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Signal Herding on Stock Markets: Evidence from Vietnam

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SIGNAL HERDING ON THE STOCK MARKETS – EVIDENCE FROM VIETNAM

1. Introduction

This paper scrutinizes different types of herding behaviors on Vietnam's stock markets. Herd behavior refers to the inclination of investors to disregard their personal beliefs and private knowledge in favor of the prevailing market consensus while trading individual assets (Scharfstein & Stein, 1990). Extensive empirical research has examined herding behavior in various financial markets and its relationship with external factors (Galariotis et al., 2016; Nguyen & Vo, 2023). These studies analyze the herd phenomenon by employing the cross-sectional dispersion of asset returns (CSAD), yielding varying results. Scholars contemplate that herding behavior leads to market unsustainability and vulnerability. Therefore, in order to maintain the sustainable financial market, understanding factors that can lead to herding is necessary.

Most of previous studies focus on recognizing herding behavior in the market. Meanwhile, researchers suggest that, due to the high uncertainty, investment decisions in the financial market are also influenced by signals obtained from external information flows (Philippas et al., 2020). Potentially, information signals may manifest as spillovers, which subsequently transform into illogical herding behavior, serving as collective signals. This research presents an original approach in which the intensity of herding in stock market is affected by informative signals derived from convex patterns seen in external factors.

The research of the herding behavior exhibited by stock investors holds significant importance. However, the study of signal herding is neglected in the current body of knowledge. Therefore, this study contributes to the gap in the literature by studying how herding intensity in the stock market is influenced by informational signals extracted from the exogenous. In accordance with the concept of U-shaped and hill-shaped signals as described in Park and Sabourian (2011), we posit that market participants get a signal from the market when they perceive these shapes in external factors, indicating a tendency to follow the signal (signal-herding). In particular, herding amplification is observed when exogenous signals illustrate a U-shaped pattern, and herding dampening is more likely when there is hill-shaped pattern.

2. Methodology

2.1. *Variable construction*

First, we calculate cross-sectional absolute deviation (CSAD) as follows:

$$CSAD_t = \frac{\sum_{i=1}^{n}|r_{i,t}-r_{m,t}|}{n-1} \quad (1)$$

Where $r_{i,t}$ is the return of asset i at time t; $r_{m,t}$ is the market return at t, and n is the number of assets to be included in the cross-section at t.

To examine signal herding, following Philippas et al. (2020), we consider herding behavior in the presence of U-shaped, hill-shaped or either U-shaped or hill-shaped in. We construct three signal variables as follows:

$D_t^U = 1$ if there's a U-shaped signal and $D_t^U = 0$ otherwise.

$D_t^H = 1$ if there's a hill-shaped signal and $D_t^H = 0$ otherwise.

$D_t^{UH} = 1$ if there's either a U-shaped or hill-shaped signal and $D_t^{UH} = 0$ otherwise.

According to Philippas et al. (2020), an exogenous variable can manifest the following signals:

Monotonic increase: $X^{t-2} < X^{t-1} < X^t$

Monotonic decrease: $X^{t-2} > X^{t-1} > X^t$

U-shape: $X^{t-2} > X^{t-1}$ and $X^{t-1} < X^t$

Hill-shape: $X^{t-2} < X^{t-1}$ and $X^{t-1} > X^{t}$

A monotonic signal such as monotonic increase or monotonic decrease should not have any impact on herding behavior in the stock markets. On the other hand, non-monotonic signals such as U-shape or hill-shape may affect herding behavior due to the fact that they are consider as a deprivation of information. The lack of information may force investors to imitate the same acts inferred from other agents' actions (Philippas et al., 2020).

2.2. *Estimation strategy*

To test for signal herding on Vietnam's stock market, we employ the approach of Philippas et al. (2020) whereby herding intensity in stock market is influenced by informative signals extracted from convex patterns present in exogenous factors. Our estimation strategy adheres to the following steps.

First we test for the presence of unconditional herding by regressing the following model proposed by Chang et al. (2000); Chiang and Zheng (2010):

$$CSAD_t = \beta_0 + \beta_1 |r_{m,t}| + \beta_2 r_{m,t}^2 + u_t \quad (2)$$

Without herding, the CAPM model suggests that fluctuations in market returns should be linearly linked with CSAD and hence β_1 should be positive and significant. The herd behavior shadows the linear relationship between CSAD and market returns and is displayed by a negative and significant β_2.

On aggregate level, herding can be associated with a number of exogenous factors which indicate periods of market stress and increased new information flow (Galariotis et al., 2016). Therefore, in addition to unconditional herding, we also test for the possibility of conditional herding (e.g. herding conditional on a set of external factors). Derived from Philippas et al. (2020), we extend model (2) for the inclusion of different exogenous factors as follows:

$$CSAD_t = \beta_0 + \beta_1 |r_{m,t}| + \beta_2 r_{m,t}^2 + \beta_X X_t + u_t \quad (3)$$

Where X_t is the exogenous factor of interest. In the absence of herding, exogenous factors should not have any impact on CSAD and hence β_X should be statistically insignificant. On the contrary, in the presence of herding, β_X should be significant. This is the case of conditional herding where investors react to exogenous factors in a unified way.

Next we test for the existence of signal herding by incorporating signal variables (D_t^U, D_t^H and D_t^{UH}) in model (2) as proposed by Philippas et al. (2020) as follows:

$$CSAD_t = \beta_0 + \beta_1 |r_{m,t}| + \left(\beta_2 + \gamma D_t^{S(X)}\right) r_{m,t}^2 + u_t \quad (4)$$

Where $S(X)$ represents the evolution of the exogenous factor X and serves as the basis for signal extraction. In model (4), the observed signals $D_t^{S(X)}$ is endogenized in the market trading behavior. In case of herding, β_2 should be negative and significant. If signals extracted from exogenous variables manifest an influence on herding, γ should be significant. If γ is negative or in other words, the sign of γ is similar to the one of β_2, then the signals of interest enhance herding behavior in the stock market. Contrarily, a positive γ means the signals mitigating herding.

2.3. *Data*

To test for the presence of herding behavior on Vietnamese stock markets, we use daily data which covers the period from the beginning of January 2015 to the end of June 2023 collected from multiple sources. Our first set of data is stock prices of firms listed on Vietnam's stock market. This data is from Fiinpro database. Our second set of data is exogenous factors including (i) market indices, (ii) uncertainty indices, (iii) media attention indices and (iv) commodity prices. Market indices are proxied by VN-Index from Fiinpro. Uncertainty indices are represented by Equity market-related Economic Uncertainty Index from Economic Policy

Uncertainty database. Media attention indices are generated from Google Trends daily data using the query term 'chứng khoán'. Commodity prices consisting of oil and gold prices are from Finnpro. Table 1 shows the descriptive statistic results for the variables included in our regression models.

Table 1. Descriptive statistics

Variable	Obs.	Max	Min	Mean	25th	Median	75th
Panel A – Unconditional herding model							
CSAD	2,121	0.041	0.000	0.020	0.017	0.019	0.022
r_m	2,120	0.049	-0.069	0.000	-0.004	0.001	0.006
Panel B - Exogenous factors							
VN_INDEX	2,121	7.332	6.257	6.802	6.556	6.860	6.983
UNC	3,103	7.115	1.569	3.731	2.784	3.782	4.609
MEDIA	3,103	4.641	-10.486	2.794	2.736	3.523	3.938
OIL_BRENT	2,098	0.162	-0.423	0.000	-0.012	0.000	0.013
OIL_CRUDE	2,075	0.320	-0.282	0.000	-0.013	0.001	0.015
GOLD_SPOT	2,085	0.058	-0.051	0.000	-0.004	0.000	0.005
Panel C - Signal variables							
DU_VNINDEX	2,122	1.000	0.000	0.243	0.000	0.000	0.000
DH_ VNINDEX	2,122	1.000	0.000	0.242	0.000	0.000	0.000
DUH_ VNINDEX	2,122	1.000	0.000	0.485	0.000	0.000	1.000
DU_UNC	3,103	1.000	0.000	0.313	0.000	0.000	1.000
DH_UNC	3,103	1.000	0.000	0.313	0.000	0.000	1.000
DUH_UNC	3,103	1.000	0.000	0.626	0.000	1.000	1.000
DU_MEDIA	3,103	1.000	0.000	0.149	0.000	0.000	0.000
DH_MEDIA	3,103	1.000	0.000	0.149	0.000	0.000	0.000
DUH_MEDIA	3,103	1.000	0.000	0.297	0.000	0.000	1.000
DU_OIL_BRENT	2,215	1.000	0.000	0.317	0.000	0.000	1.000
DH_ OIL_BRENT	2,215	1.000	0.000	0.295	0.000	0.000	1.000
DUH_ OIL_BRENT	2,215	1.000	0.000	0.613	0.000	1.000	1.000
DU_OIL_CRUDE	2,215	1.000	0.000	0.319	0.000	0.000	1.000
DH_ OIL_CRUDE	2,215	1.000	0.000	0.292	0.000	0.000	1.000
DUH_ OIL_CRUDE	2,215	1.000	0.000	0.611	0.000	1.000	1.000
DU_GOLD_SPOT	2,215	1.000	0.000	0.328	0.000	0.000	1.000
DH_ GOLD_SPOT	2,215	1.000	0.000	0.304	0.000	0.000	1.000
DUH_ GOLD_SPOT	2,215	1.000	0.000	0.626	0.000	1.000	1.000

3. Results and Discussion

3.1. *Unconditional herding*

Table 2 presents the results for the unconditional herding model. The results show that β_2 is negative and statistically significant at 1%. The rejection of null hypothesis indicates that unconditional herding does exist in Vietnam. The presence of unconditional herding behavior on Vietnam's stock market can be justified by the characteristics of Vietnam as a frontier market.

Table 2. Unconditional herding

β_0	β_1	β_2
0.0160***	0.5308***	**-1.9361*** **
[0.0001]	[0.0228]	[0.6985]

Frontier markets are characterized by modest market capitalization, limited liquidity, and few market information sources (Mateus & Hoang, 2021). Due to the lack of information

as well as investors' limitation in information processing, investors tend to copy the others' behaviors instead of following their own strategies (Luu & Luong, 2020). Our results on unconditional herding on Vietnam's stock market is consistent with earlier studies on herding in Asian stock markets (Chang et al., 2000; Chiang & Zheng, 2010) and on herding in Vietnam (Bui et al., 2018; Luu & Luong, 2020; Vo & Phan, 2019).

3.2. *Conditional herding*

Table 3 presents the results for herding behavior conditional on multiple exogenous factors. Under the null hypothesis of no conditional herding, exogenous factors should not exert any influence on CSAD and therefore $\boldsymbol{\beta_X}$ should be insignificant.

Table 3. Conditional herding

Panel A – Market indices				
Regressor	$\boldsymbol{\beta_0}$	$\boldsymbol{\beta_1}$	$\boldsymbol{\beta_2}$	$\boldsymbol{\beta_X}$
X = [VN_INDEX]	0.0060***	0.5285***	-1.9485***	**0.0015*** **
	[0.0014]	[0.0227]	[0.6993]	[0.0002]
Panel B – Uncertainty indicator				
Regressor	$\boldsymbol{\beta_0}$	$\boldsymbol{\beta_1}$	$\boldsymbol{\beta_2}$	$\boldsymbol{\beta_X}$
X = [UNC]	0.0152***	0.5296***	-2.0139***	**0.0002*** **
	[0.0002]	[0.0225]	[0.6945]	[0.0001]
Panel C – Media attention				
Regressor	$\boldsymbol{\beta_0}$	$\boldsymbol{\beta_1}$	$\boldsymbol{\beta_2}$	$\boldsymbol{\beta_X}$
X = [MEDIA]	0.0157***	0.5318***	-2.0535***	**0.0001*** **
	[0.0001]	[0.0255]	[0.7791]	[0.0000]
Panel D – Commodities				
Regressor	$\boldsymbol{\beta_0}$	$\boldsymbol{\beta_1}$	$\boldsymbol{\beta_2}$	$\boldsymbol{\beta_X}$
X = [OIL_BRENT]	0.0160***	0.5341***	-2.0414***	-0.0009
	[0.0001]	[0.0236]	[0.7253]	[0.0022]
X = [OIL_CRUDE]	0.0160***	0.5285***	-1.9495***	-0.0014
	[0.0001]	[0.0235]	[0.7222]	[0.0022]
X = [GOLD_SPOT]	0.0160***	0.5268***	-1.8400**	-0.0017
	[0.0001]	[0.0239]	[0.7402]	[0.0078]

The results in Table 4 show that conditional herding manifests in three out of four groups of exogenous factors. Significant $\boldsymbol{\beta_X}$ coefficients describe the case where investors respond to the corresponding exogenous factors in a uniform way. In Vietnam, market indices (e.g. VN_INDEX), uncertainty indicator and media attention manifest a significant though humble positive effect on CSAD. Positive $\boldsymbol{\beta_X}$ coefficients indicate that higher market index, uncertainty or media attention increase CSAD. For factors related to commodities, all $\boldsymbol{\beta_X}$ coefficients are negative indicating a reducing impact on CSAD but this impact is not statistically significant. This finding implies that increased information flow from the fluctuations in market expectation, uncertainty and media attention does affect herding behavior on Vietnam's stock market.

3.3. *Signal herding*

Table 4 presents the results for the signal herding model. Table 4 is divided into 4 panels which show the results for signals from different exogenous factors. Table 4 – Panel A illustrates the results for the signal-herding derived from the returns on market-based index (VN-Index). The γ coefficient is statistically significant when there is a hill-shaped pattern signal observed from VN-Index, providing strong evidence in favour of signal herding. In particular, there is a dampening effect when VN-Index forms a hill-shaped pattern, alleviating

the herding behavior in the market. A hill-shaped signal is associated with a sudden market return peak, and the strength of herding is reduced in this case. Furthermore, swings in VN-Index has a hybrid influence on herding at the 5% level of significance. Therefore, we conclude that the exogenous information of the market index is endogenized in the herding behavior.

Table 4. Signal herding

Panel A					
Regressor	***Signal***	β_0	β_1	β_2	γ
X = [VN_INDEX]	U-shaped	0.0160*** (0.0001)	0.5296*** (0.0154)	-1.931*** (0.3730)	0.1827 (0.4552)
	Hill-shaped	0.0160*** (0.0001)	0.5297*** (0.0151)	-2.088*** (0.3792)	**0.7586**** (0.3556)
	Hybrid	0.0160*** (0.0001)	0.5253*** (0.0153)	-2.055*** (0.3764)	**0.6901**** (0.3167)
Panel B					
Regressor	***Signal***	β_0	β_1	β_2	γ
X = [UNC]	U-shaped	0.0160*** (0.0001)	0.5290*** (0.0152)	-2.006*** (0.3769)	0.4293 (0.3420)
	Hill-shaped	0.0160*** (0.0001)	0.5307*** (0.0152)	-1.922*** (0.4022)	-0.0292 (0.3076)
	Hybrid	0.0160*** (0.0001)	0.5307*** (0.0151)	-2.157*** (0.4265)	0.3375 (0.3169)
Panel C					
Regressor	***Signal***	β_0	β_1	β_2	γ
X = [MEDIA]	U-shaped	0.0160*** (0.0001)	0.5281*** (0.0155)	-1.7950*** (0.4094)	-0.2891 (0.3476)
	Hill-shaped	0.0160*** (0.0001)	0.5289*** (0.0152)	-1.9350*** (0.3727)	0.5008 (0.5280)
	Hybrid	0.0160*** (0.0001)	0.5305*** (0.0152)	-1.9070*** (0.4030)	-0.0593 (0.3151)
Panel D					
Regressor	***Signal***	β_0	β_1	β_2	γ
X = [OIL_BRENT]	U-shaped	0.0160*** (0.0001)	0.5269*** (0.0153)	-1.9980*** (0.3742)	**0.6306*** (0.3534)
	Hill-shaped	0.0160*** (0.0001)	0.5297*** (0.0152)	-1.9940*** (0.3777)	0.3244 (0.3434)
	Hybrid	0.0160*** (0.0001)	0.5238*** (0.0154)	-2.1380*** (0.3818)	**0.7309**** (0.3059)
X = [OIL_CRUDE]	U-shaped	0.0160*** (0.0001)	0.5284*** (0.0153)	-1.9840*** (0.3750)	0.4041 (0.3469)
	Hill-shaped	0.0160*** (0.0001)	0.5305*** (0.0151)	-1.7620*** (0.3842)	**-0.6215*** (0.3370)
	Hybrid	0.0160*** (0.0001)	0.5318*** (0.0152)	-1.8590*** (0.3918)	-0.1930 (0.3025)
X = [GOLD_SPOT]	U-shaped	0.0160*** (0.0001)	0.5293*** (0.0152)	-2.0260*** (0.3790)	0.4319 (0.3322)
	Hill-shaped	0.0160*** (0.0001)	0.5302*** (0.0153)	-1.9440*** (0.3741)	0.0927 (0.3590)
	Hybrid	0.0160*** (0.0001)	0.5266*** (0.0154)	-2.0630*** (0.3832)	0.4353 (0.3065)

According to Table 4 – Panel B, all γ coefficients are insignificant, suggesting signals extracted from uncertainty index does not significantly influence herding behavior of stock investors. The exogenous variables pertaining to the uncertainty group are not incorporated into the generation of herding behavior among stock investors. Therefore, the effect of uncertainty index is purely exogenous.

Table 4 – Panel C shows the result for signal herding from the media attention index. The results suggest that the media index provides no evidence of signal herding. Therefore, signals extracted from the demand for information are not endogenized in the herding behavior of stock investors. Generally, we conclude that the influence of media index is merely exogenous.

The findings presented in Table 4 – Panel D provide empirical support for the notion that stock investors take into account the behavior of commodities when making investment decisions, especially the information extracted from the returns of oil Brent and crude oil. U-shaped signals in oil Brent dampen herding, forming the investing strategies contradict to the market average. Furthermore, swings in oil Brent returns, whether in U-shape or hill-shape, have the hybrid effect on the herding behavior of investors. In contrast, the hill-shaped pattern in the returns of crude oil intensifies the strength of herding. During periods of declining crude oil returns, investors tend to gravitate towards the market average, as crude oil does not serve as a substitute in this scenario.

4. Conclusion

This paper takes a deeper look into herding behavior on Vietnam's stock market by analyzing different types of herding including unconditional, conditional and signal. Using daily data for the period starting from the beginning of January 2015 to the end of June 2023, the paper has found evidence for the presence of these herding types in Vietnam. First, the paper shows that unconditional herding is prevalent on Vietnam's stock markets during the research period. Second, among four types of exogenous factors, herding behaviors of investors in Vietnam are conditional on market indices, uncertainty and media attention. Third, signals extracted from the fluctuations of market indices mitigate whereas ones from commodities amplify herding.

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