

The Impact of Herding Behavior on Stock Market Financial Performance: The Case of Norway

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ABSTRACT

Using a time series approach, this thesis empirically investigates the impact of investor herding behavior on stock market financial performance for the case of Norway over the 1981-2019 period. Total values of stocks traded (% of GDP) and market capitalization of listed domestic companies (% of GDP) have been used as measures for investor herding behavior and stock market financial performance, respectively, with annual data for both variables being obtained from the World Development Indicators (WDI) of the World Bank. Unit root tests indicate that both variables are integrated of order one, and Johansen cointegration test reveals that there is a long-run relationship between the variables. The coefficients estimated by the vector error correction model indicate that investor herding behavior has a statistically-significant positive impact on the stock market financial performance of Norway in the long-run, while a negative impact was revealed in the short-run.

Keywords: stock market financial performance, herding behavior, time series analysis, norway.

ÖZ

Bir zaman serisi yaklaşımı kullanan bu tez, 1981-2019 döneminde Norveç örneğinde yatırımcı sürü davranışının borsa finansal performansı üzerindeki etkisini ampirik olarak araştırmaktadır. Yatırımcı sürü davranışı ve borsa finansal performansı için ölçüt olarak, işlem gören hisse senetlerinin toplam değerleri (GSYİH'nin yüzdesi) ve borsada işlem gören yerli şirketlerin piyasa değeri (GSYİH'nin yüzdesi) kullanıldı ve her iki değişken için de yıllık veriler Dünya'dan elde edildi. Dünya Bankası Kalkınma Göstergeleri (WDI). Birim kök testleri her iki değişkenin de birinci dereceden entegre olduğunu, Johansen eşbütünleşme testi ise değişkenler arasında uzun dönemli bir ilişkinin olduğunu ortaya koymaktadır. Vektör hata düzeltme modeli tarafından tahmin edilen katsayılar, yatırımcı sürü davranışının Norveç'in borsa finansal performansı üzerinde sırasıyla uzun ve kısa vadede istatistiksel olarak anlamlı bir pozitif ve negatif etkisi olduğunu göstermektedir. Tez, borsanın finansal performansını artırmak için menkul kıymet analizlerini caydırarak yatırımcılardan daha fazla sürü davranışı önermektedir.

Anahtar Kelimeler: borsa finansal performansı, sürü davranışı, zaman serisi analizi, norveç

DEDICATION

I dedicate this work to God Almighty

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Chapter 1

INTRODUCTION

The stock market allows both individuals and institutions to invest in various assets, no matter how experienced an investor is, they tend to invest their funds in the market expecting to gain more wealth. Institutions and organizations invest large sums in such market and sometimes even altering its functioning. Recently, herd behavior has attracted considerable interest in the stock markets, as it mostly occurs in behavioral finance. According to Nofsinger and Sias (1999) defines herding as a number of individuals or entity who commits their capital in similar directions for a certain period. Investors are classified as rational (sufficient) and irrational herding (insufficient information) (Welch 1996). however, a rational investor is one who usually (1) upgrades his convictions in a timely and suitable way on getting modern data; (2) make decisions that are normatively satisfactory (Thaler, 2005).

An investors' decision to invest is not purely rational, but based purely on analytical factors such as rates, benefits, or market movement. Despite its success for several decades, the traditional financial theory is increasingly unable to explain investors' behavior that discourage the efficiency of stock markets. This fact leads to the failure of financial most models. There are times when investors are not rational and the market is not always efficient (prices do not always reflect accurate information). These questions are deepened by financial market crisis, which tend to cause a rapid drop in prices and a sharp increase in the volumes it trades.

However, it is commonly believed that market participants and professionals do not encounter difficulties when making common investment choices since they are all well informed and steady. Currently, the portfolio hypothesis and capital asset estimation model reviews that investors are not overwhelmed by the large amount of data introduced to them and are usually not constrained by their behavioral influences. Nevertheless, a few studies have shown that numerous unexplainable situations relate to stock investment decisions (Abdulsaleh & Worthington, 2013; Sadiq & Isaq; Jayashree & Chitra, 2015). Individuals are usually assumed to be swayed by others when making decisions as it is highly common for people to follow their predecessors' actions when making choices such as what to wear, which restaurant to eat or school to attend, the restaurant spot with a higher customer base or schools with large populations tend to be more attractive, this action is generally called 'herd behavior'. In the financial market this behavior is commonly found, market trends and financial experts are often followed by investors. It is therefore a key factor to analyze the behavior of market agents in stock market.

The two key factors which are attributed to investing behavior for investors in the stock market are traditional and behavioral finance point of view. (I)The traditional theories of finance which is mostly based on the Efficient Market Hypothesis (EMH), its assumptions are based on investors' rationality and arbitrage (ii) behavioral finance which focuses on the psychology of investors and limits to arbitrage (Thaler & Barberis, 2003). In view of economic theories from the past, sources of the world economy were affected by the 2008 financial recession which began in the USA and worldwide economy decline it generated. As a result, large numbers of financial and investment analyst who occupied important positions in the government were all caught unprepared by this and experienced events such as liquidations and defaults.

Indeed, after the financial calamities had begun, most people were unable to examine the impact. Shedding light in the case of Long-Term Capital Management (LTCM) merits to be mentioned specially for owing to the facts that, in spite of being joined by Noble prize economists and Wall Street traders, eventually failed (Nofsinger, 2001). This study is important as it helps to understand the herd of investors and also brings light on particular anomalies that are left unexplained by classical financial theory. It has been highly observed in recent studies that market participants follow the steps of other agents rather than follow the market behavior (De Bondt, 2008). Academic and financial practitioners herd behavior exist amongst investors in the stock market (Devenow & Welch 1996, p.603). Academic economist, are concerned about behavioral effects in the stock prices, such effects in the investors' returns and risk assessments, as a result various models were developed. Some market participants tend to update their beliefs promptly while others assume that they do so more rationally but make normatively inefficient choices. There is no doubt that herding behavioral is an investment pattern, which has been constantly noticed in the stock market through theoretical observations. The practitioner's point of view, herding behavior within market participants is to maximize profit from trading opportunities because the influence of herding among investors is capable of moving prices from its original worth (Tan, 2007, p.61-62). humans are subjected to be vulnerable to different behavioral anomalies, which in turn can act as an obstruction to wealth maximization.

In August 2007, a global financial melt-down which was traceable to the high-risk mortgage crisis in USA, these mortgages were packaged and sold as Mortgage-Backed Securities (MBS) by banks to financial institutions that were created by the US government, such institution like Federal Home Loan Mortgage Cooperation's, the loans were repackaged and sold to individual investors and financial institutions

around the globe (Ayuba,2011). Fluctuations in stock prices due to fear and expectation have made investment decision difficult for any investor, also it has been observed that market behaviors can move from good to bad and back again, within hours, days, or weeks.

The phenomenon of market participants herding has been extensively researched in recent years. The US and Asian markets have received the majority of attention in empirical research. Christie and Huang find that herding is not present in the US stock market (1995). The result is in line with the findings Chang et al. Presented in (2000). They do, however, discover convincing result in Taiwan & Southern Korea that the presence of herding occurs at times of significant trading fluctuations. In contrast to two previous findings in china stock market. Tan, (2008); Chiang & Zheng (2010), Demirer, R., & AM, Kutan, (2006) discovers no existence of investor herds in the Chinese market. Chiang and Zheng (2010) contributed in the study of herding behavior by uncovering data indicating that the US has a sizable impact on regional market. In essence, evidence was discovered that suggests the majority for the study countries gravitate toward the US market. The subject of some studies is herding in European markets. In the Athens stock market, Tessaromatis and Thomas (2009) discover sporadic evidence of herding.

Furthermore, Chiang and Zheng (2010) discover herding exists in a number of developed European nations. Khan, Hassairi and Vivan (2011) also discovers the existence of herding among four Euro nations. In their analyses no proof of herding during times of market stress was found. The Norwegian region has been the subject of few studies, the research on herding around the Nordic region carried out by Saastamoinen's (2008) and Ohlson's (2010) studies, reviews few presences of herd in

the Finnish market and some in Swedish stock market, respectively. The investigation's time frame extends from 1981 to 2019. Because it captures all periods of financial trends, the world financial recession of 2008, and burst bubble of 2000s, this time period is particularly interesting. This makes it possible to research herding during times of significant market fluctuations, as Christie and Huang originally proposed (1995). This is accomplished by breaking up the time periods into each year.

The following are some ways that this paper differs from earlier research. First off, previous research has mainly concentrated majorly on the US, Europe and Asian-markets. The Norwegian region is being looked into in this study. (ii) This study looks at the impact of herd behavior on stock market performance in Norway, because of the limited literatures of herding behavior in Norway stock market, this study aims to add more information to existing literatures on herding behavior in various countries. This study focuses only on Norway, as it highlights the impact of herding behavior on stock market financial performance.

The order of this research is; The two opposing perspectives of investors behavior in stock exchange, behavioral and traditional finance (EMH), are discussed in Chapter 2, The foundation of herd behavior is also introduced, along with its effects on the financial markets. Chapter 3 discusses the earlier empirical research on herding. Chapter 4 presents the data and the paper's methodology. The analysis and empirical findings are presented in chapter 5, the conclusion and recommendation are presented in chapter 6.

Chapter 2

THEORITICAL FRAME WORK AND LITERATURE REVIEW

2.1 Overview

The traditional and behavioral theories of finance describe the two opposite perspective behaviors of investment agents in the stock market.

The study of finance can generally be described as managing, acquiring and investing scarce resources and how they are allocated over a period of time. The traditional theory of finance analyses two major philosophy: (a) Agent of the market acts rationally; A behavior is considered rational when information is translated properly by all participant in the market at the process of renewing their assumptions. (ii) Efficiency of market, Efficient Market Hypothesis (EMH) describe the market is perfect and all information which reflect in the stock prices can be obtained. Since the 1950s, a lot of attention has been contributed towards creating and testing varieties of advanced asset pricing models. In the works of (Subrahmanyam, 2007), the philosophy of finance is centrally categorized as (i) investment portfolio according to the risk and returns expected (ii) an asset pricing models based on risk for instance (Capital Asset Pricing models (CAPM) (iii) cost of contingent claim (iv) the theorem by Modigliani-miller (M&M). It is assumed that since humans value wealth, they tend to take rational investment decisions. However, these theories reconstruct the field of finance, a lot of gaps were still void by these models.

In traditional theories there are less information on problems like; (I) the reason why individuals make investment? (ii) why stock returns vary regardless of the risk? Interestingly, psychologist discovered in their research that with anything which involves money, humans usually act in a certain pattern while making decisions. In psychology, researchers found out that mistakes in investment decisions can be as a result of cognitive errors and extreme emotions. In the study of (Shiller 2002), a discovery which is based on original experiments or observations that the CAPM, EMH and other relevant theories applied great skills in the prediction and explanations of certain occurrences in financial world. While these have been uncovered, also academics began to discover trends of behaviors and anomalies that were not explained by these traditional models, such examples as; (I) the January effect by (Rozeff and kinney, 1976), this effect is an anomaly in the stock market whereby in the month of January there are increases in the cost of securities without basic aims. (ii) Anomalies; winner's Curse by (Thaler, 1988) winning bidders overestimate the price of products bought due to extreme emotions and incomplete information, these gave rise in academics to analyze cognitive psychology so as to give account for investors displays behaviors which are not rational and logical (Phung, 2002).

The study of behavioral finance has contributed immensely to understand better how the world of finance operates with the use of relevant theories. Some early supporters of behavioral finance who were called visionaries such as Daniel Kahneman and economist Vernon Smith, received the Nobel Prize of 2002. Daniel was known for his study on human judgement and making decision under unpredictable situations, while Vernon through examination research made analysis on alternative market system. History recorded it as the first time a psychologist received the Nobel Price and this

acted as assurance to the orthodox financial economist, that investors in the financial market can behave irrational.

2.2 Efficient Market Hypothesis

The efficient market hypothesis (EMH) and its implications is a major foundation of traditional theories for finance. Firstly, a financial market is ‘efficient’ if it fully and rightly reflects all information's which are relevant in determining security prices. Market efficiency can either be weak, slightly-strong and strong, if the market hypothesis is weak, it is assumed that prices show the total previous information, slightly- strong form market hypothesis states that prices display public (general) information, lastly, strong market hypothesis reviews that price reflect all private information, (Fema 1970.). an efficient market is one in which the competition among intelligent investors drives towards a situation whereby the original price of an investor securities is already reflecting the impacts of information that are based on recently occurring events and those based on future events. Therefore, a security's actual price at any moment will reflect its intrinsic value in an efficient market, (Fema, 1965).

In terms of central finance, the Efficient Market Hypothesis (EMH) has been around for over four decades, and probably the most criticized as well. In the works of Fema (1970), defines an efficient market as one which reflects all available information. This hypothesis reveals the efficiency of the real-world stock prices, and Fema continues in his words, claiming that a trading strategy which is based on currently available data could never reliably generate excess returns. In the 1970s, the Efficient Market Hypothesis became a sensation and majority of research projects based on why hypothesis should stand, which were backed up by a mountain of theoretical and empirical evidence.

Theoretically, the foundation of EMH bases its argument on three factors (i) the market agents act rational and they value securities rationally (ii) if any market participant act irrationally, their trade becomes random and therefore cancels out each other without interfering with the prices (iii) irrational investors' impact on the market is reduced by reasonable arbitrageurs. It's a fact that the EMH did not rely solely on reason to forecast efficient market but also predicted the market efficiency in the absence of rationality, a high regard was displayed by this theory. However, the observations from 1970s, only supported the argument, such as: (i) any new information about a security should be reflected in its prices as soon as possible, and (ii) the prices should not be adjusted if there is no recent information about the company because the security's value must be exact. This is to say, non-reaction to a lack of knowledge (Shleifer, A. 2000).

2.2.1 Support and Criticism

In Fama (1965) distinguished three formations of EMH efficiency: 1. "weak" efficiency when price information is incorporated into prices based on historical prices and returns, making it practically not possible to gain under risk adjusted conditions based on past data. As a result, logical thinking is ineffective (ii) Semi-strong efficiency, describes investors who cannot earn greater returns by the use of information which are available to the public, since the information is incorporated into the price. In this case, the analysis becomes meaningless. (iii) "Strong" form of EMH states that both public and private information, fully reflect in the value of securities. An investor will have no chance of outperforming the market without insider information. In addition to the fact that it is challenging to accept the strong form, evidence indicates that insiders cannot earn excess returns when they are trading legally, (Seyhun 1998, Jeng et al, 1999). As evidence for weak form of efficiency,

Fama (1965) showed that the prices of stocks exhibited random walks. By exploring the effects of different information on the prices of shares, Fama et al (1969) demonstrated the semi strong efficiency. As described by a key inventor of the EMH, Michael Jensen, this hypothesis reached its peak when Jensen stated, "There are limited observations in economics that support the Efficient Markets Hypothesis (Jensen 1978). Almost immediately, the EMH was confronted with observations or analytical challenges. Since prices do not reflect available information.

Grossman and Stiglitz (1980) put forth the argument that efficient markets are impossible, since investors would have no incentive to obtain it. As such, investors move in actions according to information which is believe to be relevant or not, resulting in deviations from fair value. Individuals move from the standard decision-making model, for instance, according to their risk level, as Kahneman & Riepe (1998) demonstrated. The empirical literature of Shiller and Summers (1984, 1986) suggested that returns are, at least in part, predictable, contrary to the current assumption that returns are constant. Testing of EMH based on this model until the 1980s raised questions about its credibility.

2.3 Herd Behavior in Stock Market

In behavioral finance, herd behavior is a common occurrence. Herding is defined by Nofsinger & Sias (1999) as just a number of individuals or firms making trade similar direction over time. Investment herd behavior recently has gained a growing number of people, both inside and outside of academia, he has gotten a lot of attention. Most investors make this mistake, following the investment decisions made by the majority. For this reason, it can be said that the most favorable period to buy or sell on the stock market is at one's fingertips. Investors who feel they should take action may feel

pressured to refrain from acting. In most cases, peer pressure or influence plays a significant role in this. Many investors subscribed to Reliance Power's IPO in 2008 without having all the information they needed. Sherrfstein and Stein (1990) write that investor are influenced by “herding behavior” because it relates with how others take decision on investing.

People have the capacity to imitate this same behavior of a large group, regardless of how they make decision on their own towards the same direction. A particular reason is that people are social creatures who prefer to obtain acceptance from their peers over being alone. An even more justification is that market participants believe it is nearly impossible that a large group of people can make mistakes. This can lead investors to herd as a mistaken belief that the investor herd knows things, they aren't aware of.

According to Lux (1995, p. 881), the analytical finding of stock prices exhibits unstable expected returns which raises concerns about the total efficiency in the stock markets. It has long been hypothesized that investor herds play a significant role in the financial market, described by Christie & Huang (1995, p.31). As a result of several financial crises, researchers have become increasingly interested towards the phenomenon of herding. They constantly disagreed that recession results in the widespread of herding in the market, Chari & Kehole, (2004). however, Academics and market practician assume that among investors in the market, herding usually occur. Devenow & Welch, (1996).

Several definitions of herd have been proposed in the literature. According to (Banerjee, 1992, p. 798) defines herding as "when everybody acts exactly how others are acting, yet in a situation where personal knowledge implies acting the opposite of

what is," thus according to his important paper. This is indeed a general type of herding that can be used in a variety of situations in daily life. Herd behavior is a term used frequently in the field of behavioral finance to describe trade correlations as a result of the interactions between traders (Chiang & Zheng, 2010, p. 1911). Bikhchandani & Sharma (2001, p. 280) claim if market agents are aware of and influenced by the actions of others, they can be considered members of a herd. According to the authors, an agent is herding when information about another market participant investing in a certain result causes the investor to consider either to invest in the product or not. Herding also occurs when an investor makes an investment before learning about other investors results and then change their mind after understanding that they chose not to invest. In this study, we will use Hwang and Salmon's (2004, p. 585) definition: "Herding occurs if investors choose to follow particular decisions of others investors or follow market trends rather than stick to their knowledge".

Herding between financial investors are classified as intentional or spurious. herding is intentional when the result of market participants intent copies the doings of others. this herding behavior may result in market outcomes that are inefficient. In contrast, the latter occurs when groups experience similar sets of information and decision problems. As a result, they make similar decisions. As a result, this is an effective result. But though distinguishing intentional and spurious herding is an important observation. The cause are various facts determine an investment decision. (2001, p. 281) Bikhchandani & Sharma.

A few authors contend that there are various perspectives on herd behavior in stock markets. The study of Devenow & Welch (1996, p. 604), stated two conflicting perspectives of herding, namely the rational and irrational. The former is based on

externalities, suppose that efficient decision made is biased by challenges or facts problem Scharfstein & Stein (1990); Banerjee, (1992); Bikhchandani et al, (1998); Avery & Zemsky, (1998). The significance for rational herding consists of three reasons which are incomplete databases, reputation that are questionable, and remuneration frameworks (2001, Bikhchandani & Sharma, p. 283).

Therefore, herding behavior generated by inadequate facts is referred to as informational cascades. This term “Cascades” seem to be the most general explanation for herding. It aids in describing some observed theories. An example, a company chooses an investment opportunity in the R&D of one particular region or assume an expert put forward specific securities. Devenow & Welch, pp.(609-610) cascades of Information are brittle. The various kinds of obstructive shocks which can affect the flow of informational, include the entry of traders with improved facts, recent public information, and so on (Bikhchandani et al, 1998, p. 157).

An example of an informational cascade is presented by Bikhchandani & Sharma (2001, p.280). They illustrated, there were 100 investors in the process of making investment decisions to either invest or not in an emerging market. Investments should be analyzed by each individual investor. The investor's perspective on the profitable investment is different with the other investors. According to the authors, 80 people believe the investment is unprofitable, while 20 people consider it profitable. In general, investors are aware of their own valuations of investment profitability, but they may not be aware of other investors' estimations. It is likely that if knowledge is shared within investors, some might opt from trading in the market. Let us suppose that the first investors are among the 20 people who assumes that there is profit in a certain investment. In this case, they'll invest in the emerging market. This might in

turn make some among the 80 investors who had doubts about the investment feel more confident in it. In light of these factors, most of the 100 investors will likely participate in the investment. As a result, they are influenced by one another and make poor investment decisions. Unprofitable investments will cause these investors to exit the market when they are identified.

Various other models and such illustration of cascades given above by (Bikhchandani et al, 1992 & Welch, 1992) are based on fixed prices. For investors on the financial market, however, this is not realistic. Hence, the assumption in Avery and Zemsky (1998) is modified. The price mechanism makes it impossible to model herd behavior in their general model. Even so, herd behavior has been shown to be possible when more complex information structures are added.

Furthermore, reputational concerns have been used to model herding by Scharfstein and Stein (1990). Based on their analysis, they concluded that it is rational for an investor to copy others' investment decisions. In their theory, managers are either smart or inefficient. Investment decision is influenced by either informative (true) signals or uninformative (noise) signals. Moreover, the model assumes that investors have no idea whether of being well informed or inefficient, the outcome of such investment decision would not be perceptible till investments are made on the item. Only if other managers did not make the same investment does the result of a bad investment decision reveal the managers low quality. If investment decisions made by are other managers are poor, they could argue that it was because of the wrong investment pattern. As a result, when enough inefficient investor managers herd on that bad decision, even well-informed managers may follow suit rather than risking their money on a superior investment. This is to keep from being the only one. A stock market

example provides reviews how reputational herding has significant effects, as described by Scharfstein and Stein (1990, p. 465). Specifically, the bull market prior to October 1987. Money managers at that time all agreed that the price level was very high. They saw more likelihood of a market fall than an increase. Although the market was struggling, few money managers wanted to sell their holdings. As a result, if the market declined, they would have comfort in numbers, and if it continued to rise, they would not want to be viewed as lone wolves.

However, based on daily time series data from the Greek, Italian, Portuguese, and Spanish stock markets between 1998-2008, Kostakis & Philippas (2010) investigated asymmetric herding behavior (as a function of returns of market, trade volume, and return volatility). In addition, it was examined that herd behavior was present in the period of 2008 global financial crisis. In times of high market prices, herding is more prevalent according to the study. There are instances of herding around Portuguese market at period when the market returns are low, but no evidence of herding in Spanish stock market. This can be concluded that participants in Greek market would have acted rationally. Accordingly, it is stated that the presence of Herding occurred only in Portuguese market during the 2008 global financial crisis, but anti-Herding occurred in the Spanish and Italian stock markets.

Herding has attracted the attention of both economists and practitioners in financial markets. Stock prices are influenced by herding behavior, which is of interest to economists. They may be affected by changes in return and risk characteristics, which will have an impact on asset pricing models. A more profitable trading opportunity is seen in herding among investors, according to practitioners. An investor herd can push prices away from their fundamental value under the effect of investor herds.

Additionally, in the stock market, there are herding that makes it necessary for investors to obtain the same level of diversification through a wide number of securities which have a reduced level of linear relationship (Tan et al, 2007, p. 61-62).

Compensation structures are another form of rational herding. Investors tend to herd according to (Bikhchandani and Sharma, 2001, p. 292) when their compensation is influenced by their performance in comparison to others.

According to (Devenow & Welch, 1996, p. 604) a non-rational version for herding behavior, investors act like followers, disregarding available information and following others. Consider potential stock market behavior among investors as an example. When there is a decline in an increased number of stocks in a market, it is assumed that investors put their stocks for sale in order to reduce the risk of incurring losses, immediately as a reaction to the decline. In this case, investors turn a blind eye to all rational analyses and overreact in fear. Other financial phenomena such as bank panics can also exhibit this phenomenon.

The empirical study in this paper simply examines the impact of herd behavior on Investors who follow the financial performance of the stock market rather than individuals stock characteristics, engage in this type of herd behavior (Henker et al. 2006, p. 197). There is no distinction between rational and irrational herding in the market-wide herding approach. It is challenging to test empirically even though considered as a significant component in the theoretical structure which influences all impact of herding behavior in the market. Hirshleifer and Teoh (2003, p.57), however, suggest in their article that the concept of herd is the mixture of nonrational and rational

attitude of market agent of stock investments. Investors are thought to act in a more herd-like manner during times of relatively large market fluctuations.

Chapter 3

PREVIOUS EMPIRICAL RESEARCH

3.1 Past Empirical Research

The empirical observations or analysis for herd behavior in a stock market can be viewed from two points of Chiang and Zheng, (2010, p. 1911). First, behavior in similar movements that constantly changes the measurement of relation between different securities. In their 2002 book, Forbes & Rigobon examine three financial crises: the recession of 1987 US stock market, the 1994 devaluation in Mexican, and Asian crisis in 1997. Their research aims to investigate the occurrence of interdependence and contagion during these crises. According to the authors, contagion occurs when an unforeseen crisis in a nation is affected by a significant rise to cross-correlation. Interdependence is a term used when countries exhibit sustainable high levels of linkages between economies. The presence of contagion was not seen during market crises. However, there were evidence of correlation coefficients (interdependence) in times of crisis and more stable times. The results of (2002) Forbes and Rigobon concur with those of Baur and Fry (2004). They conclude that during the Asian crisis, interdependence is more important than contagion. Contrarily, Corsetti et al. (2005) provide sporadic results of financial contagion in their analysis southeastern region of China in October 1997 market crisis. They discover evidence from the market spreading to developing and industrialized nations. Boyer et additional findings on Asian crisis is presented (2006). The results contends that growing stocks market are divided into separate groups: such as those accessible to foreigners and those not

accessible. The observations suggest that there is a greater similar movement in times of more volatility. It is especially obvious for returns on stock that are easily accessible. This suggests that international investors spread crises, an added study of Chiang et al (2007) on the Asian crisis. The study's primary areas of interest are herd behavior and contagion. In all markets, high correlation coefficients are interpreted as signs of herd behavior. They distinguish between two crisis phases. Stock return correlation increases more during the first phase. A consistently higher correlation between stock return is what defines the second phase. According to the authors, one explanation could be that during the initial stages of crises, investors place a high priority on information from their home countries, making contagion a reality. The investor decisions do, however, tend to converge as the crisis becomes more widely known due to herding behavior, which leads to increased correlations. Billio & Caporin (2010) discovered proofs of market contagion in US and Asian markets in their theoretical study, which is not different with the result of (Corsetti et al. 2005) who find proofs of contagion in Hong Kong developing market

Many studies have used their methods or slightly changed versions of measurement for herding, including (Christie and Huang, 1995) and (Chang et al. 2000). Numerous studies on herd behavior have a strong emphasis on Asian markets. In the China equity market, it is stated that investor herd is not observed, in the works of Demirer & Kutan (2000). Tan et al (2008). discover contradictory proofs in Chinese market. They look at herding in double-listed A-share and B-share stocks from Shanghai and Shenzhen. Domestic individual investors predominate in A-shares, while foreign institutional investors predominate in B-shares. When looking at Shanghai A-share and B-share stocks, they discover evidence of herding. It's interesting to note that investors in Shanghai A-shares exhibit more herding behavior during bullish market conditions.

Chiang et al. provide additional proof of herding in the Chinese equity market (2010). They investigate herding behavior in Shenzhen and Shanghai A- and B-market share in manner similar to Tan et al. (2008). They found the presence of herding in A-share equity markets. They discover that A-share investors frequently engage in herding behavior in bullish and bearish market. They only discover evidence of herding behavior in B-share equity market during downturns, although. The results contradict the findings of (Tan et al, 2008). The quantile regression method was used in addition to earlier research for analyzing the herding equation. Investors in both A-share and B-share securities are found to display herding behavior in lower quantile regression. The Indian market and Chinese both exhibit signs of herding behavior, according to Lao & Singh (2011). The level of herd which was discovered depends on the market conditions. Results from studies like Chiang et al. (2010) revealed that herding behavior is more consistent in Chinese market in times of market decline and low trading volume. The findings for India indicate that when market situations are up, herding behavior is common. Using the techniques of Christie& Huang (1995) and Chang et al., (2010) Demirer et al. (2000) discovered proof of herding behavior in Taiwanese. They discover substantial proofs of herding behavior, particularly during times of significant trends in the market, which includes the example for, Chang et al, (2000). Applied the Hwang and Salmon method as well.

Additionally, empirical research on herd behavior in stock markets apart from Asian markets has been done. The Australian equity markets are the focus of Henker et al (2006). 's analysis. They check to see if there is daily and intraday herding. There is no proof of herding in the Australian equity market. Tessaromatis and Thomas look at herding behavior in Athens stock market from 1985 to 2004. (2009). Throughout the entire time period, they discover no proof of herding. However, the Athens stock

market provides evidence of herding behavior as the researcher split the time period into sub-period of 1998-2004. According to the authors, the time period under investigation was marked by significant market recent advancements followed by adjustment. Additionally, they find that almost half of the time investment fully complies with herd behavior when testing for it within individual years. This suggests that investors' herding or non-herding behaviors are transient. Saastamoinen (2008) conducted research on the Finnish stock exchange in Helsinki. A quantile regression is carried out this includes the measures suggested by Christie & Huang (1995). Chang et al. (2000). During the regular trading day, there is no presence of herding among the market agent. On days when the stock market is doing well, there is existence of herding in Helsinki stock exchange. Ohlson discovers comparable proof (2010). In his study, using information from Swedish OMX Stockholm, the existence of herding was found on days when the market was rising between 1998 and 2008. Additionally, breaking down the sample into subperiods demonstrates that herding occurred during the bull market markets of 2005 and 2007. This is in line with what Christie and Huang think (1995).

According to the study of investment herd behavior between participants in the four Nordic countries, applying the (Chiang and Zheng, 2010) approach, result shows that Finnish and Swedish market herd around US market also all Four Nordics herd around Europe market. Lindhe, E (2012).

Chiang and Zheng (2010) conduct additional herding research by looking at the world stock markets. They alter the method Chang et al. proposed (2000) discovered three set of advanced markets, Latin American and Asian markets, they look at 18 various countries and no of investors herd was presence in the United State stock market,

which is consistent with earlier research. The study's other advanced nations and the Asian markets, however, show strong evidence of herding. According to Christie & Huang (1995), herding behavior is observed at times when significant market fluctuations occur. In Asian markets, asymmetry of herding is observed during rising conditions, supporting the findings of Tan et al. (2008).

Hwang and Salmon propose a different herding measurement (2004). Their approach departs from earlier research's methodology and is based on beta dispersion. The US equity market exhibits evidence of herding behavior, which is in contrast to the result presented in earlier studies such as Chang. (2000); Chiang & Zheng (2010)). They also discover proofs of herding behavior in the South Korean and UK markets. Their empirical data demonstrates that herding toward the market exhibits notable persistence and movements that occur both independently of and in response to market circumstances. Proofs were found It was discovered which suggests that herding among investor is less common at times of short-term changes in the market. According to Christie & Huang (1995) and Chang et al., (2000) these facts are false. It's interesting that the authors don't find any proof of herding during times of market turmoil and crisis. Using Hwang and Salmon's (2004) methodology, herding behavior is analyzed in four various European nations, they show signs of herding, according to Khan et al. (2011).

The observation on herd behavior and the effects on market performance in Kenya from 2010 to 2014, evidence was found that there is a relationship between the investor herding and Nairobi stock market performance both in the long-run and short-run (Maina, 2016).

Chapter 4

DATA AND METHODOLOGY

4.1 Definition of Data

Herding is a situation where many investors trade in a similar direction over a given time period. That is, individual traders follow and imitate the behaviors of others, rather than using available information to decide for themselves. Does this herding behavior have any significant impact on the performance of financial markets? This research seeks to provide an answer.

For the case of Norway, the impact of herding behavior on stock market's financial performance will be empirically investigated, because of the limited findings of herding behavior in Norway stock market, this study aims to add more information to existing literatures on herding behavior. In their study on the effects of herding behavior in Kenya's market performance which is originally based on Calderon-Rossell (1991) behavioral model, Maina (2016) used the values of shares traded as a proxy for investor herding, and market capitalization was used as a measure for stock market performance. In a similar way, the total value of stocks traded (% of GDP) and the market capitalization of listed domestic companies (% of GDP) have been used in this study as proxies for herding behavior and stock market financial performance, respectively. The definitions and sources of the variables are provided in Table 1.

Table 1: Definition Of Data

Variable	Measure	Definition	Source
Stock Market Financial Performance	Market capitalization of domestic companies (% of GDP)	The market capitalization (“market cap”) is the product of the outstanding shares of listed domestic companies and the share price.	The World Bank (2022)
Herding Behavior	Stocks traded, total value (% of GDP)	The value of shares traded is the product of all the shares traded annually and the respective prices of each	The World Bank (2022)

In this study, annual data for the case of Norway over the 1981-2019 period has been employed. The proxies, definitions, and the data sources used in the research are shown in Table 1. Stock market financial performance (proxied by market capitalization of domestic companies (% of GDP)) is the dependent variable (regress and), while herding behavior (proxied by stocks traded, total value (% of GDP)) is the independent variable (regressor).

4.2 Descriptive Statistics

Table 2: Descriptive Statistics

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
lnMCAP	39	3.474474	0.761887	1.341298	4.536271
LnSTOCKS	39	2.683611	1.429145	-1.969838	4.622232

NOTE: MCAP and STOCKS stand for market capitalization of domestic companies (% of GDP) and total value of stocks traded (% of GDP), respectively. All the variables are in the natural logarithmic forms (ln)

Table 2 shows the main characteristics of the data. In logarithmic form, the mean values of the market capitalization of domestic companies (% of GDP) and total value of stocks traded (% of GDP) are 3.47% and 2.68%, respectively. The respective standard deviations are 0.76% and 1.43%. These show that the lnSTOCKS data have more variation from their mean value than the lnMCAP data. The time span of 39 years is sufficient for observing long-run relationships among the variables.

4.3 Model Specification

To empirically examine the relationship between herding behavior and stock market financial performance, the following model is specified:

$$\ln \text{MCAP} = f(\ln \text{STOCKS}) \quad (1)$$

$$\ln \text{MCAP}_t = \beta_0 + \beta_1(\ln \text{STOCKS}_t) + u_t \quad (2)$$

where MCAP stands for market capitalization of domestic companies (% of GDP), and STOCKS stand for total value of stocks traded (% of GDP). MCAP is the dependent variable, and STOCKS is the independent variable. All the variables are in their natural logarithmic forms (ln). As shown in equation 1, lnSTOCKS is a linear function of lnMCAP. Developed from equation 1, equation 2 shows that there is a linear relationship between lnSTOCKS and lnMCAP, with β_0 being the intercept (constant term), β_1 being the coefficient of the independent variable, lnSTOCKS, and u_t being the stochastic error term of the linear model.

All the variables have been log-transformed in order to reduce the variability in the data, thereby reducing the probability of the residuals being heteroscedastic. Secondly, by using the natural logarithmic form of the variables, normality in the distribution of the data becomes plausible. Also, by using the natural logarithmic forms, data analyses

and interpretations become easy, as the results can be discussed in terms of percentages.

4.4 Methodology

To empirically investigate the impact of herding behavior on Norway's stock market financial performance, a time series approach is applied to the study. For the case of Norway, time series data spanning from 1981 to 2019 has been obtained from the World Development Indicators (WDI) of the World Bank (The World Bank, 2022) and applied in the study. In analyzing the empirical results, the following order has been followed: unit root tests, VAR model, Johansen Cointegration test, VECM, Granger causality test under the VECM.

4.4.1 Unit Root Tests

Following the time series econometric approach, the first step is always to check the stationarity of the variables by running the unit root tests. Conventional unit root tests, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), have been used, and all the variables have been found to be integrated of order one, since they are each non-stationary at their level forms and stationary at their first differences (Dickey & Fuller, 1979).

It is important to always run unit root tests and check the stationarity of the variables. This is because if the variables are non-stationary, they may produce spurious results. Secondly, if the variables are non-stationary, then shocks to the system will not die away gradually – they will remain persistent over time. Thirdly, the non-stationarity of the variables will cause estimation results to be misleading, since t-statistics will not follow t-distributions and F-statistics will not follow F-distributions.

4.4.2 Vector Autoregression (VAR) Model

Since the integration of all variables is of order one, the three-step Johansen's technique was then applied in the study. The estimation of an unrestricted vector autoregression (VAR) model was done in the first step of the Johansen's technique. The VAR model was found to satisfy the stability condition, because no roots lie outside the unit circle; and the VAR model was used in determining the optimal lag length will be used in running the Johansen test for cointegration and in estimating the vector error correction model VECM, (Hansen, P.R, 2003)

4.4.3 Cointegration Test

Since all the variables have the same order of integration ($I(1)$), cointegration tests have been run to determine presence of a long-run relationship between the variables. The second step is the three-step Johansen's time-series approach. In particular, the Johansen test for cointegration has been performed, and one cointegrating equation (vector) has been found present, using both the trace test statistic and the maximum eigen value. (Chakraborty & Basu 2002)

4.4.4 Vector Error Correction Model (VECM)

In the third step of the Johansen's technique, a vector error correction model (VECM) has been estimated to determine the short-run coefficient of $\ln\text{STOCKS}$, the long-run (cointegrating) coefficient of $\ln\text{STOCKS}$, and the coefficient of the error correction term (ECT). The coefficient of the ECT shows the speed of adjustment of $\ln\text{MCP}$ towards its long-run equilibrium value, and it has been proven to be negative and statistically significant. Hence, the vector error correction model (VECM) has worked well, and it is appropriate for examining long-run relationships (Maysami & Koh, 2002).

4.4.5 Granger Causality Test

Under the VECM, Granger causality tests have also been applied in order to estimate the directions of both long-run and short-run relationships between $\ln\text{MCAP}$ and $\ln\text{STOCKS}$ (Hiemstra & Jones, 1994).

Chapter 5

RESULTS AND ANALYSES

The findings are presented and analyzed in this chapter. The research hypotheses set, based on a priori expectations from the graphs, are compared to the actual empirical results.

5.1 Preliminary Evidence and Research Hypothesis

The graphs of both variables are shown in figure 1.

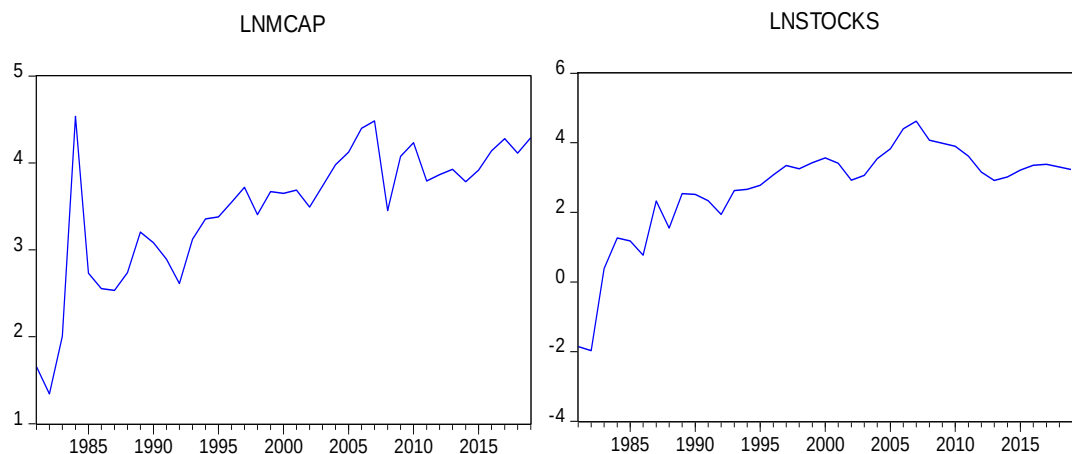


Figure 1: Line Graphs of $\ln\text{MCAP}$ and $\ln\text{STOCKS}$

The graphs in Figure 1 show the presence of a positive relationship between herding behavior ($\ln\text{STOCKS}$) and stock market financial performance ($\ln\text{MCAP}$), on average. On average, a rise in $\ln\text{STOCKS}$ will cause a rise in $\ln\text{MCAP}$, albeit there are more fluctuations in the $\ln\text{MCAP}$ graph than in that of $\ln\text{STOCKS}$.

Based on the aforementioned, it is expected that the sign of the coefficient of $\ln\text{STOCKS}$ (investor herding behavior) will be positive. Hence, the following directional hypothesis will be tested:

H_1 : Investor herding behavior has a significantly positive impact on stock market financial performance in Norway.

5.2 Empirical Findings

5.2.1 Unit Root Tests

To check the stationarity of the variables and determine their respective orders of integration, unit root tests (Augmented Dickey-Fuller and Philipps-Perron) have been performed. The two-tailed tests are used. For these non-stationarity tests, the hypotheses are as follows:

Null hypothesis (H_0): The variable has a unit root (that is, $\Phi = 1$)

Alternative hypothesis (H_1): The variable is stationary (that is, $\Phi < 1$).

The results are presented in Table 3 below:

Table 3: Unit Root Test Results

Level Form	$\ln\text{MCAP}$	Lag	$\ln\text{STOCKS}$	Lag
τ_T (ADF)	-0.71	9	-2.64	5
τ_μ (ADF)	-1.90	9	-1.70	6
τ (ADF)	0.78	2	-0.28	0
τ_T (PP)	-1.41	3	-3.11	0
τ_μ (PP)	-3.21**	0	-5.05*	5
τ (PP)	0.81	37	0.21	3
First Difference	$\Delta \ln\text{MCAP}$	Lag	$\Delta \ln\text{STOCKS}$	Lag
τ_T (ADF)	-6.83*	1	-3.35***	4
τ_μ (ADF)	-6.77*	1	-6.39*	0
τ (ADF)	-6.60*	1	-6.11*	0
τ_T (PP)	-19.42*	36	-9.21*	3
τ_μ (PP)	-12.24*	34	-9.37*	3
τ (PP)	-8.72*	17	-9.24*	3

NOTE: ADF is the Augmented Dickey-Fuller unit root test and PP is the Phillips-Perron unit root test. τ_T , τ_μ and τ represent the model with drift and trend, the drift-only model, and the model without drift and trend, respectively. *, **, *** denote the rejection of the null hypothesis at the 1%, the 5%, and the 10% significance levels, respectively

With exception in the model with drift (intercept) but without trend, all the other models under both the ADF and PP unit root tests for both the lnMCAP and lnSTOCKS variables indicate that both variables are generally non-stationary at their level forms. This is because, but for the intercept-only model, we are unable to reject the null hypothesis that the variable has a unit root even at 10% level of significance.

For both the lnMCAP and lnSTOCKS variables, all the models under both ADF and the PP unit root tests shows that at their first differences, we are able to reject the null hypothesis that the variable has a unit root at 10% level of significance. Hence, we accept the alternative hypothesis that the variable is stationary with 90% confidence. Thus, both variables are clearly stationary at their first differences.

Since both variables are non-stationary at their level forms and stationary at their first differences, we conclude that the order of integration of each of the variables is one. Hence, both variables are I (1). Therefore, we proceed by following the three-step Johansen's technique – VAR model, Johansen cointegration test, VECM.

5.2.2 Vector Autoregression (VAR) Model

After running unit root tests and determining that all variables are integrated of order one, the next step is to estimate an unrestricted vector autoregression (VAR) model which satisfies the stability condition. This VAR model will help us establish the optimal lag length to be used in the Johansen cointegration test and in estimating the vector error correction model (VECM) which will provide the long-run coefficient of lnSTOCK and the speed of adjustment of lnMCAP towards its long-run equilibrium value (the coefficient of the error correction term). The standard VAR is estimated using a lag interval of one-to-two.

From the estimated VAR model, the optimal lag length is determined based on various information criteria as shown in Table 4.

Table 4: Optimal Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
	-					
	64.646					
0	64	NA	0.139020	3.702591	3.790564	3.733296
	-					
	36.815					
1	97	51.02289	0.037019	2.378665	2.642585	2.470780
	-					
	29.192	13.12964			2.617217	
2	31	*	0.030355	2.177350	*	2.330876
	-					
	23.477		0.027775	2.082096		2.297031
3	73	9.206814	*	*	2.697909	*

NOTE: LR is sequential modified LR test statistic (each test at 5% level); FPE is Final prediction error; AIC is Akaike information criterion; SC is Schwarz information criterion; and HQ is Hannan-Quinn information criterion. * shows the lag order selected by the criterion

As seen in Table 4, the optimal lag length is 3, since lag order 3 is selected the highest number of times by the information criteria.

In order to be sure of this lag order selection, we have to make sure that the VAR model is stable. To check the stability of the standard VAR model, both the autoregressive roots (AR) graph and the AR table are observed. The results are shown in Figure 2 and Table 5, respectively.

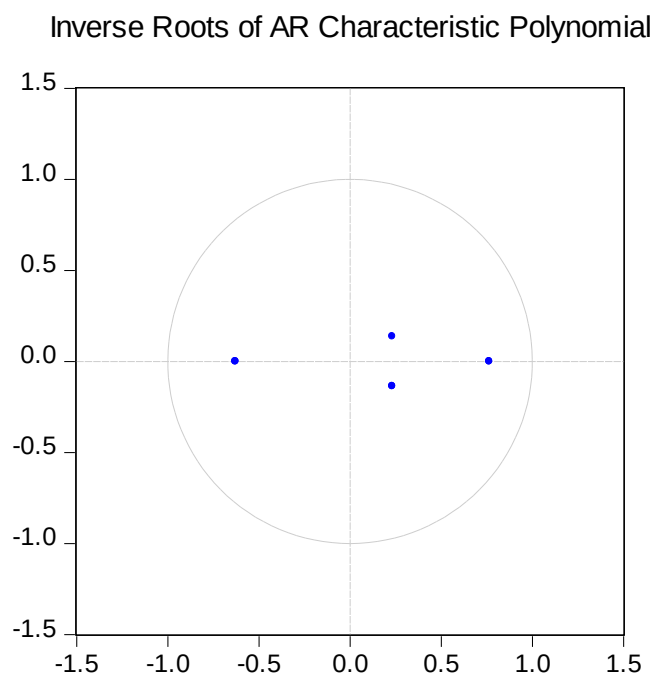


Figure 2: AR Roots Graph

Table 5: The Roots of Characteristic Polynomial

Roots	Modulus
0.765822	0.765822
-0.628028	0.628028
0.233767 - 0.136330i	0.270616
0.233767 + 0.136330i	0.270616

As can be seen from the AR roots graph in Figure 2, no roots lie outside the unit circle. The AR roots table (Table 5) also confirms this, since none of the moduli values is greater than one. Hence, the standard VAR model satisfies the stability condition.

The next step now is to perform the Johansen test for cointegration to show if there is a long-run relationship between $\ln\text{MCAP}$ (stock market financial performance) and $\ln\text{STOCKS}$ (investor herding behavior).

5.2.3 Cointegration Test

Using the optimal lag length of 3 (lag interval of one-to-three), one cointegrating vector (equation) has been found with the deterministic trend assumption: *linear*

deterministic trend (restricted). Both the Trace test statistic and the maximum Eigenvalue have been used in making this decision. The hypotheses used are as follows:

H_0 : There is no cointegrating vector present ($r = 0$)

H_1 : There is at least one cointegrating vector present.

H_0 : There is at most one cointegrating vector present ($r < 1$)

H_1 : There are at least two cointegrating vectors present.

The cointegration test results are presented in Table 6.

Table 6: Johansen Cointegration Test Results

Trace		Maximum Eigenvalue	
$r = 0$	$r < 1$	$r = 0$	$r < 1$
29.91*	4.94	24.97*	4.94

NOTE: $r = 0$ tests a null hypothesis of no cointegrating vector, while $r < 1$ tests a null hypothesis of at most one cointegrating vector. * denotes the rejection of the null hypothesis at the 5% level of significance.

For both the Trace test statistic and the maximum Eigenvalue, we reject the null hypothesis that there is no cointegrating vector present, at 5% level of significance. We therefore accept the alternative hypothesis that there is at least one cointegrating vector present, with 95% confidence.

At 5% level of significance, for both the Trace test statistic and the maximum Eigenvalue, we are unable to reject the null hypothesis that there is at most one cointegrating vector present, at 5% level of significance.

Thus, just one cointegrating equation (vector) has been found. The presence of a cointegrating vector indicates that there is a long-run relationship between lnMCAP and lnSTOCKS.

Since cointegration has been found to be present, the next step is to estimate a vector error correction model (VECM) to determine the coefficients of lnSTOCKS and of the error correction term (ECT).

5.2.4 Vector Error Correction Model (VECM)

Using a lag length of 2 (lag interval of 1-to-2) – which is actually the optimal lag length (3) minus 1 (the rule of thumb) – the VECM has been estimated. The results of the VECM are shown in Table 7.

Table 7: VECM Estimated Coefficients

	Error Correction Term (ECT)	Cointegrating Coefficient of lnSTOCKS	Short-run Coefficient of lnSTOCKS
Coefficient	-1.523038*	-0.232460*	0.475391*
Standard Error	0.32958	0.03782	0.13127
t-statistic	-4.62114	-6.14696	3.62135

NOTE: lnSTOCKS stands for the natural logarithmic form of the total value of stocks traded (% of GDP). * shows that the coefficient is statistically significant

Table 7 shows the long-run (cointegrating) coefficient of lnSTOCKS, the short-run coefficient of lnSTOCKS, and the coefficient of the error correction term (ECT).

For all the coefficients shown in Table 7, the t-statistics is greater than 2 in absolute value. Hence, the short-run coefficient of lnSTOCKS, the long-run coefficient of lnSTOCKS and the coefficient of the ECT are all statistically significant.

The coefficient of the ECT, -1.52, is negative. Since it is negative and statistically significant, it therefore means that the VECM has worked well, and it is appropriate for examining a long-run relationship between lnSTOCKS (investor herding behavior) and lnMCAP (stock market financial performance). This coefficient of the error correction term (ECT) shows the speed of adjustment of the stock market financial performance of Norway towards its long-run equilibrium value. Thus, the short-run value of lnSTOCKS (investor herding behavior) contributes to the long-run equilibrium level of lnMCAP (stock market financial performance) at a speed of about 1.52% every year. This error correction term (ECT) shows that if the stock market financial performance (lnMCAP) deviates away from its long-run equilibrium value as a result of a short-run shock, then, thanks to the short-run contribution of investor herding behavior (lnSTOCKS), the stock market financial performance (lnMCAP) will be adjusted back to its long-run value every year at an adjustment speed of about 1.52%.

The cointegrating coefficient of lnSTOCKS is -0.23. Since this coefficient is statistically significant, interpretations can then be made. While doing interpretations, the sign of the coefficient is reversed. Hence, lnSTOCKS has a positive impact on lnMCAP in the long-run. That is, over the long-run, a 1% increase in the herding behavior of investors will cause a 0.23% increase in the stock market financial performance in Norway, on average. This positive relationship is consistent with the a priori expectation (research hypothesis) set at the beginning of this chapter.

The estimated long-run equation is therefore written as:

$$\ln \text{MCAP}_t = 2.126433 + 0.232460(\ln \text{STOCKS}_t) + u_t \quad (3)$$

The short-run coefficient of lnSTOCKS is 0.48. Since this coefficient is statistically significant, interpretations can then be made. While doing interpretations, the sign of the coefficient is reversed. Hence, lnSTOCKS has a negative impact on lnMCAP in the short-run. That is, on average, a 1% increase in the herding behavior of investors will cause a 0.48% decrease in the stock market financial performance in the short run.

The R-squared (coefficient of determination) of the estimated VECM is 0.688619. Thus, the model has a decent explanatory power, since about 69% of the variation in stock market financial performance (lnMCAP) is explained by the variation in investor herding behavior (lnSTOCKS).

The research hypothesis is tested, as shown in Table 8.

Table 8: Compatibility Of Research Hypothesis With Actual Empirical Finding			
	IMPACT ON STOCK MARKET FINANCIAL PERFORMANCE (LNMCP)		
	A PRIORI EXPECTATION (A)	ACTUAL EMPIRICAL RESULT (B)	COMPATIBILITY BETWEEN A AND B?
Herding Behaviour (lnSTOCKS)	Positive (+)	Positive (+)	Yes

Table 8 shows that the sign of the long-run coefficient of the lnSTOCKS variable is consistent with the a priori expectations set based on the preliminary observation of the graphs.

5.2.5 Granger Causality Test

Next, in order to determine the direction of both the long-run and short-run relationships between investor herding behavior (lnSTOCKS) and stock market

financial performance (lnMCAP), the Granger causality test under the VECM has been performed. The results are shown in Table 9.

Table 9: Granger Causality Test Results

Independent Variable	Dependent Variable	
	D(lnSTOCKS)	D(lnMCAP)
D(lnSTOCKS)	-	14.27476*
D(lnMCAP)	13.14129*	-
All	13.14129*	14.27476*

NOTE: “All” shows long-run causality, while “D(variable)” shows short-run causality. * denotes the rejection of the null hypothesis at the 1% level of significance

Table 9 shows the results of the Granger causality test. For this test, the hypotheses are as follows:

Null hypothesis (H_0): A variable does not Granger-cause another variable

Alternative hypothesis (H_1): A variable Granger-causes another variable.

As seen in Table 9, lnSTOCKS Granger-causes lnMCAP in both the long-run and short-run, while lnMCAP also Granger-causes lnSTOCKS in both the long-run and short-run. This is because in all cases, the Chi-square test statistics are all statistically significant, since their respective probability values are all less than 1%. Hence, at 1% level of significance, we are able to reject the null hypothesis that lnSTOCKS (lnMCAP) does not Granger-cause lnMCAP (lnSTOCKS).

Therefore, in both long-run and short-run, a change in the investor herding behavior will cause a change in the stock market financial performance in Norway. Also, in both the long-run and short-run, a change in the stock market financial performance will cause a change in the investor herding behavior in Norway.

The Chi-square tests statistics are the same for both the long-run and short-run since there are only two variables (one dependent and one independent).

Since there are both long-run and short-run causalities running from both $\ln\text{STOCKS}$ to $\ln\text{MCAP}$ and from $\ln\text{MCAP}$ to $\ln\text{STOCKS}$, we therefore conclude that there is bi-directional causality between investor herding behavior and stock market financial performance in Norway, in both the long-run and short-run.

Chapter 6

CONCLUSION

6.1 Conclusion

This thesis has empirically investigated the impact of investor herding behavior on stock market financial performance for the case of Norway over the 1981-2019 period. Following the work of Maina (2016), the total value of stocks traded (% of GDP) and the market capitalization of listed domestic companies (% of GDP) have been used as proxies for investor herding behavior and stock market financial performance, respectively. Annual data for both variables has been collected from the World Development Indicators (WDI) of the World Bank. Both variables have been log-transformed, and the total value of stocks traded (% of GDP) data has been found to have more variability than the market capitalization of listed domestic companies (% of GDP) data.

Based on preliminary evidence from the existing literature and from the graphs of the variables, the research hypothesis (a priori expectation) was set that investor herding behavior has a positive impact on stock market financial performance in the long-run.

A time series approach has been applied in the study. Conventional unit root tests (ADF and PP) indicate that both variables are integrated of order one, since they are generally non-stationary at their level forms and stationary at their first differences. The three-step Johansen's procedure has then been followed. In the first step, an

unrestricted standard vector autoregressive (VAR) model which satisfies the stability condition has been estimated. From the estimated VAR model, the optimal lag length was determined to be three. In the second step, using the optimal lag length of three, Johansen cointegration test has been run to determine if the variables are in a long-run relationship, and one cointegrating equation has been found present, using both the trace test statistic and the maximum eigen value. In the third step, using a lag length of 2 (optimal lag length minus one), a vector error correction model (VECM) has been estimated to determine the coefficients of the total value of stocks traded (% of GDP) and of the error correction term (ECT). Coefficient of the error correction term (ECT) was found to be both negative and also statistically significant, implying that vector error correction model (VECM) has worked well, and is appropriate for examining a long-run relationship between the market capitalization of listed domestic companies (% of GDP) and the total value of stocks traded (% of GDP). This coefficient of the error correction term (ECT) – which shows the speed of adjustment of the stock market financial performance of Norway towards its long-run equilibrium value – indicates that the short-run value of investor herding behavior contributes to the long-run equilibrium level of stock market financial performance at a speed of about 1.52% annually. Investor herding behavior was also found to have a statistically-significant positive impact on stock market financial performance of Norway in the long-run while a negative relationship was revealed in the short-run. The long-run positive relationship is consistent with the research hypothesis (a priori expectation) set in this thesis.

Causality analysis has also been performed to determine the direction of both the long run and short run relationships between investor herding behavior and stock market financial performance. Applying Granger causality tests under the VECM, it was

revealed that investor herding behavior Granger-causes stock market financial performance in both the long-run and short-run, while stock market financial performance also Granger-causes investor herding behavior in both the long-run and short-run (bi-directional causality).

REFERENCES

- Abdulsaleh, A. M., & Worthington, A. C. (2013). Small and medium-sized enterprises financing: A review of literature. *International Journal of Business and Management*, 8(14), 36.
- Asgharian, H., Lindhe, E., & Wengström, E. (2012). *Herd Behavior in Stock Markets*. Lunds University Working Paper.
- Avery, C., & Zemsky, P. (1998). Multidimensional uncertainty and herd behavior in financial markets. *American economic review*, 724-748.
- Ayuba, H., Bambale, A. J. A., Ibrahim, M. A., & Sulaiman, S. A. (2019). Effects of Financial Performance, Capital Structure and Firm Size on Firms' Value of Insurance Companies in Nigeria. *Journal of Finance, Accounting & Management*, 10(1).
- Barberis, N., & Thaler, R. (2003). A survey of behavioral finance. *Handbook of the Economics of Finance*, 1, 1053-1128.
- Bikhchandani, S., & Sharma, S. (2000). Herd behavior in financial markets. *IMF Staff papers*, 47(3), 279-310.
- Bikhchandani, S., & Sharma, S. (2001). Herd behavior in financial markets. *IMF Staff Papers*, 2001(002).

- Bikhchandani, S., Hirshleifer, D., & Welch, I. (1992). A theory of fads, fashion, custom, and cultural change as informational cascades. *Journal of political Economy*, 100(5), 992-1026.
- Bikhchandani, S., Hirshleifer, D., & Welch, I. (1998). Learning from the behavior of others: Conformity, fads, and informational cascades. *Journal of economic perspectives*, 12(3), 151-170.
- Billio, M., & Caporin, M. (2010). Market linkages, variance spillovers, and correlation stability: Empirical evidence of financial contagion. *Computational statistics & data analysis*, 54(11), 2443-2458.
- Calderon-Rossell, J. R. (1991). The determinants of stock market growth.—Pacific Basin Capital Market Research Proceeding of the Second Annual Pacific Basin Finance conference.
- Chakraborty, C., & Basu, P. (2002). Foreign direct investment and growth in India: A cointegration approach. *Applied economics*, 34(9), 1061-1073.
- Chang, E. C., Cheng, J. W., & Khorana, A. (2000). An examination of herd behavior in equity markets: An international perspective. *Journal of Banking & Finance*, 24(10), 1651-1679.
- Chari, V. V., & Kehoe, P. J. (2004). Financial crises as herds: overturning the critiques. *Journal of Economic Theory*, 119(1), 128-150.

- Chari, V., & Kehoe, P. (2000). Financial crises as herds. *Federal Reserve Bank of Minneapolis Working Paper*, 600.
- Chiang, T. C., & Zheng, D. (2010). An empirical analysis of herd behavior in global stock markets. *Journal of Banking & Finance*, 34(8), 1911-1921.
- Chiang, T. C., & Zheng, D. (2010). An empirical analysis of herd behavior in global stock markets. *Journal of Banking & Finance*, 34(8), 1911-1921.
- Chiang, T. C., Jeon, B. N., & Li, H. (2007). Dynamic correlation analysis of financial contagion: Evidence from Asian markets. *Journal of International Money and finance*, 26(7), 1206-1228.
- Chitra, D. K., & Jayashree, M. T. (2015). Does the influence of cognitive biases on investor behaviour differ with demographic profile? An empirical study. *International Journal of Research Publication*, 5(4), 161.
- Chordia, T., Huh, S. W., & Subrahmanyam, A. (2007). The cross-section of expected trading activity. *The Review of Financial Studies*, 20(3), 709-740.
- Christie, W. G., & Huang, R. D. (1995). Following the pied piper: Do individual returns herd around the market?. *Financial Analysts Journal*, 51(4), 31-37.
- Christie, W. G., & Huang, R. D. (1995). Following the pied piper: Do individual returns herd around the market?. *Financial Analysts Journal*, 51(4), 31-37.

- Corsetti, G., Pericoli, M., & Sbracia, M. (2005). 'Some contagion, some interdependence': More pitfalls in tests of financial contagion. *Journal of International Money and Finance*, 24(8), 1177-1199.
- De Bondt, W. F., Muradoglu, Y. G., Shefrin, H., & Staikouras, S. K. (2008). Behavioral finance: Quo vadis?. *Journal of Applied Finance (Formerly Financial Practice and Education)*, 18(2).
- Demirer, R., & Kutan, A. M. (2006). Does herding behavior exist in Chinese stock markets?. *Journal of international Financial markets, institutions and money*, 16(2), 123-142.
- Devenow, A., & Welch, I. (1996). Rational herding in financial economics. *European economic review*, 40(3-5), 603-615.
- Devenow, A., & Welch, I. (1996). Rational herding in financial economics. *European economic review*, 40(3-5), 603-615.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association*, 74(366a), 427-431.
- Economou, F., Kostakis, A., & Philippas, N. (2010, June). An examination of herd behavior in four mediterranean stock markets. In *European economics and finance society conference paper* (Vol. 1, No. 1, pp. 1-20).

- Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. *International economic review*, 10(1), 1-21.
- Forbes, K. J., & Rigobon, R. (2002). No contagion, only interdependence: measuring stock market comovements. *The journal of Finance*, 57(5), 2223-2261.
- Grossman, S. J., & Stiglitz, J. E. (1980). On the impossibility of informationally efficient markets. *The American economic review*, 70(3), 393-408.
- Hansen, P. R. (2003). Structural changes in the cointegrated vector autoregressive model. *Journal of econometrics*, 114(2), 261-295.
- Henker, J., Henker, T., & Mitsios, A. (2006). Do investors herd intraday in Australian equities?. *International Journal of Managerial Finance*.
- Hiemstra, C., & Jones, J. D. (1994). Testing for linear and nonlinear Granger causality in the stock price-volume relation. *The Journal of Finance*, 49(5), 1639-1664.
- Hirshleifer, D. (2015). Behavioral finance. *Annual Review of Financial Economics*, 7, 133-159.
- Hirshleifer, D., & Hong Teoh, S. (2003). Herd behaviour and cascading in capital markets: A review and synthesis. *European Financial Management*, 9(1), 25-66.

- Hwang, S., & Salmon, M. (2004). Market stress and herding. *Journal of Empirical Finance*, 11(4), 585-616.
- Jensen, M. C. (1978). Some anomalous evidence regarding market efficiency. *Journal of financial economics*, 6(2-3), 95-101.
- Khan, H., Hassairi, S. A., & Viviani, J. L. (2011). Herd behavior and market stress: The case of four European countries. *International Business Research*, 4(3), 53.
- Lao, P., & Singh, H. (2011). Herding behaviour in the Chinese and Indian stock markets. *Journal of Asian economics*, 22(6), 495-506.
- Lux, T. (1995). Herd behaviour, bubbles and crashes. *The economic journal*, 105(431), 881-896.
- Maina, T. W. (2016). Herding Behavior and its Effect on Stock Market Performance in Kenya. Retrieved from http://erepository.uonbi.ac.ke/bitstream/handle/11295/98549/Maina_Herding%20Behavior%20and%20Its%20Effect%20on%20Stock%20Market%20Performance%20in%20Kenya.pdf?sequence=1&isAllowed=y
- Maysami, R. C., Howe, L. C., & Hamzah, M. A. (2004). Relationship between macroeconomic variables and stock market indices: Cointegration evidence from stock exchange of Singapore's All-S sector indices. *Jurnal pengurusan*, 24(1), 47-77.

- Nofsinger, J. R., & Sias, R. W. (1999). Herding and feedback trading by institutional and individual investors. *The Journal of finance*, 54(6), 2263-2295.
- Ohlson, P. (2010). Herd Behavior on the Swedish Stock Exchange.
- Rozeff, M. S., & Kinney Jr, W. R. (1976). Capital market seasonality: The case of stock returns. *Journal of financial economics*, 3(4), 379-402.
- Saastamoinen, J. (2008). Quantile Regression Analysis of Dispersion of Stock Returns-Evidence of Herd behavior. *Discussion Papers*, (57).
- Scharfstein, D. S., & Stein, J. C. (1990). Herd behavior and investment. *The American economic review*, 465-479.
- Shleifer, A. (2000). *Inefficient markets: An introduction to behavioural finance*. Oup Oxford.
- Tan, L., Chiang, T. C., Mason, J. R., & Nelling, E. (2008). Herding behavior in Chinese stock markets: An examination of A and B shares. *Pacific-Basin finance journal*, 16(1-2), 61-77.
- Tan, L., Chiang, T. C., Mason, J. R., & Nelling, E. (2008). Herding behavior in Chinese stock markets: An examination of A and B shares. *Pacific-Basin finance journal*, 16(1-2), 61-77.

Tessaromatis, N., & Thomas, V. (2009). Herding behavior in the Athens stock exchange. *Investment Management and Financial Innovations*, (6, Iss. 3 (contin.)), 156-164.

Tessaromatis, N., & Thomas, V. (2009). Herding behavior in the Athens stock exchange. *Investment Management and Financial Innovations*, (6, Iss. 3 (contin.)), 156-164.

The World Bank (2022). World Development Indicators. Retrieved from <https://databank.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG/1ff4a498/>
Popular-Indicators