Denmark, and Sweden. From the Danish stock markets, it can be observed that there is a cluster of points around zero market returns, indicating that during stable market conditions there is a limited dispersion, which suggests little evidence of herding. Additionally, when the market returns change into more extreme

in positive or negative way, the value of CSAD increases, indicating a more diverse response to the change from investors. This phenomenon indicates that herding behavior is less likely to occur in the Danish stock markets, as the expectation is to CSAD to decrease during extreme market movements if investors were all following the same trends.

***Figure* 6: Relationship between CSAD and stock returns**

From the Finnish stock markets similar patterns can be found as in the Danish stock markets. Data points are clustering near zero returns and greater dispersion can be detected at more extreme positive or negative market returns. The non-linear relationship in the Finnish stock markets between market returns and CSAD indicates that herding is unlikely to be a dominant factor in the Finnish stock market. However, the Swedish stock market illustrates a pattern where CSAD spreads out more visibly

compared to the Danish and Finnish markets. The greater variation in CSAD value at both positive and negative market returns, especially for larger market movements, shows that the Swedish market experiences more varied investor behavior during extreme market conditions. This leading to the conclusion that the Swedish stock market may be more susceptible to herding than the Danish or Finnish markets. Still, the relationship between market returns and CSAD does not appear to be strongly linear, indicating that herding behavior is not immediately evident in the Swedish market.

7 Empirical results

This section of the thesis will present the outcomes and results of the estimated regressions. With the results of the regressions, hypotheses H1-H3 will be evaluated and determined whether to accept or reject the hypotheses. To present a detailed and thorough analysis of each hypothesis, the evaluation of the hypotheses will take place with its own subchapter and in respective order. The first subchapter, evaluating H1, will explore herding behavior throughout the entire sample period from 2013-2023. The second subchapter will focus on detecting herding patterns for individual years within this timeframe, while the third subchapter will investigate herding under varying market conditions meaning up- and down-market days.

7.1 Herding during the entire sample period for every stock market

Table 2 shows the results for herding during the entire investigation period for the separate stock markets of Finland, Sweden, and Denmark. For the conducted regression analysis, the modified Chang et al. (2000) CSAD model was utilized, which includes an additional higher-order term γ_3, to express the possible complex investor behavior. Like mentioned before, the main variable of interest is γ_3, for a negative and statistically significant value would reveal the appearance of market-wide herding.

The results for the Finnish stock market, γ_3 being negative but not statistically significant, reveal that no conclusive evidence of herding behavior can be detected. The γ_2 being positive and statistically significant, indicates that the return dispersion increases as the market returns become more extreme. The results reveal, rather than herding, investors in the Finnish stock market execute independent trading patterns, meaning the investors respond to individual stock characteristics rather than following the market trend. When looking at the result from the Swedish stock markets, a similar trading pattern can be detected than in Finland. The coefficient γ_3 is negative yet statistically insignificant, which denotes that it does not provide strong evidence of herding behavior in the Swedish stock market. The significantly positive γ_2 reveals the dispersion increasing

during extreme returns. The results show that the investors in the Swedish stock markets do not follow common trend, herd, during extreme return periods but are making independent decisions based on stock specific factors.

Table 2. Regression estimates of herding behavior

Regression estimates of herding behaviour 2013-2023

	γ0	γ1	γ2	γ3	Adj. R2
Market					
Finland	0.008125 ***	0.013601 *	0.254915 ***	-0.02002	-0.000922
	(59.3202)	(1.81431)	(13.62932)	(-0.04752)	
Sweden	0.006806 ***	0.021714***	0.230397 ***	-0.528612	-0.000927
	(60.325803)	(3.38191)	(14.86747)	(-1.51598)	
Denmark	0.009256 ***	0.017514**	0.221805***	4.282816 ***	-0.000920
	(54.21112)	(1.97118)	(9.27282)	(7.25143)	

This table reports the estimated coefficients for equation (5). The sample period is 1.1.2013-29.12.2023.

A negative and statistically significant y_3 represents herding
The T-statistics are reported in parentheses
*Statistical significant at the 10% level
**Statistical significant at the 5% level
***Statistical significant at the 1% level

The results for the Danish stock markets, γ_3 being positive and highly significant, reveal that the dispersion increases significantly during extreme markets movements. Meaning, the investors in the Danish stock markets do not herd but instead, the investing behavior is more anti-herding behavior when the market returns are extreme. The positive γ_3 and significantly positive γ_2 reveal that Danish investors do not follow the herd. The investors in the Danish stock market make different independent decisions from each other, which results the stock returns to spread out even more.

H1: Herding can be detected in the Finnish, Swedish and Danish stock markets during entire sample period.

To conclude, the first hypothesis, which posits that market wide herding behavior can be detected in the Finnish, Swedish and Danish stock markets during the sample period, is rejected. The results from the investigation is aligned with the findings of Chang et al. (2000) that herding behavior is more likely to be detected on emerging markets than on developed markets. The higher stock market efficiency in developed markets decreases the occurrence of herding behavior because investors have access to high quality information and based on the information investors can make independent decisions on stock fundamentals. The results are also aligned with the findings of Rouvinen (2018), who discovered that consistent herding behavior was not present across any of the Nordic markets over the entire sample period.

7.2 Herding across separate yearly subperiods

Table 3 shows the results for the regression estimates of herding during separate yearly subperiods. The regression results were obtained by utilizing equation (5). Also, in the table 3, the main variable of interest is γ_3, for a negative and statistically significant value would reveal the appearance of market-wide herding. The aim of the investigation of herding in separate subperiods is to reveal if international or global phenomena influence the herding behaviour in the chosen stock markets. Meaning, the investigation enables to detect if the herding is more prone to appear during large market fluctuations. In this examination, the COVID-19 pandemic takes place during the investigation subperiods.

From the results for the Finnish market, the γ_3 coefficients are insignificant across all the subperiod years. Even if the γ_3 coefficient is found negative, it is statistically insignificant, indicating that there is no evidence of herding behavior in any of these years, revealing yet again that Finnish investors act independently. In turn, in the Swedish market, herding behavior is detected in 2018 and 2019, as the γ_3 coefficient is negative and highly statistically significant. The finding reveals that during 2018 and 2019, the Swedish investors have followed a common trend in the markets. After these two years, the

coefficients are less statistically significant, insignificant, and lastly turn positive, suggesting that investors in the Swedish markets began to act more independently.

In the Danish stock market, the γ_3 coefficients are statistically insignificant from 2018 to 2020, suggesting no evidence of herding behavior during these years. Yet, in 2021 the coefficient becomes positive and highly statistically significant, revealing anti-herding behavior from the investors. Meaning, the investors react independently and diversely, increasing the stock return dispersion. This finding is aligned with the results from the investors behavior during the entire sample period in Danish stock market. The same anti-herding behavior can be again detected in 2023 with the γ_3 being positive and highly statistically significant.

Table 3. Regression estimates of herding behavior, divided into yearly subperiods 2018-2023

Regression estimates of herding behaviour divided into yearly subperiods

Market	Finland	Sweden	Denmark
	γ_3	γ_3	γ_3
2018	-3.949	-11.706**	0.153
	(-0.627)	(-2.517)	(-0.042)
2019	-0.656	-11.520**	-5.717
	(-0.116)	(-2.348)	(-0.867)
2020	0.820	-0.748	-2.524
	(-0.907)	(-1.067)	(-1.171)
2021	1.876	-5.332*	8.390***
	(0.547)	(-1.883)	(2.729)
2022	-2.300	-1.456	3.358
	(-0.974)	-0.535	(0.913)
2023	2.014	2.286	7.414***
	(0.399)	(0.726)	(6.2243)

This table reports the estimated coefficients for equation (5). The sample period is 1.1.2018 29.12.2023.

A negative and statistically significant γ_3 represents herding
The T-statistics are reported in parentheses
* Statistical significant at the 10% level
** Statistical significant at the 5% level
*** Statistical significant at the 1% level

H2: Herding varies during the different subperiods in the Finnish, Swedish and Danish stock markets.

What can be noted from the table is that in 2020, when the COVID-19 pandemic hit the world, the γ_3 is negative in Sweden and in Denmark. Even though the results are not statistically significant, it can slightly indicate that the investors in the Swedish and Danish markets could lean towards the common trend during uncertain and turbulent market conditions. The results from the table 3 disclose that herding behavior is not consistent across these three Nordic stock markets. Sweden is showing temporary herding, Denmark is exhibiting anti-herding, and Finland displays no signs of herding throughout the investigated subperiod. So, the second hypothesis is accepted for the Swedish stock markets and rejected for the Finnish and Danish markets.

To have consistency to the findings of the investigation, the results of prior study are also aligned with these findings. Rouvinen (2018) conducted an investigation over the same stock markets with different subperiods and detected herding behavior once in the Swedish stock market. To add, Rouvinen (2018) also detected positive and statistically significant γ_3 in the Danish stock market. To add, the results of this subperiod investigation are consistent with the results of the previous investigation of this study, where Finland and Sweden where the markets that showed any tendency towards herding with the negative yet insignificant γ_3 and Denmark demonstrated anti-herding behavior.

7.3 Herding during up- and down-markets

Table 4 shows the results of the regression estimates of herding during up- and down-markets during the 2013-2023 sample period in the chosen stock markets. The equation (6) is used for the investigation. The main variables of interest are γ_3 and γ_4. A negative and statistically significant γ_3 would reveal the appearance of herding during up-market days. In turn, a negative and statistically significant γ_4 would reveal the appearance of herding during down-market days.

Table 4. Regression estimates of herding behavior in up- and down-markets

Estimates of herding behaviour in up- and down-markets during 2013-2023

	γ0	γ1	γ2	γ3	γ4	Adj. R2
Market						
Finland	0.008167*** (63.165)	0.243336*** (9.418)	0.235219*** (18.407)	0.0922645 (1.089)	0.4232 (1.585)	-0.001271
Sweden	0.006931*** (60.114)	0.175646*** (7.836)	0.218159*** (12.465)	2.592336*** (3.543)	-1.104579*** (-3.009)	-0.001277
Denmark	0.009211*** (53.922)	0.207396*** (7.759)	0.263234*** (8.661)	5.758696*** (8.041)	2.060643** (2.424)	-0.001269

This table reports the estimated coefficients for the equation (6). The sample period is 1.1.2013-29.12.2023.

A negative and statistically significant y_3 represents herding in up-markets
A negative and statistically significant y_4 represents herding in down-markets
The T-statistics are reported in parentheses
* Statistical significant at the 10% level
** Statistical significant at the 5% level
*** Statistical significant at the 1% level

The results from the table 4 are consistent with the results of the previous findings of this study. For the Finnish stock markets, the coefficients γ_3 and γ_4 are positive and statistically not significant. This reveals that during up- or down-market periods, there is no evidence of herding behavior among the Finnish investors, meaning, there is no difference in the herding behavior detected from the Finnish stock market. Again, this suggest that Finnish investors make independent investing decisions, based on individual stock characteristics.

For the Swedish stock markets, the coefficient γ_3 is positive and statistically significant. This indicates that there is no herding behavior during the up-market periods but instead it reveals that Swedish investors react independently, based on individual stock

information, as the stock return dispersion increases when the market is performing well. The main finding in the table 4 is the coefficient γ_4 for Swedish stock market, that is negative and statistically significant at the 1% level. The γ_4 coefficient reveals herding behavior during down-market conditions in the Swedish stock markets, indicating that investors tend to collectively sell of stocks when the market declines. Based on the results, it can be stated that the Swedish stock markets exhibits difference, asymmetry, in herding behavior during rising or declining markets.

For the Danish stock markets, the findings show that the coefficients γ_3 and γ_4 are positive and statistically significant. The positive γ_3 indicates no herding behavior during rising prices but yet again that the investors in Denmark act independently as the dispersion increases. The positive γ_4 indicates that during down-market conditions the Danish investors act in independent ways and even in diverse trading actions.

H3: Herding occurs differently during up- and down-markets in the Finnish, Swedish and Danish stock markets during the sample period.

In this investigation the asymmetry refers to the difference in the herding behavior during different market conditions, meaning the up- and down-market days. Based on the findings in the table 4, in the Finnish markets there is no evidence of herding behavior. The Swedish markets demonstrate no herding during up-market periods but reveal herding behavior during down-market times, supporting the hypothesis of asymmetrical herding, as herding behavior is only detected during the time of down-market. For Danish market there is no evidence of herding behavior in either up- or down-market periods. As a results, the third and last hypothesis is rejected for Finland and Denmark but accepted for Sweden.

8 Conclusions

The findings of this thesis reveal that herding behavior is not consistently prevailing in the Finnish, Swedish and Danish stocks markets during the entire investigation period. The findings are consistent with previous studies conducted by Christie and Huang (1995) and Chang et al. (2000). Like stated before, these studies reveal that in the developed markets, characterized by higher efficiency and access to high quality information, herding behavior is less likely to occur compared to emerging markets. Additionally, Hwang and Salmon (2004) established in their investigation, that in markets where investors have the possibility to rely on detailed stock specific information rather than general trends, herding behavior is less likely to be detected.

The conducted investigation of the yearly subperiods in the chosen stock markets revealed temporary herding in the Swedish market during 2018 and 2019, indicating that even in the developed markets, herding behavior can be detected under specific market conditions. This finding is consistent with Mobarek et al. (2014) and Chiang and Zheng (2010), who disclosed that herding behavior can vary based on the market conditions and regional factors. From the Danish stock market, the investigation revealed anti-herding behavior, meaning investors act independently based on stock specific information, like expected in developed markets.

For the Finnish stock market, the results of this investigation showed no significant herding behavior across the entire period nor during the subperiods or during up- or down-market times. Yet, the previous studies conducted by Lindhe (2012) and Rissanen (2015) have revealed herding behavior in the Finnish market during specific conditions, such as periods of market volatility or optimism. Thus, the negative and insignificant results of the subperiod investigation of this study, is slightly aligned with the findings of Lindhe (2012) and Rissanen (2015), that Finnish investors could lean towards the common market trend and execute herding behavior.

The investigation of herding behavior during different market conditions revealed statistically significant evidence of herding in the Swedish stock market during down-market periods. This finding discloses that Swedish investors have the tendency to collectively sell off stocks when the market takes a downturn. This finding is not aligned with Hwang and Salmon (2009), who disclosed that developed markets can exhibit reduced herding during turbulent market times. The result of this investigation indicates that Swedish investors can tend to panic sell when faced with negative market conditions, even though the Swedish stock markets are developed. Additionally, this study also indicates that the Finnish and Danish investors appear to be more resistant to collective investing behavior, herding, and from the Swedish stock market it can be concluded that herding can still occur under specific market stress conditions. The market stress conditions can be impacted by external factors such as global financial events or economic downturns.

Future research could explore these market stress conditions further and investigate the underlying causes of herding behavior in the Nordic stock markets. Also, to determine the context of any kind of global crises in herding behavior, as highlighted by Hwang and Salmon (2012), to better understand the impact of external shocks on developed stock market behavior. For example, a specific investigation of the post-pandemic time period could provide additional insight of how herding behavior occurs in changing circumstances. Additionally, the impact and weight that social media has over individuals can be detected in the stock markets by the behavior of individual investors. It can be stated that the social media and how the information spreads in the different platforms, has created a form of pure herding. A practical example of pure herding is when a well-known individual posts a tweet in X (former Twitter) about a certain company and creates a buying movement for the specific stock. In that case, the individual investor purely acts on the behavior of other investors on the market. It can be concluded, the way herding behavior occurs in the stock markets varies and changes as time goes on, thus the methods used to detect herding behavior should develop simultaneously.

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