Article Type: Research Paper

Sectoral Herding During Global Rare Events: Evidence from the Indonesian Capital Market

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THIS ARTICLE IS AVAILABLE IN:
http://journal.umy.ac.id/index.php/mb

DOI: 10.18196/mb.v15i1.21601

CITATION:
Hariyanto, D., Brahmana, R. K., & Wendy, W. (2024). Sectoral Herding During Global Rare Events: Evidence from the Indonesian Capital Market. *Jurnal Manajemen Bisnis*, *15*(1), 99-116.

ARTICLE HISTORY
Received:
08 Feb 2024
Revised:
12 Feb 2024
06 Mar 2024
16 Mar 2024
21 Mar 2024
22 Mar 2024
Accepted:
26 Mar 2024

Abstract
Research Aims: This research aims to examine the effects of increased levels of herding on abnormal returns during rare events.
Design/Methodology/Approach: Time series regression including all stocks across 9 sectors in the Indonesia Stock Exchange from 1997 to 2020, totaling 5,615 observations is used. The primary model is predicated on three factors derived from Fama-French and prospect theory to incorporate herding as a primary risk factor in assessing the impact of on abnormal returns during rare events.
Research Results: The results show that various events produce impacts on herding behavior across different sectors. During bearish market conditions, this behavior manifests significant negative effect leading to greater abnormal returns. Conversely, positive and significant anti-herding behavior is observed in bullish market conditions. Rare events do not necessarily induce herding behavior but may lead to anti-herding behavior.
Theoretical Contribution/Originality: In this research, the variables are developed from the Efficient Market Hypothesis, Capital Asset Pricing Model, prospect theory, and market integration theory. The estimation model is grounded in prospect theory and the contribution addresses the research gaps.
Practitioners/Policy Implications: The provision of insights to stakeholders in the capital market regarding the impact of rare events on financial behaviors influences investors' decision-making processes in stock investments.
Research Limitations/Implications: The measurement of herding refers to Chang et al. (2000) due to the availability of aggregate data from the Indonesian Stock Exchange. Comprehensive micro-level data is not unavailable and the accessibility of complete micro-level data can be conducted. The presence of these data in the capital markets of other countries should be investigated.
Keywords: Herding; Rare Events; Behavioral Finance; Abnormal Returns

Introduction

The possibility of herding behavior in the capital markets is high, allowing investors to construct portfolios across various sectors. In this context, some investors may prefer the same sectors in portfolio formation, potentially facing similar failure risks. The investment decisions of others may also be copied to avoid unsatisfactory outcomes. A consequence of this herding behavior is the potential misallocation of significant financial resources.

The possibility of herding behavior varies due to differing levels of information among sectors and investors' tendencies to follow trends

based on prevailing market sentiment. This can occur without a specific market leader directing movements specifically during increased pressure in both bearish and bullish market conditions. Therefore, herding in the stock market varies according to sectoral dynamics and rare event occurrences. Discrepancies in cross-sector occurrences are consistent with the temporal change theory. Even though this phenomenon has the potential for varied implications, comprehensive empirical research addressing the issue is lacking.

Herding in capital markets worldwide has been extensively studied, and nearly all the results reported the occurrence of the phenomenon. Furthermore, it reflects similarity in investment decision-making (Clements et al., 2017) and remains under investigation in the capital markets. Herding occurs among all participants in the capital and financial markets, including individual investors, institutions, domestic or foreign investors, male or female investors, and fund managers. Moreover, domestic individual investors engage in herding behavior (Christoffersen & Stæhr, 2019) and this is driven by the limitations of the information obtained. Individual investors heavily rely on public information in trading because the concepts are influenced by market sentiment and events capturing attention (Li et al., 2015). The capital market investors are not only dominated by males but also females (Salem, 2019).

Herding targets rational investors who behave irrationally by copying the evaluations of others when making decisions. This occurs among economic agents in the capital markets of advanced countries under various conditions. Herding has been reported in developed countries and the capital markets of Asian countries (Chiang & Zheng, 2010). However, the phenomenon does not occur in the capital markets of the United States, Hong Kong, and Japan (Chang et al., 2000). Significant evidence of herding behavior exists in developing countries (Chang et al., 2000) due to inefficient capital markets, resulting in asymmetric information among economic agents (Javaira & Hassan, 2015). There are numerous aspects contributing to herding behavior, with the dominant aspect being crises causing simultaneous market declines during global financial problems (Economou et al., 2011). In addition, the health crisis caused by COVID-19 resulted in simultaneous global market declines in several countries. The decrease in economic productivity is a highly relevant theme in connection with herding behavior. Research on investor behavior reported strong evidence that the pandemic increased herding behavior (Méndez & Arias, 2021).

This research is motivated by the failure of the efficient market hypothesis to explain empirical results in rare events impacting the economy. A traditional capital asset pricing model is proposed by elaborating on prospect theory using Fama and French, which serves as a point of differentiation and interest compared to previous research.

Literature Review and Hypotheses Development

Financial literature contains strong assumptions and the hypothesis transforms the understanding of economic agents concerning the reaction of the capital markets.

Empirically, several research argued regarding the efficient market hypothesis method concerning the rationality of economic agents during rare events, creating uncertainty. In economic situations such as the Asian financial, global and health crises, the efficient market hypothesis asserts that the market responds rationally and cannot generate abnormal profits.

Kan and O'Callaghan (2007) focused on the application of the efficient market hypothesis in post-crisis cases across several Asia Pacific countries, namely Korea, Taiwan, Thailand, Indonesia, Malaysia, the Philippines, Japan, Singapore, Australia, and New Zealand. The results showed that the efficient market hypothesis did not hold in certain time periods, except for selected country pairs such as Korea–Indonesia, Korea–Thailand, and Taiwan–Thailand.

During the health crisis, several research examined the efficient market hypothesis in the context of the capital market. Akhtaruzzaman et al. (2020) and Corbet et al. (2020) showed a significant increase in the correlation between returns in the stock sector, and the overall market during the pandemic. Conversely, Dima et al. (2021) reported no fundamental changes in market mechanisms or investor decisions, contradicting the efficient hypothesis. Dias et al. (2020) also presented diverse confirmations regarding the efficient market hypothesis by considering conclusions from variance rank tests. The random walk hypothesis is rejected in cases of stock indices such as Dow Jones, SSE, and PSI 20. This partially rejected indices including BEL 20, CAC 40, FTSE Athex 20, and DEX 30, but accepted IBEX 35 and ISEQ. The results also showed that prices did not fully reflect available information since the changes were not independent and identical.

Herding behavior in global capital markets has been extensively studied, showing prevalent phenomenon across individuals, institutions, domestic or foreign investors. Furthermore, it targets situations where rational economic agents behave irrationally by imitating the assessments of others when making decisions. Developing countries' capital markets report significant herding behavior (Chang et al., 2000), suggesting the presence of inefficient capital markets.

In normal conditions, herding behavior has limited potential and the relevant coefficient appears insignificant in many cases for normal and asymmetric scenarios, using a dispersion method to detect activities (Shrotryia & Kalra, 2020). Even though herding behavior is observed during days of low trading volume and remains unsubstantiated, the concept is not detected during significant religious days (Ramadhan). The financial crisis of 2007-2008 reported the behavior due to increased uncertainty and information asymmetry.

The health crisis triggered by COVID-19 pandemic has impacted global stock markets, following a decline in stock indices worldwide. In these circumstances, the possibility of panic selling arises, followed by a substantial portion of economic agents. The presence of herding behavior in Australia shows that investors initially refrain from investing when facing a health crisis.

***H₁**: Higher herding behavior leads to abnormal returns in rare events*.

Research Methods

The use of time series data obtained from the Indonesia Stock Exchange and Bank Indonesia was motivated by the examination of per-period herding bias. In addition, daily data for each sector's stocks were collected, including trading volume, market capitalization, bid and ask volumes, Price to Book Value, book value, adjusted closing price, LQ45 Index, sectoral indices, and BI 7-Day Reverse Repo Rate. The research period spanned from 1997 to 2020 and the curation was performed based on sectoral classification according to the Jakarta Stock Exchange Industry Classification.

The primary model was grounded on three factors originating from Fama & French (1995) and prospect theory to uncover the presence of herding in bullish (D^U) and bearish (D^L) markets. Furthermore, interactive meetings were also held to address the research question by incorporating abnormal returns and Dawson's (2014) method was considered as follows:

$$\pi_t = \beta_0 + \beta_1 D_t^U{}_t + \beta_2 D_t^L{}_t + \beta_3 RE_t + \sum \beta_{i=4}^{9} [\, D_t^U + D_t^L][Shocks] + \beta_5 SMB_t + \beta_6 HML_t + \beta_7 SIZE_t + e_t$$

In this research, the dependent variable is abnormal return (AR) and returns of sector *i* in time *t* (R_t), is used to calculate (AR_t). Subsequently, the result is deducted by the market returns $E[R_t]$, which is the Indonesian stock market returns at time *t*, and the formula is as follows:

$$AR_t = R_t - E\left[R_{i,t}\right]$$

Herding behavior of economic agents is identified by using the formula that establishes the relationship between Cross-Sectional Absolute Deviation (CSAD) and market returns (Chang et al., 2000). The association between cross-sectional absolute deviation and market returns is quantified through regression analysis with a quadratic equation as follows:

$$CSAD_t = a_0 + a_1\left|R_{m,t}\right| + a_2 R_{m,t}^2 + e_t$$

Where:
α = Intercept variable
α1 = Linear coefficient between CSAD and market portfolio returns
α2 = Non-linear coefficient between CSAD and market portfolio returns
Rm,t = Market return in period t
et = Standard error
D_t^L = 1 if CSDA on day t is in the lowest tail of the return distribution
D_t^L = 0 otherwise
D_t^U = 1 if CSAD on day t lies in the upper tail of the return distribution
D_t^U = 0 otherwise

Results and Discussion

Descriptive Analysis

Abnormal returns, firm size, and high minus low (HML) variable show standard deviations twice the mean across the agricultural, consumer goods, financial, mining, real estate, and construction sectors. Meanwhile, herding behavior during bullish and bearish markets, as well as small minus big (SMB) variable in these sectors, falls below twice the average value. In basic and chemical sector as well as trade, service, and investment sector, firm size and HML variable exceed twice the mean. In addition, abnormal growth, herding during bullish and bearish markets, and SMB variable fall below the threshold. In infrastructure, utilities, and transportation sector, firm size, SMB, and HML show standard deviations exceeding twice the mean, while abnormal growth, as well as herding during bullish and bearish market variables fall below the threshold. Various industrial sectors report variables with standard deviations above twice the mean, such as abnormal growth and HML. Firm size and SMB remain below this threshold due to herding behavior during bullish and bearish markets.

Table 1 presents the average abnormal returns generated by agricultural sector at 0.03%, basic and chemical sector at 0.200%, consumer goods sector at 0.565%, financial sector at 0.127%, infrastructure, utilities, and transportation sector at 0.138%, mining sector at 0.211%, miscellaneous industries at -0.289%, property, real estate, and construction sector at 0.118%, and trade, services, and investment sector at 0.029%. Positive values show that these sectors are capable of generating abnormal returns, while negative values suggest a deviation from the efficient market hypothesis. These negative results are consistent with the efficient market hypothesis, where abnormal returns cannot be consistently generated. Khan et al. (2021) supported the efficient market hypothesis for the Dow Jones Sustainability Index (DJSI) but refuted the concept for the Dow Jones Islamic Market Index (DJIMI) from January 2008 to December 2017.

Herding coefficients are shown for bullish and bearish market conditions approaching zero, specifically 0.040 and 0.011 for the agricultural sector. Basic and chemical sector reported coefficients nearing zero for both market conditions, with 0.012 and 0.013 for bullish and bearish markets. Consumer goods industries showed coefficients of 0.012 and 0.043, whilefinancial sector recorded values of 0.014 and 0.011. Infrastructure, utilities, and transportation sector reported values of 0.037 and 0.011. Mining sector had coefficients of 0.013 and 0.011, while miscellaneous industries presented 0.019 and 0.010. Property, real estate, and construction sector recorded 0.046 and 0.012, while trade, services, and investment sectors reported 0.013 and 0.012. These observed values were lower compared to the values found in Spain, as reported by Blasco et al. (2010).

Table 1 Summary Statistics

	Sector 1						Sector 2						Sector 3					
Variable	AR	D^U	D^L	Size	SMB	HML	AR	D^U	D^L	Size	SMB	HML	AR	D^U	D^L	Size	SMB	HML
Mean	0.03	0.04	0.01	-16.73	18.46	0.12	0.20	0.01	0.01	-12.83	10.57	0.24	0.57	0.02	0.04	-17.84	100.48	0.03
Std Dev	0.13	0.20	0.10	-0.91	12.91	5.33	0.33	0.12	0.12	-0.73	299.05	4.00	0.42	0.12	0.20	-0.77	28.72	2.64
	Sector 4						Sector 5						Sector 6					
Mean	0.13	0.01	0.01	-35.29	101.41	0.03	0.14	0.04	0.01	-15.96	10.37	-0.02	0.21	0.01	0.01	-13.86	36.36	0.07
Std Dev	0.21	1.12	0.10	-0.87	33.48	2.57	0.25	0.19	0.12	-1.00	500.73	3.75	0.34	0.11	0.12	-0.92	757.55	4.42
	Sector 7						Sector 8						Sector 9					
Mean	-0.29	0.02	0.01	-12.84	21.16	0.03	0.12	0.05	0.01	-26.98	53.31	0.01	0.03	0.01	0.01	-10.14	11.80	0.13
Std Dev	0.20	0.12	1.10	-0.78	613.11	4.80	0.28	0.21	0.12	-0.95	294.94	3.48	0.31	0.11	0.12	-4.49	109.63	3.29

Note: Descriptive Statistics for Abnormal Returns (AR), Herding when bullish (D^U), Herding when bearish (D^L), firm size (SIZE), market capitalization portfolio (SMB), value-growth portfolio (HML) from 1997 to 2020.

Sector 1 (agriculture), 2 (basic and chemical industry), 3 (consumer goods industry), 4 (finance), 5 (infrastructure, utilities, and transportation), 6 (mining), 7 (miscellaneous industries), 8 (property, real estate, and construction), and 9 (trade, services, and investment).

Table 2 Regression Analysis

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7	Sector 8	Sector 9
D^U	1.183**	4.079**	5.245**	5.755**	0.872**	5.895**	3.507**	0.623**	3.889**
	(0.14)	(0.23)	(1.11)	(0.38)	(0.12)	(0.26)	(0.19)	(0.13)	(0.21)
D^L	-5.372**	-4.637**	-1.076*	-5.520**	-4.834**	-7.289**	-4.915**	-3.849**	-4.417**
	(0.30)	(0.23)	(0.51)	(0.39)	(0.26)	(0.28)	(0.29)	(0.31)	(0.21)
Shock$*D^U$	5.505**	0.711*	-0.583	-4.607**	4.860**	-1.259**	1.698**	4.266**	(0.45)
	(0.40)	(0.38)	(1.91)	(0.57)	(0.35)	(0.43)	(0.42)	(0.41)	(0.32)
Shock$*D^L$	-1.403**	0.574	-1.759	-3.529**	-0.637	2.399**	-0.417	-1.029*	0.22
	(0.50)	(0.35)	(1.67)	(0.66)	(0.41)	(0.46)	(0.47)	(0.49)	(0.34)
Intercept	-3.056**	-2.515**	-2.355	-1.684*	-1.885**	-3.739**	-1.109*	-0.968*	-1.922**
	(0.57)	(0.49)	(3.16)	(1.00)	(0.73)	(0.53)	(0.63)	(0.55)	(0.49)
Adj R-squared	0.2246	0.2024	0.0256	0.1448	0.1684	0.2651	0.1819	0.1258	0.2203

Regression Analysis

This research focused on the interaction between shock and herding when the market is in bullish and bearish conditions, and the regression model is estimated across nine different sectors. Table 2 and column 1 reported that herding during bullish markets had a positive effect on abnormal returns in the agricultural sector (β = 1.183, SE = 0.14), basic industry and chemicals sector (β = 4.079, SE = 0.23), consumer goods sector (β = 5.245, SE = 1.11), financial sector (β = 5.755, SE = 0.38), infrastructure, utilities, and transportation sector (β = 0.872, SE = 0.12), mining sector (β = 5.895, SE = 0.26), miscellaneous industries (β = 3.507, SE = 0.19), real estate, property, and construction sector (β = 0.623, SE = 0.13), as well as trade, services, and investment sector (β = 3.889, SE = 0.21). These positive effects signify significant differences between anti-herding and herding investors. In the agricultural sector, anti-herding behavior during bearish markets increase by 1.183%, basic industry and chemicals sector increase by 4.079%, consumer goods sector increase by 5.245%, financial sector increase by 5.755%, infrastructure, utilities, and transportation sector increase by 0.872%, mining sector increase 5.895%, miscellaneous industries increased by 3.507%, real estate, property, and construction sector increase by 0.623%, and trade, services, and investment sector increase by 3.889%. This result contradicted hypothesis 1 but was consistent with Ferreruela & Mallor (2021) which observed differences between days showing positive and negative abnormal returns, or high levels of volatility. However, herding behavior can be observed in the market on days with high volatility.

The results for herding during bearish market conditions show a negative effect on abnormal returns in the agricultural sector (β = -5.372, SE = 0.30), consumer goods industry (β = -1.076, SE = 0.51), financial sector (β = -5.520, SE = 0.39), infrastructure, utilities, and transportation (β = -4.834, SE = 0.26), mining sector (β = -7.289, SE = 0.28), miscellaneous industries (β = -4.915, SE = 0.29), real estate, and construction (β = -3.849, SE = 0.31), as well as trade, services, and investment sector (β = -4.417, SE = 0.21). Specifically, herding behavior during bearish markets in the agricultural sector increased by 5.372%, while basic and chemical industries increased by 4.637%, consumer goods industry increased by 1.076%, financial sector increased by 5.520%, infrastructure, utilities, and transportation increased by 4.834%, mining sector increased by 7.289%, miscellaneous industries increased by 4.915%, real estate and construction increased by 3.849%, as well as trade, services, and investment sector increased by 4.417%. This result supported Hypothesis 1 and was consistent with Wu et al. (2020) that higher herding occurred during periods of extreme volatility and contributed to abnormal returns.

The interaction of rare events moderates the relationship between herding behavior and abnormal returns, as well as between herding behavior and abnormal returns (β = 5.505, SE = 0.40) in sectors of agriculture, basic industry, and chemicals (β = 0.711, SE = 0.38), infrastructure, utilities, and transportation (β = 4.860, SE = 0.35), miscellaneous industries (β = 1.698, SE = 0.42), and real estate and construction (β = 4.266, SE = 0.41). The interaction partially supports Hypothesis 1, showing that the positive effects of herding behavior increase during rare events. This result was consistent with Pochea (2021), which

documented strong evidence of the phenomenon during periods characterized by high sentiment.

The observed interactions in financial sector include the moderation of rare events in the relationship between herding behavior and abnormal returns. The results show that rare events also reduce the negative relationship between the two variables (β = -4.607, SE = 0.57). Similar effects are evident in mining sector with a value of β = -1.259, SE = 0.43. The adverse impact of anti-herding behavior in financial and mining sectors on abnormal returns is reduced during rare events, hence rejecting Hypothesis 1.

Table 2 shows that rare events moderate the relationship between herding when the market is in bearish and abnormal returns, while rare events weaken the negative relationship between herding when the bearish market condition and abnormal returns (β = -1.403, SE = 0.50) in the agricultural and financial sectors (β = -3.529, SE = 0.66), as well as property and construction sector (β = -1.029, SE = 0.49). This partially shows non-support for Hypothesis 1, suggesting that herding behavior in agricultural, financial, and property and construction sectors on abnormal returns decreases during rare events.

In mining sector, the moderating effect on the relationship between herding in bearish market conditions and abnormal returns differs from bullish conditions and abnormal returns in the agricultural, financial, real estate, and construction sectors. Therefore, rare events moderate the relationship between herding behavior in bearish market conditions and abnormal returns (β = 2.399, SE = 0.46). This partly shows a lack of support for Hypothesis 1, suggesting that herding behavior in the mining sector on abnormal returns increases during rare events.

Robustness Check 1: Herding (both during bullish and bearish market conditions) per event

Shocks were divided into eleven subsamples or events covering the period from 1997 to 2020 to isolate the heterogeneous effects generated by each event over the entire period. Table 3 presents herding tests for the global financial crisis in 2008, where herding during rising market conditions was positive and significant, showing anti-herding behavior. This result is consistent with the observations made by Bouri et al. (2021), showing the prevalence of anti-herding behavior across the markets, with anti-herding tendencies observed in the complete sample across all countries. Similar trends were observed during the Fukushima nuclear disaster, crude oil crisis, Black Monday in China, and COVID-19 pandemic. Furthermore, the trends were reported in 2002 due to SARS outbreak and European debt crisis. Herding behavior during rising market conditions for all sectors showed anti-herding, except for property, real estate, and construction sector. During Brexit decision event, anti-herding behavior is shown by all sectors, except for financial sector as well as infrastructure, utilities, and transportation sector. However, mining sector reported herding during rising market conditions and Brexit decision events.

Table 3 The Results of the Subsample Regression Analysis

Events	Herding	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7	Sector 8	Sector 9
Asian Financial Crisis	D^U	10.453**	11.932**	10.246**	10.252**	-1.423	-7.077**	-7.945**	-6.769**	-9.077**
		(1.01)	(0.87)	(1.05)	(1.65)	(3.8)	(0.64)	(0.5)	(0.3)	(1.76)
	D^L	-14.116**	-14.714**	-9.690**	-9.946**	11.831**	8.398**	11.897**	10.830**	10.021**
		(3.63)	(1.85)	(1.27)	(0.52)	(2.1)	(0.63)	(2.97)	(0.33)	(0.61)
Dot-Com Crash	D^U	-6.756**	0.837	-3.699**	-4.165**	4.886*	-5.828**	-3.325**	3.296**	-1.586**
		(2.55)	(0.72)	(0.46)	(0.69)	(2.37)	(0.88)	(0.49)	(0.88)	(0.5)
	D^L	11.645**	0.087	3.697**	4.126**	4.182	4.937**	2.247**	-1.432*	3.346*
		(3.72)	(0.66)	(0.33)	(0.35)	(3.89)	(0.52)	(0.51)	(0.63)	(1.68)
War Against Terror	D^U	4.086**	4.684**	-3.210**	-5.295**	0.0001	-5.434**	-2.661**	-5.136**	-1.764**
		(0.81)	(1.67)	(0.44)	(0.73)	(0.00)	(0.5)	(0.37)	(0.5)	(0.51)
	D^L	-5.078**	-2.891**	4.242**	4.733**	4.364*	8.496**	2.950**	5.695**	1.687**
		(0.87)	(0.37)	(0.58)	(0.37)	(2.25)	(0.99)	(0.34)	(0.32)	(0.45)
SARS Epidemic in 2022	D^U	10.555**	2.645**	2.893**	3.700**	7.402**	6.406**	3.202**	0.0001	1.926**
		(1.07)	(0.28)	(0.23)	(0.49)	(2.29)	(0.82)	(0.89)	(0.00)	(0.34)
	D^L	-6.672**	-4.662**	-3.050**	0.0001	0.0001	-5.177**	-3.209**	0.0001	-1.221**
		(0.64)	(0.5)	(0.36)	(0.00)	(0.00)	(0.52)	(0.75)	(0.00)	(0.25)
Global Financial Crisis	D^U	7.493**	3.297**	3.344**	4.751**	3.830**	5.424**	5.273**	3.216*	2.939**
		(0.95)	(0.25)	(0.16)	(0.19)	(0.23)	(0.27)	(0.31)	(1.34)	(0.25)
	D^L	0.0001	-3.021**	-4.331**	-3.525**	-4.376**	-4.851**	-4.998**	-50.91	-3.086**
		(0.00)	(0.19)	(1.08)	(0.5)	(0.38)	(0.34)	(0.3)	(34.7)	(0.25)
European Sovereign Debt Crisis	D^U	3.125**	3.311**	3.576**	3.446**	2.239**	3.839**	4.316**	-48.594	2.805**
		(0.36)	(0.33)	(0.26)	(0.66)	(0.35)	(0.46)	(0.46)	(33.84)	(0.54)
	D^L	-3.779**	-3.459**	-2.356**	-2.398**	-3.899**	-3.732**	-3.257**	-2.634*	-3.684**
		(0.32)	(0.42)	(0.19)	(0.21)	(0.42)	(0.47)	(0.36)	(1.41)	(0.35)
Fukushima Nuclear Disaster	D^U	4.708**	5.206**	3.504**	4.723**	2.150**	4.751**	5.494**	3.184**	3.502**
		(0.46)	(0.86)	(0.19)	(0.44)	(0.55)	(0.52)	(0.24)	(0.29)	(0.17)
	D^L	-7.159**	-6.311**	-4.669**	-5.840**	-2.129**	-6.683**	-7.469**	-5.982**	-5.474**
		(0.5)	(1.06)	(0.71)	(1.07)	(0.57)	(0.9)	(0.82)	(0.27)	(0.63)

Table 3 The Results of the Subsample Regression Analysis (cont')

Events	Herding	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7	Sector 8	Sector 9
Crude Oil Crisis	D^U	1.987**	3.226**	2.101**	1.830**	2.249**	2.814**	3.893**	1.818**	1.978**
		(0.22)	(0.46)	(0.15)	(0.35)	(0.12)	(0.23)	(0.49)	(0.28)	(0.16)
	D^L	-1.315**	-3.797**	-2.177**	-3.069**	-2.171**	-2.893**	-4.062**	-3.373**	-1.965**
		(0.17)	(0.68)	(0.35)	(0.35)	(0.16)	(0.12)	(0.65)	(0.45)	(0.2)
China's Black Monday	D^U	5.639**	2.610**	2.364**	2.298**	2.052**	1.829**	3.239**	2.601**	1.277**
		(1.39)	(0.14)	(0.14)	(0.27)	(0.14)	(0.15)	(0.31)	(0.32)	(0.21)
	D^L	-5.259**	-3.641**	-3.566**	-3.808**	-2.495**	-2.278**	-4.381**	-3.381**	-1.613**
		(0.71)	(0.54)	(0.45)	(0.83)	(0.3)	(0.36)	(0.21)	(0.29)	(0.36)
Brexit Decision	D^U	3.646**	2.581**	3.618**	0.0001	0.0001	-0.835**	6.047**	1.562**	1.381**
		(1.11)	(0.51)	(0.51)	(0.00)	(0.00)	(0.18)	(0.57)	(0.23)	(0.19)
	D^L	-2.835**	-2.016**	-2.330**	0.0001	-3.771**	-1.808**	-4.809**	-1.926**	-1.102**
		(0.49)	(0.23)	(0.19)	(0.00)	(0.51)	(0.38)	(0.65)	(0.14)	(0.13)
COVID-19	D^U	1.825***	6.898**	6.598**	5.827**	8.027**	3.357**	5.370**	4.348**	2.404**
		(0.47)	(0.95)	(1.04)	(1.31)	(1.48)	(0.23)	(1.55)	(0.94)	(0.58)
	D^L	-3.939***	-5.304**	-3.808**	-3.752**	-5.885**	-2.840**	-5.690**	-1.420*	-1.235**
		(0.39)	(0.85)	(0.29)	(0.48)	(0.53)	(0.3)	(0.53)	(0.55)	(0.24)

During the Asian monetary crisis, Dot-Com Crash, and the war against terrorism, investors showed varied reactions across different sectors. In the Asian monetary crisis, during bullish market conditions, anti-herding behavior was observed in the agricultural sector, basic and chemical industries, consumer goods industry, and financial sector. Conversely, this phenomenon was evident in the mining sector, diverse industries, property, real estate, construction, and trade, services, and investment sectors. In Dot-Com Crash, anti-herding behavior was limited to infrastructure, utilities, and transportation, as well as property, real estate, and construction sectors. During the war against terrorism, it occurred in the agricultural sector as well as basic and chemical industries. Herding behavior was also reported in the consumer goods industry, financial sector, mining sector, diverse industries, property, real estate, and construction, as well as trade, services, and investment sectors. This result was consistent with Jirasakuldech & Emekter (2020), where herding behavior occurred during extreme market movements with negative or positive returns on days characterized by high trading volumes.

Herding behavior was observed across all sectors during bearish market periods characterized by events such as the European debt crisis, the Fukushima nuclear disaster, the crude oil crisis, Black Monday in China, and COVID-19 pandemic. In the case of the global financial crisis, the phenomenon occurred in eight sectors, except for the agriculture sector, showing contrarian behavior. Similarly, during the Brexit decision event, herding behavior was prominent in eight sectors, except for financial sector, reporting contrarian behavior. During Brexit decision event, herding behavior was observed in the UK stock market (Caporale et al., 2021). This was consistent with Hasan et al. (2023), which uncovered significant evidence following the Brexit vote, driven by non-fundamental information during negative market conditions across Asia-Pacific, Latin, and European countries. In the case of the 2002 SARS event, herding behavior was observed during the bearish market period in agriculture, basic and chemical industries, consumer goods industries, mining, miscellaneous industries, as well as trade, services, and investment sector.

During Asian financial crisis, Dot-Com Crash, and war on terror, investors reported varying reactions across different sectors. In the Asian financial crisis, herding behavior was stated in the agriculture, basic industry and chemicals, consumer goods industry, and financial sectors, while anti-herding behavior was reported in infrastructure, utilities, transportation, mining, miscellaneous industries, property, real estate, and construction, as well as trade, services, and investment sectors. During Dot-Com Crash, herding behavior was limited to property, real estate, and construction sector, while anti-herding behavior occurred in agriculture, consumer goods industry, financial, mining, miscellaneous industries, and trade, services, and investment sectors. Herding behavior was only observed in the agriculture, as well as basic industry and chemicals sectors during the war on terror event. Conversely, anti-herding behavior was evident in the consumer goods industry, financial, infrastructure, utilities, transportation, mining, miscellaneous industries, property, real estate, construction, trade, as well as services, and investment sectors.

Robustness Check 2: Moderation Plot

According to Dawson (2014), the results of the moderation plot contribute to the precision of interpreting the coefficients significant in the interaction between the independent and moderating variables.

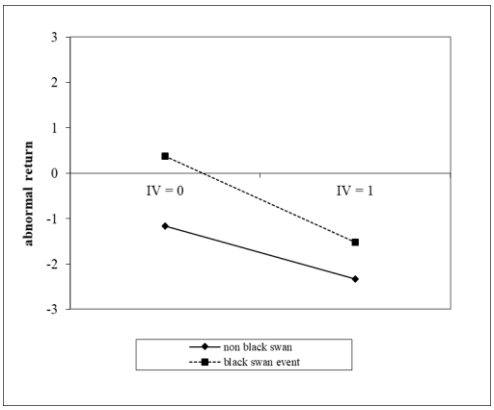

Figure 1 Interaction between bullish herding and rare events in the agricultural sector

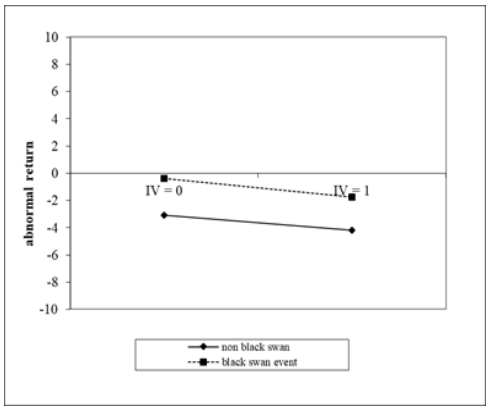

Figure 2 Interaction between bearish herding and rare events in the agricultural sector

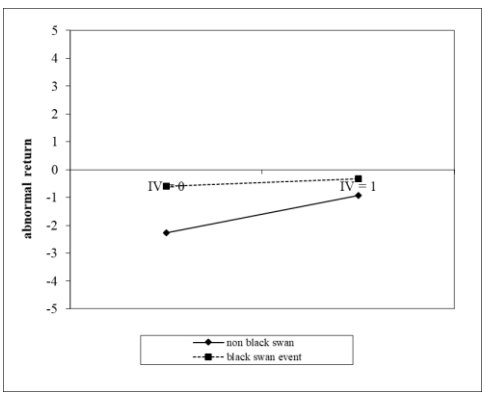

Figure 3 Interaction between bullish herding and rare events in financial sector

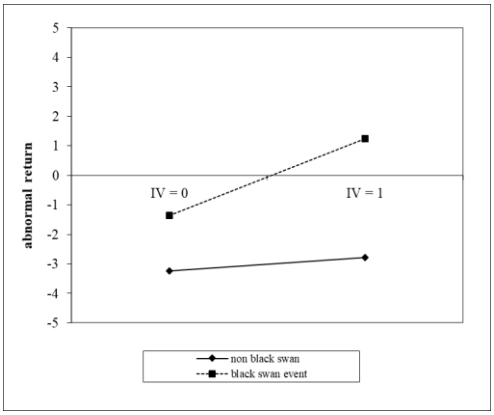

Figure 4 Interaction between bearish herding and rare events in financial sector

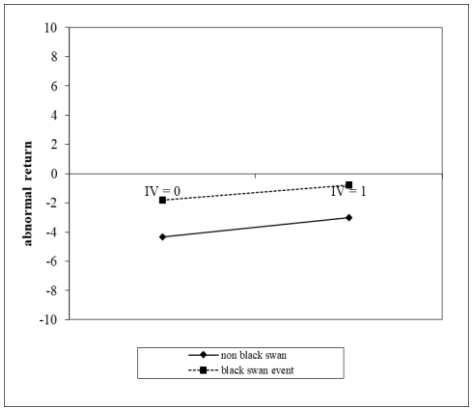

Figure 5 Interaction between bullish herding and rare events in mining sector

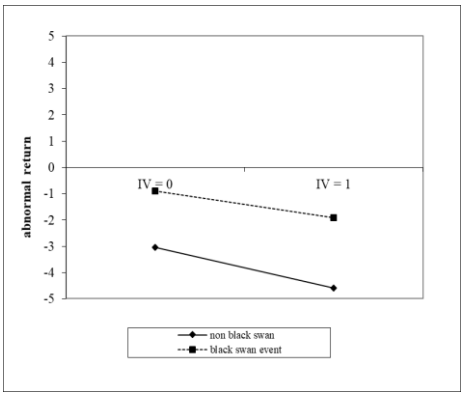

Figure 6 Interaction between bearish herding and rare events in mining sector

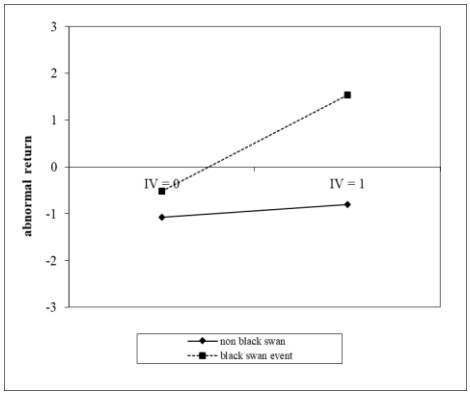

Figure 7 Interaction between bullish herding and rare events in property, real estate, and construction sector

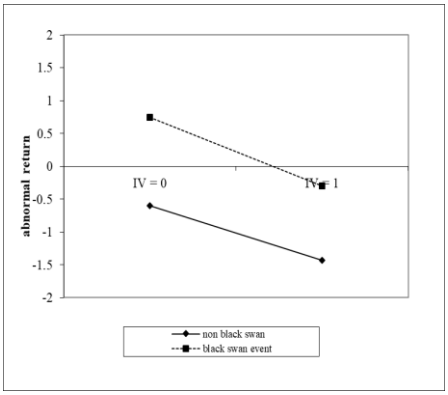

Figure 8 Interaction between bearish herding and rare events in property, real estate, and construction sector

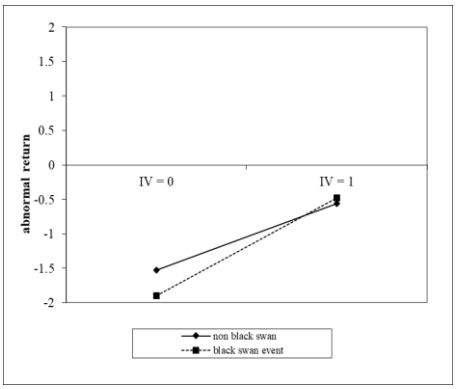

Figure 9 Interaction between bullish herding and rare events in basic and chemical sector

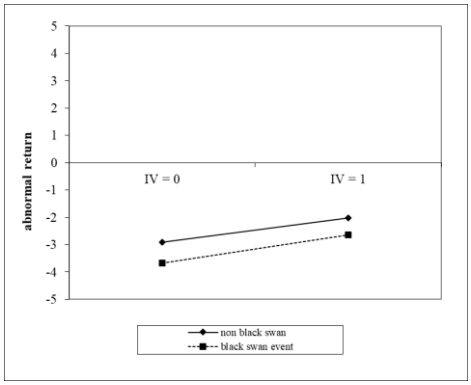

Figure 10 Interaction between bullish herding and rare events in infrastructure, utilities, and transportation sector

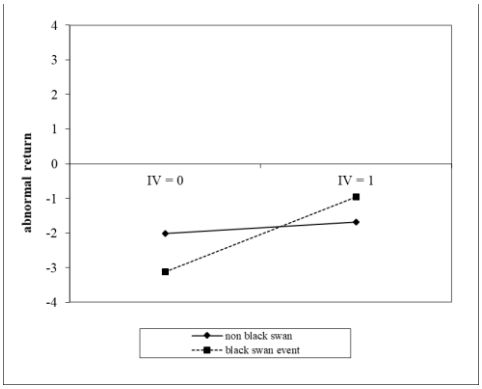

Figure 11 Interaction between bullish herding and rare events in miscellaneous industries sector

Figures 1, 6, 7, 9, 10, and 11 suggest that herding during bullish market leads to efficiency, regardless of rare events or normal market conditions. The impact of herding becomes stronger, thereby increasing abnormal returns. Figures 2, 3, 4, 5, and 8 report that herding behavior in bearish market results in efficiency, implying the absence of abnormal returns during rare events. The influence of herding during bearish markets and abnormal returns is also reduced.

Conclusion

In conclusion, this research was related to representative bias in the form of herding behavior in the Indonesian capital market, which obtained positive and negative impacts on abnormal returns. Various events resulted in differential effects on herding behavior, and the impacts also varied across sectors. For instance, herding behavior during bullish market conditions had a positive effect on abnormal returns across all sectors. During bearish market conditions, this variable had a negative effect on abnormal returns across all sectors.

The presence of significant positive herding behavior was reported in agricultural sector, basic and chemical sector, infrastructure, utilities, and transportation sector, miscellaneous industries, as well as property, real estate, and construction sector. The results showed significant negative herding in financial and mining sectors. Moreover, striking differences were also observed between bull and bear market periods, where herding behavior was reported during bear markets.

Rare events naturally created instability, uncertainty, and anxiety in financial market. An attention-grabbing method that used sensational news or information could easily capture the attention of investors in understanding extraordinary and impactful events. Investors emotionally affected by this news overreacted and gained unusual returns with rapid responses to the triggered market changes. This could lead to extremely volatile price fluctuations and provide opportunities to achieve unusual profits during periods of market volatility. Furthermore, stock market behavior during rare events impacted the economy from financial behavior perspective. External events also reported similar phenomena, with market reactions suggesting a tendency for stock markets to show greater levels of integration.

The implications of this research for investors were that rare events occurred rapidly, and had three characteristics, namely scarcity, extreme impact, and low predictability. Investors also considered rare event when making an investment decision since the variable presented different potentials and risks. A pertinent example was the contrast between the Asian monetary crisis event and COVID-19 pandemic. For instance, economic versus non-economic rare events had repercussions on the economy and financial markets. In making investment decisions, firm size during rare events should also be considered. Firm with poor corporate governance practices during adverse conditions could influence earnings quality, affecting investors. Therefore, the importance of corporate quality should be understood to consider factors related to the national and global environment, as well as corporate governance implementation, when evaluating the effectiveness of firm earnings quality in investment decisions. By considering these factors, a more holistic evaluation of earnings quality could be conducted before making better investment decisions.

The limitations of this research were primarily related to the representative bias, specifically cognitive bias. This type of bias addressed herding behavior, while various psychological biases warranted observation during event occurrences.

The subsequent limitation pertained to herding measurement referring to Chang et al. (2000) due to the aggregate nature of the available data in the Indonesian Stock Exchange database. Comprehensive micro-level data sets were not accessible but the analysis could be reevaluated when complete micro-level data become available.

The final limitation was the selection of rare events based on events from 1997 to 2020 affecting both the Indonesian and global markets. The categorization of events was stated by Taleb (2007), where the magnitude of the increase or decrease was unspecified but

the selection process had limitations. This research used secondary data, providing opportunity for future analysis to use micro-level data in other countries.

References

Akhtaruzzaman, M., Sensoy, A. & Corbet, S. (2020). The influence of Bitcoin on Portfolio Diversification and Design. *Journal Pre-proof, 37*. https://doi.org/10.1016/j.frl.2019.101344

Blasco, N., Corredor, P., & Ferreruela, S. (2013). Does herding affect volatility? Implications for the Spanish stock market. *Quantitative Finance*, *12*(2), 311-327. https://doi.org/10.1080/14697688.2010.516766

Bouri, E., Demirer, R., Gupta, R., & Nel, J. (2021). COVID-19 Pandemic and Investor Herding in International Stock Markets. *risks*, 1-11. *https://doi.org/10.3390/risks9090168*

Caporale, G. M., Alana, L. G., & Plastun, A. (2018). Is market fear persistent? A long-memory analysis. *Finance Research Letters*, 1544-6123. https://doi.org/10.1016/j.frl.2018.02.007

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*, 1651-1679. https://doi.org/10.1016/S0378-4266(99)00096-5

Chang, C. L., McAleer, M., & Wang, Y. A. (2020). Herding behaviour in energy stock markets during the Global Financial Crisis, SARS, and ongoing COVID-19. *Renewable and Sustainable Energy Reviews*, *134*, 1-15. https://doi.org/10.1016/j.rser.2020.110349

Chiang, T. C., & Zheng, D. (2010). An empirical analysis of herd behavior in global stock markets. *Journal of Banking & Finance*, *34*(8), 1911-1921. https://doi.org/10.1016/j.jbankfin.2009.12.014

Christoffersen, J., & Stæhr, S. (2019). Individual risk tolerance and herding behaviors in financial forecasts. *European Financial management*. https://doi.org/10.1111/eufm.12231

Clements, A., Hurn, S., & Shi, S. (2017). An empirical investigation of herding in the U.S. stock market. *Economic Modelling*, 184-192. https://doi.org/10.1016/j.econmod.2016.12.015

Corbet, S., Larkin, C. & Lucey, B. (2020). The contagion effects of the COVID-19 pandemic: Evidence from Gold and Cryptocurrencies. *Finance Research Letters, 35*. https://doi.org/10.1016/j.frl.2020.101554

Dawson, J. F. (2014). *Moderation in Management Research: What, Why, When, and How*. New York: Springer Science+Business Media, *29*, 1-19.

Dias, R., Teixeira, N., Machova, V., Pardal, P., Horák, J., & Vochozka, M. (2020). Random walks and market efficiency tests: evidence on US, Chinese and European capital markets within the context of the global Covid-19 pandemic. *Oeconomia Copernicana*, *11,* 585-608.

Dima, B., Dima, Ş. M., & Ioan, R. (2021). Remarks on the behaviour of financial market efficiency during the COVID-19 pandemic. The case of VIX. Finance Research Letters, *43*, 1-9. https://doi.org/10.1016/j.frl.2021.101967

Economou, F., Kostakis, A., & Philippas, N. (2011). Cross-country effects in herding behaviour: Evidence from four south European markets. *Journal of International Financial Markets, Institutions and Money*, 443-460. https://doi.org/10.1016/j.intfin.2011.01.005

Fama, E. F. & French, K. R. (1995). Size and Book-to-Market Factors in Earnings and Returns. *The Jounal Of Finance, L*(1), 131-155. https://doi.org/10.1111/j.1540-6261.1995.tb05169.x

Ferreruela, S., & Mallor, T. (2021). Herding in the bad times: The 2008 and COVID-19 crises. *North American Journal of Economics and Finance*, *58*, 1-19. https://doi.org/10.1016/j.najef.2021.101531

Guo, W., Maaitah, A., & Parhi, M. (2022). COVID-19, 'Meteor Showers' and the Dependence Structure. *Emerging Markets: Finance eJournal*, 1-50. http://dx.doi.org/10.2139/ssrn.4281334

Hasan, I., Tunaru, R., & Vioto, D. (2023). Herding behavior and systemic risk in global stock markets. *Journal of Empirical Finance*, 107-133. https://doi.org/10.1016/j.jempfin.2023.05.004

Javaira, & Hassan. (2015). An examination of herding behavior in Pakistani stock market. *International Journal of Emerging Markets*, 474 - 490. https://doi.org/10.1108/IJoEM-07-2011-0064

Jirasakuldech, B., & Emekter, R. (2020). Empirical Analysis of Investors' Herding Behaviours during the Market Structural Changes and Crisis Events: Evidence from Thailand. *Global Economic Review*, 139-168. https://doi.org/10.1080/1226508X.2020.1821746

Kan, D. & Andreosso-O'Callaghan, B. (2007). Examination of the efficient market hypothesis the case of post-crisis Asia Pacific countries. *Journal of Asian Economics, 18*(2), 294–313. https://doi.org/10.1016/j.asieco.2007.02.003

Khan, A., Khan, M. Y., Khan, A. Q., Khan, M. J., & Rahman, Z. U. (2021). Testing the weak form of efficient market hypothesis for socially responsible and Shariah indexes in the USA. *Journal of Islamic Accounting and Business Research*, *12*(5), 625-645. https://doi.org/10.1108/JIABR-02-2020-0055

Li, Z., Shi, Y., Chen, W., & Kargbo, M. (2015). Do Attention-Grabbing Stocks Attract All Investors Evidence from China. *Emerging Markets Finance and Trade*. https://doi.org/10.1080/1540496X.2014.1013856

Méndez, C. E., & Arias, J. (2021). COVID-19 effect on herding behaviour in European capital markets. *Finance Research Letters*. https://doi.org/10.1016/j.frl.2020.101787

Nguyen, Y. B., & Vo, A. K. (2023). Herding behavior before and after COVID-19 pandemic: evidence from the Vietnam stock market. *Journal of Economic Studies*, *51*(2) 357-374. https://doi.org/10.1108/JES-01-2023-0031

Pochea, M. M. (2021). Intentional and spurious herding during unconventional events and high sentiments. *SSRN*, 1-39. http://dx.doi.org/10.2139/ssrn.3948847

Salem, R. (2019). Examining the investment behavior of Arab women in the stock market. *Journal of Behavioral and Experimental Finance*, 151-160. https://doi.org/10.1016/j.jbef.2019.03.001

Shrotryia, V. K. & Kalra, H. (2020). Herding and BRICS markets: a study of distribution tails. *Review of Behavioral Finance.* https://doi.org/10.1108/RBF-04-2020-0086

Taleb, N. N. (2007). Black Swans and the Domains of Statistics. The American Statistician, *61*(3), 198-200. https://doi.org/10.1198/000313007X219996

Wu, G., Yang, B., & Zhao, N. (2020). Herding Behavior in Chinese Stock Markets during COVID-19. *Emerging Markets Finance and Trade*, *56*(16) 3578-3587. https://doi.org/10.1080/1540496X.2020.1855138