

Is 'Herding' Peculiar to Certain Stocks? A Perspective from the Turkish Stock Market

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ABSTRACT

We test the existence of daily/weekly herding behavior in the Turkish stock market between June 2013 and October 2020 on the stocks that remained listed on the benchmark stock index over the analysis period. Rather than performing the test on a set of stocks belonging to firms with different characteristics as in the literature, we conduct it on subsets of stocks we form based on foreign ownership ratio, firm size (measured by total assets), and prominent financial indicators (price-to-earnings and market-to-book ratios). Our analysis provides no evidence of herding behavior but yields important insights. Specifically, it demonstrates that financial indicators have no bearing on herding behavior, but investor type and firm size may. A slight indication of herding tendency emerges in stocks with a relatively higher investment from local investors but disappears in those with a comparatively higher investment from foreign investors. This finding suggests a potential market knowledge disparity between local and foreign investors, with the less expert being the local group. Moreover, a faint sign of herding tendency also appears in stocks that belong to small firms, possibly due to a heightened uncertainty inherent in such stocks.

Keywords: Herding Behavior, Firm Size, Foreign Ownership, Financial Ratios.

'Sürü Davranışı' Belirli Hisse Senetlerine mi Özgü? Türk Hisse Senedi Piyasasından Bir Bakış

ÖZ

Haziran 2013 ile Ekim 2020 tarihleri arasında Türk borsasında günlük/haftalık sürü davranışının varlığını, analiz dönemi boyunca gösterge borsa endeksinde kote kalan hisse senetleri üzerinde test ediyoruz. Testi literatürde olduğu gibi farklı özelliklere sahip firmalara ait bir dizi hisse senedi üzerinden yapmak yerine, yabancı sahiplik oranı, firma büyüklüğü (toplam varlıklarla ölçülen) ve öne çıkan finansal göstergelere (fiyat-kazanç ve piyasa-defter oranları) göre oluşturduğumuz hisse alt kümeleri üzerinden yapıyoruz. Analizimiz, sürü davranışına ilişkin bir kanıt sağlamamakta, ancak önemli içgörüler sunmaktadır. Spesifik olarak, analizimiz finansal göstergelerin sürü davranışı üzerinde bir etkisi olmadığını, ancak yatırımcı türü ve firma büyüklüğünün olabileceğini göstermektedir. Sürü eğiliminin hafif bir göstergesi yerel yatırımcılardan nispeten daha yüksek yatırım alan hisse senetlerinde ortaya çıkarken, yabancı yatırımcılardan nispeten daha yüksek yatırım alan hisse senetlerinde kaybolmaktadır. Bu bulgu, yerel ve yabancı yatırımcılar arasında daha az uzman olanın yerel grup olduğu olası bir pazar bilgisi çeşitliliği olduğuna işaret etmektedir. Ayrıca, muhtemelen bu tür hisse senetlerinin doğasında var olan daha büyük bir belirsizlik nedeniyle, küçük firmalara ait hisse senetlerinde de hafif bir sürü eğilimi belirtisi ortaya çıkmaktadır.

Anahtar Kelimeler: Sürü Davranışı, Firma Büyüklüğü, Yabancı Mülkiyeti, Finansal Oranlar.

1. Introduction

Investment decisions wield substantial influence over asset price dynamics. Consequently, any theory that seeks to understand the financial markets, particularly the behavior of prices, must address how investors make those decisions. Traditional finance theory contends that investors consistently make rational decisions, thoroughly analyzing all relevant information to maximize their interests. Conversely, behavioral finance theory acknowledges instances where investors' decisions deviate from rationality, thereby introducing a contrasting perspective. The behavioral approach argues that irrationality arises due to psychological factors that give rise to anomalies in the perception and processing of information and

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the decision-making itself, as categorized by Roßbach (2001).¹ As a classic example of investor irrationality, behavioral theorists commonly cite the phenomenon known as herding, wherein investors tend to follow the crowd's actions, even when they think these actions may be wrong. Herding is viewed as a pivotal factor contributing to market crashes and bubbles (e.g., Dass et al., 2008; Devenow & Welch, 1996; Johansen & Sornette, 1999; Tan et al., 2008). However, research testing the presence of herding in financial markets yields inconsistent results across studies, highlighting its complexity. While some identify evidence of herding (e.g., Cakan & Balagyozyan, 2016; Chong et al., 2017; Lakonishok et al., 1992), others produce inconclusive (Altunoz, 2018; Ganesh et al., 2017) or no evidence at all (Christie & Huang, 1995; Demirer & Kutan, 2006; Garg & Jindal, 2014).

A line of research investigates herding in relation to a variety of factors, including the type of investors (foreign vs. local), the size of the firm involved (small-cap vs. large-cap stocks), and the financial metrics such as the price-to-earnings and market-to-book ratios. Unfortunately, much like the literature that scrutinizes the very existence of herding itself, this corpus of research also yields mixed findings. To begin with, scholars who explore herding with respect to investor types link it to different groups. Some discover it as a phenomenon characteristic of foreign investors (Yao et al., 2014), while others identify it as unique to local investors (Iihara et al., 2001). Additionally, several researchers document herding among both foreign and local investors (Bowe & Domuta, 2004; Tan et al., 2008). Those who examine it in connection with the firm size generally find herding to be more prevalent in small-cap stocks. The works of Chang et al. (2000), Hsieh (2013), Venezia et al. (2011), Wermers (1999), and Zhou and Lai (2009), among others, all provide evidence to this effect. The tendency of investors to herd in small- rather than large-cap stocks is ascribed to the elevated information risk associated with small firms. This is because the limited availability of information about such firms hinders the ability to determine the fair value of their stocks. However, it is important to note that there are scholars, like Wylie (2005) and Kremer & Nautz (2013), who relate herding to large-cap stocks. In particular, they demonstrate that fund managers display notable herding propensities toward large-cap stocks when it comes to international markets. Lastly, research concerning the role of financial metrics on herding – although less extensive than research on other factors – also generates conflicting findings. For instance, Zheng et al. (2015) establish that institutional herding is more likely to occur in stocks with higher price-to-earnings (hereafter P/E) and higher market-to-book (hereafter P/B) ratios, which sharply contrasts with the findings of Sias (2004) and Wermers (1999) that arrive at the opposite conclusion. Overall, the literature lays out the need for further research to better understand the underlying factors influencing herding behavior in diverse contexts.

Motivated by this scholarly need, this paper aims to contribute to the literature by delving into the herding phenomenon in the Turkish stock market (BIST). It is pertinent to note that we are not the first to investigate the herding behavior in the BIST. While previous studies have explored herding in the BIST, they have failed to reach a unified consensus, echoing the general trend in the literature. To exemplify, Balcilar & Demirer (2015), Cakan & Balagyozyan (2016), and Dalgıç et al. (2021) come up with evidence in favor of herding among investors. In contrast, Altunoz (2018) and Dođukanlı & Ergün (2015) report evidence only in certain periods, and Solakoglu & Demir (2014) do so only in the secondary market. More to the point, none of them has investigated herding considering the abovementioned factors: the foreign ownership ratio, the firm size, and the P/E and P/B ratios. Thus, the primary contribution of this paper is to examine the herding behavior regarding these specific factors, except that we measure the firm size in total assets instead of market capitalization.² More specifically, the current work sets out to answer four key questions:

- i. Is there evidence of herding in the Turkish stock market (BIST) on a daily or weekly basis?
- ii. Does herding manifest in stocks with a high foreign concentration, low concentration, or both?
- iii. Does the firm size, as measured by its total assets, affect herding behavior toward its stocks?
- iv. Is herding behavior correlated with financial metrics, particularly the P/E and M/B ratios?

¹ For an able survey of finance theories, see Holtfort (2019).

² The stability of total assets makes them a more reliable indicator of a firm's size than market capitalization.

The snapshot of our results is as follows. Irrespective of the investment horizon considered, our aggregate analysis of all stocks without specific categorization fails to identify any trace of herding. Our investigation of specific stock groups, on the other hand, offers valuable insights. We see a slight hint of herding in stocks with a relatively higher concentration of local investors, but only over weekly periods. Interestingly, any sign of herding disappears for stocks with a relatively lower presence of local investors. Given that more local investors imply fewer foreign ones, this could mean that foreign investors may possess superior knowledge compared to their local peers. This implication parallels the findings of Solakoglu & Demir (2014), who report no traces of herding in BIST30, where most portfolio holdings belong to foreigners but do so in the Second National Market, where they belong to locals. In congruence with the predominant view in the literature, we do not observe any indication of herding in large firm stocks but do so in small firm stocks, particularly in times of market stress. Somewhat surprisingly, our analysis indicates that financial ratios do not play a significant role in herding behavior. As Lux (1995) points out, the immateriality of financial metrics for herding behavior may stem from traders' limited level of sophistication and comprehension regarding the market fundamentals.

The rest of the paper is structured as follows. The next section presents the data. Section 3 discusses the methodology employed and presents the results. Section 4 concludes.

2. Data

This study uses the daily closing values of the BIST100 index, the corresponding prices of 62 stocks that remained continuously listed on the BIST100, and the exchange rate between the US Dollar and the Turkish Lira (USD/TL) throughout 03.06.2013 and 01.10.2020. Additionally, the study incorporates specific grouping criteria for the 62 stocks, namely the foreign ownership ratio (i.e., the percentage of outstanding stocks owned by foreign investors), the total assets of the associated firms, and the P/E and M/B ratios.

The daily closing values of the BIST100 index are extracted from www.finet.com, while the closing prices of the 62 stocks, accompanied by their respective firms' total assets, are sourced from www.finbox.com. Furthermore, the USD/TL exchange rate data, as well as the P/E and M/B ratios, are retrieved from the data provider, Matriks. Finally, the foreign ownership ratio is collected from www.isyatirim.com.tr.

3. Methodology and Results

For the analysis, we adapt the method devised by Christie & Huang (1995). More specifically, to test a group of n stocks for herding behavior, we run the following autoregressive time series regression:

$$S_t = \alpha_0 + \sum_{i=1}^{T_1} \alpha_i S_{t-i} + \beta_L D_t^L + \beta_H D_t^H + \sum_{j=0}^{T_2} \gamma_j DR_{t-j} + \varepsilon_t \quad (1)$$

In Eq. (1), the dependent variable S_t denotes the cross-sectional standard deviation of the stock returns of interest for the time period from $t-1$ to t , which refers to two consecutive days or weeks. Formally, let $P_{i,t}$ be the closing price of stock i at time t . Then, given n stocks, S_t is defined as

$$S_t = \sqrt{\frac{\sum_{i=1}^n (r_{i,t} - \bar{r}_t)^2}{n-1}} \quad (2)$$

, where $r_{i,t} = (P_{i,t} - P_{i,t-1}) / P_{i,t-1}$ is the return of stock i over the time frame of $t-1$ and t , and \bar{r}_t is the mean return of the stocks in question. Likewise, DR_t represents the return of the US Dollar against the Turkish Lira over the same interval. Lastly, D_t^L and D_t^H are two dummy variables that take the value of 1 when the market (i.e., the BIST100) return at t respectively falls within the bottom and top 10% of all

returns over the entire analysis period (03.06.2013 - 01.10.2020). To put it simply, D_t^L (the 'low' dummy) captures the times when the market fares exceptionally poorly and D_t^H (the 'high' dummy) when it fares extraordinarily well – the two periods when one would expect investors to have the strongest motivation for following the herd.

Our model specification differs from Christe and Huang's in that we incorporate the lagged values of the dependent variable and the US Dollar's return (and its lagged values) against the Turkish Lira as explanatory factors in addition to the two dummies capturing extreme market moods. These additional independent variables enable our model to enjoy a better predictability power than theirs. Naturally, however, we stick to their interpretation in the identification of herding behavior. We infer that investors herd in a low market if the coefficient estimate for the low dummy D_t^L is negative (i.e., $\beta_L < 0$), and they do so in a high market if that for the high dummy D_t^H has a negative coefficient (i.e., $\beta_H < 0$). Here, the idea is that when investors engage in herding behavior, stock returns should be less volatile; that is, the herding behavior should reduce the cross-sectional variance of the stocks.

To determine the maximum lags of S_t and DR_t (i.e., T_1 and T_2), we use the Schwarz information criterion. Tables 1 and 2 display the relevant values for the daily and weekly analyses, with lag lengths of up to five.

Table 1. Schwarz Information Criterion (Daily)

		DR_t (Lags up to T_2)					
		0	1	2	3	4	5
S_t (Lags up to T_1)	1	-14069.2	-14067.8	-14061.4	-14045.7	-14042.2	-14027.0
	2	-14103.7	-14104.6	-14099.8	-14083.9	-14079.8	-14064.3
	3	-14099.6	-14101.0	-14097.0	-14089.5	-14084.6	-14068.7
	4	-14106.2	-14107.7*	-14104.1	-14096.6	-14094.5	-14078.7
	5	-14092.6	-14094.4	-14090.6	-14083.1	-14081.6	-14074.4

It is straightforward to see from Table 1 that $T_1=4$ and $T_2=1$ for the daily frequency. Similarly, it is readily apparent from Table 2 that $T_1=1$ and $T_2=1$ for the weekly frequency.

Table 2. Schwarz Information Criterion (Weekly)

		DR_t (Lags up to T_2)					
		0	1	2	3	4	5
S_t (Lags up to T_1)	1	-2144.9	-2149.3*	-2136.7	-2124.1	-2111.8	-2099.8
	2	-2137.1	-2140.1	-2134.2	-2121.6	-2109.5	-2097.5
	3	-2124.2	-2127.4	-2121.5	-2115.8	-2103.6	-2091.6
	4	-2112.8	-2115.7	-2109.8	-2104.2	-2098.6	-2086.5
	5	-2100.7	-2103.6	-2097.7	-2092.2	-2086.6	-2080.8

Accordingly, our model specification, i.e., Eq. (1), turns into Eq. (3) for the daily analysis and Eq. (4) for the weekly, where

$$S_t = \alpha_0 + \sum_{i=1}^4 \alpha_i S_{t-i} + \beta_L D_t^L + \beta_H D_t^H + \sum_{j=0}^1 \gamma_j DR_{t-j} + \varepsilon_t \tag{3}$$

and

$$S_t = \alpha_0 + \alpha_1 S_{t-1} + \beta_L D_t^L + \beta_H D_t^H + \sum_{j=0}^1 \gamma_j DR_{t-j} + \varepsilon_t \tag{4}$$

To proceed further, we need to check that the specifications above meet the assumptions of a time series regression, namely, the assumptions of stationary variables and serially uncorrelated and homoskedastic error terms. Rejecting the null hypothesis for the presence of a unit root, the Augmented Dickey-Fuller test statistics in Table 3 ascertain that S_t and DR_t are stationary at the 1% level for both daily and weekly frequencies.

Table 3. ADF Unit Root Test Results (03.06.2013 - 01.10.2020)

Variable	ADF		Significance (α)	Critical Level (at α)
	Daily	Weekly		
S_t	-27.519	-13.116	1%	-3.451
DR_t	-37.367	-16.921	5%	-2.875
			10%	-2.570

Similarly, Table 4 fails to reject the null hypothesis of no autocorrelation (i.e., no serial correlation) between the error terms.

Table 4. Breusch-Godfrey Autocorrelation Test Results

Frequency	Chi-Square Test Statistic	P-Value
Daily	1.670	0.196
Weekly	2.642	0.104

As is common in the literature, we assume one lag.

As for the heteroskedasticity, the Breusch-Pagan-Godfrey test results in Table 5 reject the null hypothesis of homoskedasticity and hence point to heteroskedasticity in the error term. We circumvent this issue by using heteroskedasticity-robust estimators.

Table 5. Breusch-Godfrey Heteroskedasticity Test Results

Frequency	Chi-Square Test Statistic	P-Value
Daily	153.85	0.000
Weekly	69.57	0.000

Having established that our autoregressive time series regression specification fulfills the underlying assumptions, we are now ready to present the results. Table 6 shows the regression outputs for Eq. (3) and Eq. (4) for the entire collection of all 62 stocks, without any grouping.

Table 6. Regression Results without Grouping

Frequency	D_t^L	D_t^H	Adjusted R^2
Daily	0.0041*** (0.000)	0.0022*** (0.000)	0.2691
Weekly	0.0022 (0.272)	0.0023 (0.313)	0.1594

*** at 1%.

Note that in what follows, including Table 6, the numbers in the parentheses refer to p-values. Also, it is essential to recall that a negative coefficient estimate serves as evidence of herding and a positive one as the manifestation of rationality. Hence, regardless of the time frame (i.e., daily or weekly), the positive estimates in Table 6 do not side with herding behavior but with a rational one. This inference matches that of Altunoz (2018), who also fails to identify evidence in favor of herding using Christie and Huang's (1995) model. Moreover, considering that the estimates are statistically significant at the 1% significance

level for the daily analysis but insignificant for the weekly, the shorter time frames tend to be more in line with rational behavior. This finding is in accord with Christie & Huang's (1995) suggestion that herding may require a longer time to influence stock prices.

We now turn to the main novelty of the present study, which is to repeat the above analysis for stocks with similar characteristics. To this end, we first divide the stocks into two groups based on the criteria we mentioned earlier (the foreign ownership ratio, the associated firm's total assets, and the P/E and M/B ratios), the ones whose values for the criterion at hand are above the median of all stocks' values and those below it. We begin with the foreign ownership ratio.

Table 7. Regression Results by the Foreign Ownership Ratio

Frequency	Foreign Ownership Ratio	D_t^L	D_t^H	Adjusted R^2
Daily	High	0.0039*** (0.000)	0.0024*** (0.000)	0.3555
	Low	0.0037*** (0.000)	0.0012** (0.035)	0.1566
Weekly	High	0.0067*** (0.001)	0.0059*** (0.000)	0.2111
	Low	-0.0010 (0.671)	-0.0004 (0.897)	0.1074

*** at 1% and ** at 5%.

Since foreign investors can be thought of as having inferior information about stocks relative to their local counterparts, we conjecture that if investors follow the herd, this must be more noticeable for stocks that foreigners invest in more heavily. Our conjecture is not supported by the regression outputs laid out in Table 7. As is evident from Table 7, all estimates are positively significant at 1% (or 5%), except for the case where the foreign ownership ratio is low and the time frame is a week. In this specific case, the estimates end up being negatively insignificant. Thus, the results in Table 7 speak to rational behavior in stocks with a high concentration of foreign investors, independent of the time frame. Conversely, for stocks with a low density of foreign investors, the results point to rationality over daily periods but a weak sign of herding over weekly periods. This observation may be attributed to local investors' propensity to follow market momentum and trend-following strategies over weekly rather than daily periods, possibly due to the need to process more information in longer intervals.

Next, we examine the herding behavior for the stocks of firms with high total assets and those with low ones. A firm's total assets can be conceived as a measure of its size and financial strength, with more assets indicating a larger size and more strength. Consequently, it is reasonable to posit that a stock will be less susceptible to manipulation as the total assets of its firm increase. Therefore, in agreement with the widespread view in the literature, we hypothesize that the herding phenomenon will be more likely to materialize in the stocks of firms with low total assets. Table 8, which shows the regression outputs for the 31 stocks of firms with high total assets and the 31 stocks with low ones, only weakly bolsters our hypothesis.

Table 8. Regression Results by Total Assets

Frequency	Total Assets	D_t^L	D_t^H	Adjusted R^2
Daily	High	0.0033*** (0.000)	0.0026*** (0.000)	0.3274
	Low	0.0044*** (0.000)	0.0008*** (0.000)	0.1648
Weekly	High	0.0067*** (0.000)	0.0039*** (0.009)	0.2329
	Low	-0.00004 (0.986)	0.0009 (0.800)	0.0869

*** at 1%.

As apparent in Table 8, the coefficient estimate, albeit statistically insignificant, becomes negative solely for the stocks related to the low-asset firms, which arises in the case of the weekly analysis when the market is severely down. In other words, there is a vague indication that investors tend to herd in the stocks of low-asset firms when the time horizon is relatively long, and the market is in major decline. This finding partially supports our initial hypothesis and aligns with our earlier observation that the longer time horizons favor herding. The fact that herding seems to arise during market downturns, as opposed to upturns, is tenable on the grounds of heightened anxiety and fear during such times. When they feel more anxious or fearful, investors may be more likely to make decisions based on emotion rather than logic, causing them to follow the crowd even if they do not believe that the crowd is making the right decision.

Finally, Table 9 demonstrates the regression results for the stock groups with high and low P/E ratios, and Table 10 does the same according to the M/B ratio criterion.

Table 9. Regression Results by the Price-to-Earnings Ratio

Frequency	P/E Ratio	D_t^L	D_t^H	Adjusted R^2
Daily	High	0.0038*** (0.000)	0.0015*** (0.000)	0.2265
	Low	0.0041*** (0.000)	0.0023*** (0.000)	0.1924
Weekly	High	0.0023 (0.304)	0.0005*** (0.000)	0.1228
	Low	0.0031 (0.189)	0.0040 (0.262)	0.1104

*** at 1%

Table 10. Regression Results by the Market-to-Book Ratio

Frequency	M/B Ratio	D_t^L	D_t^H	Adjusted R^2
Daily	High	0.0038*** (0.000)	0.0009*** (0.000)	0.2610
	Low	0.0042*** (0.000)	0.0029*** (0.000)	0.1717
Weekly	High	0.0027 (0.232)	0.0022 (0.305)	0.1580
	Low	0.0025 (0.291)	0.0027 (0.411)	0.0913

*** at 1%.

For a particular firm's stock, both measures will be dependent on the sector in which the firm operates. Nonetheless, large values for both measures can be construed in two ways: (i) the stock is overvalued, and (ii) investors hold high expectations about the firm's prospects. No matter which interpretation one espouses, the stocks with high P/E or high M/B ratios will probably be inherently more speculative and, in turn, more conducive to herding behavior. A quick inspection of Table-9 discloses that all estimates are positive, thereby disagreeing with our hypothesis. In a similar vein, Table 10 exposes that neither the stocks with high market-to-book ratios nor those with low ones favor herding behavior.

4. Conclusion

This study explores the herding behavior in the Turkish stock market (BIST) between June 2013 and October 2020, focusing on both daily and weekly horizons. Its main innovation is to analyze it with respect to foreign ownership, firm size (measured in total assets), and financial metrics like P/E and M/B ratios. Our analysis that involves all stocks under consideration without any subgrouping reveals no evidence of herding in the BIST. Nevertheless, it does identify some herding behavior for stocks that are heavily invested in by local investors, which is absent for those heavily invested in by foreign investors. In other words, local investors exhibit some herding behavior, while foreign investors always act rationally. Besides, in harmony with the prior literature, herding appears endemic to small-cap stocks, particularly

during times of market stress. Notably, our investigation unveils that financial ratios do not matter for herding behavior, possibly due to investors who are not well-versed in market fundamentals, in line with Lux's (1995) suggestion.

All in all, our research implies that a longer time horizon, a higher level of local ownership in a firm stock, and a smaller size of the corresponding firm are all factors that foster herding behavior among stock investors. As such, these factors create a tendency for investors to mimic the actions of their peers and engage in herding.

Arařtırmacıların Katkı Oran Beyanı / Contribution of Authors

Yazarların alıřmadaki katkı oranları Mustafa YILDIRIM %50/ İrem ETİNKAYA %50 řeklinde dir.
The authors' contribution rates in the study are Mustafa YILDIRIM %50/ İrem ETİNKAYA %50 form.

ıkar atıřması Beyanı / Conflict of Interest

alıřmada herhangi bir kurum veya kiři ile ıkar atıřması bulunmamaktadır.
There is no conflict of interest with any institution or person in the study.

İntihal Politikası Beyanı / Plagiarism Policy

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In this study, the rules specified within the scope of the Higher Education Institutions Scientific Research and Publication Ethics Directive were followed.

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