Stock Herding among Swedish Mutual Fund Managers

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Bachelor Thesis in Finance

Spring 2016

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Abstract

The study uses new holding data from 93 Swedish equity funds with 78 distinct mutual fund managers to examine stock herding behaviour in Sweden. High levels of fund manager herding is found in the average stock when employing the method developed by Lakonishok et al. (1992). A smaller market capitalization for a stock predicts a higher herding measure for that stock. The industry with the highest herding is Oil & Gas. There is no evidence of cyclical changes in herding among fund managers. The extent of herding in Sweden is closer to that of emerging countries than to the U.S. and other mature financial markets.

Acknowledgements

Special thanks to Irina Zviadadze, assistant professor of Finance at Stockholm School of Economics, for her valuable guidance and support.

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1. Introduction

The key role played by open ended mutual funds worldwide has motivated research mainly related to fund performance. In Sweden, the direct household ownership in public stocks is billion SEK 690, while Swedish equity funds have billion SEK 1,971 under management as of Q4 2015 (Statistics Sweden & Swedish Investment Fund Association, 2016). Between 2010 and 2015, equity funds in Sweden have seen billion SEK 74 in net investments, whereas the active equity funds have experienced net withdrawals of billion SEK 11 (Swedish Investment Fund Association, 2016). The scrutiny of actively managed funds has likely led to the paradigm shift in investor preference toward index funds. Fund fees and risk adjusted performances are becoming more transparent for potential investors due to new comparison technologies. Swedish equity funds as of today have the lowest fees in Europe (Swedish Investment Fund Association, 2016). With fees serving as a proxy for the competitiveness of the fund landscape, career pressure for managers has likely increased. This could have an effect on herding behaviour.

To study Swedish mutual fund herding is of particular interest because of the prevailing market outlook. Herding shows evidence of investors with different trading behaviour, and occurs when fund managers are "buying (selling) simultaneously the same stocks as other managers buy (sell)" (Lakonishok et al., 1992). Thus, to reach a better understanding of the financial market dynamics it can be effective to study herding. This dissertation tests herding among Swedish mutual fund managers from March 2013 to March 2016, with a method developed by Lakonishok et al. (1992). The herding phenomenon can be a good determinant of financial market matureness and the results can be compared with other studies to more clearly understand the Swedish financial market setting (Bikhchandani et al., 1992).

This research is to the best of our knowledge the first study to investigate herding for Swedish equity mutual fund managers. The only other paper that has researched herding on the Swedish market is seemingly Manganaro and Von Martens (2007). However, they investigate herding between funds and not managers. This leads to a bias that they do not mention, as some managers manage more than one fund. Their resulting herding measure can thus not be compared with past studies mainly focusing on managers. Furthermore, they study the Swedish market during 2000 to 2007 using data publicly available from Finansinspektionen. Yet, in 2006 special funds stopped reporting their holdings (Finansinspektionen, 2006). Special funds can have a more concentrated investment

portfolios than non-special funds, but are often regular Swedish equity funds according to Morningstar. This paper uses data that includes special funds making this study likely the first comparable Swedish herding research ever conducted. The study is incorporating up to and including the most recent quarter and will likely be the herding study with the most contemporary data when published.

The remainder of this paper is organised with a brief literature review next followed by a section on the data sample. The method of measuring herding is then in detail described after which the results on fund manager herding is presented. Lastly the implications are discussed and areas for further research are suggested.

2. Previous Literature

Herding behaviour is often referred to as information cascades or correlated buying and selling. Defined as the tendency for a group of investor to hoard on one side of the market, herding is often seen as a friction in market efficiency. In mature markets, herding should to a large extent be of intra-day nature, as arrival of public information stops the herding, (Patterson and Sharma, 2010). There exist two forms of herding and statistical measures of herding incorporate both; intentional herding and spurious herding (Bikhchandani and Sharma, 2000). Spurious herding is when investors draw the same conclusions and take the same trading decisions simultaneously (Hirshleifer et al., 1994). Intentional herding on the other hand can be based on three reasons. Trading like others whose trades are believed to reveal information, fund manager incentives rewarding imitation, and an intrinsic preference among individuals for conformity (Bikhchandani and Sharma, 2000). Evidence on institutional investor herding is mixed and, as intentional herding is hard to measure directly, only evidence of overall herding can be investigated. An area frequently examined in herding literature is the comparing of herding in emerging markets with the herding in mature ones.

Influential herding studies in the U.S.: Lakonishok et al. (1992) (henceforth LSV) formed what would become the standard method of measuring herding in empirical studies of fund managers. LSV found only weak evidence for herding in small stocks by pension fund managers when investigating the U.S. market. By employing the LSV measure Grinblatt et al. (1996) presented evidence of a higher herding measure. Wermers (1999) finds strong evidence for herding, but little variation with the number of funds trading a stock. The study also finds more herding in smaller capitalization stocks. Herding measures range from 2% (Lakonishok et al., 1992) to 5.55% (Grinblatt et al., 1995).

Research on herding outside the U.S.: Some of the studies conducted on other markets than the U.S. are: Choe et al. (1999) South Korea; El Hedi Arouri (2013) France; Wylie (2005) UK; Voronkova and Bohl (2005) Poland; Venecia et al. (2011) Israel; Walter and Weber (2006) Germany; and Borensztein and Gelos (2000), and Gelos and Wei (2003) for several different emerging markets. These all have high herding measures in common. Herding measures range from 2.5% in UK to over 20% for South Korea and Poland.

3. Data & Methodology

3.1 Data Description

Data on changes in mutual fund holdings is gathered from the service Morningstar Direct. The frequency of observations is quarterly stretching from March 2013 to March 2016, i.e. 13 calendar quarters. In order to exclude buy-side effects when new mutual funds are initiated the first quarter of funds' lives are deleted manually. Sell-side effects are naturally adjusted for as funds not surviving until March 2016 are excluded in the dataset. Furthermore, an early version of Wylie (2005) has shown that survivorship bias has a negligible effect on herding.

This paper focuses on the Morningstar category Sweden Equity, which includes funds with at least 75% of their assets under management invested in equities listed on Swedish stock exchanges. There were 93 mutual funds in the dataset spread over 78 managers (Table 1). Funds belonging to managers with a mandate of managing more than one fund were merged. Holding changes were netted from funds that had the same manager to see whether a stock was net bought, sold or not subject to change.

The Morningstar data reports changes in the number of shares held at calendar quarters, and is adjusted for splits and other non-recurring corporate events. Information, on market capitalization and industry-group, was extracted from DataStream. Stocks covered in the sample were almost exclusively traded on the Nordic stock exchanges.

Morningstar collects its data from fund firms. Morningstar rating is one of the main evaluation measures in Sweden and to systematically provide wrong data would be illegal for fund firms. Thus, it is reasonable to believe that the data is accurate, and that a few errors would not interfere with the results due to the large sample.

Table 1 – Summary Statistics for Morningstar Holding Data:	**Total**
Mutual funds:	93
Mutual fund managers:	78
Quarters in dataset:	13
Number of certain stocks traded:	453
Number of net changes of stocks (trades) in dataset by managers, no trade limit:	17 188
Number of net changes of stocks (trades) in dataset by managers, five trade limit:	13 995

Table 1: Contains holding information from the Morningstar Direct data. There were 93 mutual funds in the dataset spread over 78 managers. There are 13 calendar quarters from March 2013 to March 2016. The fourth row contains the number of specific stocks traded over the period. The data reports changes in the number of shares held at every calendar quarter, adjusted for splits and other non-recurring corporate events. 17 188 is the number of unique net changes of all stocks over all the quarters. 13 995 is the number of unique net changes of all stocks over all the quarters when introducing a limit of at least five trades in a given quarter to keep a stock in the dataset.

From DataStream, market capitalization over the 13 quarters and subsector information were extracted for stocks traded a minimum of 5 times in any given quarter. Then, all sub-sectors belonging to the same industry according the ICB benchmark were merged. The datasets were merged with regard to stock, to get stock herding measure and market capitalization in synchronization. The merger showed that the small cap stock "Acando" did not have market capitalization data, hence it was removed. The same procedure was done with the industry codes which also lacked information on “Acando”. This bias of one missing small cap stock with low liquidity does probably not have any impact on the inferences made in this paper.

3.2 Methodology

This thesis researches if Swedish equity mutual funds investing mainly in Sweden engage in herding. The herding result is naturally compared with studies from other markets to test the hypothesis regarding the matureness of the Swedish financial market. Tests wills also be carried out on subgroups that have empirically exhibited herding characteristics. Five hypotheses are tested in total.

H1. Swedish equity mutual funds investing mainly in Sweden engage in stock herding behaviour. One can expect that the Swedish financial market with regards to trader

preferences can be divided into two groups. These are Swedish equity mutual fund managers and the rest of the market.[1]

H2. A decreasing stock size correlates with a higher herding tendency of that stock.

Empirically, small capitalization stocks have shown evidence of more herding as the market capitalization correlates with analyst coverage and other factors affecting the degree of uncertainty (Lakonishok et al., 1992).

H3. Swedish equity mutual funds investing mainly in Sweden engage in industry herding.

Motivations for herding should cause tendencies for herding within industries.

H4. There is cyclical variation in both stock herding and industry herding.

Bear markets may be prone to generate increased herding behaviour because of increased uncertainty regarding what troubled assets which company possesses.

H5. There is less herding among Swedish fund managers than for fund managers investing in emerging markets, and higher herding than in the mature market of the U.S.

Walter and Weber (2006) show that herding is linked to the development stage of a financial market. In mature markets, herding should to a large extent be of intra-day nature, as arrival of public information and trust in transparency stop the herding (Patterson and Sharma, 2010).

The methodology by Lakonishok et al. (1992), the LSV method, is used. The method developed in their paper is the most widely used in empirical studies on institutional investor herding behaviour. Thus we can compare our study with previous studies using the same method. In this paper the herding estimate for each stock will be measured as below:

The LSV measure:

$$H_i = \left| \frac{Buyers_{i,t}}{(Buyers_{i,t} + Sellers_{i,t})} - p_t \right| - AF_i$$

In this formula $Buyers_{i,t}$ is the number of mutual fund managers that increase holdings in a certain stock during a quarter, i.e. net buyers. $Sellers_{i,t}$ is the number of mutual fund managers that reduce their holdings in a certain stock during a quarter, i.e. net sellers. p_t is

[1] If one subgroup of investors has correlating buy and sell trades, then at least one other subgroup with trade correlation must exist.

the expected ratio of mutual funds buying in that specific quarter. This can be approximated by the average proportion of buys across all stocks traded in all of the mutual funds in that quarter. The proportion is thus kept constant for all stocks in a certain quarter meaning there will be 13 different p_t in total.

$$p_t = \frac{\sum_{i=1}^{n}\left[\frac{Buyers_i}{(Buyers_i + Sellers_i)}\right]}{n}$$

Where n = number of different stocks traded.

The AF_i is an adjustment factor which is calculated as the expected value of the term inside the absolute value sign in the first equation if there was no herding. Under the null hypothesis that there is no herding behaviour the probability of $\frac{Buyers_i}{(Buyers_i + Sellers_i)}$ should in expectation be equal to p_t the average buying proportion in a quarter.

$$AF_i = \left|\frac{Buyers_{i,t}}{(Buyers_{i,t} + Sellers_{i,t})} - p_t\right| * \sum_{k=0}^{K_i} P\,(Buyers_i = k)$$

where $\boldsymbol{Buyers_i \sim Bin\,(K_{i,t}, p_t)}$

$\boldsymbol{P}$ *is the binomial probability that we end up with the observed number of buyers when*:

$\boldsymbol{K_{i,t}}$ *is the number of managers trading the stock.*

$\boldsymbol{p_t}$ *is the expected proportion of buyers in quarter*$_t$*, i.e the probability of success.*

Given that managers trade independently the buying proportion of a certain stock should not be expected to be either higher or lower than the average buying tendency in that quarter. The estimation is based on the assumption that the direction of trades, buy or sell, in this case would follow a binominal distribution where buy and sell are the possible outcomes. In other words the number of buyers follows a binomial distribution where $K_{i,t}$ is the number of managers trading the stock i.e. "number of trials"), is the expected proportion of buyers in a given quarter i.e. the probability of successes. The binomial probability P is then the probability of ending up with the observed numbers of buyers under the assumption of independent trading. The AF term will then adjust for the possible random effect of ending up

with what would be considered herding. Therefore, herding is only acknowledged if the observed difference inside the absolute brackets in the main formula is larger than what can be expected by random variation. The AF-term is calculated as the observed buying proportion for the specific stock minus the observed average buying proportion during the specific quarter. This is then multiplied with the probability of ending up with the observed under the assumptions of independent trading and the binomial probability of buying as explained.

Lastly, a positive value of the herding measure gives indication of herding within a stock quarter. For example if the average buying proportion (p_t) is 50% in a quarter and the herding (H_i) measure ends up to be 10%, then 60% of fund managers were changing their holdings in one direction and (100%-60%) = 40% in the other direction.

3.2.1 LSV Criticism

It is important to note that the measure does not take the magnitude of trades into consideration. It only acknowledges whether a stock is bought or sold. The intra-quarter trading patterns are not revealed and it would be better to have a time interval t that matches with the average time span it takes to make a trade. It is however difficult to know what time interval is the most adequate. Particularly Wylie (2005) criticizes that short selling constraints for fund managers can lead to evidence of herding even when there is none. However, Wermers (1999) shows that this must not be the case. Furthermore, initial weight of stocks and investment flows do not change the expected propensity to buy for a fund manager.

Nevertheless, no statistical method can distinguish between spurious and intentional herding, and LSV is today the most used approach when measuring herding. For comparison reasons we employ the LSV method.

4. Results

4.1 Overall Herding

By using the LSV-methodology, herding measures for stocks traded by Swedish equity mutual funds were calculated. Since the herding measure is calculated for each stock in each quarter, the herding measures are averaged across time to present an average herding measure representative for each stock in the sample. To get overall herding measures for all stocks over all quarters, these average measures across time were averaged over all stocks. The average across all stocks over all 13 quarters turned out to be 16.83% as presented in Table 2.

One should note that this measure is calculated when restricting the set of stocks on basis of the number of trades. Wermers (1999) highlights that one or a small number of funds trading a stock cannot be considered herders. For comparability, this paper will as in the case of Wermers (1999) and Lakonishok et al. (1992), include a trade limit. Accordingly a stock is kept in the dataset if the number of trades in any unique quarter is at least five. Further calculations will mainly use the herding data with the five trade limit.

Table 2 – Overall Herding

Range:					[.0094866, .52262741]
Missing:					0/162
Mean:					**.168271**
Std. dev:					.093071
Percentiles:	10%	25%	50%	75%	90%
	.084041	.10956	.146547	.194302	.301282

Table 2: The mean of the average herding measures across all the 13 quarters for each stock is 16.83%. The median is 14.65% and the standard deviation is 9.31%. This is in the case for stocks with at least five trades in any unique quarter. Zero values are missing meaning there are 162 stocks providing herding measures with the five trade stock limit. The interpretation of a herding measure at 16.83% is as follows: If for example the average buying proportion in a quarter is 0.5 i.e. 50%, then the herding measure would indicate that on average for any stock in any quarter 66.83% (50% + 16.83%) of managers were trading in one direction and 33.17% (100% - 66.83%) in the other direction. A 95% confidence interval of the mean indicated that the mean is significantly different from zero, meaning that there is reason to believe that herding exists among Swedish mutual fund managers. (See appendix for further output regarding this statistical test).

4.2 Herding and Stock Market Capitalization

Acknowledging that herding is present among Swedish mutual fund managers, a regression to test if market capitalization among stocks affect the herding measure was done. The reason behind the regression is the hypothesis that smaller stocks are herded to a larger extent since they might not be covered to the same degree by analysts. Managers could therefore feel an increased uncertainty when it comes to smaller stocks. This uncertainty would then lay the foundation for herding.

Data on market capitalization in billion SEK from DataStream for each stock over all the quarters were averaged to get an average market capitalization for each stock. These values were then matched by stock to merge the data with the calculated average herding measures for each stock. Only one stock, "Acando" did not have market capitalization data. Therefore this stock was removed which should not lead to any major effect on the dataset. In Table 3 information regarding the average market capitalization on the stocks is presented.

Table 3 - Average Market Capitalization in Billion SEK

AVG MCAP BILL					
Range:					[.37592307, 598.10797]
Missing:					0/161
Mean:					38.4092
Std. dev:					80.7676
Percentiles:	10%	25%	50%	75%	90%
	2.12189	3.42688	9.99462	29.8632	112.536

Table 3: The market capitalization for each stock is averaged across the 13 quarters. The table contains data for these, showing a wide range of average market capitalization from million SEK 376 to billion SEK 598 with a mean of billion SEK 38.4. Note that the number of stocks (observations) now is 161 instead of 162 since the dropping of the stock "Acando" due to lack of data.

Presented in table 4 are results from regressing herding on market capitalization. The relationship is significant on the 1% level for all stocks within the five trade criterion. The regression shows a significant negative relationship with a negative coefficient of -0.000218.

Table 4 – Regression. Herding on Average Market Capitalization.

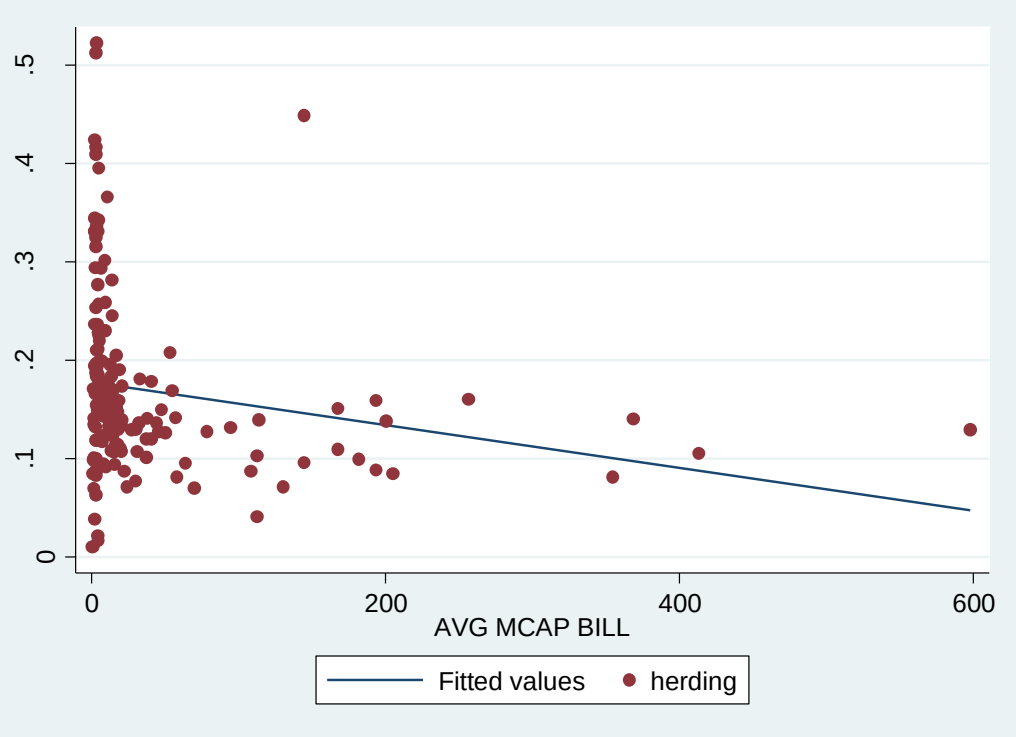
VARIABLES	(1) herding
avgmcapbill	-0.000218***
	(6.95e-05)
Constant	0.178***
	(0.00822)
Observations	161
R-squared	0.036

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Results from regressing herding on average market capitalization for each stock. The Stata output shows a significant negative relationship with a coefficient of -0.000218. Note that the number of stocks (observations) now is 161 instead of 162 since the dropping of the stock "Acando" due to lack of data.

This means that for every billion SEK in market capitalization a stock can be predicted to be less herded by a factor of 0.000218, i.e. 0.0218%. Conversely, for every billion SEK of lower market capitalization, a stock is expected to be herded to a 0.0218% larger extent. This supports the hypothesis that Swedish mutual fund managers herd stocks with smaller market capitalization to a larger extent. This is in line with comparable studies, such as LSV who also show greater herding among smaller stocks in the U.S. Graph 2 plots the herding measure on market capitalization for each stock.

Graph 1 - Regression. Herding on Average Market Capitalization.



Graph 1: Results from regressing herding on average market capitalization for each stock with fitted values (blue line). The stata output shows a significant negative relationship at the 1% level with a coefficient of -0.000218. Note that the number of stocks (observations) now is 161 instead of 162 since the dropping of the stock "Acando" due to lack of data.

4.3 Herding at the Individual Stock Level for Industries

In order to test the hypothesis concerning herding separated by industries, the stocks with at least five trades in any unique quarter were matched with data on subsector groups from DataStream. Once again, there was no data for the stock "Acando" and it was therefore dropped. The stocks were then relabeled into industry groups according to the Industry Classification Benchmark (ICB) in which the subsectors from DataStream are the most specific classifications. The stocks were spread across 52 subsectors which were part of 9 industries according to the ICB. Table 5 shows the number of stocks in each industry.

Table 5 – Industry Herding at the Stock Level

Order |	Industry	Industry Herding	Stocks
1 |	Oil & Gas	.239848	3
2 |	Health Care	.2348457	13
3 |	Technology	.1849042	12
4 |	Basic Materials	.1758153	8
5 |	Consumer Services	.1742573	17
6 |	Industrials	.1651801	50
7 |	Telecommunication	.156483	3
8 |	Financials	.1533672	34
9 |	Consumer Goods	.1403423	21
	Total		**161**

Table 5: When using the methodology to investigate industry herding at the stock level, the distribution of stocks in each industry is as presented above. The stocks are the ones traded during the observed time span i.e the stocks where there have been at least five holding net changes by managers during any of the thirteen quarters. The stocks in the dataset could be placed into 9 ICB industry groups based on 52 ICB subsector levels. The clearly most herded industries are Oil & Gas and Health Care. The least herded is Consumer Goods. The mean herding level is 16.8%. Note that the number of stocks (observations) now is 161 instead of 162 since the dropping of the stock "Acando" due to lack of data.

Theories on social behaviour of mutual fund managers hypothesize that the tendency to herd increases with the uncertainty of a stock. This is often related to career concerns of managers, rather wanting to "stick with the herd", as a lone fund manager investing in an uncertain stock might risk losing their job in the process.

The hypothesis regarding industry herding is supported by the results. The top three industries in which stocks are herded are Oil & Gas, Healthcare and Technology. The Oil & Gas industry contains companies engaged in oil and gas prospecting which often comes with uncertainty. Not only due to the risky exploration ventures themselves but also because of macro-factors such as volatile commodity prices. In the Healthcare industry pharmaceutical, biotechnology and medical equipment companies are found. The success of these companies is to a large extent dependent on patents and approvals from authorities. The Technology industry share these characteristics.

As a critique to these results one should mention that drawing conclusions on the Oil & Gas industry might be problematic since it only contains trading of three stocks.

4.3.1 Herding into Industries

A further idea influenced by LSV is to fuse stocks into industries before setting the five trade limit. An industry would then be dropped if the number of trades in that industry is below a certain level and more stocks could in that way be included. One would then focus on herding in and out of industries rather than the herding of specific stocks in an industry. Results from this methodology is presented below in Table 6.

Table 6 - Herding into Industries

Order |	Industry	Herding into Industry	Stocks
1 |	Oil & Gas	.123137	26
2 |	Consumer Services	.0893536	45
3 |	Telecommunication	.0665732	8
4 |	Technology	.0569309	54
5 |	Health Care	.0516732	49
6 |	Financials	.0429514	86
7 |	Consumer Goods	.0425855	47
8 |	Basic Materials	.0387384	20
9 |	Industrials	.0341368	115
	Total		**450**

Table 6: When using the methodology to investigate herding into industries, the distribution of stocks in each industry is as presented above. The stocks are the ones traded during the observed time span i.e the stocks where a manager has done a net change in a position at least one time during the thirteen quarters. Note that the industry "Utilities" is dropped for further comparison since it is traded only between zero and three times per quarter. This disqualification can be compared to the previous dropping of stocks if it was not traded at least five times in a quarter. The stocks in the dataset could be placed into 10 (9 excluding Utilities) ICB industry groups based on 52 ICB subsector levels. The total number of stocks traded between the quarters after excluding Utilities is 450, before 453, so only three stocks were classified as Utilities. Herding measures were then calculated for each industry. The clearly most herded industry is Oil & Gas. The least herded is Industrials. The mean herding level is 6.1%.

Important to note is that the herding measures for each industry are in general lower now than in the stock level industry herding case. The reason is that the trades (net increase or net decrease) of stocks now are netted into broader categories. Earlier, one stock might have been herded at the buy side in one quarter and one stock at the sell side, both showing herding. If these are fused into the same industry they would together likely show low herding as the buys in one stock and sells in the other would offset each other.

As described, all industries show evidence of lower herding than for the average in the overall stock sample, indicating that the main driver of herding is specific stocks. Thus, mutual fund managers may be more inclined to mimic the stock allocation rather than industry allocation of other managers. Furthermore, the Oil & Gas industry is relatively highly herded and is likely foremost the result of high herding within specific stocks. Another explaining variable could be underlying factors, in this case the oil price. Oil stocks can partly be viewed as derivatives on the oil price, a macroeconomic factor that managers may want to trade. Due to limitations in trading regulations, managers are often not allowed to pursue direct trades in derivatives. Thus, an investor investing in an oil related stock can be seen by other investors as investing in the commodity itself, leading to higher relative herding into that industry.

4.4 Cyclical Variation in Herding

There is interest in exploring whether herding seems to be more prevalent in times of financial uncertainty. The careful reader notices that this reasoning is based on the same theory as the industry segregated herding, which showed increased herding in presumably uncertain industries. Hence, herding in a bull market state as well as bear market is investigated. In the Nordic stock markets there was a bull trend during the first eight quarters in the dataset i.e. the beginning of 2013 to early 2015. Since then, the market has entered a bear trend, with the Swedish stock index declining close to 20% until early 2016, comprising our last five quarters. These quarters are defined as our bear quarters.

To test this hypothesis, average herding for each stock in the bull quarters is calculated and then averaged across all stocks. The same procedure is done for the bull quarters. Results from the two calculations in Table 6 show that the average herding for any stock in any of the bull quarters is 16.91%. The average herding measure for any stock in any of the bear quarters is 15.79%.

Table 7 – Cyclical Herding

	Bull market	Bear market
Range:	[.0094866, .52262741]	[.00663934, .44743386]
Unique values:	131	130
Missing:	26/162	31/162
Mean:	**.16911**	**.157865**
Std. dev:	.106931	.089389

Table 7: For both bull and bear trends the statistics are presented. The main focus is to compare the means for each trend. The bull market shows a larger average herding measure (16.91%) than for the bear market (15.79%). Calculating 95% confidence intervals for the means one can assume that both are significantly different from zero. A two sample Wilcoxon rank sum test indicated that there is no significant difference between the herding measures in bull and bear markets at any relevant significance level (see appendix for further output regarding these statistical tests).

These results do not support the hypothesis of increased overall herding in times of a bear trend. It rather shows somewhat lower herding during the bear quarters and higher in the bull quarters. Calculating 95% confidence intervals for the means one can assume that both are significantly different from zero. Now that there is reason to believe that herding exists among Swedish mutual fund managers in both bull and bear trend, it is of interest to test if there is any significant difference in the sample means. Therefore a two-sample Wilcoxon rank sum test is done for the herding measures for each stock in the bull and bear markets. The test does not support that there is significant difference between herding in bull and bear markets at any relevant significance level. Relating back to a study on the financial crisis that showed increased herding during that time, it might be the case that an average bear trend does not lead to increased herding.

5. Implications & Conclusions

By employing the methodology proposed by LSV on 93 funds, this paper shows evidence of herding among 78 Swedish mutual fund managers investing mainly in Sweden during the

time period from 2013 to 2016. The herding stock average is higher than in studies from earlier time periods on the U.S. market for both stock and industry herding.

With a mean herding measure of around 16.8%, there is reason to believe that herding exists in the Swedish mutual fund market according to the definition by LSV. In foreign studies, the herding measure has been between 2.7% and 25% where the higher herding measures have been found in more emerging markets i.e. less developed financial markets. Herding results have in past studies been interpreted as indicators for the matureness of markets. Using solely this explanation, the equity market in Sweden would be equal in development to that of an emerging country market. This might be the case, but a recent paradigm shift in retail investors favoring index funds over active funds could have rendered the possibility to compare recent time span studies with older studies obsolete. One would predict a Scandinavian market such as Sweden to be in between the U.S. and emerging markets in terms of herding. Furthermore, the fees of active Swedish equity funds are the lowest in Europe and there have been net withdrawals from the funds. The pressure on mutual fund managers does likely have implications for their behaviour as reputation is on the line (Scharfstein and Stein, 1990). This could push managers to not risk making trades yielding losses in the short term relative to competitor benchmarks. The resulting high herding may have led to market inefficiencies.

The publicity of fund holdings is opaque, and the circulation of such information is likely partly governed by informal networks. The time lag from that trades occur to that the information reaches managers is hard to study. However, fund holdings of the top ten holdings of funds are publicly available and updates regularly. The rise of index funds has seemingly pushed active fund managers to use changes in stock holdings as marketing opportunities and share it with prospective investors via social media, websites, in news or by email. Morningstar also provides monthly updates on holdings for institutional clients. This provides reason that intentional herding occurs among Swedish mutual fund managers. Nevertheless, the other way around with retail investors driving the high herding is also possible. In the same way fund managers share their stock picks, trade bloggers announce investments. New social media tools and a bigger community in Sweden for investing might lead to herding among private investors.

With regards to the nature of herding, fund managers seem to be more prone to copy each other's stock trades than to mimic industry allocations. The average herding measure in the overall stock sample shows evidence of higher herding than the industry with the highest

herding tendency, Oil & Gas, indicating that the main driver of herding is specific stocks. Hirshleifer et al. (1994) mention that herding could occur when managers make the same decisions after receiving correlated information. As the external analyses that fund managers subscribe to cover both macro conditions for industries as well as equity research, it seems like managers must infer more information, or have higher incentives to trade like others, when it comes to trades in specific stocks. The discrepancy in herding levels between stocks and industries could then suggest that intentional herding at least exists for stock trading. Bikhchandani et al. (1992) argue that this intentional herding can arise due to managers' beliefs that other institutional investors are better informed, or as safety cushion for their careers in the case of making bad investments (Scharfstein and Stein, 1990).

5.1 Further Research

Although herding can destabilize prices moving them away from fundamental values, herding can also quickly incorporate new information into prices according to Lakonishok et al. (1992). It is consequently of interest to study the prevailing stock return herding dynamics on the Swedish market as we have now provided evidence of high herding. Especially the high level of herding in small stocks could trigger significant stock price movement.

Intra-quarter trades netting out the positions taken before the quarter ends are not covered by our data. If such data were to become available, a study on herding with higher frequency of holdings would complement this study of herding in Sweden. Data on fund investment flows can also deepen our understanding of Swedish fund manager behavior, as the flows could correlate with herding if funds trade stocks they already hold in common.

As of last year, fund managers in Sweden need to report costs for external equity research. It could be a step, in triangulating where the herding originates from, to compare herding levels and changes in average analysis expenditures for funds. This could after sufficient years of data provide possible evidence if herding is correlated with receiving the same analyses.

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7. Appendix

Table 8 – Summary Statistics of the Morningstar Data.

Variable |	No Limit	5 trade Limit
Total Number Of Trades Q1|	787	565
Total Number Of Trades Q2|	1515	1246
Total Number Of Trades Q3|	1208	946
Total Number Of Trades Q4|	1501	1229
Total Number Of Trades Q5|	1395	1157
Total Number Of Trades Q6|	1349	1122
Total Number Of Trades Q7|	1257	1049
Total Number Of Trades Q8|	1350	1105
Total Number Of Trades Q9|	1359	1124
Total Number Of Trades Q10|	1378	1104
Total Number Of Trades Q11|	1287	1063
Total Number Of Trades Q12|	1795	1540
Total Number Of Trades Q13|	1007	745
Total number of Trades	17 188	13 995

Table 8: The total number of trades between quarters i.e. the total number of net changes in a stock holding between quarters are presented for both all stocks across all managers as well as for stocks with at least five trades in any unique quarter. In addition, below the quarterly data, the total number of trades i.e. the total number of net changes in a stock holding for all quarters are presented for both all stocks across all managers (17 188) as well as for stocks with at least five trades in any unique quarter (13 995).

Table 9 – Summary Statistics of Unique Stocks Traded in Each Quarter.

Variable|	No Limit	5 trade Limit
Unique Stocks traded Q1 |	191	63
Unique Stocks traded Q2|	236	97
Unique Stocks traded Q3|	232	81
Unique Stocks traded Q4|	264	97
Unique Stocks traded Q5|	231	90
Unique Stocks traded Q6|	234	94
Unique Stocks traded Q7|	220	90
Unique Stocks traded Q8|	239	94
Unique Stocks traded Q9|	231	94
Unique Stocks traded Q10|	250	93
Unique Stocks traded Q11|	224	96
Unique Stocks traded Q12|	259	116
Unique Stocks traded Q13|	205	71
Total unique stocks traded	453	162

Table 9: The number of unique stocks traded i.e. stocks where there have been net changes in holdings between quarters. These are presented for both all stocks with no trade frequency requirement as well as for stocks with at least five trades in any unique quarter. In addition, below the quarterly data, the total number of certain stocks traded i.e. the number of unique stocks that fund managers have changed their holdings in across all quarters are presented for the case with no trade limit (453) as well as for stocks with at least five trades in any unique quarter (162).

Table 10 – Average Buying Proportions p_t in the Quarters Observed

Variable |	Value
PQ1 |	.6301562
PQ2 |	.6144798
PQ3 |	.562343
PQ4 |	.6321831
PQ5 |	.5398609
PQ6 |	.7039953
PQ7 |	.4745257
PQ8 |	.5241429
PQ9 |	.5262014
PQ10 |	.5514006
PQ11 |	.5212106
PQ12 |	.6567751
PQ13 |	.5004305

Table 10: The average buying proportions are shown for each quarter. This is in the case for stocks with at least five trades in any unique quarter. p_t is treated as the expected ratio of mutual fund managers buying in that specific quarter. This can be approximated by the average proportion of buys across all stocks traded in all of the mutual funds in that quarter. The proportion is thus kept constant for all stocks in a certain quarter meaning there will be 13 different p_t in total.

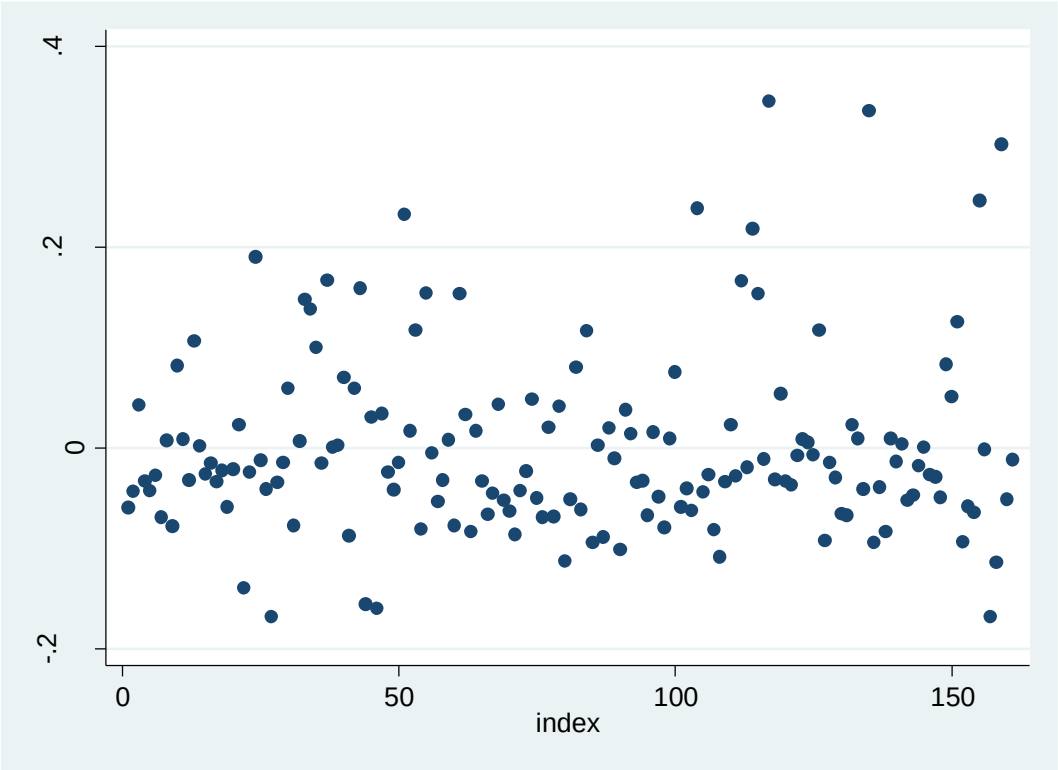
Table 11 – Confidence Interval for Overall Herding

Confidence Interval

Variable |	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Average Herding By Stock |	162	.168271	.0073123	.0930709	[.1538305	.1827115]

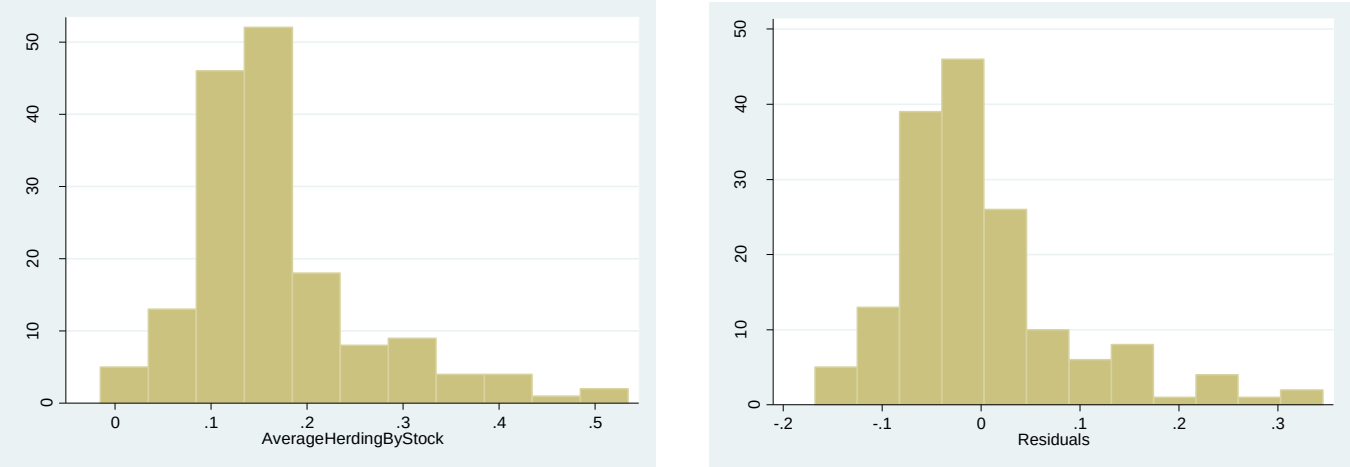
Table 11: Confidence interval for the overall mean herding measure assuming normal distribution of the mean under the central limit theorem. To test if the mean herding measure for all stocks with at least five trades in any unique quarter is significantly different from zero, a confidence interval is calculated. This shows that the mean is between 15.38% and 18.27% with 95% confidence. With a p-value less than 0.0001, one can reject the null hypothesis of having a herding mean equal to zero. This shows that there is reason to believe that herding exists among Swedish mutual fund managers.

Graph 2 – Scatter Plot of Residuals. Regressing Herding on Market Capitalization



Graph 2: A scatter plot of the residuals from the OLS regression of herding on market capitalization. There is not strong enough evidence for heteroscedasticity to motivate another method than the OLS.

Graphs 3 - Average Herding by Stock over Quarters Frequency Distribution and Residuals from Regressing Herding on Market Capitalization Frequency Distribution



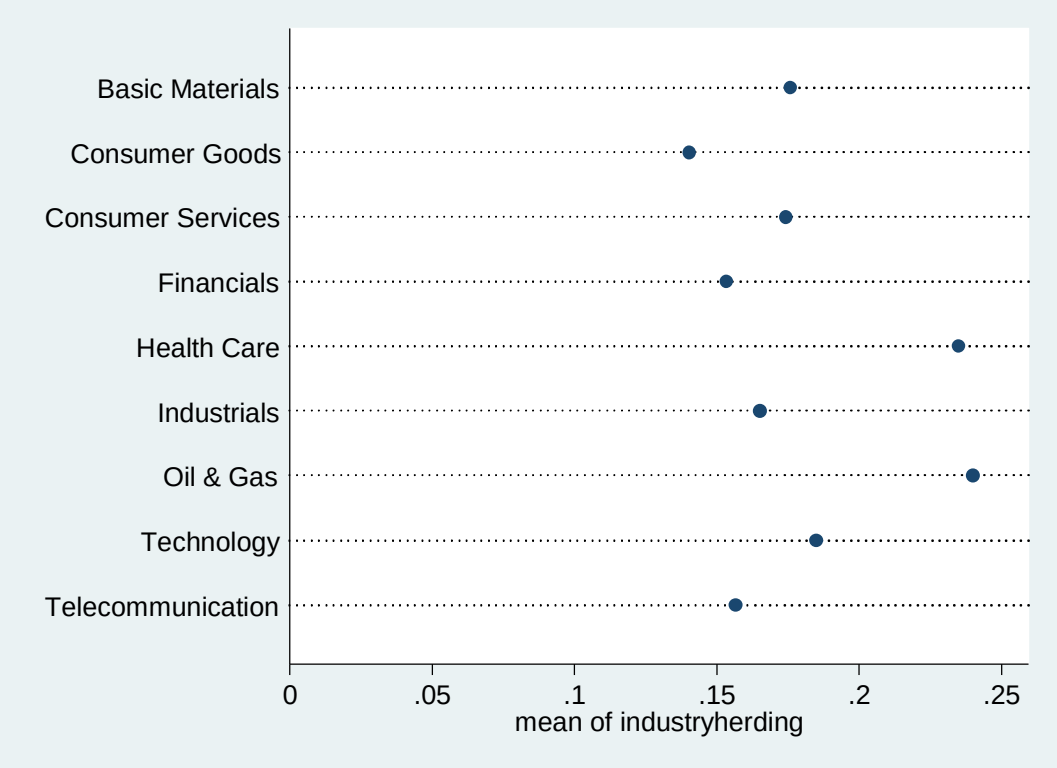
Graphs 3: Left: Frequency distribution (histogram) of the average herding measures for each stock over the 13 quarters. Most observations are centered on the mean of 16.8%. Median 14.7%. Right: Frequency distribution (histogram) of the residuals from regressing herding measure for each stock on average market capitalization over the 13 quarters. When plotting a frequency distribution of the residuals (right graph) from regressing herding on market capitalization, one can compare it to the previous distribution of average herding measures for each stock (left graph). The variable market capitalization is to some extent explaining the phenomenon of herding as the distribution is a somewhat better fit to a normal distribution. However, since the distribution still seems far from normal there is still much to explain.

Table 12 – Summary Statistics for Industry Herding at the Stock Level

INDUSTRY|	Stocks	Percent
Basic Materials |	8	4.97
Consumer Goods |	21	13.04
Consumer Services |	17	10.56
Financials |	34	21.12
Health Care |	13	8.07
Industrials |	50	31.06
Oil & Gas |	3	1.86
Technology |	12	7.45
Telecommunication |	3	1.86
Total |	161	100

Table 12: When using the methodology to investigate industry herding at the stock level, the distribution of stocks in each industry is as presented above. The stocks are the ones traded during the observed time span i.e where there have been at least five holding net changes by managers during any of the thirteen quarters. Note that the total number of stocks now is 161 instead of 162 since the dropping of the stock “Acando” due to lack of data.

Graph 4 – Industry Herding at the Stock Level



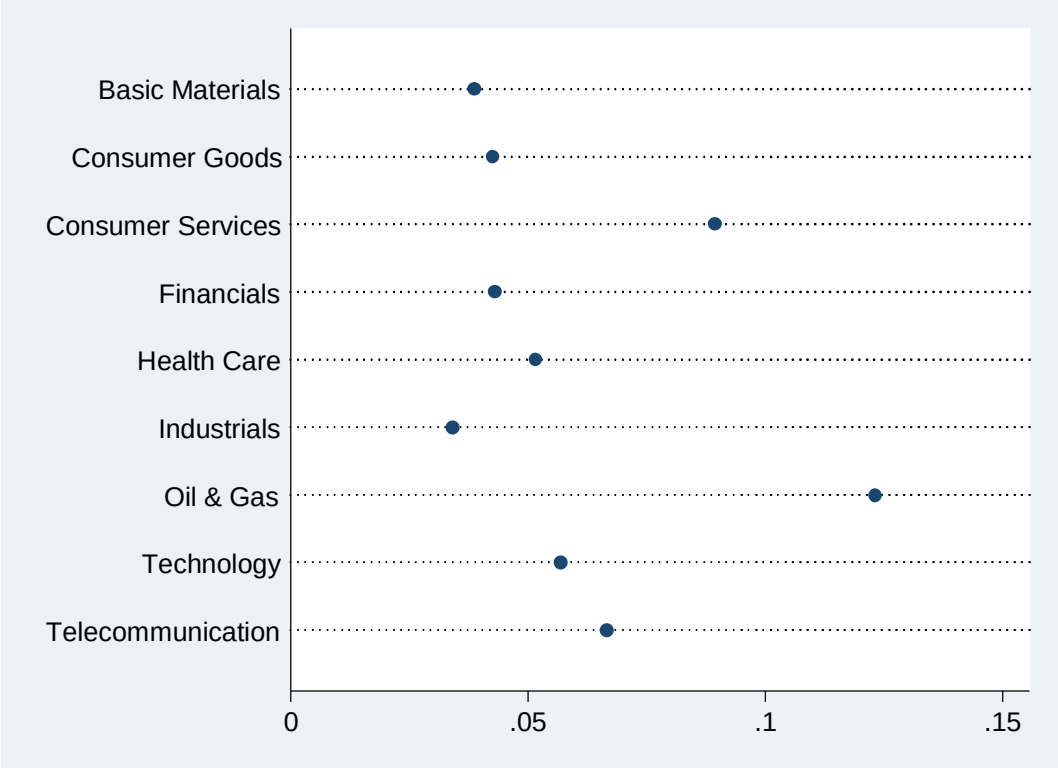
Graph 4: The plot graphs herding separated by industries according to the Industrial Classification Benchmark. The clearly most herded industries are Oil & Gas and Health Care. The least herded is Consumer Goods. The mean herding level is 16.8%.

Table 13 – Herding into Industries. Statistics of Number of Traded Stocks from each Industry

INDUSTRY |	Stocks	Percent
Basic Materials |	20	4.42
Consumer Goods |	47	10.38
Consumer Services |	45	9.93
Financials |	86	18.98
Health Care |	49	10.82
Industrials |	115	25.39
Oil & Gas |	26	5.74
Technology |	54	11.92
Telecommunication |	8	1.77
Utilities |	3	0.66
Total |	453	100.00

Table 13: When using the methodology to investigate herding into industries, the distribution of stocks in each industry is as presented above. The stocks are the ones traded during the observed time span i.e. the stocks where a manager has done a net change in a position at least one time during the thirteen quarters. Note that the industry "Utilities" is dropped for further comparison since it is traded only between zero and three times per quarter. This disqualification can be compared to the previous dropping of stocks if it was not traded at least five times in any quarter.

Graph 5 – Herding into industries



Graph 5: The plot graphs herding into industries following to the Industrial Classification Benchmark. The clearly most herded industry is Oil & Gas. The least herded is Industrials. The mean herding level is 6.1%. Note that this is lower than the previous overall stock herding mean of 16.8%. Trades, i.e. (net increase or net decrease) of stock holdings are now are netted into broader categories. Earlier, one stock might have been herded at the buy side in one quarter and one stock at the sell side, both showing herding. If these are fused into the same industry they would together show low herding as the buys in one stock and sells in the other are matched.

Table 14 – Confidence Interval for Bull Trend Herding

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
BULL	136	.1691104	.0091693	.1069312	[.1509764	.1872444]

Table 14: Confidence interval for bull trend mean herding measure assuming normal distribution of the mean under the central limit theorem. To test if the mean herding measure for all stocks with at least five trades in any unique quarter is significantly different from zero in a bull trend, a confidence interval is calculated. This shows that the mean is between 15.10% and 18.72% with 95% confidence. With a p-value less than 0.0001, one can reject the null hypothesis of having a herding mean equal to zero. This shows that there is reason to believe that herding exists among Swedish mutual fund managers in a bull trend.

Table 15 - Confidence Interval for Bear Trend Herding

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
BEAR	131	.1578647	.00781	.0893894	[.1424136	.1733158]

Table 15: Confidence interval for bear trend mean herding measure assuming normal distribution of the mean under the central limit theorem. To test if the mean herding measure for all stocks with at least five trades in any unique quarter is significantly different from zero in a bear trend, a confidence interval is calculated. This shows that the mean is between 14.24% and 17.33% with 95% confidence. With a p-value less than 0.0001, one can reject the null hypothesis of having a herding mean equal to zero. This shows that there is reason to believe that herding exists among Swedish mutual fund managers in a bear trend.

Table 16 - Two-sample Wilcoxon Rank-Sum (Mann-Whitney) Test

1 = BULL

2 = BEAR

Trend	obs	rank sum	expected
1	136	18381	18224
2	131	17397	17554
Comb.	267	35778	35778
unadjusted variance		397890.67	
adjustment for ties		-1.25	
adjusted variance		397889.41	

Ho: HerdingTrend(Trend==1) = HerdingTrendd(Trend==2)

z = 0.249

Prob > |z| = 0.8034

Table 16: Now that there is reason to believe that herding exists among Swedish mutual fund managers in both bull and bear trends, it is of interest to test if there is any significant difference in the means. Therefore a two-sample Wilcoxon rank sum test is done for the herding measures for each stock in the bull and bear markets. It is adequate with a non-parametric test since the data does require any identifiable distribution and now no underlying distribution of the data is assumed to avoid rough approximations. The two sample Wilcoxon rank-sum (Mann-Whitney) test for herding in bull and bear market is based on the following procedure. The data points are ranked and then they are summed for the respective trend. The rank sum for the bull trend is 18 381 and for the bear trend 17 397. In relation to what can be expected, the test does not support that there is significant difference between herding in bull and bear markets at any relevant significance level.