ELIT
Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

For citation:

Bagh T, Khan M.A., Fenyves, V., Olah, J. (2023), "Asymmetric Effect of Investors Sentiments on Herding Behavior and Stock Returns: Pre and Post Covid-19 Analysis", *Montenegrin Journal of Economics*, Vol. 19, No. 1, pp. 43-55.

Asymmetric Effect of Investors Sentiments on Herding Behavior and Stock Returns: Pre and Post Covid-19 Analysis

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ARTICLE INFO

Received June 20, 2022
Revised from July 21, 2022
Accepted August 20, 2022
Available online January 15, 2023

JEL classification:

G15, G32, G41, D82, E44.

DOI: 10.14254/1800-5845/2023.19-1.4

Keywords:

Investors sentiments,
stock returns,
COVID-19,
herding behaviour,
S&P 500.

ABSTRACT

The study investigates the asymmetric effect of investors sentiments on herding behavior and stock returns of S&P 500 markets during pre and post covid 19. We analyze daily data from May 15, 2000 (Pre Covid) to 20 Feb 2020 and form 20 Feb to –13 May, 2022 (Post Covid). We conduct Modified multiple regression Analysis by introducing investors sentiments proxy i.e., trading volume into the Chang et al., (2000) herding model named as cross-sectional absolute deviation along with Vector Autoregressive Regression and Granger Causality tests. We establish that trading volume increases herding asymmetric. Post COVID-19 has significant negative effects on herding behaviour. The findings illustrate that COVID-19 increased herding behavior in S&P 500 markets and became more intensified during COVID-19, which contributes to accentuate and elongate it. The study also documents significant positive effect of investor sentiment on stock returns, whereas COVID-19 has negative effect on S&P 500 stock returns. We propose that investor sentiments may present extrapolative or predictive feature of herding behaviour. The study will be beneficial to shape an understanding of different dynamics associated with portfolio and market in-efficiency, trading strategies as well as risk management perspective.

INTRODUCTION

Over the years, the modeling of decision-making process and how investors behaviour patterns impact stock prices have turned out to be a challenge among stock markets players, academia and financial researchers. While efficient market hypothesis (EMH) stats that investors are fully rational, their decision

making is grounded on all available information and markets are informationally efficient. The behavioral finance theory challenged and argue that in real world market participants are not rational fully. A growing of empirical evidence that demonstrates agents are not fully rational, because they don't have the same faculty or programming in the mind to process all information in the same way, con-sequently commit systemic error, and manifested in the form of inefficient prices (Jlassi and Bensaida, 2014; and Choi and Yoon, 2020). Besides, the decisions are significantly complicated in markets with the asymmetry of the information caused by many reasons, first of all, illegal activity of economic actors (Mishchuk et al., 2018; Shkolnyk et al., 2020). The investment behaviour of markets participants' is associated with many factors such as volatile economic environment, trading behaviour of other markets players and changes in corporate values. Some authors explain changes in investment behaviour by shifts in business culture (Gao et al., 2022), including changes in stakeholders values that should be met by companies (Samoliuk et al., 2022). In the similar strain, there are various flaws and cognitive (How People think) biases, such as human errors in financial markets trading process. In this situation, sometime invertors fail to act their own information or ignore their beliefs and tend to follow market sentiments or rely profoundly on others investments actions and act to buy or sell. This is what we call herding behaviour meaning people are imitating each other.

This phenomenon was seen in financial markets for example the 2007-2008 global financial crunch and 2000-2021 IT bubble (Alexakis, 2011; Ergun and Durukan, 2017 and Zouaoui and Nouyrigat, 2011). In addition, Investors' Herding can be of two types i.e., rational or irrational herding (Alexakis, 2011). Where participants in the financial markets utilizes information about the behaviour of others participants rather than taking cues from the financial markets themselves is called rational herding (Zouaoui and Nouyrigat, 2011; Choi and Yoon, 2020). Whereas, sometime people follow the flow of market without assessing the fundamental values is termed as irrational herding (Ergun and Durukan, 2017). Numerous authors assert that based on emotions and psychological biases only the behavioral finance may perhaps put forword an adequate apprehension of one of the complex puzzles of as far as human's decision-making is concerned. In behavioral finance herding is regarded as one of the key features in eludcidating the market fantasy or bubbles because it is mostely viewed as a motivating force of bubble and price's variation or heterogeneity from its fundamental value. Moreover, in existence of (SC) social connectivity erroneous thought ,Concepets as well as beliefs can be carried particularly from one individual and generate an adding bubble as well as prime to market disruption (Jlassi and Bensaida, 2014; Grullon et al., 2005) and Dawkins, 1976). A lot of violations of EMH proposition has been reported over the past couple of years. In the paper "The end of Behavioral Finance", Thaler (1990) concludes: "*I predict that in the not-too-distant future, the term "behavioral finance" will be correctly viewed as a redundant phrase. What other kind of finance is there? In their enlightenment, economists will routinely incorporate as much "behavior" into their models as they observe in the real world. After all, to do otherwise would be irrational*". Contends that the (FM) "*financial markets are efficient and security prices fully reflect all available information at any time; and investors are rational in these efficient markets. But reality is somewhat different and investor's decisions are governed by their emotions and individual behaves irrationally because their decisions are caused by their emotions*".

Considering the aforementioned trajectory of background of the problem there is growing scholarly empirical evidence that demonstrates agents are not fully rational, because they don't have the same faculty or programming in the mind to process all information in the same way, consequently, commit systematic error, and manifested in the form of inefficient prices (Jlassi and Bensaida, 2014; Grullon et al., 2005). The volatile economic environment and fluctuations in the stock returns and cognitive basis such as herding, overconfidence, prospect theory, mental accounting, framing, investors sentiments and disposition effect the investors decision are get affected (Zouaoui and Nouyrigat, 2011; Choi and Yoon, 2020). There is sheer knowledge gap therefore We take a different approach.We link psychological research and a traditional modified basic model by conducting robust survey of herding behaviour. We introduce investors sentiments as an explanatory behavioral bias to investigate whether investors sentiments are preponderating force or factor specifically fueling herding behaviour during tranquil as well as turmoil period. As one of the utmost contagious viruses in history named as Corona Virus (Covid-19) spread with astound pace around the globe blighting millions of people in the year 2020. Above and

beyond, killing massive number of persons, the catastrophe not only exploded severe panic and chaos among them, it even affected vast businesses and stock markets around the globe.

Therefore, this study is undertaken to investigate asymmetric impact of investors sentiments on extent of herding behaviour and stock market in S&P 500 markets during spread of covid-19. This study uses daily data from May 15, 2000 –13 (Pre-Covid) and MAY, 2022 Post-Covid. We purpose that investor sentiments may present extrapolative explanatory or predictive feature of herding behaviour. We conduct Modified multiple regression Analysis (MMRA) by introducing investors sentiments proxy i.e., Trading Volume (TV) to herding model named as CSAD- cross sectional absolute deviation. We establish that Trading volume contributes in increasing herding asymmetric. Post Covid 19 pandemic has negative and statistically significant effects on herding behaviour. The current research fallouts also illustrate robust indication that Covid 19 pandemic increased herding behavior in S&P 500 markets. We find that investors herding behaviour is more intensified during Covid out-break, whichin tern contributes to accentuate as well as elongate it. The study also documents those investors sentiments has significant positive effect before covid 19 whereas covid 19 has negative effect on S& P 500 stock returns.

The first contribution of this paper is the inclusion of the asymmetric effect of Covid-19 pandemic and investors sentiment proxy (Trade Volume) on herding behavior by conducting Modified multiple regression Analysis (MMRA) to herding model named as CSAD- cross sectional absolute deviation. This paper analyzed daily time series data with covering good Spain of time data which is the second contribution.The reminder of the study is as follows: - the section 1 presents the literature reviw and formulation of hypotheses, section 2 consort with research methodology and data description, the section 3 offers the empirical results and discussion and section 4 contains the conclusion summary, policy implication, research limitations and directions for future researchers.

1. LITERATURE REVIEW

A strand of literature is replete with more empirical studies than the scholarly theoretical studies on herding behaviour because the measurement of the extent of herding behaviour in real market is difficult. So, several herding behavior measurements have been utilized in carrying out empirical studies, such as (CSAD) Cross-sectional Standard deviation, (LSV) Lakonishok Shleifer and Vishay model, (PCM) Portfolio change measure as well as (CSSA) Cross-Sectional Absolute Deviation (Ergun and Durukan, 2017; Zouaoui and Nouyrigat, 2011; and Chang et al. 2000). However, after gone over recent literature till present day, the most popular approach has been the CSAD, since other herding behaviour measurement methods based on low frequency data as well as need investor's holding information (Choi and Yoon, 2020; Chang et al. 2000; Chiang and Zheng, 2010). In context of US stock markets Christie and Huang CSSD model was used by major empirical studies to examine the investors herding behavior during market stress. The fallouts of these studies reported that there were no investors herding behavior in time of high price volatility. To that respect, Chang et al. (2000) applied the CSAD in place of the CSSD and reported that there was no herding behaviour in perspective of US, Japan and Hong Kong.

However, their research documents herding behaviour in cases of Taiwan and Koeria. Lao and Singh (2011) documented herding presence in cases of Chinese A share companies in their studies. These researchers also documented stronger herding behaviour evidences during high trading volume than down-market trading volume. To that respect Lam and Qiao (2015) established evidence of herding behaviour in case of Hong Kong's stock market. Another important study carried by Economou et al. (2015) established that herding behavior in context of Portuguese market. Moreover, in context of frontier economy like (Bangladesh, Egypt) emerging (Indonesia, Malaysia, Pakistan) and developed economies like (Morocco and Turkey) To this addition, Pochea et al. (2017) also established the herding behavior among seven countries in their analysis including, Croatia, Hungary, the Czech Republic as well as Bulgaria. On the other extreme of the strand of literature, several recent empirical studies reported the reverse he herding behaviour for instance. an important study conducted by Jlassi, and Bensaida, (2014) in order to investigate reverse herding and found that reverse herding accentuates and elongate return dispersion return dispersion above the national prices level. This infers that the investors accommodate their investment portfolios to shelter risk-less assets within high uncertainty. The IS means investors the

optimism/pessimism about the activity of future stock market (Jlassi, and Bensaida, 2014). Investors sentiments (IS) as the way investors form beliefs (Ibid.). The measurement of investors has always been thought-provoking. Baker et al. (2012) argued that investor sentiment is an important type of overconfidence bias and acting as an imperative behavioral factor in explaining investors herding behaviour (Jlassi, and Bensaida, 2014) reported that Spanish stock market to probe whether the behaviour of investors can be described by emotional factors or not by employing a popular Granger causal test, and established that herding behavior was described by past returns as well as investor sentiment. They also argued that the investor sentiment is one of the imperative factors that explaining herding behaviour. In the similar stern PH and Rishad, (2020) and Economou et al. (2018) also argued that the market sentiment is a most important factor in elucidating herding behavior.Choi and Yoon (2020) studied the linkage between herding behaviour and investors sentiments in context of Korean stock market by employing the CSAD herding technique. Through quantile regression found herding evidence and conclude that the IS are one of the imperative features that can cause herding behavior. Baker et al. (2012) developed sentiment index by considering United Kingdom, Germany, France, United States, Japan by gathering pooled data covering period from 1981 to 2006 and argued that investors can help to predict returns. Fernandes et al. (2013) used CCI to investigate the impact of IS on markets returns of Portuguese share and negative impact IS on returns.

Lemmon and Portniaguina (2006) employed CCI and indicated that individual investors incline to be uncovered to mispricing owing to sentiment. Cheema et al. (2018) conduct research in perspective of China and found positive linkage between sentiments during bubble and insignificant after bubble period. Literature is replete with many proxy measures for IS . For instance CCI (Oprea and Brad, 2014), Fear and greed index Baker and Stein (2012) and trading volume by (Jlassi, and Bensaida, 2014; Anusakumar, and Wooi, (2017).There are different proxies to be used if different proxies give fallouts (Güler, 2021). Lemmon and Portniaguina (2006) stated that in spite of its widespread appliciation in theoretical research, T.V. trading volume was only new-flanged unified measure in the APM named as asset pricing models. In addition, trading volume has complex non-linear linkage with stock prices and herding behavior is an important psychological force.

1.2 Formulation of Hypothesis

The RT-Rational theory assumes that there is linear association between dispersion of Stock & returns. But, if investors imitate (herd) each other, then (SR) stock returns would not diverge in a significant manner from (MR) market return. So, we should in turn observe a decline as far as the dispersion level in the period of economic turmoil is concerned (Jlassi, and Bensaida, 2014). Under CAPM theorem, the relationship between return dispersion of equity and market returns in considered to be linear. If herding behavior exists it would in turn imply violation of return model. The behavioral proponents argue that investors tend to follow aggregate behavior of the market behavior, by forgetting their investment strategies. Consequently, the linkage between returns of equity and market return will become non-linear (Choi et al., 2020). We proposed that IS may present extrapolative or predictive feature of herding behaviour as doumented by (Jlassi and Bensaida, 2014 and Grullon et al., 2005). A lot of violations of EMH proposition has been reported over the past couple of years Baker et al. (2012) argued that investor sentiment is an important type of overconfidence bias and acting as an imperative behavioral factor in explaining investors herding behaviour. Jlassi, and Bensaida, (2014) documented whether the behaviour of investors can be described by emotional factors or not by employing a popular Granger causal test, and established that herding behavior was described by past returns as well as investor sentiment. They also argued that the investor sentiment is one of the imperative factors that explaining herding behaviour. In the similar stern et al. (2018) also argued that the market sentiment is a most important factor.

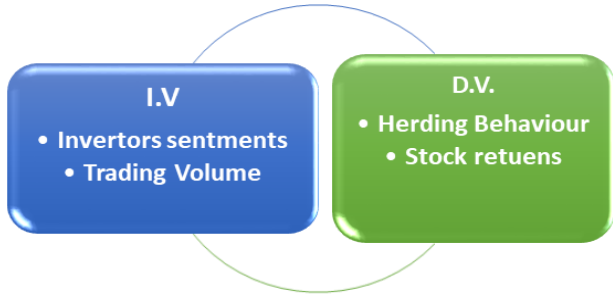

Figure 1. Conceptual Framework _investors sentiments herding behavior and stock returns

Source: authors conceptualization

Hypotheis of the study are outlined below:

H1: *There is significant asymmetric association between investor sentiments and herding behaviour during tranquil period* (before Covid 19 Pandemic).

H2: *There is significant asymmetric association between investor sentiments and herding behaviour during turmoil period* (after Covid 19 Pandemic).

H3: *There is significant asymmetric association between investor sentiments and stock returns during tranquil period* (before Covid 19 Pandemic).

H4: *There is significant asymmetric association between Stock returns and herding behaviour during turmoil period* (after Covid 19 Pandemic).

2. METHODOLOGICAL APPROACH

The study investigated the asymmetric effect of investors sentiments on herding behavior and stock returns of S&P 500 markets during pre and post covid 19 pandemics.

2.1 Study Population, Sample and data collection

The population of the study was companies listed on US stock exchange. We analyzed daily data from May 15, 2000 (Pre Covid) to 20 Feb 2020 and form 20 Feb to –13 May, 2022 (Post Covid). The Table 1 presents the Sources of Data collection.

Table 1. Data Streams and Sources of Data collection

S.No.	*Data streams and Sources*
1	https://www.investing.com/
2	https://tradingeconomics.com/
3	https://www.spglobal.com/spdji/en/indices/equity/sp-500/#overview).
4	https://finance.yahoo.com/
5	https://finance.yahhttps//finance.yahoo.com/,https://www.thomsonreuters.com/en.html,
6	https://www.investopedia.com/terms/s/sp500.asp

2.2 Variable Description Measurement and Econometrics Modeling

We used equation 1 to calculate stock returns as used (Jlassi and Bensaida, 2014; Anusakumar, and Wooi, 2017).

Equation 1. Rm, t=100*(log (Pt)-(log (Pt-1)

Where Rm, t= returns, t=at time, Pt =Closing individual stock daily price prices, P t-1= Price of individual stocks at the end of the previous month. In order to maintain a consistent proxy measure of investor sentiment across markets a proxy measure of IS' we took into consideration was the trading volume throughout as a measure of investors sentiments as used by (Jlassi and Bensaida, 2014; Anusakumar, and Wooi, 2017). Based on logarithmic this study utilized following formula as used by (Jlassi, and Bensaida, 2014; PH and Rishad, 2020 and Güler, 2021).

Equation 2. IS_TVm, t=log (IS_TVm, t)-log (IS_TVm, t-1)

Where, IS_VO represents investors sentiments measured through Trading volume, t is the daily IS_TV scaled by market capitalization. Formal CSADt (Chang et al., 2000) equation as under:

Equation 3. $CSADt=\alpha+\Upsilon_1 |Rm, t|+\Upsilon_2 R^2 m, t+\varepsilon_t$

In equation 3, Rm, t = is the average market return of a cross section of all firms' stocks at time t, |Rm, t|= absolute term (of a cross section of all firms' stocks at time t), R2m, t= is the non-linear term (to capture investors herding behavior), ϒ=coefficient, εt= error term. If the ϒ2 (coefficient) is negative and statistically significant, this suggests that herding behavior exists in stock market. If ϒ2 (coefficient) is positive and statically significant, this suggests that there is a reverse herding exists in the stock market. The term absolute return (Equaion 4) means the absolute gain or loss (in terms of %) an investment generates over a specific period of time (Chang et al., 2000).

Equation 4. $\mathrm{CSADt} = 1/N \sum_{I=1}^{N} |\mathrm{Ri,t} - \mathrm{Rm,t}|$

Equation 5. $\mathrm{CSADt} = \alpha + \Upsilon_1 |Rm,t| + \Upsilon_2 R^2 m,t + \Upsilon_3 |\mathrm{IS-TVm,t}| + \Upsilon_4\ S\_TV^2 m,t + \varepsilon t$

In equation 5, Rm, t = is the average market return of a cross section of all firms' stocks at time t, |Rm, t|= absolute term (of a cross section of all firms' stocks at time t), R2m, t= is the non-linear term (to capture investors herding behavior),|ϒ3IS_TVm, t| = absolute Term cross section trading volume of all firms at time t), IS_ TV 2m, t= is the non-linear term (to capture investors sentiment i.e., trading volume effect), ϒ=coefficient , εt= error term , If the ϒ2 (coefficient) is negative and statistically significant, this suggests that herding behavior exists in stock market. If ϒ2 (coefficient) is positive and statically significant, this suggests that there is a reverse herding exists in the stock market, the term absolute return means the absolute gain or loss (in terms of percentage) an investment generates over a specific period of time.

Equation 6. $\mathrm{CSADt} = \alpha + \Upsilon_1 |\mathrm{Rm,t}| + \Upsilon_2 \mathrm{R^2 m,t} + \Upsilon_3 |\mathrm{IS-TVm,t}| + \Upsilon_4\ \mathrm{S\_TV^2 m,t} + \delta_1 \mathrm{DCt} + \varepsilon t$

In equation 6, by addeding Covid 19 (DCt) as dummy variable that takes value 1 in equation 3 to capture the impact of post Covid 19 effects on herding.

2.3 Asymmetric Effect of Investor sentiment on herding behavior

Additionally, to offer robustness surveys we inspect the asymmetric effect between the variables. Ceremoniously, we determine or asses investors herding behavior across periods of (HTV) i.e., high trading volume as well as low trading volume (LTV) by considering dummy variables as used in litrature. We used top 10th percentile for abnormal (HTV) whereas for abnormal (LTV) bottom 10th percentile in line with (Jlassi, and Bensaida, 2014; Anusakumar, and Wooi, 2017). The staticically significant negative value of Υ_1 and Υ_2 parameters encapsulate the presence of investors herding and vice versa i.e,.positive & significant sign encapsulate inexistance. DCt= DCt represents Covid 19 as dummy variable that takes value 1 to capture the impact of post Covid 19 effects on herding. To do so, equation 7 and 8 have been foluulated stated as under;

Pre- Covid

Equation 7. $\mathrm{CSADt} = \alpha + \Upsilon_1 |\mathrm{Rm,t}| + \Upsilon_2 \mathrm{R^2 m,t} + \theta_1\ \mathrm{IS-TV_{high} R^2 m,t} + \theta_2 \mathrm{IS-TV_{low} R^2 m,t} + \varepsilon t$

Post Covid

Eqution 8. $\mathrm{CSADt} = \boldsymbol{\alpha} + \Upsilon_1 |\mathrm{Rm,t}| + \Upsilon_2 \mathrm{R^2 m,t} + \boldsymbol{\theta}_1 \mathrm{IS-TV_{high} R^2 m,t} + \boldsymbol{\theta}_2 \mathrm{IS-TV_{low} R^2 m,t} + \delta_1 \mathrm{DCt} + \varepsilon t$

2.4 Vector Autoregressive Regression (VAR) and Granger Causality tests

We used Vector Autoregressive Regression (VAR) and Granger Causality tests between trading Volume (TV) a measure of investors sentiments and herding. It is extensively acknowledged that the divergent in TV often precedes the change in the price of stocks. For example,HIP termed as high index prices are cause by (HTV). Yet, the extent of delay as well as the nature of linkage between the (PV) price-volume leftover. Exclusively, less is explored with regard to dual influencing linkage relaying on TV and herding as it is deducted based on return of stock (SR) dispersion (Jlassi, and Bensaida, 2014; Anusakumar, and Wooi, 2017).

Equation 9. $I: Prob\ (\ X_{t+1}\acute{O}\ l\ \Omega_t)\ \#Prob\ (\ \Omega_t - X_{t+1}\acute{O}\ l\ \ \Omega_{t+1}t - \ Y_1)$

In the equation 9, Omega (Ω), t(time), Ωt variable is the information set comprising of all the available information bot up to as well as at time t. Hence, Yt can cause Xt+1 when it keeps some of the exclusive information with regard to Xt+1. Certainly, (dummy) disiginates with symbol (X) can support to outline (Y). Moreover, if the β of the lagged difference (LD) of (X) are statistically meaningful as well as significant statistically. This study employed (GC) Granger causality equations formally as used by (Jlassi, and Bensaida, 2014; Anusakumar, and Wooi, 2017) as under.

Equation 10. $\mathrm{CSADt} = \Upsilon_1 + \sum_{\mathrm{I=1}}^{\mathrm{p}} \boldsymbol{\alpha}_{\mathrm{i}}\ \mathrm{CSAD}_{\mathrm{t-i}} + \sum_{\mathrm{J=1}}^{\mathrm{p}} ß_1\ \ \mathrm{IS\_TV}_{\mathrm{m-i=J}} + \varepsilon\mathrm{t}$

Equation 11. $\mathrm{IS\_TV\ t} = \Upsilon_1 + \sum_{\mathrm{I=1}}^{\mathrm{p}} \boldsymbol{\alpha}_{\mathrm{i}}\ \mathrm{IS\_TV}_{\mathrm{t-i}} + \sum_{\mathrm{J=1}}^{\mathrm{p}} ß_1\ \mathrm{CSSD}_{\mathrm{t=J}}\ + \varepsilon\mathrm{t}$

The restoring forces into the market equilibrium are stating in equation (10 and 11), where γ1 and 1 p is number of lags. IS_TV m-i=J as well as CSSDt=J both are corresponding lagged herding Variable (LHV) and (LTV) lagged Trading Volume. The null hypothesis is;

Equation 12. $\mathbf{H}_0: \alpha_{\mathrm{J}} = 0$

The IS_TV does not Granger-cause investors herding behaviour (P<5 %) indicate that market return may enhance herd behavior. In addition to this, "it should be emphasized that granger causality (GC) assumption i.e., 2 time series of TV and investors herding variable should be cointegrated, i.e., both variables variation's wavelengths have to be of the same order"(Jlassi, and Bensaida, 2014)

2.5 Effect of Investors Sentiments on S&P Stock Return

To analyze c effect Investors sentiments, on stock return post and pre Covid 19 pandemic, the study built following MMR model.

Equation 13. $\mathrm{Rm,t}\ = \alpha + \beta_1 \mathrm{IS\_TV}^2\mathrm{m,t} + \delta_1 \mathrm{DCt} + \varepsilon\mathrm{t}$

Equation 14. $\mathrm{Rm,t} = \alpha + \beta_1 \mathrm{IS\_TV}^2\mathrm{m,t} + + \varepsilon\mathrm{t}$

3. CONDUCTING RESEARCH AND RESULTS

3.1 Summary Statistics

The Table 2 reports the summary statistics by providing the statistical feature for returns Rm, t, (TV) and CSAD for S&P 500 markets over sample period (05/15/2000-05/13/2022). The mean return for S& P 500 companies over a period of (05/15/2000-05/13/2022) is very small (-0.482) whereas the TV have a (+) mean value (0.043) which are indicating that excessively trading by investors which further provide insights on irrational behavior. The standard deviation is larger than mean and maximum values which indicate there is a high volatility of S&P 500 market index.

Table 2. Descriptive Statistics of Investor Sentiments (Trading Volume) and CSAD

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
CSAD	5536	0.729	0.414	0.230	0.418
$R_{m,t}$	5536	-0.002	0.208	-0.782	0.213
IS-$TV_{m,t}$	5536	0.043	0.216	0.033	0.329

3.2 Normality and Stationary Test

Before proceeding further as ideally the normality test should be done as prerequisite means before undertaking a time series regression estimation. We used time series data because for this study the data collection has been done at number of specific points in time i.e., S and P 500 stocks prices. Moreover, time series can have different frequencies (Daily, weekly as well as monthly). The ADF is one of the most common statistical techniques specially when it comes to dealing with stationary time series data. The estimated statistics from ADF test whether a given time series is stationary or not are reported in table 3. It is to note that the data points are often considered as non-stationary or when they have covariance, means as well as variances that change over time and it cannot be forecasted or modeled further supposed to be unpredictable. ADF in case of -S&P 500 market Index, time series does not have a unit root because the value of p is significant at 5% confidence interval. It means data is stationary do not change overtime. Jarque-Bera test values are always positive or close to zero if not means data does not have normally distributed. The table 3 reports Jarque-Bera test statists are indicating the sample data is normally distributed and there is no issue in the data set.

Table 3. Jarque-Bera and Augmented Dickey Fuller)-S&P 500 Market Index

Variables	Jarque Bera	ADF
CSAD-Cross-sectional Absolute deviation	7804.21 ***	33.721***
$R_{m,t}$ is the average market return of a cross section of all firms' stocks at time t,	6696.123***	34.316***
IS_$TV_{m,t}$ Investors sentiments (Trading Volume)	4300.11***	30.209***

Note: *** indicates level of significance at 1%.

3.3 Modified Multiple Regression Estimation Results

Table 4. Modified Multiple Regression Estimation Results

Model 1			*Model 2*		
Effect of trading volume on herding behavior (Per-covid)			*Effect of trading volume on herding behavior (Post covid)*		
CSAD	Coef.	t-value	CSAD	Coef.	t-value
Abs_$R_{m,t}$	0.541 (0.019)	9.021	Abs_$R_{m,t}$	0.531 (0.053)	10.018
$R^2_{m,t}$	-0.431 (0.024)	-2.041	$R^2_{m,t}$	-0.046 (0.003)	-15.333
abs_IS_$TV_{m,t}$	0.052 (0.018)	2.888	abs_IS_$TV_{m,t}$	0.593 (0.016)	9.938
IS_$TV^2_{m,t}$	-0.059 (0.018)	-4.916	IS_$TV^2_{m,t}$	-0.093 (0.042)	-2.214
Cons_	0.021 (0.008)	2.625	DCt	-0.975 (0.311)	-3.136
Parametric Statistics (Normal distribution)			Constant	0.031 (0.008)	3.875

Number of obs	4952	Number of obs	816
R^2	0.141 (14.1%)	R^2	0.151 (15.1%)
Prob > F	10.103	Prob > F	12.003

Table 4 reports the equation 4 and 6 estimation results. The β (ϒ1=0.541), is positive and statistically significant at (** p<.05 and * p<.1) is singling that there is lack of compliance with or the violation of (LNC) linear regression condition and suggesting the presence of herding behavior on S&P 500 Markets. Besides, the β i.e., R^2m, t=is the non-linear term to capture investors herding behavior, (γ_2=-0.431) is also negative significant at threshold (** p<.05 and * p<.1) which significs herding on S&P markets during pre-Covid pandemic. The finding of this study confirms that the investors imitative behavior is not only present in S&P 500 markets. Hence, herding is a daily and long-lived market Participants phenomenon. The study results are in agreement with (Chang et al., 200). If the γ_2 β is negative and significant, this suggests that herding behavior exists in stock market. If γ_2 is positive and statically significant, this suggests that there is a reverse herding exists in the stock market (Chang et al., (200).The value of F-test is significant signifying precise specification of model employed with extrapolative/predictive power 14.1%. The coefficient term of (γ_3=0.052) absolute TV has positive that suggests market return (MR) dispersion upsurge with TV. Nevertheless, the β value (γ_4=-0.059) indicates this increase at a decreasing degree. The results or in consistent with (Chiang & Zheng, 2010).

Table 4 reports the results of Equation 5, over the period of 20 January 2020 to 13, May 2022 , post covid. The coefficient value (γ_5=-0.975) is negative and statistically which indicates Covid 19 effects on S&P stock herding behavior. The results also illustrate robust evidence that Covid 19 outbreak increased herding behavior in S&P 500 markets. The results are in line with (Espinosa-Méndez et al., 2021). The study outcomes of CSAD (daily cross-sectional absolute standard deviation) Eq-6 after Covid. The coefficient term of (γ_1=0.531), is positive and significant is the violation of (LNC) and signifying the evidence of herding on S&P 500 Markets. Besides, the β the non-linear term to capture investors herding behavior, (γ_2=-0.046) is also negative significant statistically at threshold (** p<.05 and * p<.1) which significs herding on S&P markets (pre-Covid pandemic). The finding of this study confirms that the investors imitative behavior is not only present in S&P 500 markets. In addition, the study results are in agreement with (Chang et al., 200). If the γ_2 (coefficient) is negative and statistically significant, this suggests that herding behavior exists in stock market. If γ_2 (coefficient) is positive and statically significant, this suggests that there is a reverse herding exists in the stock market (Chang et al., (200). The value of F-test is significant signifying precise specification of model employed with extrapolative/predictive power 14.1%. The coefficient term of (γ_3=0.593) absolute TV has positive that suggests market return (MR) dispersion upsurge with TV. Yet, the coefficient term of (γ_4=-0.093) directs this increase at a decreasing degree. The results or in consistent with (Chiang & Zheng, 2010).

3.4 Asymmetric Effect of Investor Sentiment on Herding Behavior

The table 5 reports the Equation 7 and 8 results. The empirical findings of our study corroborate modified regression results as stated in table 5 suggesting that in spite of controlling for highest as well as lowest trading days the herding in S& P 500 markets is still exits. The estimated values θ_1 and θ_2 reflects the effect of change in S&P 500 (High and low trading volume) on herding behavior. If the value of θ1 is negative and significant this infers the prevailing of herding during high market liquidity (HTV) and the same for θ_2 (LTV). Equation 8 estimated values θ_1 and θ_2 reflects the effect of change in S&P 500 (High and low trading volume) on herding behavior. If the value of θ_1 is negative and statistically significant this infers the prevailing of investors herding during (HTV) and the same as for as θ_2 (LTV) is concerned. The results of asymmetric effect of TV (investors sentiments are in agreement with volume-return equilibrium model (VREM), deposition, overconfidence models as well as information asymmetric (IA) models (Ngene and Mungai, 2022).

Table 5. Asymmetric effect of trading volume on herding behavior

Model 3			*Model 4*		
Asymmetric effect of trading volume on (Pre-Covid)			*Asymmetric effect of trading volume on (Post-Covid)*		
CSAD	Coef.	t-value	CSAD	Coef.	t-value
$Abs\_R_{m,t}$	0.5747 (0.092)	6.247	Abs_rm, t	0.673 (0.092)	7.3152
$R^2_{m,t}$	-0.523 (0.048)	-10.896	RM2m, t	-0.423 (0.051)	-8.2941
θ_1_Abs_IS_$TV_{m,t}$	-0.639 (0.125)	-5.112	θ_1_Abs_TVm, t	-0.643 (0.125)	-5.1440
θ_2_IS_$TV^2_{m,t}$	-0.317 (0.032)	3.648	θ_2_TV2m, t	-0.432 (0.091)	-4.7473
Cons_	0.225 (0.032)	-7.031	DC_t	-0.067 (0.032)	-2.0938
Parametric Statistics (Normal distribution)			Cons_	0.131 (0.032)	4.0938
Number of obs	4952		Number of obs	816	
$\theta_1 - \theta_2$	-0.322		$\theta_1 - \theta_2$	-0.211	
Adjusted R^2	0.167 (16.7%)		Adjusted R^2	0.187(18.7%)	
X^2(p-value)	23.509		X^2(p-value)	24.501	
F-test	12.191		F-test	14.101	

4.5 Vector Autoregressive Regression (VAR) and Granger Causality tests

The table 6 reports the estimated results (Eq. 10 and 11) .The empirical results (VAR) are in line with (Chuang and lee 2006*;* Jlassi, and Bensaida, 2014*)*. Here, we used the Akaike (AIC) and Schwarz (SIC) information criterions. Resultantly, we capture the effect of past one-two days log-TV on current investors herding and vice versa. We consider trading volume-investors herding linkage, 1st investors herding effect on investors sentiments proxy TV and IS proxy trading volume on investor herding. the study estimated results are meaningfull i.e., significant to one-day as well as one, two day lagged investors herding and signaling that investors herding is only influenced in S&P 500 markets by the past herding movements respectively. These empirical findings are in line with (Jlassi, and Bensaida, 2014) . Besides, these results provide insights that while the trading volumes could put forward a potential cause and it is not the prime driven factor of herding. The herding behavior is enhanced in morewhere markets are liquid, the reason behind HTV have more readily accessible financial infomation. Therefore, the investors can fetch return quicker as far as high liquid markets are concerned (Ibid.) .

In addition, Granger Causality test indicates that the IS i.e., TV Causality is driven in on sense/ direction. The estimated value of Wald_test statistics for Sand P 500 markets reject the null hypothesis means that market return (MR) dispersion (CSAD) does not granger cause TV of S&P 500 Markets since the estimated P statistics (0.031) is less than 5% threshold with significant F-Statistics value (4.883). Moreover, in accordance with VA regression test and GCT, we conclude that TV for S&P 500 markets cannot generate herding behaviour expect for the liquid markets.

Table 6. Vector Autoregressive Regression (VAC) Granger Causality tests_(GCT)

	$CSAD_t$	$IS\_TV_{,t}$
$CSAD_{t-1}$	0.732*** (-34.139)	0.421 (1.571)
$CSAD_{t-2}$	0.063 (-1.259)	-0.579** (-2.543)
$IS\_TV_{,t-1}$	0.007 (0.0431)	-0.339*** (-21.01)
$IS\_TV_{,t-2}$	(-0.005) (-0.164)	-0.212*** (-11.223)
Adjusted R^2	0.347	0.201
Statistics	71.613	65.51
Granger Causality Tests, for S&P 500 markets		
Null Hypothesis	F-Statistic	P-Value	Sig.
CSADt does not Granger Cause IS_TV m, t	4.563	0.031	***
IS_TVm, t does not Granger Cause CSADt	0.631	0.511	

Note: *** p<.01, ** p<.05, * p<.1

The study findings also suggests that investors one period herding relies on the past herding periods. The results also indicates that TV for previous two days is significant and negative. The empirical estimated values a decreasing signifying that the investor sentiments' proxy is widely explained by actual as well as past days tendency of investors herding. In addition, significant (+) and (-) linkage between investors herding d S&P 500 markets TV is highly significant indicating that investors herding can have the potential to generate (HTV). Further, (+) and significant β implying that more contemporaneous investors herding i.e., smaller CSAD will produce the HTV in S&P 500 markets in next period. The β negative value implies that 1% decrease in CSAD will cause an upsurge (accentuate) of more than 1% in the degree of TV. According to Grullon et al., (2005) under the turmoil environment, particularly during market disorder the traders have to make decision in a short time frame, resultantly they frequently fail or inapt to determine the correct fundamental value; therefore, traders elucidate the signals wrongly (RTS) relative to stock prices and they are called "Nice Traders". They are incline to go for or make irrational strategies which will further lead them towards herding and fuel the market with an abnormal accentuate TV which in turn contributes to the upsurge of increase stocks volatility.

4.6 Effect of trading volume on S&P 500 Markets returns

Table 7. Effect of trading volume on S&P 500 Markets returns

Model 5			*Model 6*		
Effect of trading volume on herding (Per-covid)			*Effect of trading volume on herding (post covid)*		
Stock return	Coef.	t-value	CSAD	Coef.	t-value
$IS\_TV^2_{m,t}$	0.174 (0.042)	2.2381	$IS\_TV^2_{m,t}$	0.094 (0.042)	2.2381
Cons_	0.031 (0.008)	3.8751	DCt	-1.065 (0.332)	-3.2078
Parametric Statistics (Normal distribution)			Constant	0.031 (1.185)	3.81029
Number of obs	4952		Number of obs	816	
R^2	0.119 (11.9%)		R^2	0.151	
Prob > F	58.003***		Prob > F	61.003***	

Note: *** p<.01, ** p<.05, * p<.1

The Table 7 reports the results of Equation 13 and 14. The term coefficient (β1 =0.094) implies that average TV has significant and positive impact on S&P 500 markets. The β_1=-1.065) is negative and significant suggests that covid 19 has significant negative impacts on S&P 500. The F-test value implies that model is correctly specified. The R^2 is explained 15.1% variability in variable stock return is due to TV and covid 19 pandemic. The Equation estimated coefficient value indicates that there is positive and significant the term coefficient (β1 =0.094) implies that average TV has significant and positive impact on average return S&P 500 markets.

CONCLUSION

This study analyzed the asymmetric effect of investors sentiments on herding behavior and stock returns of S&P 500 markets during pre and post covid 19 pandemics. We proposed that IS may present extrapolative explanatory or predictive feature of herding behaviour and tested time series daily data from May 15, 2000 (Pre Covid) –13 May, 2022 (Post Covid). We conducted (MMRA) along with Vector Autoregressive Regression and Granger Causalityby introducing investors sentiments proxy i.e., Trading Volume (T.V) into the Chang et al., (2000) herding model i.e., CSAD-.We established that TV. contributes in increasing herding asymmetric. Post Covid 19 has negative and significant effects on herding behaviour. We also found robust indication that Covid 19 increased herding behavior in S&P 500 markets. We found that herding in S&P markets is more intensified in Covid 19 period, which in turn contributes to accentuate as well as elongate it. The study also documented those IS has significant positive effect before covid 19 whereas covid 19 has negative effect on S&P 500 stock returns. This study concluded that in the period of extreme market conditions herd behavior exists. The Investors herd behavior built on market conditions and other investors decisions somewhat using their information because of heighted anxiety and fear. This study also demonstrated that sentiments of investors one of the imperative factors that could lead to investors herding behavior. So, based on study results we recommends that, the investors should be more careful to make investments decision rationally, especially where extreme market conditions and returns drop.

This paper contributes through inclusion inclusion of the asymmetric effect of Covid-19 pandemic and investors sentiment proxy (Trade Volume) on herding behavior by conducting (MMRA) to herding model. Future researchers can use alternative measures for investors sentiments, like consumer confidence index. Secondly, they can investigate the impact of macroeconomics-fundaments because herding behaviour occurs in extreme market conditions. They can also use overconfidence model and other behavioral finance basis like disposition effect, prospect theory and stock returns with updated methodology. Moreover, Future researchers may investigate the impact of investors overconfidence and loss aversion behavioral biases on economic and market performance by conducting firms level analysis (sector-wise).

FUNDING ACKNOWLEDGEMENT:

This research was supported by the János Bolyai Research Scholarship of the Hungarian Academy of Science.

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