Remeasuring Sectoral Herding in the Financial Markets

Mohammad K. Elshqirat

1 School of Management, Walden University, Minnesota, U.S.A

Correspondence: Mohammad K. Elshqirat, Minnesota, U.S.A. E-mail: mohammad.elshqirat@waldenu.edu

Abstract

Herding behavior was concluded to exist in some sectors and under some market conditions in the Jordanian stock market when measured using the cross-sectional absolute deviation. The purpose of this study was to retest the existence of the sectoral herding using the cross-sectional dispersion of betas and compare the results with those reached using the measure of the cross-sectional absolute deviation. Behavioral finance theory represents the main base on which this study was built. In this study, the researcher tried to answer questions related to whether herding behavior exists in the Jordanian market and its sectors if measured using cross-sectional dispersion of betas and whether results will be different from those reached using other measures. In this quantitative study, data from Amman stock exchange were used and the period covered was from 2000 to 2018. These data were used to calculate the cross-sectional dispersion of betas which was tested using t-test, Kruskal–Wallis test, Mann-Whitney U test, and Wilcoxon Signed-Rank test. Results indicated that herding behavior existed in market and in each sector at the same level which was not affected by the financial crisis. Furthermore, the study revealed that herding level was the same when the market (sector) was rising and when it was falling and this similarity has not been changed by the occurrence of the global financial crisis. Finally, results indicated that herding was at its lowest level in the entire market and in the industrial sector during the time of financial crisis. These results are different from those of the study conducted in Jordan using cross-sectional absolute deviation which implies that using different herding measures yields different results.

Keywords: Amman stock exchange, behavioral finance, herding, sectoral herding, cross-sectional dispersion of betas, financial crisis

1. Introduction

Herding behavior in the financial markets can increase the gap between the actual and the expected prices of stocks (Cakan, & Balagoyozyan, 2016). This means that herding in the market causes loss to investors by pushing the prices to unexpected levels. Based on this, the problem is that herding behavior can lead the market to be inefficient where the prices are determined by other variables than the relevant information (Hilal, 2015). The specific problem is that there are many measures of herding to choose from and use to detect the behavior (Demirer & Zhang, 2018) and that using different measures can lead to different decisions about the existing of herding behavior in a given market or sector (Vieira & Pereira, 2015). Herding behavior may be concluded to exist in a financial market if a given measure is used while the behavior may be concluded as absent using another measure. This conflict of results may confuse investors about whether their price expectations will be affected by anomalies like herding or not. The existing of herding is an important factor that should be considered by investors because if it exists, prices of stocks will be different than those expected based on the available information (Filip, Pochea, & Pec, 2015). Many studies were conducted in many countries to test the existence of herding using only one measure (Akinsomi, Coskun, & Gupta, 2018; Dutta, Gahan, & Panda, 2016; Nasarudin, Noordin, Law, & Yahya, 2017; Sharma, Narayan, & Thuraisamy, 2015; Trenca, Pece, & Mihut, 2015). The conclusions of these studies may have provided misleading indicators about the existence of herding in their markets if the conclusions of other measures are different. To sum up, conclusion about herding existence may differ based on the measure used to detect the behavior (Vieira & Pereira, 2015).

Like many other countries, herding in the Jordanian stock market was studied using one measure only and at market level (Ramadan, 2015; Nasarudin et al., 2017) and at market and sectors levels (Elshqirat, 2019). This study was conducted to achieve the objective of examining the existence of the behavior of herding in Jordan at market and at sectors level using different measure than those used before and then compare the results with the other measures. Achieving this objective may help in understanding how different measures can lead to different
conclusions about the existence of herding in the financial markets. This study may contribute to the literature by revealing the results of testing herding behavior at market and sectoral level using the standardized herd measure in an emerging market like Jordan and compare these results with the results of other measures. To make the conclusions of this study comparable with the study of Elshqirat (2019), who studied the behavior in Jordan at market and sectors level using the cross-sectional absolute deviation (CSAD), the same four hypotheses used in that study were used in this study. The first hypothesis was about testing the existence of herding in the Jordanian market at market-level and at sector-level. Hypothesis two was about the influence of the global financial crisis on herding in the market and sectors while the third hypothesis was created to examine the behavior when market and sector indices are rising and when its falling. The last hypothesis was formulated to test the difference in the effect of market and sector rising and falling on herding before the financial crisis and after it. All hypotheses were tested based on the cross-sectional dispersion of betas introduced by Hwang and Salmon (2009).

2. Literature Review

2.1 Herding Behavior

Herding behavior can be defined as the act of copying the investment actions of other investors in the market (Senarathne & Jianguo, 2020). The presence of herding behavior in a financial market can cause a gap between the actual value of a stock in the market and its intrinsic value (BenSaïda, Jlassi, & Litimi, 2015). According to Indårs, Savin, and Lübloy (2019), herding can be an intentional or unintentional behavior. Unintentional herding exists when investors take the same investment decisions because they have the same information while intentional herding occurs when investors take the same investment decision because they want to copy the decisions of other investors (Adem & Saroğlu, 2020). Unintentional herding can lead the market to be efficient while intentional herding can bring inefficiency to it (Adem & Saroğlu, 2020). This last fact about intentional and unintentional herding may be true because if all investors are taking their decisions based on the available information then this information will be reflected in the prices and the market will become efficient. If investors are just imitating the decisions of others then, prices will not reflect the available information but it reflects the behavior pattern of investors which means that the market is inefficient.

Herding in financial markets is a behavior that exists in many countries such as United States and United Kingdom (Galariotis, Rong, & Spyrou, 2015), Turkey (Adem & Saroğlu, 2020), Pakistan (Shah, Shah, & Khan, 2017), China (Mahmud & Tiniç, 2018), Jordan (Elshqirat, 2019), Germany (Kremer & Nautz, 2013), Nigeria and Kenya (Guneý, Kallinterakis, & Komba, 2017), Spain (Andreu, Gargallo, Salvador, & Sarto, 2015), Saudi Arabia (Rahman, Chowdhury, & Sadique, 2015), Tunisia (Hammami & Boujelbene, 2015), and Kuwait & Qatar (Demir & Solakoğlu, 2016). The conclusions of these studies indicated that herding can be considered a global anomaly that affects the efficiency of many financial markets. Testing the existence of herding in the financial markets using different measures than those utilized in these studies may be of a great value in proving whether the behavior truly exists in these countries or not.

2.2 Measures of Herding Behavior

The presence of herding in the financial markets has been tested using many measures, these measures can be classified into two groups (Demirer, Lien, & Zhang, 2015): the first group is concerned with the relationship between the movement of stocks’ returns and the movement of market returns while the second group is concerned with measuring herding by studying the concurrent or succeeding changes in the investor’s ownership of the stock. The first group includes the measures of: cross-sectional standard deviation (CSSD) of dispersion of returns introduced by Christie and Huang (1995), the cross-sectional absolute deviation (CSAD) of returns introduced by Chang, Cheng, and Khorana (2000), the measure of cross-sectional dispersion of betas introduced by Hwang and Salmon (2004), and the standardized herd measure developed by Hwang and Salmon (2009). The measures of Hwang and Salmon belong to the first group but it uses the CSSD of systematic risk (beta) instead of the CSSD of returns (Khan & Rizwan, 2018). The second group includes the measures of Lakonishok, Shleifer, and Vishny (1992) and the measure introduced by Sias (2004).

There is no preference for one measure over another; researchers used all measures to detect herding in many markets all around the world. Herding was tested using CSSD measure by Vieira and Pereira (2015); Zafar and Hassan (2016); Lee, Liao, and Hsu (2015); Dutta, Gahan, and Panda, (2016); Ababio and Mwamba (2017); Mertzanis and Allam (2018); and Sharma (2019). CSAD measure of herding was utilized in many studies including Cakan and Balagyozyan (2014); Demirer, Kutan, and Zhang (2014); Mobarek, Mollah, and Keasey (2014); Gaviрилідісі, Калінтеракісі, и Тсалавутас (2016); Filip, Pochea, and Pece (2015); Demirer and Zhang (2018); and Akinsomi, Coskun, and Gupta (2018). Moreover, many researchers used the measure of Hwang and
Salmon (Güvercin, 2016; Krokida, Spyrou, & Tsouknidis, 2017; Lin, (2017); Teng, 2018). The measures of the second group, Lakonishok et al. (1992) and Sias (2004), were also used in many studies to measure herding behavior (Boyd, Buyukshahin, Haigh, & Harris, 2016; Cai, Han, Li, & Li, 2019; Choi, 2016; Fang, Lu, Yau, & Lee, 2017; Popescu & Xu, 2018). In addition, many studies were conducted using more than one measure including Shrotryia and Kalra (2019) who used three measures of CSSD, CSAD, and a modified CSSD measure introduced by Yao, Ma, and He (2014). Adem (2020) and Yousaf, Ali, and Shah, (2018) tested the behavior using CSSD and CSAD measures. Chen and Demirer (2018) tested herding using measures of CSSD, CSAD, and the measure of Hwang and Salmon (2004) while Nikulina and Bouev, (2018) used measures of CSSD, CSAD, Hwang, and Salmon measure, and a measure developed by Munoz Torrecillas, Yalamova, and McKelvey (2016).

The same results about the presence of herding were concluded using different measures in some studies including the study of Shrotryia and Kalra (2019) and Yousaf, et al. (2018). On the other hand, testing the existence of herding using different measures may yield different results (Vieira & Pereira, 2015). In the same study, herding may be claimed to exist using one measure and concluded to be absent using another. For instance, Adem (2020) tested the behavior using CSSD and CSAD and found that each measure gave a different result about herding presence in Istanbul exchange. In that study, herding behavior during market rising was absent using CSSD measure but existed using CSAD measure. Another example is when Khan and Rizwan (2018) found that herding was absent in all sectors of Pakistani market using CSAD measure while they detected herding in two sectors using the CSSD measures. Finally, Hilal (2015), concluded that herding was absent when tested using both CSSD and CSAD while it existed using Hwan and Salmon measure. In Jordan, herding was tested using CSSD and CSAD measures by Al-Shboul (2012) who concluded that different measures resulted in different decisions regarding the presence of herding in Jordan. In addition, Chen (2013) examined herding behavior in many countries at market-level including Jordan and found that the behavior was absent when measured using CSSD while it existed when measured using CSAD and the measure of Hwang and Salmon (2004). Herding behavior at sector-level in the Jordanian stock market was not tested before using Hwang and Salmon measure. This study adds to the literature by filling the gap of detecting herding behavior using the measure of Hwang and Salmon (2009) at sectors level, by testing herding when the sector index is rising and when its falling, and by testing herding before and after the financial crisis. Moreover, the study may verify the existence of herding in the Jordanian market at market and sectors level by comparing its results with the results of previous study that tested herding in Jordan using another measure.

2.3 Cross-Sectional Dispersion of Betas

This measure of herding belongs to the group of measures that detect herding by testing the movement of the stock’s returns compared to the movement of market returns. CSSD and CSAD use the dispersion of returns from the market to detect herding while the measure of Hwang and Salmon uses the dispersion of stocks’ betas from the equilibrium to detect the behavior (Khan & Rizwan, 2018). When investors in the financial market herd, the betas of capital asset pricing model (CAPM) will deviate from what it should be in the equilibrium and its cross-sectional dispersion will become less than that in the equilibrium (Hwang & Salmon, 2004). The measure of cross-sectional dispersion of betas was first introduced by Hwang and Salmon (2004) and they test it in the stock markets of the United States, United Kingdom, and South Korea. The first measure of Hwang and Salmon was a state space model that includes the following equations (Hwang & Salmon, 2004):

\[
\begin{align*}
\text{Log}[\text{Stdc}(\beta_{imt})] &= \mu_m + H_{mt} + \nu_{mt} \\
H_{mt} &= \varphi_m H_{mt-1} + \eta_{mt} 
\end{align*}
\]

(1)

Where \( \text{Stdc}(\beta_{imt}) \) is the cross-sectional standard deviation of the stocks’ betas, \( \mu_m = E[\text{Log}[\text{Stdc}(\beta_{imt})]] \), \( H_{mt} \) is the herding effect, \( \nu_{mt} \sim iid \ (0, \sigma_{\nu_{mt}}^2) \), and \( \eta_{mt} \sim iid \ (0, \sigma_{\eta_{mt}}^2) \). If herding exists in the market, \( \sigma_{\nu_{mt}}^2 \) will have a significant value while if its value is zero, herding behavior is absent (Hwang & Salmon, 2004). This measure was adjusted by Hwang and Salmon (2009). The two equations for the new herding measure were as follows (Hwang & Salmon, 2009):

\[
H_{mt} = \frac{1}{N_t} \sum_{i=1}^{N_t} (b_{imt}^c - 1)^2
\]

(2)
Where $H^*_mt$ is the standardized herd measure, $N_t$ is the number of stocks at time $t$, $b^s_{int}$ is the observed estimate of beta of stock $i$ at time $t$, $\hat{\sigma}_{Eit}$ is the sample standard deviation of the ordinary least squares (OLS) residuals, and $\hat{\sigma}_{mt}$ is the sample standard deviation of market excess return at time $t$. The lower the value of $H^*_mt$ the higher the standardized beta herding (Hwang and Salmon, 2009). If $H^*_mt=0$, then perfect standardized beta herding exists because this is the minimum value of the measure.

The measure of herding calculated in Equation 2 is called “beta-based herd measure” while the measure in Equation 3 is called the “standardized herd measure” (Hwang and Salmon, 2009) and it has the advantage of dealing with herding as a dynamic behavior that changes over time rather than a static phenomenon (Krokida, Makrichoriti, & Spyrou, 2017). This measure can be used to test herding at market-level and sector-level (Hwang and Salmon, 2009). In this study, I used the standardized herd measure calculated in equation 3 to detect herding in the Jordanian stock market at both levels of market and sectors. The standardized herd measure was utilized in many studies to measure herding behavior including the study of Krokida, Spyrou, et al. (2017) who used the measure to measure herding and study its relationship with liquidity and the study of Jokar, Shamsaddini, and Danesi (2018) who utilized the measure to estimate herding variable and include it in their model which was developed to test the effect of investors’ behavior and management on the stock returns in the Iranian market. In Jordan, studies conducted to detect herding using Hwang and Salmon’s standardized herd measure are absent at market and at sectoral level. This study may contribute to the literature by revealing the results of testing herding behavior at market and sectoral level using the standardized herd measure in an emerging market like Jordan and compare these results with the results of other measures.

2.4 Hypotheses

Four hypotheses were developed to achieve the purpose of measuring herding behavior in the Jordanian stock market and its sectors using the standardized herd measure. Following Elshqirat (2019), each hypothesis was divided into two sections: the first section is related to the entire market and the second section is related to each sector. The purpose of the first hypothesis was to test the existence of herding in the market and in its sectors while the second hypothesis was formulated to examine the effect of the financial crisis of 2008 on the presence of herding in the market and sectors. The third hypothesis was about whether the existence of herding behavior is different during market (sector) rising and falling. The last hypothesis was formulated to test whether the effect of market conditions of rising and falling on the presence of herding was the same before the financial crisis and after it. For each hypothesis there were two sub-hypotheses, the first sub-hypothesis was related to the market (denoted with $m$ like $H1_m$) and the other sub-hypothesis is related to the sectors (denoted with $s$ like $H1_s$). The study hypotheses were as follows:

$H1_m$: Herding exists in the Jordanian stock market

$H1_s$: Herding exists in each sector of the market

$H2_m$: Existence of herding behavior in the market is not the same prior to and post financial crisis

$H2_s$: Existence of herding behavior for each sector is not the same prior to and post financial crisis

$H3_m$: Existence of herding behavior is not the same during conditions of market increasing and decreasing

$H3_s$: Existence of herding behavior is not the same during conditions of sector increasing and decreasing

$H4_m$: The effect of market increasing and decreasing on the existence of herding behavior is different prior to and post financial crisis

$H4_s$: The effect of sector increasing and decreasing on the existence of herding behavior is different prior to and post financial crisis

3. Method

3.1 Research Data

All companies that were listed on Amman Stock Exchange from January, 2000 to December, 2018 were included in this study which is the same period covered by Elshqirat (2019). The total number of listed companies as on
December 31, 2018 was 191 companies while the total number of companies included in the study was 85 companies from which 33 companies were from the financial sector, 19 companies were from the services sector, and 33 companies were from the industrial sector. Companies that became unlisted during the study period were excluded. For the purposes of testing the hypotheses related to the global financial crisis, the same two sub-periods in Elshqirat (2019) were used: 2000 – 2007 (before financial crisis) and 2009 – 2018 (after the financial crisis). The ASE free float index was used to calculate the market return for the covered period and the interest rates on the Jordanian treasury bills were used as the risk-free rate of return for the same period. Monthly closing prices for the ASE index and for the included stocks for the period from January 2000 to December 2018 were obtained from the website of ASE while the interest rates on the treasury bills were obtained by email from the central bank of Jordan who provides such information to the public through its website and email. Beta’s of stocks were estimated using the standard capital asset pricing model (CAPM) and then the data were used to calculate the standardized herd measure presented in Equation 3.

3.2 Research Design

This quantitative study was conducted to examine the existence of herding in the stock market of Jordan and its sectors, to examine the effect of the financial crisis on the presence of herding, to test the impact of market and sector increasing and decreasing on the existence of herding, to examine the effect of financial crisis on the herding presence when market and sectors increasing and decreasing, and to compare the results with those of the other measure used before. These objectives were achieved using the standardized herd measure which consists of the dependent variable of the herding measure ($H_{mt}$) and the independent variables of stocks beta ($b_{imt}$), the sample standard deviation of the OLS residuals ($\hat{\sigma}_{Eit}$), and the sample standard deviation of market excess return ($\hat{\sigma}_{mt}$).

3.3 Variables Definitions

**Beta of the stock with the market** ($b_{imt}$): is the sensitivity of the rate of return of the stock to the change in the rate of return for the market (Dzaja & Aljnovic, 2013). This variable can be calculated using the following equation (Matar, 2016):

$$b_{im} = \frac{\text{COV}(R_i R_m)}{\sigma^2 R_m}$$  \hspace{1cm} (4)

Where $R_i$ is the rate of return of stock i, $R_m$ is the rate of return on the market, and $\sigma^2 R_m$ is the variance of the market return. This variable was estimated using the standard capital asset pricing model by regressing the stock’s excess return on the market excess return.

**Beta of the stock with the sector** ($b_{ist}$): is the sensitivity of the rate of return of the stock to the change in the rate of return for the sector. This variable can be calculated as follows:

$$b_{is} = \frac{\text{COV}(R_i R_s)}{\sigma^2 R_s}$$  \hspace{1cm} (5)

Where $R_i$ is the rate of return of stock i, $R_s$ is the rate of return on the sector, and $\sigma^2 R_s$ is the variance of the sector return. This variable was estimated using the standard capital asset pricing model by regressing the stock’s excess return on the sector excess return.

**Market excess return**: is the rate of return on the market index for a given holding period (one month) less the risk-free rate of return for the same period

**Rate of return on the stock** ($R_i$): is the realized rate of return on stock i that actually generated during the month. This return is calculated as follows (Elshqirat, 2019):

$$R_{i,t} = \left[ \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \right] \times 100$$  \hspace{1cm} (6)

Where $P_{i,t}$ is the closing price of the stock at the end of month t and $P_{i,t-1}$ is the closing price of that stock at the end of month t-1 or the month before.

**Rate of return on the market** ($R_m$): is the realized rate of return on the market free float index and it was determined as follows:

$$R_{m,t} = \left[ \frac{P_{m,t} - P_{m,t-1}}{P_{m,t-1}} \right] \times 100$$  \hspace{1cm} (7)
Where \( P_{m,t} \) is the closing price of the sector index at the end of month \( t \) and \( P_{m,t-1} \) is the closing price of that index at the end of month \( t-1 \).

Rate of return on the sector \( (R_s) \): is the realized rate of return on the sector index. The following equation was used to calculate this variable:

\[
R_{s,t} = \left( \frac{P_{s,t} - P_{s,t-1}}{P_{s,t-1}} \right) * 100
\]  

(8)

Where \( P_{s,t} \) is the closing price of the sector index at the end of month \( t \) and \( P_{s,t-1} \) is the closing price of that index at the end of month \( t-1 \).

Risk-free rate of return: is the riskless return represented by the rates of return on the treasury bills issued by the central bank of Jordan during the study period.

Sector excess return: is the rate of return on the sector index for a given holding period (one month) less the risk-free rate of return for the same period.

Standardized herd measure for the market \( (H^-m_t) \): is the standardized measure of beta herding that was introduced by Hwang and Salmon (2009) to test the herding behavior in the stock markets. This measure can be calculated as follows:

\[
H^-{m_t} = \frac{1}{N_t} \sum_{i=1}^{N_t} \left( \frac{b^m_{i,mt} - 1}{\hat{\sigma}_E / \hat{\sigma}_{mt}} \right)^2
\]  

(9)

Where \( H^-{m_t} \) is the standardized herd measure for the market at time \( t \), \( N_t \) is the number of stocks at time \( t \), \( b^m_{i,mt} \) is the observed estimate of beta of stock \( i \) with the market at time \( t \), \( \hat{\sigma}_E \) is the sample standard deviation of the OLS residuals, and \( \hat{\sigma}_{mt} \) is the sample standard deviation of market excess return at time \( t \).

Standardized herd measure for each sector \( (H^-{m_s}) \): is the standardized measure of beta herding that was utilized to test herding behavior in the sectors of the financial market. This measure can be calculated as follows:

\[
H^-{m_s,t} = \frac{1}{N_{st}} \sum_{i=1}^{N_{st}} \left( \frac{b^s_{i,st} - 1}{\hat{\sigma}_E / \hat{\sigma}_{st}} \right)^2
\]  

(10)

Where \( H^-{m_s,t} \) is the standardized herd measure for each sector at time \( t \), \( N_{st} \) is the number of stocks in the sector at time \( t \), \( b^s_{i,st} \) is the observed estimate of beta of stock \( i \) with the sector at time \( t \), \( \hat{\sigma}_E \) is the sample standard deviation of the OLS residuals, and \( \hat{\sigma}_{st} \) is the sample standard deviation of sector excess return at time \( t \).

Stock excess return: is the rate of return on the stock for a given holding period (one month) less the risk-free rate of return for the same period.

4. Results

4.1 Descriptive Statistics

Companies included in this study belong to the three groups of companies in Amman stock exchange (ASE): financial group, services group, and industrial group. Because of the exclusion of companies that became unlisted during the study period, the percentage of included companies to the total number of listed companies in each sector at the end of 2018 was as follows: 34% of listed financial companies, 41% of services companies, and 70% of industrial companies. This means that industrial companies have the most stable listing status among all sectors while the financial companies have the least stable status. Some univariate statistics for the variables included in the study are presented in Table 1.
Table 1. Descriptive statistics about variables of: $b^e_{int}$, $b^e_{ist}$, stocks excess returns, market excess return, sector excess return, $\hat{\sigma}_{Eit}$, $\hat{\sigma}_{mt}$, and $\hat{\sigma}_{st}$

| Variable                        | Mean  | Standard deviation | Min    | Max    |
|---------------------------------|-------|--------------------|--------|--------|
| **Market**                      |       |                    |        |        |
| $b^e_{int}$                     | 0.668 | 0.408              | -0.038 | 2.084  |
| Stocks excess returns %         | -0.046| 11.543             | -86.367| 232.853|
| Market excess returns %         | -0.164| 4.501              | -22.996| 15.347 |
| $\hat{\sigma}_{Eit}$           | 10.466| 3.473              | 5.423  | 21.327 |
| $\hat{\sigma}_{mt}$            | 4.511 | 0.000              | 4.511  | 4.511  |
| **Financial sector**            |       |                    |        |        |
| $b^e_{ist}$                     | 0.682 | 0.456              | 0.003  | 1.884  |
| Stocks excess returns %         | -0.087| 11.263             | -86.367| 213.045|
| Sector excess return %          | -0.002| 5.245              | -17.765| 21.489 |
| $\hat{\sigma}_{Eit}$           | 9.951 | 3.162              | 5.424  | 21.021 |
| $\hat{\sigma}_{st}$            | 5.256 | 0.000              | 5.256  | 5.256  |
| **Services sector**             |       |                    |        |        |
| $b^e_{ist}$                     | 0.667 | 0.305              | 0.242  | 1.433  |
| Stocks excess returns %         | -0.032| 10.882             | -79.327| 212.357|
| Sector excess return %          | -0.379| 3.979              | -21.458| 12.426 |
| $\hat{\sigma}_{Eit}$           | 9.874 | 3.603              | 5.795  | 21.607 |
| $\hat{\sigma}_{st}$            | 3.988 | 0.000              | 3.988  | 3.988  |
| **Industrial sector**           |       |                    |        |        |
| $b^e_{ist}$                     | 0.469 | 0.388              | -0.048 | 1.693  |
| Stocks excess returns %         | -0.013| 12.173             | -79.100| 232.853|
| Sector excess return %          | -0.140| 5.363              | -34.916| 18.785 |
| $\hat{\sigma}_{Eit}$           | 11.204| 3.586              | 5.910  | 19.840 |
| $\hat{\sigma}_{st}$            | 5.375 | 0.000              | 5.375  | 5.375  |

* Percentage of significant $b^e_{int}$’s for the market at 5% = 85%, percentage of significant $b^e_{ist}$’s at 5%; for financial sector = 85%, for services sector = 95%, for industrial sector = 61%

4.2 Hypotheses Testing

4.2.1 Hypothesis One

There were two sections in this hypothesis: the first section was to test the existence of herding at the level of market and section two was to examine the same in each sector. Calculated values and descriptive statistics of $H^*_{mt}$ and $H^*_{mst}$ (market-level and sector-level herding measures) are summarized in Table 2. It can be noticed from Table 2 that herding was very high when measured at market-level because the value of $H^*_{mt}$ for the entire
period was very close to zero (perfect herding). At sector-level, however, the highest level of herding was in the services sector followed by the financial sector and then the industrial sector. In addition, the maximum values of $H_{mt}$ for market-level and $H_{mst}$ for the industrial sector were in the year 2008 which is the year of the global financial crisis. This means that herding behavior in market and in the industrial sector was at its lowest level during the global financial crisis.

Table 2. Values and descriptive statistics for $H_{mt}$ and $H_{mst}$

| Details                  | Value for the entire period | Yearly calculated 2000 - 2018 |
|--------------------------|-----------------------------|--------------------------------|
|                          |                             | Mean       | Standard deviation | Min     | Max     |
| $H_{mt}^{*}$             | 0.071                       | 0.548      | 0.323              | 0.218   | 1.248   |
| $H_{mst}^{*}$ financial sector | 0.120                     | 0.625      | 0.500              | 0.137   | 1.811   |
| $H_{mst}^{*}$ services sector | 0.044                    | 0.417      | 0.282              | 0.083   | 1.019   |
| $H_{mst}^{*}$ industrial sector | 0.135                     | 0.724      | 0.723              | 0.151   | 3.066   |

The movement of standardized beta herding measure for the market and for each sector during the study period is illustrated in the Figure of herding measure movement (Figure 1). The higher the value of herding measure, the lower the level of standardized beta herding. The Figure clarifies that herding movement was slightly different between market-level and other sectors except for industrial sector which had only one big peak related to 2008, the year of global financial crisis. No trends were noticed in the movement of herding behavior at market-level and at sectors-level.

Figure 1. Herding measure movement 2000-2018
To test whether there herding behavior at market-level and at sectors-level was different, I used Kruskal–Wallis test. I used this test because I have more than two groups (market-level and three sectors) and because the data of $H^*_{mt}$, $H^*_{mst}$ were not normal at a significance level of 5% as suggested by the results of Shapiro-Wilk test of normality summarized in Table 3. Based on the results of Kruskal–Wallis test, it can be concluded that herding behavior at market and sectors level was the same during the study period (Kruskal–Wallis statistic = 3.687, $p = .297$). To sum up, herding behavior existed in market and in each sector at the same level.

Table 3. Results of Shapiro-Wilk test of normality for hypothesis one

| Details       | Market-level | Financial sector | Services sector | Industrial sector |
|---------------|--------------|------------------|----------------|------------------|
| Statistic     | .869         | .735             | .885           | .683             |
| $P$ value     | .014         | <.001            | .026           | <.001            |

4.2.2 Second Hypothesis

This hypothesis was about the impact of the financial crisis of 2008 on the herding behavior at market-level and sector level. The first section of the hypothesis was about the effect of the crisis on herding at the level of market. To test this hypothesis, data were first tested for normality using Shapiro-Wilk test. Based on the test of normality clarified in Table 4, data of $H^*_{mt}$ for market-level were normal while data of $H^*_{mst}$ for sector-level were not normal. The value of $H^*_{mt}$ (as calculated for the whole period before the crisis and the whole period after the crisis) for market-level before the financial crises was 0.088 and after the crisis was 0.064. Both values are very close to zero which means that herding was high before and after the crisis. To examine the first section of this hypothesis, I used the independent samples t-test because there were two groups for this hypothesis (before and after financial crisis) with homogenous variance (Levene’s test $p = .998$) and because data were normal. The results of t-test showed that herding level in the entire market can be considered the same before the financial crisis and after it, $t(16) = -.291$, $p = .774$.

Table 4. Results of Shapiro-Wilk test of normality for the second hypothesis

| Details       | Market-level | Financial sector | Services sector | Industrial sector |
|---------------|--------------|------------------|----------------|------------------|
| Statistic     | .878         | .875             | .770           | .812             |
| $P$ value     | .181         | .114             | .006           | .020             |

The values of $H^*_{mst}$ for each sector (as calculated for the whole period before the crisis and the whole period after the crisis) are clarified in Table 5. From the values of herding measure in Table 5, it can be said that herding level was high in all sectors because all values are close to zero. Because data for sectors were not normal, I used Mann-Whitney U test to examine the second section of hypothesis two.

Table 5. Values of $H^*_{mst}$ for each sector before and after the financial crisis

| Details        | $H^*_{mst}$ before financial crisis | $H^*_{mst}$ after financial crisis |
|----------------|-----------------------------------|-----------------------------------|
| Financial sector| 0.159                             | 0.09                              |
| Services sector| 0.037                             | 0.088                             |
| Industrial sector| 0.061                            | 0.161                             |
The results of Mann-Whitney test for each sector are illustrated in Table 6. These results suggest that the null hypothesis that the presence of herding behavior in each sector is the same pre and post the financial crisis cannot be rejected and thus, it can be said that the crisis had no effect on the herding behavior in all sectors.

Table 6. Results of Mann-Whitney U test for the second hypothesis—second section

| Details          | Statistic | P value |
|------------------|-----------|---------|
| Financial sector | 35        | .657    |
| Services sector  | 35        | .657    |
| Industrial sector| 26        | .214    |

4.2.3 Third Hypothesis

This hypothesis was related to the level of herding behavior at times of market (sector) rising (i.e. $R_{mt}, R_{st} > 0$) and falling (i.e. $R_{mt}, R_{st} < 0$). As done in the previous hypotheses, the first step was to test market and sectors’ data for normality. The results of Shapiro-Wilk test of normality are illustrated in Table 7. These results indicate that data for market and sectors were not normal.

Table 7. Results of Shapiro-Wilk test of normality for the third hypothesis

| Details          | Market-level | Financial sector | Services sector | Industrial sector |
|------------------|--------------|------------------|-----------------|-------------------|
|                  | Market rising | Sector rising    | Sector falling  | Sector rising     | Sector falling    |
| Statistic        | .835         | .614             | .435            | .397              | .499             |
| P value          | .008         | <.001            | <.001           | <.001             | <.001            |

The values of $H_{mt}^*$ and $H_{nst}^*$ (as calculated for the whole period during market rising and the whole period during market falling) for market and sectors are illustrated in Table 8. Because all values are close to zero, it can be claimed that herding was high at market-level when the market was rising and falling and high at sector-level for all sectors when the sector was rising and when it was falling.

Table 8. Values of $H_{mt}^*$ and $H_{nst}^*$ for market and for each sector when market (sector) increasing and decreasing

| Details          | Market-level | Financial companies | Services companies | Industrial companies |
|------------------|--------------|---------------------|-------------------|---------------------|
|                  | Market rising | Market falling      | Sector rising     | Sector falling      | Sector rising      | Sector falling |
| $H_{mt}$         | 0.036        | 0.057               |                   |                     |                   |               |
| $H_{nst}$        |              | 0.077               | 0.085             | 0.034               | 0.047             | 0.098 |

To test this hypothesis at market and sector levels, I used Wilcoxon Signed-Rank test. The results of this test are summarized in Table 9. It can be noticed from Table 9 that all $p$ values are insignificant at 5% level which means that herding measure was the same at times of increasing and decreasing in market and in sectors. In other words, conditions of market (sector) increasing and decreasing did not affect the level of herding in market and in each sector.
Table 9. Results of Wilcoxon Signed-Rank test for the third hypothesis

| Details | Market-level | Financial companies | Services companies | Industrial companies |
|---------|--------------|---------------------|--------------------|----------------------|
| z       | -0.724       | -0.310              | -0.806             | -0.121               |
| P value | .469         | .756                | .420               | .904                 |

4.2.4 Hypothesis Four

This hypothesis was about whether herding during times of market (sector) increasing and decreasing is different pre and post the financial crisis of 2008. Data required to test this hypothesis were normal at market-level before the crisis but not normal after the crisis and at sector-level, it was not normal before and after the crisis as clarified in Table 10. The values of $H_{mt}^*$ and $H_{ms}^*$ (as calculated during market (sector) rising and falling for the entire period before financial crisis and the entire period after the financial crisis) are illustrated in Table 11.

Table 10. Results of Shapiro-Wilk test of normality for the fourth hypothesis

| Details | Market-level | Financial sector | Services sector | Industrial sector |
|---------|--------------|------------------|-----------------|-------------------|
|         | Before financial crisis | After financial crisis | Before financial crisis | After financial crisis | Before financial crisis | After financial crisis |
| Statistic | .869 | .760 | .849 | .698 | .557 | .476 | .538 | .508 |
| P value | .262 | .005 | .193 | .001 | <.001 | <.001 | <.001 | <.001 |

Under rising

| Statistic | .941 | .810 | .728 | .736 | .744 | .840 | .812 | .764 |
| P value | .675 | .019 | .018 | .002 | .007 | .057 | .038 | .005 |

Under falling

It can be noticed from Table 11 that highest herding level before the financial crisis was in the services sector during the time of sector falling while the lowest level was in in the financial sector during the time of falling. After the financial crisis, however, the highest level of herding changed to be at market-level during market falling and the lowest level changed to be in the industrial sector during sector increasing.

Table 11. Values of $H_{nt}^*$ and $H_{ms}^*$ for market and for each sector during market (sector) increasing and decreasing pre and post the financial crisis

| Details | Market-level | Financial companies | Services companies | Industrial companies |
|---------|--------------|---------------------|--------------------|----------------------|
|         | Pre-financial crisis | Post financial crisis | Pre-financial crisis | Post financial crisis | Pre-financial crisis | Post financial crisis |
| $H_{nt}^*$ under rising | 0.056 | 0.071              |                  |                   |
| $H_{nt}^*$ under falling | 0.102 | 0.030              |                  |                   |
| $H_{ms}^*$ under rising | 0.107 | 0.109 | 0.050 | 0.115 | 0.058 | 0.165 |
| $H_{ms}^*$ under falling | 0.151 | 0.048 | 0.029 | 0.035 | 0.032 | 0.057 |

To test the first section of this hypothesis (at market-level) before the financial crisis, I used the paired sample $t$-test because data for the market were normal and because there were two values for each year (increasing and decreasing). The results of this test indicated that herding behavior before the financial crisis was the same under market rising and falling $t(4) = 0.255$, $p = .811$. To test data at market-level after the crisis, Wilcoxon Signed-Rank test was used because data were not normal. The results of the test indicated that herding after the financial crisis was the same under market rising and falling $z = -1.173$, $p = .241$. Based on this, the null
hypothesis of the first section cannot be rejected and it can be concluded that investors in the entire market herded during market increasing and decreasing in the same manner prior to and post the crisis. To test the second section of this hypothesis (at sector-level), Wilcoxon Signed-Rank test was used because data for sectors were not normal before and after the crisis. The results of this test are illustrated in table 12. As the results revealed, the alternate hypothesis can be rejected and thus, it can be concluded that investors in each sector herded during sector increasing and decreasing in the same way pre and post the crisis.

Table 12. Results of Wilcoxon Signed-Rank test for second section of fourth hypothesis (sectors-level)

| Details          | Financial companies | Services companies | Industrial companies |
|------------------|---------------------|--------------------|----------------------|
|                  | Before crisis       | After crisis       | Before crisis        | After crisis        | Before crisis | After crisis |
| $z$              | -1.214              | -0.968             | -0.980               | -0.533             | -0.420        | -0.357       |
| $P$ value        | .225                | .333               | .327                 | .594               | .674          | .721         |

4.2.5 Comparing Results

The results of this study can be compared with the study of Elshqirat (2019) because it covered the same period (2000-2018) and the same financial market (Jordanian stock market). In addition, the same hypotheses were tested in this study to facilitate the comparison. Elshqirat (2019) used the measure of CSAD to test herding while in this study, the measure of Hwang and Salmon (2009) was used. The purpose of the comparison was to determine if different herding measures yield different results. The results of the comparison are illustrated in Table 13. Results are different between the two measures for all hypothesis except for the effect of financial crisis at market-level and the effect of rising and falling at sector-level. From these results, it can be claimed that different herding measures result in different decisions about the behavior even if those measures belong to the same family. In other words, results of detecting herding in the stock market depend on the measure used and thus, reaching reasonable results about herding in a market may require utilizing more than one measure.

Table 13. Results of comparing the results of CSAD measure with the measure of Hwang and Salmon (2009)

| Details                                | Market-level |          |          |          |
|----------------------------------------|--------------|----------|----------|----------|
|                                        | CSAD | Hwang and Salmon | CSAD | Hwang and Salmon |
| Presence of herding                    | No herding | Herding exists | Herding exists in services and industrial sectors only | Herding exists in all sectors |
| Effect of financial crisis             | No effect | No effect | Financial crisis affected services and industrial sectors | No effect |
| Effect of market(sector) increasing and decreasing | Herding affected | No effect | No effect | No effect |
| Financial crisis effect on herding during increasing and decreasing | Financial crisis affected herding during increasing and decreasing | No effect | Financial crisis changed herding during increasing and decreasing | No effect |

5. Discussion

Study results revealed that investors in the stock market of Jordan practiced herding at the level of the entire market which is the same conclusion reached by Obaidat (2016), Ramadan (2015), Nasarudin et al. (2017), and Chen (2013) and opposite to the results of Al-Shboul (2012). In addition, results indicated that herding existed in
each sector of the market which supports the conclusions of Cakan, and Balagyozyan (2016) who detected herding in all industries of the stock market in Turkey. However, study results are different from other studies in which it was concluded that herding existed in some and not all of the market sectors including the study of BenSaïda (2017), Jabeen,and Rizavi (2019), and Litimi (2017). The results of this study indicated that investors herded at the same level in the entire market and in each sector. The results of this study indicated also that the global financial crisis of 2008 did not affect herding behavior neither at the level of market nor at the level of sectors (herding existed in both periods pre and post the crisis). The results about the effect of financial crisis at market-level do not support the results reached by Angola-Maria, Maria, and Miruna (2015) and BenSaïda, Jlassi, and Litimi (2015) who concluded that the global financial crisis had an effect on the herding behavior at market-level. On the other hand, these results are in line with those concluded by Al-Shboul (2012) who claimed that herding behavior was the same before and after the financial crisis at market-level and in the financial sector.

Based on the results of this study, it was concluded that herding behavior was the same during times of market (sector) rising and falling. These results are opposite to the results concluded by and Rahman, Chowdhury, and Sadique (2015) who claimed that herding at market-level is higher during the time of market rising and also opposite to the results of Tabesh, Kelly, and Poulose (2018) who concluded that herding behavior respond in different way in each sector when the market was rising and falling. These results, however, support the conclusions of Yousaf, et al. (2018) who concluded that herding at market-level was the same in times of market rising and falling and Elshqirat (2019) who claimed that herding at sector-level was not affected by the conditions of sector rising and falling. As concluded in this study, the level of herding behavior during market (sector) rising and falling was the same before and after the global financial crisis. Investors in Amman stock exchange continued herding in the same manner during market rising and falling even after the global financial crisis. Finally, the results of this study clarified that the results reached about herding using the measure of Hwang and Salmon (2009) were different from those reached using CSAD measure for the same market (Jordan) and the same period (2000-2018) implying that the decision about the behavior is affected by the measure used. Herding at market level was absent when tested using CSAD measure by Elshqirat (2019) while it existed when tested in this study using Hwang and Salmon (2009). At sector level, however, herding exited in some sectors when measured using CSAD while it exited in all sectors at the same level when measured using Hwang and Salmon (2009). When herding was measured using Hwang and Salmon measure, there was no effect for the financial crisis on herding at both levels: market and sectors while the crisis affected two sectors when herding was measured using CSAD. In addition, herding was affected by the market condition of rising and falling at market-level only when CSAD was utilized but these conditions had no effect at all levels when the measure of Hwang and Salmon was used. In addition, different herding manners during rising and falling were detected before and after the crisis using CSAD at all levels while the same manners were observed before and after the crisis using Hwang and Salmon measure. The latter conclusions about reaching different results using different measures of herding are supported by some studies including the study of Adem (2020) who concluded that herding existed during market rising using CSAD while it was absent using the measure of cross-sectional standard deviation (CSSD). Other studies that used different measures and reached different results include Khan and Rizwan (2018) and Hilal (2015). In Jordan, different conclusions about herding where reached using different measures by Al-Shboul (2012) who used CSAD and CSSD to test the behavior and Chen (2013) who used CSSD, CSAD, and the measure of Hwang and Salmon (2004) to test herding at market-level. What this study may add to the previous studies about herding is that different measures may result in different decisions about herding at sector-level and not only at market-level.

The results of this study can be generalized to all sectors of the Jordanian stock market because it included all companies listed for the entire period from 2000 to 2018 and not only a sample. In addition, results can be generalized to other markets that have the same specifications of the Jordanian stock market. It was known from the previous studies that using different measures may result in different decisions about herding but that was mostly at market-level and in countries other than Jordan. This study is the first study in Jordan to examine the effect of using different measures on the testing of herding at market-level and at sector-level by comparing the results of two measures: CSAD and Hwang &Salmon (2009). Knowing that different measures of herding may lead to different results can change the investors’ view of the market. Investors may no longer depend on the results of one measure to decide if herding exists in the market and they may reconsider the factors included in their price expectations. In addition, the study results may benefit the management of the market by providing them with additional information about the existence of herding at market and at sector levels. Market management may plan to educate and train investors to make their own investment decisions instead of just copying others. Further research may be needed to gain more understanding about herding behavior at sector-level and to develop new measures that can be used when studying the behavior in each sector.
References
Ababio, K. A., & Mwamba, J. W. M. (2017). Herding behaviour in financial markets: empirical evidence from the Johannesburg Stock Exchange. *African Finance Journal, 19*(1), 23-44. Retrieved from https://ideas.repec.org/s/afj/journl.html

Adem, A. M. (2020). Asymmetrical herding in the up and down market: an empirical analysis from Istanbul stock exchange. *IOSR Journal of Economics and Finance, 11*(1), 19-39. Retrieved from www.irosrjournals.org

Adem, A. M., & Sarıoğlu, S. E. (2020). Analysis of Investors Herding Behaviour: An Empirical Study from Istanbul Stock Exchange. *European Journal of Business and Management Research, 5*(2). https://doi.org/10.24018/ejbmr.2020.5.2.250

Akinsomi, O., Coskun, Y., & Gupta, R. (2018). Analysis of herding in REITs of an emerging market: the case of Turkey. *Journal of Real Estate Portfolio Management, 24*(1), 65-81. https://doi.org/10.1080/10835547.2018.12090007

Al-Shboul, M. (2012). An examination of herd behavior in the Jordanian equity market. *International Journal of Economics and Finance, 5*(1), 234-249. https://doi.org/10.5539/ijef.v5n1p234

Andreu, L., Gargallo, P., Salvador, M., & Sarto, J. L. (2015). Bayesian analysis of herding behaviour: an application to Spanish equity mutual funds. *Applied Stochastic Models in Business and Industry, 31*(6), 745-761. https://doi.org/10.1002/asmb.2087

Angela-Maria, F., Maria, P. A., & Miruna, P. M. (2015). An empirical investigation of herding behavior in CEE stock markets under the global financial crisis. *Procedia Economics and Finance, 25*, 354-361. https://doi.org/10.1016/S2212-5671(15)00745-5

BenSaïda, A. (2017). Herding effect on idiosyncratic volatility in US industries. *Finance Research Letters, 23*, 121-132. https://doi.org/10.1016/j.frl.2017.03.001

BenSaïda, A., Jlassi, M., & Litimi, H. (2015). Volume–herding interaction in the American market. *American Journal of Finance and Accounting, 4*(1), 50-69. https://doi.org/10.1504/AJFA.2015.067837

Boyd, N. E., Buyukshin, B., Haigh, M. S., & Harris, J. H. (2016). The Impact of Herding on Futures Prices. *Journal of Futures Markets, 36*(7), 671-694. https://doi.org/10.1002/fut.21756

Cai, F., Han, S., Li, D., & Li, Y. (2019). Institutional herding and its price impact: Evidence from the corporate bond market. *Journal of Financial Economics, 131*(1), 139-167. https://doi.org/10.1016/j.jfineco.2018.07.012

Cakan, E., & Balagyozyan, A. (2014). Herd behaviour in the Turkish banking sector. *Applied Economics Letters, 21*(2), 75-79. https://doi.org/10.1080/13504851.2013.842629

Cakan, E., & Balagyozyan, A. (2016). Sectoral herding: Evidence from an emerging market. *Journal of Accounting and Finance, 16*(4), 87-99. Retrieved from http://www.nabusinesspress.com/jafopen.html

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. https://doi.org/10.1016/S0378-4266(99)00096-5

Chen, T. (2013). Do investors herd in global stock markets? *Journal of Behavioral Finance, 14*(3), 230-239. https://doi.org/10.1080/15427560.2013.819804

Chen, C. D., & Demirer, R. (2018). The profitability of herding: evidence from Taiwan. *Managerial Finance, 44*(7), 919-934. https://doi.org/10.1108/MF-12-2016-0357

Choi, S. (2016). Herding among local individual investors: Evidence from online and offline trading. *Economics Letters, 144*, 4-6. https://doi.org/10.1016/j.econlet.2016.04.030

Christie, W. G., & Huang, R. D. (1995). Following the pied piper: Do individual returns herd around the market? *Financial Analysts Journal, 51*(4), 31-37. https://doi.org/10.2469/faj.v51.n4.1918

Demirer, R., Kutun, A. M., & Zhang, H. (2014). Do ADR investors herd?: Evidence from advanced and emerging markets. *International Review of Economics & Finance, 30*, 138-148. https://doi.org/10.1016/j.iref.2013.10.006

Demirer, R., Lien, D., & Zhang, H. (2015). Industry herding and momentum strategies. *Pacific-Basin Finance Journal, 32*, 95-110. https://doi.org/10.1016/j.pacfin.2015.02.010
Demirer, R., & Zhang, H. (2018). Do firm characteristics matter in explaining the herding effect on returns?. Review of Financial Economics, 1-16. https://doi.org/10.1002/rfe.1036

Dutta, A., Gahan, P., & Panda, S. K. (2016). Evidences of herding behaviour in the Indian stock market. Vilakshan: The XIMB Journal of Management, 13(2), 23-40. Retrieved from https://xub.edu.in/faculty-research-publications/vilakshan/

Dzaja, J., & Aljinovic, Z. (2013). Testing CAPM model on the emerging markets of the central and southeastern Europe. Croatian Operational Research Review, 4, 164-175. Retrieved from http://hrnak.srce.hr/corr

Elshqirat, M. K. (2019). Testing sectoral herding in the Jordanian stock market. International Business Research, 12(8), 88-106. https://doi.org/10.5539/ibr.v12n8p88

Fang, H., Lu, Y. C., Yau, H. Y., & Lee, Y. H. (2017). Causes and impacts of foreign and domestic institutional investors’ herding in the Taiwan stock market. Emerging Markets Finance and Trade, 53(4), 727-745. https://doi.org/10.1080/1540496X.2015.1103126

Filip, A., Pochea, M., & Pece, A. (2015). The herding behaviour of investors in the CEE stocks markets. Procedia Economics and Finance, 32, 307-315. https://doi.org/10.1016/S2212-5671(15)01397-0

Galariotis, E. C., Rong, W., & Spyrou, S. I. (2015). Herding on fundamental information: A comparative study. Journal of Banking & Finance, 50, 589-598. https://doi.org/10.1016/j.jbankfin.2014.03.014

Gavriilidis, K., Kallinterakis, V., & Tsalavoutas, I. (2016). Investor mood, herding and the Ramadan effect. Journal of Economic Behavior & Organization, 132, 23-38. https://doi.org/10.1016/j.jebo.2015.09.018

Guney, Y., Kallinterakis, V., & Komba, G. (2017). Herding in frontier markets: Evidence from African stock exchanges. Journal of International Financial Markets, Institutions and Money, 47, 152-175. https://doi.org/10.1016/j.intfin.2016.11.001

Güvercin, A. (2016). Sentimental herding: The role of regional and global shocks in Egyptian and Saudi stock markets. Sosyoekonomi, 24(27), 25. https://doi.org/10.17233/se.53541

Hammami, H., & Boujelbene, Y. (2015). Investor herding behavior and its effect on stock market boom-bust cycles. IUP Journal of Applied Finance, 21(1), 38-53. https://doi.org/10.1504/IJIFS.2016.075935

Hilal, H. R. Ö. (2015). Empirical analysis of herd behavior in borsa Istanbul. International Journal of Economic Sciences, 4(4), 27-52. https://doi.org/10.20472/ES.2015.4.4.003

Hwang, S., & Salmon, M. (2004). Market stress and herding. Journal of Empirical Finance, 11(4), 585-616. https://doi.org/10.1016/j.jempfin.2004.04.003

Hwang, S., & Salmon, M. (2009). Sentiment and beta herding. UK: Warwick University

Indârs, E. R., Savin, A., & Lublóy, Á. (2019). Herding behaviour in an emerging market: Evidence from the Moscow Exchange. Emerging Markets Review, 38, 468-487. https://doi.org/10.1016/j.ememar.2018.12.002

Jabeen, S., & Rizavi, S. S. (2019). Herd behaviour, short-lived phenomenon: Evidence from Pakistan stock exchange. The Lahore Journal of Business, 8(1), 51-72. https://doi.org/10.35536/ljb.2019.v8.i1.a3

Jokar, H., Shamsaddini, K., & Daneshi, V. (2018). Investigating the effect of investors’ behavior and management on the stock returns: Evidence from Iran. Advances in Mathematical Finance and Applications, 3(3), 41-52. Retrieved from http://amfa.iau-arak.ac.ir/

Khan, S. U., & Rizwan, M. F. (2018). Do investors herd: Evidence from an emerging market. Lahore Journal of Business, 6(2), 27-46. https://doi.org/10.5536/ljb.2018.v6.i2.a2

Krokida, S. I., Makrichoriti, P., & Spyrou, S. I. (2017). The effect of monetary policy on herd behavior during financial crises (Behavioural Finance Laboratory, AUEB, BeFin Lab WP, 01). Athens: Greece: Athens University of Economics & Business. https://dx.doi.org/10.2139/ssrn.3065905

Krokida, S. I. A., Spyrou, S. I., & Tsouknidis, D. A. (2017). Liquidity and beta herding in emerging equity markets. In F. Economou, K. Gavriilidis, G. N. Gregoriou, & V. Kallinterakis (Eds.), Handbook of Investors' Behavior During Financial Crises (pp. 319-333). Cambridge, MA:Academic Press. https://doi.org/10.1016/B978-0-12-811252-6.00018-9

Lakonishok, J., Shleifer, A., & Vishny, R. V. (1992). The impact of institutional trading on stock prices. Journal of Financial Economics, 32, 23-43. https://doi.org/10.1016/0304-405x(92)90023-q

Lee, Y. H., Liao, T. H., & Hsu, C. M. (2015). The impact of macroeconomic factors on the herding behaviour of...
investors. *Asian Economic and Financial Review*, 5(2), 295-304. https://doi.org/10.18488/journal.aefr/2015.5.2/102.2.295.304

Lin, S. J. (2017). Herding and Returns in Taiwan’s Stock Market. *Journal of Applied Business and Economics*, 19(12). https://doi.org/10.33423/jabe.v19i12.782

Litimi, H. (2017). Herd behavior in the French stock market. *Review of Accounting and Finance*, 16(4), 497-515. https://doi.org/10.1108/RAF-11-2016-0188

Matar, A. (2016). Does Portfolio’s Beta in Financial Market Affected by Diversification? Evidence from Amman Stock Exchange. *International Journal of Business and Management*, 11(11), 101. https://doi.org/10.5539/ijbm.v11n11p101

Mertzanis, C., & Allam, N. (2018). Political instability and herding behaviour: Evidence from Egypt’s stock market. *Journal of Emerging Market Finance*, 17(1), 29-59. https://doi.org/10.1177/0972652717748087

Mobarek, A., Mollah, S., & Keasey, K. (2014). A cross-country analysis of herd behavior in Europe. *Journal of International Financial Markets, Institutions and Money*, 32, 107-127. https://doi.org/10.1016/j.jifm.2014.05.008

Munoz Torrecillas, M. J., Yalamova, R., & McKelvey, B. (2016). Identifying the Transition from Efficient-Market to Herding Behavior: Using a Method from Econophysics. *Journal of Behavioral Finance*, 17(2), 157-182. https://doi.org/10.1080/15427560.2016.1170680

Nasarudin, A. F., Noordin, B. A. A., Law, S. H, Yah, M. U. D., Shah, A., & Khan, S. U. (2017). Herding behavior in the Pakistan stock exchange: Some new insights. *Research in International Business and Finance*, 42, 865-873. https://doi.org/10.1016/j.ribaf.2017.07.022

Shah, M. U. D., Shah, A., & Khan, S. U. (2017). Herding behavior in the Pakistan stock exchange: Some new insights. *Research in International Business and Finance*, 42, 865-873. https://doi.org/10.1016/j.ribaf.2017.07.022

Sharma, K. (2019). Investor's Herding: A Study of the National Stock Exchange of India. *International Journal of Financial Management*, 9(3), 36-40. Retrieved from http://www.publishingindia.com/ijfm/

Sharma, S. S., Narayan, P., & Thuraisamy, K. (2015). Time-varying herding behavior, global financial crisis, and the Chinese stock market. *Review of Pacific Basin Financial Markets and Policies*, 18(2), 1-31. https://doi.org/10.1142/S0219091515500095

Shrotyria, V. K., & Kalra, H. (2019). An Empirical Investigation of Herding in the Indian Stock Market. *e-Journal of Social & Behavioural Research in Business*, 10(1), 40-53. Retrieved from http://ejsbrb.org/

Sias, R. (2004). Institutional herding. *Review of Financial Studies* 17(1), 165-206. https://doi.org/10.2139/ssrn.307440

Teng, Y. P. (2018). An examination of stock market herding behavior with different market maturity. *Journal of Statistics and Management Systems*, 21(6), 1121-1130. https://doi.org/10.1080/09720510.2018.1492891
Trenca, I., Pece, A. M., & Mihut, I. S. (2015). Herd behaviour of Institutional and individual investors in the context of economic governance: Evidence from Romanian stock market. *Review of Economic Studies and Research Virgil Madgearu, 8*(1), 177-190. Retrieved from https://econ.ubbcluj.ro/rvm/en

Vieira, E. F. S., & Pereira, M. S. V. (2015). Herding behaviour and sentiment: Evidence in a small European market. *Revista de Contabilidad, 18*(1), 78-86. https://doi.org/10.1016/j.rcsar.2014.06.003

Yao, J., Ma, C., & He, W. P. (2014). Investor herding behaviour of Chinese stock market. *International Review of Economics & Finance, 29*(1), 12-29. https://doi.org/10.1016/j.iref.2013.03.002

Yousaf, I., Ali, S., & Shah, S. Z. A. (2018). Herding behavior in Ramadan and financial crises: the case of the Pakistani stock market. *Financial Innovation, 4*(1), 16. https://doi.org/10.1186/s40854-018-0098-9

Zafar, N., & Hassan, A. (2016). An Empirical Investigation of Herding: Case of Karachi Stock Exchange. *Pakistan Journal of Life & Social Sciences, 14*(2). Retrieved from www.pjlss.edu.pk

**Copyrights**

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).