INDUSTRIAL POLICY
A Scientific Journal Dedicated to Economic Development and Industrial Policy

OPEN ACCESS

www.indpol.org

Foreign Investment Flows and Evidence of Market-Wide Herding in the Turkish Capital Markets

Seyid F. Mahmud[a], Murat Tiniç[b]

[a] Department of Economics, Social Sciences University of Ankara (ASBU), Ankara, Turkey
[b] Faculty of Economics, Administrative and Social Sciences, Kadir Has University, Istanbul, Turkey

Abstract

This study examines market-wide herding in Borsa Istanbul (BIST) during 2005-2014 period using a state-space model employing cross-section standard deviations of systematic risk (beta). We document that sentimental herding in BIST100 is statistically significant. More importantly, the results reveal that increase in foreign investment flows into the Turkish capital markets also cause increase in market-wide herding, which may lead to mispricing of stock prices and contribute to inefficiencies in the market. Herding trends over the sample period indicate that the financial crises, Lehman Brothers of 2008-09 and Euro Debt Crisis of 2011-2012, appeared to reduce sentimental herding in Borsa Istanbul. During the crisis period investors do seem to revert back to market fundamentals.

Article History
Received December 10, 2021
Revised December 29, 2021
Accepted January 1, 2022

Keywords
Beta herding, Market fundamentals, BIST-100, Cross-section volatility

JEL Codes
C13, G14, G12

1. Introduction

Foreign investment into capital markets in developing countries provides much-needed liquidity. It has also led to a rise in negative perceptions about the impact of foreign investors on the stability in these markets (Lakshman et. al, 2013). Some studies argue that foreign institutional investors follow short-term strategies that are not based on "market fundamentals." It may make stock prices overreact to changes in fundamentals (de Long et. al., 1990; Dornbusch and Park, 1995; Sias and Whidbee, 2006). Several theories explain the herd behaviour of foreign investors. Scharstein and Stein (1990) discovered that money managers herd since they consider moving against the crowd detrimental for their reputation. Studies also argue that money managers retrieve private information from better-informed managers and follow the same directions (Banerjee, 1992; Bikchandani et. al., 1992).

In this study we examine if foreign institutional investors have any impact on the market-wide herding behavior in BIST100 between 2005 and 2014. This work is also an extension of our previous work (Demir et al., 2014) in which Hwang and Solomon (2004) approach had been employed to study market-wide herd behavior in BIST100. The paper reported significant evidence of herding in BIST100. The paper also examined the investors behavior during the financial crisis of 2000-2002 Demir et al. 2014), it has been found that the crisis period is followed by an interval in which investors resort back to fundamentals. In this paper the work has been extended to link the herd behavior to the dynamics of foreign investment flows into BIST100. To the best of our knowledge such study has not been conducted for Turkish Stock Market.Istanbul Stock Exchange that was founded in 1986, renamed Borsa Istanbul (BIST) in 2013, brings together all exchanges operating in Turkish capital markets. From its inception, with only about 657 million USD market capitalization and 80 listed companies, by May 2014 the market capitalization had increased to 235 billion USD with

CONTACT Seyid F. Mahmud seyidfahri.mahmud@asbu.edu.tr

223 listed companies in the national market. The process of the financial liberalization of Turkish capital markets that begun in early 1990's has been further accelerated during the last decade or so. Turkey has also been able to attract flows from abroad into its capital market. According to the Turkish capital market Association the foreign investment in Borsa Istanbul constituted 63% of total market capitalization in May, 2014. Furthermore, Foreign funds by institutions contributed 45% of the total capitalization while only 18% by the foreign individual investors. Sevil et al. (2012) also reported significant increase in foreign investment flows into BIST100 during last decade. To that extent, foreign investors are an important player in BIST, especially for the period that we study. The sample period selection has been based on the developments in the global financial markets after the implementation of quantitative easing polices advanced economies in 2010. The period after 2014 is marked with the tapering of Fed Rate that led to significant reversals in capital flows to Turkey. Furthermore, the currency crisis in 2018 also added some anomalies in the data. We continue to work on these anomalies and extend the present work to include the post-Pandemic period as well.

The study is organized as follows: In the second part a short review of literature related to empirical modeling of herd behavior has been provided. Part three outlines the empirical model employed in this study. In part four data and results of the model have been discussed.

2. Review of Literature

Herding in financial markets arises when investors start imitating the observed decision of others or movements in market rather than taking decisions on the basis of their own beliefs and information. Theoretical and empirical research in explaining such behavior has been diverse and several approaches/models have been proposed in the literature. These approaches can be classified broadly into two groups. The studies in the first group have focused in explaining the behavior of investors, either institutional or private, who mimic and/or follow the actions of others. Such behavior is further classified as rational and irrational (see Lakonishok et al. (1992), Banerjee (1992), Oehler et al. (2000), Gompers et al. (2001), Voronkova, et al. (2005), Kim et al. (2005), Frey et al. (2007) and Puckett et al. (2007), among several others). The second group of studies employs a "market wide" approach, which focuses on the cross-sectional dispersion of returns and/or betas. Christie and Hwang (1995) used cross-sectional deviations of returns (CSSD) to test the presence of herding in the market. Hwang and Solomon (2004) extended the work by focusing on the cross-sectional variability in factor sensitivities (betas) instead of looking at the variability of returns[1].

In this paper we focus on market-wide herding and utilize the framework of Hwang and Salmon (2004). This method uses information held in the cross-sectional movements in factor sensitivities (betas). Believing that herding is an outcome of investors' unobserved sentiments, Hwang and Salmon (2004) developed a state-space model to reveal empirically herd behavior towards the market. When investors herd towards market consensus, it is possible that the CAPM-betas will deviate from their respective equilibrium values. As a result, the beta of a stock may vary with the sentiments of the investors and herding may cause decrease in the cross-sectional dispersion of betas. The model also allows examining the impact of other factors on herding behavior, by incorporating them into the model explicitly. However, it is important to distinguish herding based on the unobserved sentiments (sentimental herding) of investors independent of particular state of the market and herding that directly relates to various states of markets, such as market returns, volatility of returns, other macroeconomic factors and investment behavior of foreign investors.

Lakshman et al. (2013) document that foreign institutional investors in Indian stock exchange does not contribute to market-wide herd behavior In a different context and motivation, Sevil et al. (2012) have investigated whether foreign investors make their decisions about portfolio investment, in Turkey, that are based on BIST market index, ignoring private information related to individual stocks. In this study Vector Error Correction Granger Causality test have been used to test the direction of causality between the buying of foreign investors and market return index. They found evidence of causality from buying of foreign investors to market return index in their sample period and concluded that the foreign investors may create noise trading. Alemanni (2006), analyzed the herd behavior of foreign investors of 9 emerging markets including Turkish capital market. They employed Lakonishok et al. (1992) approach (referred as LSV approach in literature), which examines the particular behavior of group of investors to follow other investors, different from our concept of market-wide herding in this study. Çelik (2013) examined herd behavior in both developed and emerging markets including Turkey. She employed Christie and Huang (1995) methodology and found no evidence of herding.[2]

3. Methodology

The hypothesis of Hwang and Salmon (2004) emphasizes sentiment behavior of investors which is unobservable and moves in association with the systematic risk indicator beta. They also use the cross-sectional behavior of assets similar to that of Christie and Huang (1995). Their model is different,

[1] Lakshman et al (2013) provide a good summary of both theoretical and empirical papers on herding.

[2] Solakoglu and Demir (2014) also examined herd behavior in Turkish stock market in two distinct types of investors in the market informed vs uninformed. The paper found no evidence of herding in BIST30 but significant evidence of herd behavior in less informed group of investors.

however, in that it is based on the notion of market-wide herding using betas rather than returns. In market-wide herding, investors may decide to follow market trends, and this may cause the individual asset returns to move in tandem with the market returns. As the sentiments of the investors vary, the beta values of the stocks will also change to previous equilibrium values, confining themselves to the market beta of unity. In short, the theoretical and empirical modeling of herd behavior used by Hwang and Salmon differs fundamentally from Christie and Huang and Chang Cheng and Khorana (2000) in that they make a clear distinction between unobserved sentimental herding and herding associated with market fundamentals, and they provide a framework in which to estimate it. The other models rely on observed dispersions of returns brought about by a combination of sentimental and fundamental movements[3].

The Capital Asset Pricing Model (CAPM) models the expected excess returns of a risky asset to the contemporaneous expected excess returns on market portfolio. Hwang and Salmon (2004) made the argument the existence of herding based on CAPM can be biased and introduced herding towards the market portfolio parameter, h_{mt} at time t (see eq. 1)

The model is based on a relationship between observed biased beta (β^b_{imt}) and unobserved true beta *(β_{imt})* as follows:

$$\frac{E^b_t(r_{it})}{E_t(r_{mt})} = \beta^b_{imt} = \beta_{imt} - h_{mt}(\beta_{imt} - 1) \quad [1],$$

where $E^b_t(r_{it})$ is the biased short run conditional expectation on the excess return of asset i at time t, and $E_t(r_{mt})$ is the conditional expectation of the market excess return at time t. The relation in [1] would imply that there is no herding towards the market when h_{mt} is zero and perfect herding when it is one. So the interval, $0 < h_{mt} < 1$would suggest degree of herding, depending on the value of h_{mt}. The unobserved herd behavior indicator h_{mt} is the parameter assumed proportional to the deviation of the individual true beta from market beta unity. The cross sectional variation of β^b_{imt} becomes:

$$Std_c(\beta^b_{imt}) = Std_c(\beta_{imt})(1 - h_{mt}) \quad [2].$$

Taking logarithms of both sides of [2], we get,

$$\ln[Std_c(\beta^b_{imt})] = \ln[Std_c(\beta_{imt})] + \ln(1 - h_{mt}) \quad [3].$$

We may now re-write equation [3] as:

$$\ln[Std_c(\beta^b_{imt})] = \mu_m + H_{mt} \quad [4],$$

where $\mu_m = \ln[Std_c(\beta_{imt})]$ is an assumed constant in the short term *and* H_{mt}= ln(1-h_{mt}). Hwang and Salmon (2004) now allow herding, H_{mt}, to follow a dynamic process AR(1), such that the system becomes :

$$\ln[Std_c(\beta^b_{imt})] = \mu_t + H_{mt} + v_{mt} \quad [5]$$

$$H_{mt} = \varphi_m H_{mt-1} + \eta_{mt}$$

where the two error terms are v_{mt}~iid(0,σ^2_{mv}) and η_{mt}~iid(0,$\sigma^2_{m\eta}$), respectively.

The two equations in [5] constitute the standard state-space model. One of the key parameters of interest in equation [5] is the variance of the error term of the state equation $\sigma^2_{m\eta}$. When $\sigma^2_{m\eta}$ is zero, it would imply that there is no herding, since $H_{mt} = 0$ for all t. A statistically significant value of $\sigma^2_{m\eta}$, however, would indicate the presence of herding in the market. Furthermore, a significant φ_m, provided that $|\varphi_m|\leq 1$, would support the autoregressive process. Hwang and Salmon (2004) further tested the robustness of their model by including both market volatility and market returns in the first equation of the model. They argued that if H_{mt} becomes insignificant after the inclusion of these market fundamentals in the model, then changes in $Std_c(\beta^b_{imt})$ can be explained by market fundamentals. The standard model can therefore be modified to include these fundamentals as control variables to test for robustness as follows:

$$\ln[Std_c(\beta^b_{imt})] = \mu_m + H_{mt} + \theta_{c1} \ln \sigma_{mt} + \theta_{c2} r_{mt} + v_{mt} \quad [6]$$

$$H_{mt} = \varphi_m H_{mt-1} + \eta_{mt},$$

where $\ln \sigma_{mt}$ and r_{mt}represent market volatility and log return in time period t. The two equations in [6] constitute our Model 2.

Finally, in Model3, foreign investment (FII) has been added to evaluate the impact of FII on herding, Model 3:

$$\ln[Std_c(\beta^b_{imt})] = \mu_m + H_{mt} + \theta_{c1} \ln \sigma_{mt} + \theta_{c2} r_{mt} + \theta_{c3} FII + v_{mt} \quad [7]$$

$$H_{mt} = \varphi_m H_{mt-1} + \eta_{mt}$$

The paper employs the model in [7] to examine two distinct hypotheses in this paper. First, it reexamines the behavior of unobserved sentimental herding as proposed by Hwang and Salmon (2004). Second, to determine whether FII causes herding in BIST100 or not? The paper also aims to analyze the herd behavior during extreme market stress due to global financial crises.

5. Data and Results

The daily share prices for the firms in the BIST100 index as well as their index levels were obtained from the Bloomberg Terminal. The data cover the dates between February 28, 2005 and May, 23, 2014 providing us with 2370 usable observations. Each month, Borsa Istanbul also publishes the nominal value of transactions carried out by foreigners[4]. We subtracted nominal buy from the nominal sell value and aggregate the net difference across each month in order to capture the behavior of the overall cumulative changes in the foreign holdings in BIST. In calculating the monthly beta of a stock, we utilized the the market model and regressed log returns of firm i on the log returns of the market

[3] Discussion of methodology in this section, with some modifications, has been taken from our previous paper, Demir et al. (2014).

[4] The justification of the sample size selection has been provided in the introduction in detail.

index, usingdaily data for each month. Hence, we have one beta estimate for each firm for each month, giving us 100 beta estimates per month (unless there are missing data in the sample).

Once we have the individual betas, we calculate the cross-section standard deviations of betas for each month based on the following formula:

$$Std(beta)_t = \sqrt{\frac{\sum_{i=1}^{n}(beta_{it}-\overline{beta}_t)^2}{n-1}},$$

where t represents the month, i represents the firm i, and $\overline{beta}_t$ represents the cross-sectional average of all betas in month t.

Table 1 reports some of the statistical properties of the estimated cross-sectional standard deviations of the betas covered by the BIST-100 market portfolio.

Table 1. Properties of Cross-sectional Standard Deviations of BETAS.

	Cross-sectional Standard Deviation OLS Betas	Log cross-sectional Standard Deviation OLS Betas
Mean	0.478954	-0.751147
Standard Deviation	0.085040	0.085040
Skewness	0.806154	0.188154
Kurtosis	4.371876	3.285191
Jarque-Bera	20.91403	1.040395

The results indicate that the $Std_c(\beta^b_{imt})$ is significantly different from zero. The Jarque-Bera statistics for normality clearly suggest that the distribution of the $std_c(\beta^b_{imt})$ is not Gaussian. However, estimated log cross-sectional standard deviations do not seem to deviate from Gaussianity.

In the first stage base model (Model 1) has been estimated, the maximum likelihood estimates of the parameters are also reported in Tables 2.

Table 2. Estimates of State-Space Standard Model.

Kalman Filter State-Space Model
Maximum Likelihood Model
Number of Observations:112

	Coefficent	Std. Err.	Z-Stat.	Prob.	Variable	
C(1)	-0.750537	0.024476	-30.66458	0.0000	μ_m	-0.750537
C(2)	0.550748	0.336439	1.636990	0.1016	φ_m	0.550748
C(3)	4.197638	0.658854	-6.371117	0.0000	$\sigma_{m\eta}$	0.100726
C(4)	-4.590589	1.097558	-4.182548	0.0000	$\sigma_{m\nu}$	0.122603
			Signal to Noise Ratio		$\sigma_{m\nu}$ / Log Std β	0.582356
			Log-Likelihood	42.84866		
			Akaike Criterion	-0.693726		
			Schwarz criterion	-0.596637		

It is immediately clear that H_{mt} is fairly persistent as the estimated value of φ_m is statistically significant with a signal to noise ratio of about 0.5823%. That is 58% of the total variability in $\ln[Std_c(\beta^b_{imt})]$ is being explained by sentimental herding. Similarly, the estimated $\sigma_{m\eta}$, which is the standard deviation of the error term η_{mt} in the state equation, is also highly significant. If $\sigma_{m\eta}$ were equal to zero, it would have indicated that there is no herding. We may therefore conclude, on the basis of the base model specification, that there is strong evidence of market-wide herding towards the market portfolio for the BIST-100. Furthermore, a fairly high value of 'signal to noise ratio' implies that the process of herding has not been very smooth. The results of H_{mt} in Model 2, which also takes into account the market volatility of returns and the levels of returns in order to test for the robustness of the model, also suggest fairly persistent and statistically significant presence of sentimental herding towards the market portfolio for the Turkish stock market. However, a significant coefficient of volatility seems to impact the herding patterns as well. So when market becomes riskier, that is volatility of return increases it causes betas to herd towards the market, i.e., $\ln[Std_c(\beta^b_{imt})]$ decreases and vice a versa. The coefficient of returns in the model turned out to be statistically insignificant. The signal to noise ratio drops to 0.1840% in model 2. These results further support the earlier results reported in Demir et. al. (2014).

Table 3. Estimates of State-Space Model with Market Volatility and Market Returns.

Kalman Filter State-Space Model
Maximum Likelihood Model
Number of Observations:112

	Coefficent	Std. Err.	Z-Stat.	Prob.	Variable	
C(1)	-2.218076	0.170223	-13.03037	0.0000	μ_m	-2.218076
C(2)	0.813686	0.207804	3.915651	0.0001	φ_m	0.813686
C(3)	-4.448278	0.223812	-19.87505	0.0000	$\sigma_{m\eta}$	0.0031833
C(4)	-6.894528	1.572514	-4.384399	0.0000	$\sigma_{m\nu}$	0.111726
C(5)	-0.351374	0.040758	-8.621086	0.0000	θ_{c1}	0.838881
C(6)	0.182448	2.804980	0.065044	0.9481	θ_{c2}	1.095514
			Signal to Noise Ratio		$\sigma_{m\nu}$ / Log Std β	0.184045
			Log-Likelihood	80.18901		
			Akaike Criterion	-1.324804		
			Schwarz criterion	-1.179170		

Finally, in Model 3, foreign inflows have also been included in the model in order to test the second hypothesis of this paper. Both the coefficients of volatility and foreign inflows, θ_{c1} and θ_{c3}, turned out to be highly significant. The coefficient of foreign investment flows is found to be significantly negative. This indicates that $\ln[Std_c(\beta^b_{imt})]$ increases /decreases when these flows falls/rises[5]. In other words, increase in foreign investment flow causes herding in BIST100. This is an important result, it suggests that as cumulative foreign capital flows into BIST increases, the market participants tends to herd towards market. Furthermore, we also found that $\sigma_{m\eta}$ is significantly different from non-zero and we may conclude that besides herding caused by foreign flows, there is still some evidence of

[5] Other variables related to foreign investent such as buying/selling of stocks, net of buying/selling have also been employed, however, they were found statistically insignificant.

presence of sentimental herding in the market[6]. In Figure 1, we have shown the patterns of the sentimental herding computed from three specifications of the model and results are fairly comparable with each other. And in particular, the patterns of sentimental herding of model 2 and model 3 follow almost similar paths. However, these results need to be interpreted with some care. First, we have only been able to incorporate overall net flows of foreign funds into the model due to the fact that further disaggregated sources of these funds were not available for the sample period of this study. For example, Lakshman et al (2013) found no evidence of herding caused by overall foreign funds into the Indian Capital Market. However, they did find that foreign mutual funds do significantly cause herding in the market. So upon availability of the sources of these funds into the Turkish market, it will be interesting to see if particular types of foreign funds cause more herding or not in future work. Ekinci and Sakarya (2020) have examined, for example, how Exchange-Traded Funds (ETFs) may contribute to exchange rate volatility. The results have shown that large inflows ETFs do contribute positively to exchange rate volatility. ETFs are basket of securities and can be included in the model framework of this paper to examine their impact on herd behavior in our future research. Second, Hwang and Salmon (2004) considered volatility and market returns as fundamental(s) of market and herding caused by these fundamentals were not interpreted as sentimental herding by them, which is otherwise unobservable. It is, however, not obvious whether foreign inflows and outflows constitutes one of the fundamentals of capital market. Therefore, in our interpretations of these results, we think that injections/withdrawals of foreign funds into BIST100, is one the important determinants of the herd behavior of agents in this market. And this is an important result of this study as this behavior of agents may lead to inefficiencies and mispricing of assets.

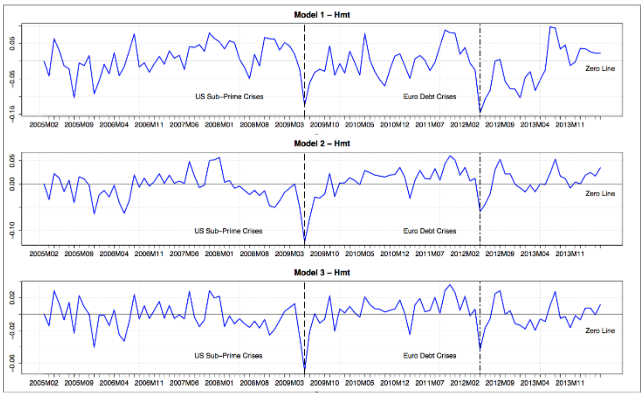
Table 4. Estimates of State-Space Model with Foreign Institutional Investment (FII)

Kalman Filter State-Space Model
Maximum Likelihood Model
Number of Observations:112

	Coefficent	Std. Err.	Z-Stat.	Prob.	Variable	
C(1)	-2.135562	0.156020	-13.68774	0.0000	μ_m	-2.135562
C(2)	0.270804	0.799034	0.338914	0.7347	φ_m	0.270804
C(3)	-5.035536	3.349037	-1.503577	0.1327	$\sigma_{m\eta}$	0.082504
C(4)	-4.989813	3.321876	-1.502107	0.1331	$\sigma_{m\nu}$	0.080639
C(5)	-0.348150	0.037963	-9.170787	0.0000	θ_{c1}	0.810234
C(6)	0.714398	2.689047	0.265670	0.7905	θ_{c2}	1.42932
C(7)	-0.050334	0.027605	-1.823353	0.0682	θ_{c3}	0.975147
			Signal to Noise Ratio		$\sigma_{m\nu}$ / Log Std β	0.477004
			Log-Likelihood	81.99640		
			Akaike Criterion	-1.339221		
			Schwarz criterion	-1.169315		

Three herding measures of h_{mt}, based on three different specifications of the model have also been plotted (see Figure 1). The time series also reveal different phases of market-wide herding and reverse herding during the sample period. It is also very evident that during the global financial crisis 2008-09, there had been sharp decrease in sentimental herding, indicating that market reverts back to fundamentals under severe crisis. Similarly during 2011-12, during Euro Debt Crisis, similar pattern has been observed. Interestingly few months prior to Sub-Prime crisis in 2008-09 and Euro-Debt crisis in 2011-12, herding starts to fall. However, continued increase in the equity prices after the crises, again led investors to herd. This further supports Hwang and Solmon (2004) argument that when market(s) are under extreme stress, investors tend to stop herding and try to follow the market fundamentals.

Figure 1. Sentimental Herding Patterns[7].

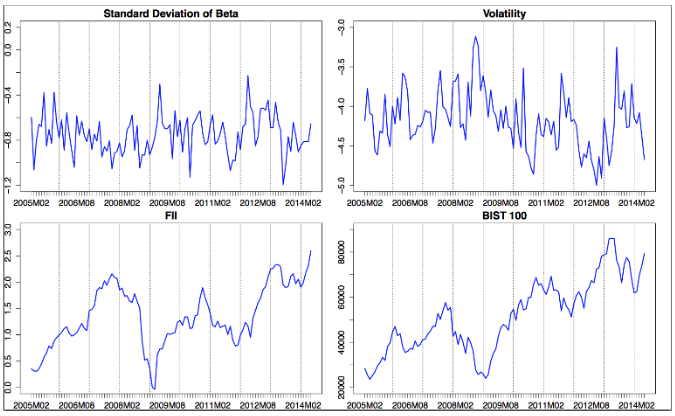


In Fig 2 beta herding measure, $\ln\left[Std_c\left(\beta^b_{imt}\right)\right]$ has been plotted together with cumulative foreign investment FII, Volatility and BIST100 market index. It further confirms the results reported earlier, based on the estimated model. Both higher volatility and cumulative foreign investment cause betas to herd towards the market. It also confirms the results of Sevil (2012), in which they had shown that foreign investment also causes some noise in BIST100 by impacting the market index. However, in this paper our focus has been to examine the herd behavior based on the movements in the standard deviations of betas.

[6] Both Akaike and Schwarz criteria and the values of log-likelihood function show significant improvement in overall fit of Model 2 and Model 3 over Model 1.

[7] Herding measure hmt (=1-exp(Hmt))

Figure 2. Herding Patterns, Volatility, Foreign Investment and BIST-100 index.



6. Conclusions

In this study herding behavior in the Borsa Istanbul has been analyzed, employing monthly data between 2005 and 2014. Several variations of State-Space Model, as proposed by Hwang and Salmon (2004) have been estimated and the Kalman filter is used to make herding observable.

The study is an extension of our previous work (Demir et al.,2014) by incorporating foreign investment flows in the model explicitly. It has been found that herding towards the market in the BIST-100 is both significant and persistent independently from other variables such as the volatility of returns, levels of market returns and foreign investment flows. It is concluded that not only the investors' sentiments cause market-wide herding but increase in foreign investment flows and volatility of returns also significantly impact the herd behavior in the market. One of the important contributions of the paper is that, foreign investment into BIST100 significantly reduces the standard deviations of observed betas of individual stock and therefore causes market-wide herding. The path of herding during the sample period also reveals that during severe financial crises, such as Lehman Brothers crisis in 2008-09 and Euro Debt crisis in 2011-12, also negatively impact the herd behavior. During these crises, market participants seem to return to the market fundamentals, this further supports the conclusions of Hwang and Salmon (2004) results. The results also suggest that this decline in herding starts few months prior the peak period of crises. Furthermore, the sentimental herding in the Turkish market has not been very extreme, fluctuating between +0.09 and -0.07. There is a need to further examine this channel of herding caused by foreign investment in more detail in future. For example, herding patterns of subset of stocks with more foreign investment as compared to the other stocks may further foster our understanding of these results. And use of more disaggregated data on the sources of foreign investment may also be another direction for future work.

References

Alemanni, B. & Ornelas, J. R., (2008). Herding Behaviour by Equity Foreign Investors on Emerging Markets. *Available at SSRN 1114608*.

Banerjee, A. V. (1992). A simple model of herd behavior. *The Quarterly Journal of Economics*, 797-817.

Bikhchandani, Sushil, David Hirshleifer, and Ivo Welch (1992). "A theory of fads, fashion, custom, and cultural change as informational cascades." Journal of political Economy 100.5, 992-1026.

Celik, S. (2013). Herd behavior in world stock markets: Evidence from quantile regression analysis. Iktisat Isletme ve Finans, 28(329), 75-96.

Chang, E. C., Cheng, J. W., & Khorana, A. (2000). An examination of herd behavior in equity markets: An international perspective. *Journal of Banking & Finance*, *24*(10), 1651-1679.

Christie, W. G., & Huang, R. D. (1995). Following the pied piper: Do individual returns herd around the market?. *Financial Analysts Journal*, 31-37.

Demir, N. S., Mahmud, F. and Solakoglu, M. N. (2014) Sentiment and beta herding in Borsa Istanbul (BIST), in *Risk Management Post Financial Crisis: A Period of Monetary Easing*, Vol. 96, Batten, J. A. and Wagner, N. F. (Eds), Emerald.

De Long, J. B., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990). Positive feedback investment strategies and destabilizing rational speculation. *the Journal of Finance*, *45*(2), 379-395.

Dornbusch, R., & Park, Y. C. (1995). Financial integration in a second-best world: are we still sure about our classical prejudices. *Financial Opening: Policy Lessons for Korea, Korea Institute of Finance, Seoul, Korea*.

Frey, S. Herbst, P. & Walter, A. (2007), Measuring Mutual Fund Herding: A Structural Approach, mimeo.

Gompers, P. A., & Metrick, A. (1998). *Institutional investors and equity prices* (No. w6723). National bureau of economic research.

Hwang, S. and Salmon, M., (2004). Market Stress and Herding, *Journal of Empirical Finance*, 11(4), 585-616.

Kim, K. A., & Nofsinger, J. R. (2005). Institutional Herding, Business Groups, and Economic Regimes: Evidence from Japan*. *The Journal of Business,78*(1), 213-242.

Lakonishok, J., Shleifer, A., & Vishny, R. W. (1992). The impact of institutional trading on stock prices. *Journal of financial economics*, *32*(1), 23-43.

Lakshman, M. V., Basu, S., & Vaidyanathan, R. (2013). Market-wide herding and the impact of institutional investors in the Indian capital market. *Journal of Emerging Market Finance*, *12*(2), 197-237.

Oehler, A., & Chao, G. G. C. (2000). Institutional herding in bond markets.*Bamberg University Dept. of Finance Working Paper*.

Puckett, A., & Yan, X. (2007). *The determinants and impact of short-term institutional herding*. Working Paper.

Sakarya, B., & Ekinci, A. (2020). Exchange-traded funds and FX volatility: Evidence from Turkey. *Central Bank Review*, *20*(4), 205-211.

Scharfstein, D. S., & Stein, J. C. (1990). Herd behavior and investment. *The American Economic Review*, 465-479.

Sevil, G., Özer, M., & Kulalı, G. (2012). Foreign Investors and Noise Trade in Istanbul Stock Exchange. *International Journal of Business & Social Science, Special Issue*, *3*(4), 93-101.

Sias, R. W., & Whidbee, D. A. (2010). Insider trades and demand by institutional and individual investors. *Review of Financial Studies*, *23*(4), 1544-1595.

Solakoglu, M.N. and Demir, N., (2014). Sentimental herding in Borsa Istanbul: informed versus uninformed. Applied Economics Letters, 21(14), pp.965-968.

Voronkova, S., & Bohl, M. T. (2005). Institutional traders' behavior in an emerging stock market: Empirical evidence on polish pension fund investors. *Journal of Business Finance & Accounting*, *32*(7-8), 1537-1560.

www.borsaistanbul.com

www.tspb.org.tr