



Impact of Herding on Buy & Hold, Momentum & Contrarian Strategy in Tehran Stock Exchange

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ABSTRACT

This paper aims to study the effect of herding on buy and hold, momentum and contrarian strategy. In this research, the cross-sectional absolute deviation is used to identify herding behavior in twenty industries in Tehran stock market. It is observed that the down and boom periods had more industries with herding. Moreover, the weak herding is more common than the strong herding in this market. In addition, the results showed that in all studied strategies, strong herding had a negative effect on industries return in every period except in the bust periods. On the other side, industries with the weak herding had more return than industries without herding in all periods except the bust period.

Keywords:

Herding, Buy and hold strategy, Momentum strategy, Contrarian strategy

1. Introduction

The principal reason for conducting many of financial research is choosing the better investing strategy, which results in the highest return in diverse conditions of the financial markets. Analyzing the behavior of price and its reaction over the time is one of the ways to find this optimum strategy. For the first time, Bondt and Thaler (1985) and Bondt et al. (1987) proved the existence of a returning movement of price and suggested that purchasing loser stock and selling the winner stock of the previous period could be led to higher returns. Unlikely, Jegadeesh and Titman (1993) suggested that buying the winner stock and selling loser stock, which is based on the return of previous portfolio investment, could make an extra significant return. Conrad and Kaul (1998) analyzed return of contrarian strategy in long-term and momentum strategy's return in the short term by checking a long-term period of market stock of America. They stated that success of these strategies depends on investment horizon considered. Indeed, Jegadeesh and Titman (2001) argued by criticizing hypothesis of Conrad and Kaul (1998) that if momentum profits are due to the sectional difference of return then past winners (past loser), unlimitedly should keep their higher (lower) return in future. Instead, the results show that the return of momentum portfolios is positive only for 12 months after its formation, and if everything is the way expected, the return will be negative after 12 months. By using of a large set of option contracts, Guerard et al. (2015) found that further return of last year, will continue between 1 and 12 next months, but the return would be negative in long-term horizons. This extra return, also, depends on the previous performance of bonds.

The remainder of this paper is organized as follows. Section 2 is about older researches in the field of herding behavior and also, investment strategies. Section 3 is devoted to the presentation of data and the method. The results are argued in section 4, and finally, the section 5 includes analyzing and interpretation of the results.

2. Literature Review

In previous studies, many reasons have been mentioned for the formation of the momentum effect. Hong et al. (2000) analyzed that using of gradual release of information to explain momentum effect is

appropriate. The behavior of micro-investors (Hvidkjaer, 2006), also, and the ratio of informed traders to noise traders (Sadka, 2006) are other aspects mentioned in other research. Besides, some analysis believes that momentum is caused by behavioral factors (Danie et al., 1998; Hong and Stein, 1999). Jahanmiri et al. (2017) show that for the variables such as book value to market value, company age, the size of the entity, lowest price to the highest price of the stock ratio, and the standard deviation of operating cash flow, by increasing the degree of information uncertainty (a behavioral factor), stock returns trend increases (decreases) for winning (loser) portfolios. Also, Bakhtiari et al. (2019) Show that some behavioral factors are different from each other based on specific company variables, and this difference can cause make extra returns.

Some analysis has engaged in the correlation between momentum return and herding behavior. According to Nofsinger and Sias (1999), herding causes increasing price or effect of momentum, in next months. Conversely, Singh (2013) and Brown et al. (2013) supposed that in the long term, the return would be reversed due to this behavior. In any case, it could result that one of the effective factors on price trend and momentum impact is herding.

For the first time, Keynes (1936) defined herding as a tendency of investors to collective behavior instead of their information. It is possible that due to lack of enough information or believing to the accuracy of other investor's information, investors imitate others' pattern (Bikhchandani and Sharma, 2000). Other reasons for herding could be biases of investors. Availability bias (Kuran and Sunstein, 1999), conformity (Hirshleifer, 2001), and home bias (Feng and Seasholes, 2004) are some behavior factors for the existence of herding. Shiller (2007), also, claimed that herding is the result of optimism about increasing price of an asset.

The existence of herding behavior may cause different effects on market conditions and asset prices. Herding causes an increase in the price from its fundamental price and at last, the market will become more inefficient (Banerjee, 1992; Bikhchandani et al., 1992; Bikhchandani and Sharma, 2000). The study of Brock and Hommes (1997, 1998), also, showed that the irrational behavior causes chaos in the market, though some researchers had believed that this behavior aids to the market to become more efficient.

Froot et al. (1992), Hirshleifer et al. (1994), and Hey and Morone (2004) suggested that herding causes to accelerate the movement of the stock to its fundamental price and as a result, the efficiency of the market will improve.

In our investigated period, Tehran stock exchange (TSE) experience excessive fluctuations in price. From August 2012 to end of 2013, nearly all industries had high returns. After that, and until mid-2015, the market suffered a severe fall. Moreover, the transaction volume increased significantly. Therefore, it seems essential to study TSE, which is also a young and less-studied market, to know more about its behaviors. Examining the impact of herding on return of buy and hold, momentum and contrarian strategies is the next purpose. Analyzing the performance of momentum and contrarian strategies is necessary because they could have different performances in different markets (Nnadi and Tanna, 2017). The period of forming herding in each market should vary from the others (Mobarek et al., 2014; Galariotis et al., 2015).

Lakonishok et al. (1992) by using equity funds data looked for herding among institutional money managers. Although, they did not find this behavior among pension managers. Christie and Huang (1995) introduced Cross-Sectional Standard Deviation (CSSD), which is based on the relation between stock market movements and the individual stock returns. They indicated herding behavior just in turmoil periods. Chang et al. (2000) used a non-linear model to improve CSSD. They use Cross-Sectional Absolute Deviation (CSAD), which has a general quadratic relationship with the market return for finding herding. Both CSSD and CSAD are based on Capital Asset Pricing Model; however, Weighted Cross-Sectional Variance (WCSV) proposed by Xie et al. (2015) is based on Arbitrage Pricing Theory. This method tests herding by removing the weaker patterns in the model.

Comparing to Lakonishok, Shleifer, and Vishny (LSV) model, CSAD does not require the detailed investors' transaction and instead, uses whole market data. Moreover, CSAD can be used in different states of a market, and not only in an efficient market setting. Even though WCSV is a new method for measuring herding, but according to Xie et al. (2015), it is not completed yet, and not studied adequately. On the other side, CSAD method is used in many studies, such as Demirer et al. (2015) in China stock market, Bensaida (2017) in American stock market, and Fnag

et al. (2017) in U.S. equity market. Therefore, we benefited from CSAD to find herding in our study. The effects of herding in diverse states of the market, also, is studied by dividing the whole period into four different periods based on the return of the overall market.

According to Chang et al. (2000), herding shows itself as a significant negative estimation of a coefficient in CSAD equation. However, the positive but insignificant estimate in CSAD equation contains important information that cannot be ignored. Following Fang et al. (2017), we introduced two different concepts of herding, strong herding, and weak herding. Strong herding occurs when a group of investors imitates each other's investment strategies, and it can be in the extent of the market (Christie and Huang, 1995). Strong herding will appear as a significant and negative coefficient in CSAD regression equation. On the other side, we have weak herding when a group of investors moves into, or out of one subset of markets simultaneously (Gebka and Wohar, 2013). Weak herding is an insignificant positive estimation in CSAD equation.

3. Methodology

3.1. Data

The data included stocks of 20 industries of Tehran stock exchange market, which is examined from the first of July in 2009 to end of June in 2016. We categorized this period into four periods based on the overall index return of TSE. The first period is included from the beginning of July in 2010 to the end of March in 2011, which the return of both market and most of the studied industries were positive, so we called it "up period." The next period is from the first of April to the end of the July in 2012 which shows negative return in overall index and some industries, and it is named "down period." The return of overall index and all industries in the third period, from the first of August in 2012 to the end of December in 2013, is positive and significant relative to the up period that is called "boom period." In the last period, the return of overall index and most of the industries were significantly negative, which we called it "bust period." This period included from the first of January in 2014 to the end of June in 2015.

Possessing enough corporations (more than four corporations) was the measure of choosing industries,

in the studied period. Industries are categorized based on announcing the Tehran stock exchange organization. See industries in Table 1

3.2. Forming investment portfolio

The existing firms in an industry are categorized into the group of winners and the group of losers, based on their previous performance (checking period). The winner stock has more return relative to the median return of all stocks, whereas the loser stock has less return relative to the median. For the more accurate study, the checking period could be 1, 2, 3, 6 or 12 months.

The holding period is the time, which the considered stock is purchased at the first of this period and will be sold at the end of it. The period, also, could be one of the 1, 2, 3, 6 and 12 months. The return of recent month is considered to calculate in this period. Even though Li (2016) found that intra-industry momentum premium is more profitable than intra-industry and overall stocks momentum, but we use the intra-industry momentum strategy, because we want to examine all of the stocks in every group.

Based on Madanchi et al. (2017), the momentum phenomenon exists in TSE. Therefore, we can measure this effect in our study. The profitability of momentum strategy depends on buying of previous winners and selling of previous losers. Consequently, the winning stock will be purchased and lose stocks will be sold after calculating the return of checking period. Conversely, trades which are based on contrarian strategy due to a returning movement of price is opposite of the momentum strategy (Grinblatt and Titman, 1989; Jegadeesh and Titman, 2001). Hence, in each period, previous loose stocks are bought, and former winning stocks will be sold. Finally, regardless of return of former period, by taking advantage of buy and hold strategy the stock is bought and it is held during investment horizon. Eventually, similar to other strategies, it is sold at the end of the holding period.

Due to the absence of short selling in Tehran stock exchange, selling loser stocks (by momentum strategy) and winner stocks (by contrarian strategy) is not accomplished, at the first of the period. In fact, the stock is bought by the considered strategy, then at the end of the holding period, it will be sold, and its return is calculated.

3.3. Measuring the value of herding

We benefited from Cross-Sectional Absolute Deviation (CSAD) technique to discover herding. It is an improved method of Cross-Sectional Standard Deviation (CSSD). Christie and Huang (1995) found (presenters of CSSD) that the correct result could be derived, only in time of chaos, from the CSSD method. Chang et al. (2000), also, was not able to achieve any evidence of existing herding by taking advantage of CSSD. Furthermore, by using CSSD, Huang et al. (2015) obtained inconsistent results. Consequently, in this research, we only benefited from CSAD technique to analyze herding.

The basis of the technique is to find herding in an industry. Because investors of an industry encounter similar problems, consequently, the tendency of imitation will grow (Bikhchandani and Sharma; 2000). Chang et al. (2000) defined CSAD by using a nonlinear equation of stocks in the industry and the return of the market:

$$CSAD_{k,t} = \frac{1}{N_k} \sum_{i=1}^{N_k} |R_{i,t} - R_{m,t}| \quad (1)$$

Where N_k , is the number of firms in the k industry, $R_{i,t}$, the return in time of t . For each industry, we computed the coefficients of the regressive equation by using maximum likelihood (ML) method to obtain the values of daily CSAD, as follow:

$$CSAD_{k,t} = \alpha_0^k + \alpha_1^k |R_{m,t}| + \alpha_2^k (R_{m,t})^2 + \varepsilon_t \quad (2)$$

The determination of the type of equation of CSAD and the return of the market is evaluated by significantly estimating the coefficient of α_2^k in Eq. (2). Usually, it is expected that the equation between the return of the market and CSAD is positive (Litimi et al., 2016), though the return of the industries is more parallel with the market return and less scatter is observed when herding exists in the market. The similarity causes a negative and nonlinear equation of the return of industries and the market. This nonlinear and negative connection emerges in the coefficient of α_2^k and, the significant and the more negative coefficient of the estimation is, the more intensive herding will be noticed.

In this study, when α_2^k is significantly negative, we have a strong herding. Because in this condition, it is expected that the industry return converges with market return. As a result, this convergence causes a negative and nonlinear relation between the industry return and market return. In contrast, weak herding occurs when some investors move into or out of a part of the market. Therefore, we expect the return dispersion of market components increase. This event is addressed as positive but insignificant α_2^k coefficient in Eq. (2).

4. Results

4.1. The CSAD Results

The statistics data of studied industries are shown in Table 1. In each industry, #firms indicate numbers of subsidiaries. The Return is representative for the average percentage of monthly return in investigated periods.

Table 1. Descriptive statistics

Industry	#Firm	Return				
		Whole	Up	Down	Boom	Bust
Banks	11	2.12% (0.0740)	4.96% (0.0560)	-0.18% (0.0547)	6.07% (0.0860)	-1.00% (0.0663)
Basic metals	19	2.20% (0.0857)	6.69% (0.0712)	0.90% (0.0629)	6.76% (0.1030)	-3.19% (0.0568)
Cars	30	2.25% (0.1222)	9.93% (0.1374)	-3.33% (0.0542)	6.78% (0.1572)	-0.92% (0.0891)
Cement	31	2.53% (0.0854)	2.19% (0.0435)	1.61% (0.0545)	8.73% (0.1196)	-2.33% (0.0440)
Chemical	29	3.54% (0.0757)	6.55% (0.0486)	2.34% (0.0583)	8.22% (0.0987)	-1.30% (0.0360)
Computer	6	3.61% (0.0883)	11.52% (0.1331)	0.89% (0.0966)	4.70% (0.0658)	1.05% (0.0400)
Electronic devices	8	2.95% (0.1156)	4.81% (0.0829)	-0.83% (0.1125)	8.77% (0.1362)	-0.11% (0.0930)
Food except sugar	20	3.06% (0.1146)	3.51% (0.0829)	1.11% (0.0599)	9.77% (0.1641)	-1.76% (0.0804)
Investments	16	2.60% (0.0868)	6.82% (0.0968)	-0.30% (0.0451)	7.21% (0.1025)	-1.28% (0.0677)
Machinery	11	2.54% (0.0892)	1.19% (0.0520)	0.25% (0.0439)	8.75% (0.1101)	-0.61% (0.0878)
Mass production	12	1.91% (0.0974)	3.37% (0.0631)	1.69% (0.0689)	5.72% (0.1145)	-2.23% (0.1057)
Metal ore	9	2.25% (0.0923)	6.09% (0.1124)	0.68% (0.0354)	8.41% (0.1064)	-4.11% (0.0524)
Metal products	5	2.70% (0.1094)	3.91% (0.1325)	-2.05% (0.0729)	10.73% (0.1014)	-1.25% (0.0928)
Non metallic mineral	11	3.67% (0.1123)	1.25% (0.0546)	1.01% (0.0467)	14.01% (0.1321)	-2.52% (0.0911)
Petroleum products	7	3.58% (0.1191)	4.37% (0.0724)	1.40% (0.0832)	12.39% (0.1397)	-3.22% (0.0958)
Pharmaceutical ingredients	27	3.12% (0.0766)	4.82% (0.0604)	0.28% (0.0291)	8.42% (0.1076)	-0.21% (0.0457)
Rubber and Plastic	7	3.18% (0.1041)	0.86% (0.0925)	1.11% (0.0403)	10.46% (0.1389)	-0.70% (0.0803)
Sugar	12	2.81% (0.1040)	5.59% (0.0540)	6.42% (0.1319)	5.26% (0.1023)	-4.11% (0.0607)
Tile and ceramic	10	3.12% (0.1169)	3.38% (0.0734)	1.73% (0.1236)	11.74% (0.1354)	-3.90% (0.0362)
Transportation	5	7.84% (0.4733)	-2.26% (0.0519)	-0.96% (0.1205)	32.42% (0.8158)	-2.52% (0.2293)

Notes: The numbers in parentheses are the variance of the returns for each period

The results of Table 1. show that the “Transportation” industry, in the whole period, had the highest return, though “Mass production” industry represented the least return. Besides, in the up period, the “Computer” and the “Cars” industries indicated the great return. However, in this period, the only industry with a negative return was “Transportation” industry. Moreover, the return of the “Sugar” industry, in the down period, was positive and higher than the other industries. Unlike the up period, the “Cars” industry achieved the least return in the down period. The return of all industries, in the boom period, was positive and the “Transportation” industry obtained the greatest return. Finally, all industries in the bust period, except “Computer” industry experienced negative return. In addition, the least percentage of

return, in this period, was devoted to the “Sugar” and “Metal ore” industries

Table 2. indicates the results of estimation of Eq. (2), which is categorized into the industries and the periods. As can be seen, we have strong herding only in “Electronic devices” in the whole period, in “Food except sugar” in the boom period, and in down period in “Petroleum products”. However, weak herding can be seen in many industries and all periods. Weak herding was more common during down, boom, and up periods respectively. We can be sure that herding (of any kind) does not exist in 15 out of 20 industries in the bust period and 13 industries in the whole period.

Table 2. Regression of cross sectional absolute deviation

Industry		Whole	Up	Down	Boom	Bust
Banks	R2 adj	0.199	0.350	0.284	0.119	0.146
	α_2	-1.273	-8.360	-5.263	6.736	1.398
		(-0.519)	(-1.137)	(-0.764)	(0.793)	(0.471)
Basic metals	R2 adj	0.454	0.400	0.422	0.335	0.531
	α_2	5.676*	10.933	8.273	7.252*	5.650*
		(3.571)	(1.367)	(1.281)	(1.699)	(2.832)
Car	R2 adj	0.159	0.326	0.472	0.128	0.198
	α_2	16.181*	-10.891	-1.746	5.181	19.417*
		(5.957)	(-1.238)	(-0.300)	(0.738)	(5.685)
Cement	R2 adj	0.438	0.644	0.401	0.250	0.598
	α_2	2.932	-3.994	7.745	5.498	4.093*
		(1.508)	(-0.608)	(1.128)	(0.845)	(2.165)
Chemical	R2 adj	0.340	0.606	0.280	0.173	0.487
	α_2	8.040*	-5.194	2.662	9.227	12.379*
		(4.217)	(-0.903)	(0.348)	(1.861)	(6.221)
Computer	R2 adj	0.021	0.018	-0.001	0.121	0.290
	α_2	3.659	-4.929	-24.560	13.570*	1.404
		(0.502)	(-0.272)	(-0.395)	(1.730)	(0.449)
Electronic devices	R2 adj	0.038	0.118	0.072	-0.006	0.022
	α_2	-6.626*	-12.855	10.353	-2.173	-5.352
		(-1.970)	(-0.862)	(0.742)	(-0.235)	(-1.304)
Food except suger	R2 adj	0.003	0.006	0.395	0.154	0.455
	α_2	-33.984	-398.384	7.139	-10.573*	8.240*
		(-0.715)	(-0.549)	(1.152)	(-1.826)	(3.881)
Investments	R2 adj	0.277	0.175	0.265	0.197	0.318
	α_2	8.144*	5.292	2.703	2.157	9.887*
		(3.720)	(0.554)	(0.313)	(0.343)	(3.289)
Machinery	R2 adj	0.239	0.386	0.298	0.140	0.290
	α_2	11.323*	-2.865	1.257	3.873	14.426*
		(4.937)	(-0.343)	(0.174)	(0.583)	(5.011)

Industry		Whole	Up	Down	Boom	Bust
Mass production	R2 adj	0.077	0.510	0.062	0.113	0.033
	α_2	6.300* (2.442)	-0.833 (-0.105)	12.064 (1.182)	3.484 (0.560)	7.308* (2.174)
Metal ore	R2 adj	0.059	0.292	0.157	0.116	0.027
	α_2	7.140 (1.435)	2.517 (0.257)	32.980* (3.075)	-0.617 (-0.088)	8.764 (0.845)
Metal products	R2 adj	0.201	0.176	0.164	0.124	0.252
	α_2	9.447* (3.489)	17.058 (1.298)	11.884 (1.049)	24.879* (3.111)	7.381* (2.237)
Nonmetallic mineral	R2 adj	0.146	0.580	0.359	0.062	0.146
	α_2	10.600* (3.957)	8.067 (1.116)	8.894 (1.264)	2.344 (0.353)	13.856* (4.099)
Petroleum products	R2 adj	0.104	0.152	0.126	-0.001	0.156
	α_2	-1.417 (-0.492)	-19.891 (-1.307)	-20.454* (-1.809)	4.227 (0.644)	-2.697 (-0.660)
Pharmaceutical ingredients	R2 adj	0.339	0.515	0.630	0.167	0.367
	α_2	4.702* (1.968)	13.975* (1.697)	17.426* (3.402)	0.057 (0.006)	6.884* (2.371)
Rubber and plastic	R2 adj	0.131	0.226	0.313	0.058	0.098
	α_2	10.328* (3.467)	3.235 (0.285)	16.570* (1.848)	8.890 (1.152)	13.770* (2.971)
Sugar	R2 adj	0.098	0.252	0.002	0.052	0.170
	α_2	26.269* (2.809)	64.201* (1.855)	39.188 (0.912)	53.153* (2.136)	25.132* (2.391)
Tile and ceramic	R2 adj	0.174	0.231	0.065	0.070	0.336
	α_2	7.490* (2.577)	5.592 (0.453)	17.696 (1.417)	13.598 (1.433)	8.150* (3.142)
Transportation	R2 adj	0.079	0.116	0.016	0.055	0.158
	α_2	13.751* (3.433)	5.737 (0.267)	9.485 (0.429)	8.529 (0.781)	20.073* (5.291)

Notes: 1. numbers in parentheses indicate t-values.

2. * indicates statistical significant at 10% confidence level of two tails

Since investors tend to follow the dominant tendency in the time of chaos, Christie and Huang (1995) expected that herding would increase. However, due to their inefficient measuring method, they were not able to present related evidences. Nonetheless, Zheng et al (2015) by analyzing stock market of China, Fang et al (2017) by studying investment funds in market of America and BenSaida (2017) and Clements et al. (2017) by studying the stock market of U.S. derived a result that in the bust period, there is more intensive herding. But Tan et al. (2008) and Lee et al. (2013) by analyzing Stock market of China and, and Litimi et al. (2016) by using CSAD technique claimed the converse result that herding is more likely to exist in the bull market.

4.2. Herding and buy and hold strategy

The results of Table 3. show that in buy and hold investment strategy, the return of industries without herding was more than industries with strong herding except in the bust period. These results are shown as “No – S” in Table 3., which show the average monthly return of industries without herding minus industries with strong herding. Moreover, for every holding periods, except 12-month holding period, these differences in the bust period is negative. As a result, strong herding has a negative effect on industries’ return in all periods except the bust period.

Table 3. Herding and Buy and Hold strategy

Holding period (Month)	1		2		3		6		12	
	No - S	No - W	No - S	No - W	No - S	No - W	No - S	No - W	No - S	No - W
Whole	0.290%	-1.469%	0.064%	-0.639%	0.154%	-0.633%	0.250%	-0.687%	0.099%	-0.935%
Up	0.556%	-1.345%	0.276%	-1.661%	0.216%	-1.164%	0.198%	-0.840%	0.152%	-0.660%
Down	0.208%	0.011%	0.133%	-0.093%	0.020%	-0.202%	0.163%	-0.427%	0.155%	-1.018%
Boom	0.656%	-5.161%	0.094%	-1.818%	0.461%	-1.894%	0.719%	-1.994%	0.049%	-2.211%
Bust	-0.114%	0.638%	-0.131%	0.501%	-0.047%	0.439%	-0.088%	0.391%	0.070%	0.208%

Notes: This table reports monthly return difference between industries with strong and weak herding from industries without herding for buy and hold strategy

The “No - W” columns in Table 3. show the average monthly return of industries without herding minus industries with weak herding. These results show that weak herding had a positive effect on the return of industries in all periods, except the bust period. In the bust period, industries without herding had more return than the industries with weak herding (except in 12-month holding period).

It can be concluded that the impact of weak herding on industries' return is totally opposite of strong herding. When weak herding had a positive effect on returns, strong herding had a negative effect, and vice versa. Zheng et al. (2015) proved the opposite result by studying the stock market of China. Their result indicated that the existence of herding causes an increase in return for the buy and short positions. They, however, considered herding as negative and significant estimation in CSAD equation.

4.3. Herding and momentum strategy

To analyze the impact of herding on the return of the momentum and the contrarian strategy we should consider an evaluated term (checking period) for every holding period. Because, in these strategies, the previous return of the stock is a principle for future decisions. Therefore, the most efficient checking period for each holding period (according to average monthly return), is shown in Table 4. Roy and Shijin (2018) by examining the international stock returns in many regions also found the momentum return (except in Japan). Following results are based on the combination of a checking period with holding period, which has most monthly average return in each holding period. Following results are based on the combination of a checking period with holding period,

which has most monthly average return in each holding period.

Table 4. Returns of

Holding Period	Checking Period	Mom	Con
1	1	1.5842%	1.1956%
	2	1.5416%	1.1650%
	3	1.7227%	0.9791%
	6	1.4418%	1.3669%
	12	1.6508%	1.0301%
2	1	1.0982%	0.8241%
	2	1.1931%	0.6811%
	3	1.1313%	0.7138%
	6	1.0314%	0.8990%
	12	0.9994%	0.6879%
3	1	1.1326%	0.8547%
	2	1.1440%	0.7981%
	3	1.1170%	0.8183%
	6	1.0534%	0.9464%
	12	0.9687%	0.7476%
6	1	1.1810%	1.0123%
	2	1.1395%	1.0503%
	3	1.1539%	1.0396%
	6	1.1718%	1.0106%
	12	1.0579%	0.8772%
12	1	1.2501%	1.0907%
	2	1.2297%	1.0906%
	3	1.2456%	1.0522%
	6	1.2029%	1.0404%
	12	1.1034%	0.9794%

Notes: This table reports the average monthly return of different checking periods for each holding period.

Table 5. shows average monthly return difference between industries without herding from industries with strong and weak herding. The results are representative of the negative impact of the strong herding on the return of the momentum strategy in all periods, except in the bust period. Conversely, the result shows that the impact of weak herding on industries (except in the bust period), is positive. In the boom period, we have the farthest return variation between industries without herding and industries with both herding.

Similar to buy and hold strategy, the effects of strong and weak herding on the return of industries are opposite. Strong herding had the positive effect on industry return only in the bust period; however, weak herding had this positive effect in all periods except in the bust period. Only by considering strong herding, Yao et al. (2014) obtained similar results in their research. They argued that if the level of herding were not considerable, taking buy position in winning stocks and sell position in loser stocks would result in more return that is significant.

Table 5. Herding and Momentum strategy

Holding period (Month)	1		2		3		6		12	
	No - S	No - W	No - S	No - W	No - S	No - W	No - S	No - W	No - S	No - W
Whole	0.166%	-1.107%	0.090%	-0.442%	0.129%	-0.220%	0.086%	-0.535%	0.034%	-0.681%
Up	0.262%	-0.856%	0.188%	-1.041%	0.136%	-0.777%	0.107%	-0.503%	0.072%	-0.477%
Down	0.188%	-0.132%	0.041%	0.012%	0.051%	-0.022%	0.079%	-0.270%	0.075%	-0.709%
Boom	0.333%	-3.564%	0.256%	-1.085%	0.380%	-0.522%	0.234%	-1.455%	-0.013%	-1.549%
Bust	-0.061%	0.221%	-0.071%	0.061%	-0.043%	0.168%	-0.058%	0.082%	0.024%	0.062%

Notes: This table reports monthly return difference between industries with strong and weak herding from industries without herding for momentum strategy.

4.4. Herding and the contrarian strategy

In Table 6., the average difference of the return of industries, between industries with herding (both kind) and without it, is calculated and categorized in different holding periods. Like momentum strategy, we analyze a combination of checking period and holding period, which has the highest return for this strategy.

The results of this strategy are very similar to buy and hold and the momentum strategies. "No - S" columns in Table 6., in most cases, show the return difference of industries with strong herding and industries without herding in the up, down, boom and whole periods is negative. However, in the bust period, strong herding had a positive effect on industry return (except for 12-month holding period).

Table 6. Herding and Contrarian strategy

Holding period (Month)	1		2		3		6		12	
	No - S	No - W	No - S	No - W	No - S	No - W	No - S	No - W	No - S	No - W
Whole	0.146%	-0.733%	0.059%	-0.306%	0.069%	-0.292%	0.126%	-0.296%	0.065%	-0.254%
Up	0.387%	-0.420%	0.263%	-0.596%	0.166%	-0.395%	0.035%	-0.383%	0.080%	-0.183%
Down	0.041%	0.119%	-0.034%	-0.030%	-0.022%	-0.073%	0.051%	-0.267%	0.081%	-0.309%
Boom	0.348%	-2.742%	0.132%	-0.895%	0.201%	-0.861%	0.406%	-0.820%	0.063%	-0.662%
Bust	-0.073%	0.251%	-0.028%	0.149%	-0.023%	0.102%	-0.027%	0.216%	0.045%	0.146%

Notes: This table reports monthly return difference between industries with strong and weak herding from industries without herding for contrarian strategy.

By examining the “No - W” columns, which show the return difference between industries with weak herding from industries without herding, we found that weak herding had a positive effect on industry return in all periods (except in the bust period). This positive effect had the highest value in the boom period.

5. Discussion and Conclusions

Evaluating the impact of herding on the buy and hold, momentum and contrarian strategies in Tehran stock exchange market is the primary goal of this paper. This research is carried out for different periods (according to the return of the overall index) and different holding periods. The result is derived by taking advantage of CSAD equation, and following Fang et al. (2017), we introduce two concepts, strong herding, and weak herding. Strong herding occurs when the industry return converges with market return. On the other hand, we expect the return dispersion of market components increase when weak herding exists.

By examining the 20 active groups in Tehran stock exchange market, we find that weak herding is more common than strong herding. In the whole period, we observed strong herding in one industry and weak herding in three industries out of twenty. Moreover, strong herding was observed just three times in different periods and industries, but weak herding was observed thirty nine times.

Our results show that herding (both kind) is more exist in the down and boom periods in TSE. Although, Fang et al. (2017) by examining the investment funds in U.S. market, discovered positive herding behavior (strong herding) in recessionary periods and negative herding behavior (weak herding) in expansionary periods. In addition, Zheng et al. (2015) by examining the stock market of China, and Clements et al. (2017) by studying the stock market of U.S derived that herding is more common during the bust period. Conversely, Lee et al. (2013) by analyzing the stock market of China, and Litimi et al. (2016) by studying the stock market of U.S derived different results. Their results indicated that herding occurred during the boom period of the market. Indārs et al. (2019) found that reason of investors' herding behavior changes under specific market circumstances such as market trends, liquidity, arrival of new information, and etc.

Furthermore, strong herding causes a decrease in the return of all three investment strategies, which we

studied, in all periods, exclude the bust period. Demirer et al. (2015) had found that the winner and loser industries, with a few levels of herding, achieved more return than industries with a high level of herding. Yan et al. (2012) claimed that taking a long position in the winner industries and a short position in loser stock could provide significant return when herding is small. In converse, weak herding results were quite opposite of strong herding. Weak herding has a positive effect on industry return in the up, down, boom, and whole periods, however, in the bust period it causes the negative effect. Nevertheless, the returns of industries without herding minus returns of industries with weak herding are greater than the returns of industries without herding minus returns of industries with strong herding. As a result, weak herding has a higher impact on return industries than strong herding.

The difference of the return between the industries without herding and the ones with herding (both weak and strong) has the highest value in the boom period, and after that in the up period. Therefore, weak and strong herding had the greatest impact on periods that market return is above zero.

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