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Herd instinct in stock markets: a perspective from the GameStop short squeeze

ABSTRACT

This study investigates herd behavior in the stock market using aggregate statistical information, emphasizing the influence of distinctive members with diverse knowledge. We investigate the herding gap among up and down markets while accounting for daily price limitations and the influence of the present economic meltdownn. We build on recent fundamental and non-fundamental herding studies and provide a strategy for examining herd behavior in diverse groups of investors. We also look at GameStop's latest short squeeze in early 2021. While not the only example of a short squeeze, this event has specific unique characteristics that make it particularly fascinating, primarily because it was orchestrated by non-institutional investors using social media sites such as Reddit. We find deliberate and robust herding even when inadvertent herding is taken into account. Our empirical findings also reveal possible within-group herding and among-group relationships between market intermediaries and noise traders.

LITERATURE REVIEW

(Evangelos, Eleftheria, & Polydoros, 2021) studies the short squeeze of the GameStop (GME) stock in early 2021. The paper studied that the short squeeze was organized by non-institutional investors through social media like Twitter, Reddit. (Evangelos, Eleftheria, & Polydoros, 2021) found that data on volume and Google searches for information can provide investors with useful information. The study gives an analysis that may be used to develop investment strategies when such situations arise in the markets, as well as some views for regulators on the influence of networks, whether social or not, on financial market stability.

(Dang & Lin, 2016) focuses on the role of idiosyncratic players with heterogeneous knowledge in herd behaviour using aggregate market data for equities. The paper examines up and down market herding asymmetry, taking into account daily price restrictions and the influence of the current financial crisis. (Dang & Lin, 2016) proposes a method for analysing the herd behaviour of distinct

groups of investors, as well as improving current tests for fundamental and non-fundamental herding. Empirical data from Vietnam's Ho Chi Minh Stock Exchange was used to that there is more herding on up days than on down days, and that the size of herding has decreased significantly since the crisis. Even when inadvertent (basic) herding is taken into account, they find significant purposeful herding. The paper's empirical findings also reveal possible within-group herding and between-group interactions in the market between arbitrageurs and noise traders.

(Burnette, 2021) highlights how the market regulator has been sluggish to oversee the use of social media and other developing technology in financial markets, a shortcoming that might sabotage efforts to resolve the GameStop case. Companies could utilise technologies to regulate social media buzz to track investment patterns. By recognising retail trader investment plans in advance, institutions can prevent unplanned market movements and better manage market investment risk. Another important conclusion from the short squeeze's occurrences was that there must be restrictions in place when it comes to unnecessary risk. The short squeeze revealed a problem: brokers were unable to protect themselves, and they were unable to collect adequate collateral to cover the deals, forcing them to cease trading on the impacted stocks. Brokerages should have rules in place to reduce the risks associated with events with high volume and high volatility.

INTRODUCTION

Scholars and politicians have listened carefully to the pursuit of consensus in the stock market. Herding occurs when a group of investors trades in the same way over time, resulting in behavioral cues that match people, which is undesirable for risk diversification. Another necessary consequence of crowd behavior when market participants tend towards market consensus is that investor trading can cause asset prices to deviate from fundamentals and assets to be valued improperly. Herding can induce investors to trade at inefficient prices, making it difficult for them to carry out diversification. As a result, it is critical for financial institutions and hastens the variability and instability of stock markets. The empirical literature on crowd behavior is generally divided into two main components.

The first strand uses precise stakeholder information to track the creation of swarms by institutional shareholders by comparing transaction patterns of certain investor groups, often fund managers. The second strand tries to leverage aggregated financial data to identify fluctuations in market consensus depending on personal investor activity. This paper falls into the second strand and tests the pursuit of market consensus, focusing on further investigating the role of unique investors with heterogeneous information. Crowd psychology literature on the stock market is extensive, but challenges remain to clarify the existence and causes of crowd behavior empirically. One of the challenges is to remove the effects of fake herds to separate and identify the actual (intentional) packs. Indistinguishable studies may overestimate the survival and intensity of livestock production. We separated and quantified parasitic and intentional propagation to solve this problem. What is GME? GME is an American retailer of video games and appliances. A company built on a network of physical stores is the largest retailer of gaming products, with over 5,000 stores worldwide. GME's profits declined primarily due to the surge in online sales. The coronavirus pandemic further lowered stock prices as people turned to online shopping amid blockades and social distance measures. Given this pessimistic outlook, hedge funds have run out of stock. Is short-term sales something new in the financial markets? What makes the GME case so unique? Short cells are not a new strategy. Many shares are sold short, with an average temporary position of about 5% of outstanding shares. In the case of GME, the ratio of sold-out shares (float short ratio) to the total number of public shares has been close to 100% since 2019 and is often above this threshold (Angel (2021)). .. Therefore, the term "short squeeze" better describes the case of GME than the term "short sale." GME is the first well-known example of many individual investors, the Reddit platform's r / Wallstreetbets community (referred to as individual investors), taking action against significant hedge funds. Small investors have opted to take a long position at GME prices, even though their fundamentals are not good and their outlook is not promising. The long position of GME's stock price is not rationally based solely on fundamentals and the company's outlook. Individual investor adjustments and short squeeze conditions have made this irrational behavior. Co-investment is an essential issue for the financial

system's stability. The increasing use of social media and internet platforms will make it easier than ever to collaborate in human history. Therefore, we investigate whether Google Search (data from Google Trends Tools) can be an important explanatory variable when analyzing GME inventory. It also tests the role of volumes in GME performance.

DATA AND METHODOLOGY

The role of herd instinct has long since been acknowledged in the GME short squeeze of early-2021. This has been modelled in previous literature using various factors such as number of tweets, short sales, and other traditional media (Umar, Gubareva, Yousaf, & Ali; 2021), analysis of textual sentiments (Long, Lucey, & Yarovaya; 2021), and more. Considering the significant effect of the volume of traders on platforms such as Reddit (r/WallStreetBets) and Twitter, we aim to analyse the herding effect via econometric tests on volume and Google searches to determine their causality on intraday GME stock performance.

We will employ 2 tests subsequently – 1) a Granger causality test between the time series data on returns, change in volume, and change in Trends index; 2) a GARCH (1,1) to model the returns. The Granger test is convenient to check for precedence between multiple sets of time-series data, while the GARCH (1,1) is used in agreement with previous literature on financial markets (Shen, Urquhart, & Wang; 2019) demonstrating that the variables are not normally distributed. Activity based on immediate Google searches is a classic indicator of herding in financial markets, and we will draw a contrast between an immediate investor response, and a one-hour delayed response.
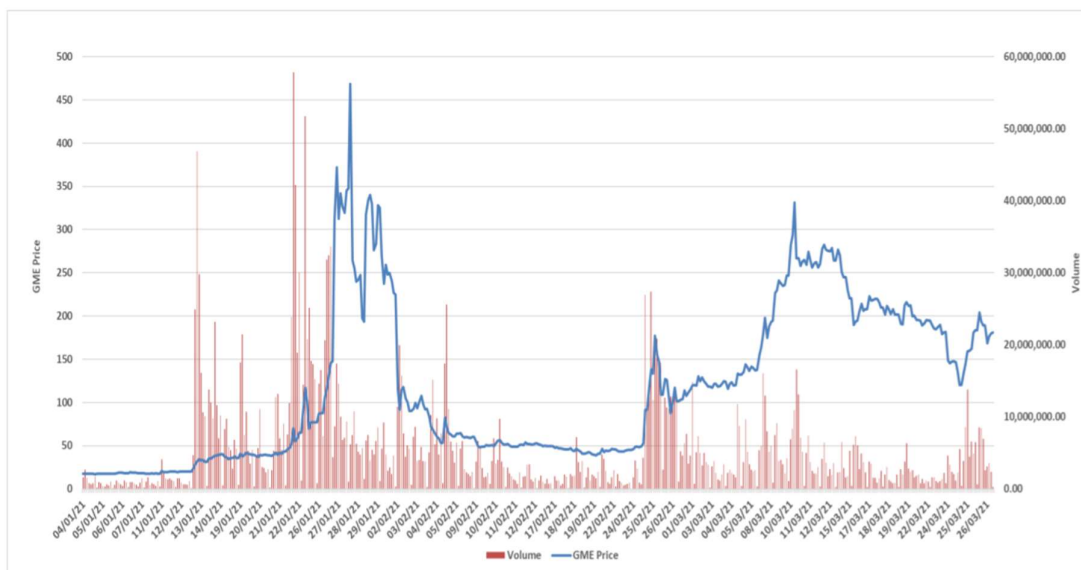
Figure: Daily Price and Volume of GME from 4/1/21 to 26/3/21. Source: Author's calculations

Day	Price (USD)	Change		Volume
		Net	%	
January 11	19.94	+2.25	+12.72%	14,927,612
January 12	19.95	+0.01	+0.05%	7,060,665
January 13	31.40	+11.45	+57.39%	144,501,736
January 14	39.91	+8.51	+27.10%	93,717,410
January 15	35.50	−4.41	−11.05%	46,866,358
January 19	39.36	+3.86	+10.87%	74,721,924
January 20	39.12	−0.24	−0.61%	33,471,789
January 21	43.03	+3.91	+9.99%	57,079,754
January 22	65.01	+21.98	+51.08%	197,157,946
January 25	76.79	+11.78	+18.12%	177,874,000
January 26	147.98	+71.19	+92.71%	178,587,974
January 27	347.51	+199.53	+134.84%	93,396,666
January 28	193.60	−153.91	−44.29%	58,815,805
January 29	325.00	+131.40	+67.87%	50,566,055
February 1	225.00	−100.00	−30.77%	37,382,152
February 2	90.00	−135.00	−60.00%	78,183,071
February 3	92.41	+2.41	+2.68%	42,698,511
February 4	53.50	−38.91	−42.11%	62,427,275
February 5	63.77	+10.27	+19.20%	81,345,013

Figure: Tracking the daily price changes over time, with respect to volume. Source: NYSE

In our study we utilise Google's Trends index with four input words: "GameStop", "Wallstreetbets", "Robinhood" and "short squeeze" over the critical period of January to March 2021. This index returns values from 0 to 100 with a higher value indicating more interest in GME.

For our statistical tests, we define the return on GameStop stock as:

$$GME\ Returns_t = \frac{Gamestop\ Price_t}{Gamestop\ Price_{t-1}} - 1$$

We use the first difference of Trends index and volume (notated as **d_Google** and **d_Volume**) since the differences influence the GME returns.

Statistic	GME Returns	d_Google	d_Volume
Mean	1.013%	0.00	-2,840.96
Median	0.040%	-0.08	-148,154.00
Maximum	109.954%	62.22	37,225,492.00
Minimum	-48.889%	-11.13	-30,961,480.00
Std. Dev.	10.807%	3.55	5,912,830.00
Skewness	3.479	11.89	0.27
Kurtosis	34.540	206.63	13.69

Table: Statistical data for GME returns, d_Google and d_Volume. Source: Author's calculations

A linear Granger test can now be run on the following equations, with an optimal lag period of 1:

$$GME\ Returns_t = c_0 + \sum_{i=1}^{n} c_{1i} GME\ returns_{t-i} + \sum_{i=1}^{m} c_{2i} X_{t-i} + \varepsilon_{1t}$$

$$X_t = d_0 + \sum_{i=1}^{n} d_{1i} GME\ Returns_{t-i} + \sum_{i=1}^{m} d_{2i} X_{t-i} + \varepsilon_{2t}$$

Here, X_t can denote either of d_Google or d_Volume. The results of the test, utilising 463 observations, are tabulated as follows:

Null Hypothesis	F-Statistic
d_Volume does not Granger Cause GME Returns	27.256 (0.000)*
GME Returns do not Granger Cause d_Volume	13.046 (0.000) *
d_Google does not Granger Cause GME Returns	9.739 (0.001)*
GME Returns do not Granger Cause d_Google	0.020 (0.889)

Table: F-statistics for Granger causality test. Indicated parantheses are P-values at 1% significance.

The above obtained results convey 2 things – firstly, there is a bidirectional causality between returns and d_Volume; and secondly, there is a unidirectional precedence from d_Google to GME returns, indicating a change in the number of Google searches reflects in the GME stock price.

The GARCH (1,1) model, with a t-distributed error term, is being utilised to model the returns because it resolves autocorrelation issues historically observed in financial market data. The equations are as follows:

$$\text{GME Returns}_t = a_0 + a_1 \times \text{d\_Google}_t + a_2 \times \text{d\_Volume}_t + \varepsilon_t$$

$$\sigma_t^2 = c + \alpha \times \varepsilon_{t-1}^2 + \beta \times \sigma_{t-1}^2$$

d_Google_t and d_Volume_t are the growth in Trends index and volume respectively at time t. α and β are the coefficients of the ARCH and GARCH terms respectively, which must each be positive and with sum less than 1. The term c here denotes the average value of volatility in the long-run.

We can also consider another equation taking a 1-hour lag on the explanatory variables into account:

$$\text{GME Returns}_t = a_0 + a_1 \times \text{d\_Google}_t + b_1 \times \text{d\_Google}_{t-1}$$
$$+ a_2 \times \text{d\_Volume}_t + b_2 \times \text{d\_Volume}_{t-1} + \varepsilon_t$$

We test this version of the model as well, since the Google Trends index can be available to users only after a lag of around one hour. The variance equation remains the same as before.

The results of the test are as follows:

	GARCH (1,1) estimation	
	Mean Equation	
	Mean Equation (without lag)	Mean Equation (with 1-hour lag on d_Google)
a_0	0.001824	0.001788
	(0.2596)	(0.2698)
a_1	0.003856	0.003664
	(0.0000)*	(0.0000)*
b_1		-0.002452
		(0.0029)*
a_2	2.84E-09	2.90E-09
	(0.0000)*	(0.0000)*
b_2		-4.78E-10
		(0.2901)
	Variance Equation	
c	0.000165	0.000182
	(0.0000)*	(0.0000)*
α	0.134421	0.135724
	(0.0000)*	(0.0000)*
β	0.849389	0.846018
	(0.0000)*	(0.0000)*

Table: GME GARCH model parameters. Parantheses indicate p-values at 1% significance.

The mean equation gives us the following inferences: 1) when Google searches increase, so does the return on GME stock, and vice versa (because a_1 is statistically significant and positive); 2) when volume increases, so do returns (because a_2 is statistically significant and positive.) These observations are consistent with previous studies (Hamid and Heiden; 2015, Vasileiou; 2020) and empirical observations, indicating that internet forum activity, publications and searches are positively correlated with GameStop returns.

Interesting inferences can be made from the 1-hour delayed equation: d_Google information that is instantly available is positively related with GME price, but when this information is lagged by an hour, it has a negative relation. Moreover, information on volume obtained one hour delayed has no significant influence on GME price. This is as per empirical findings, as volume information is typically very easy and fast to procure from markets. Both these findings demonstrate the importance of speed in beating the efficient markets hypothesis – only by acting quickly may a herding investor be able to get decent returns on GME stock.

CONCLUSION

We used hourly data from 4/1/ 2021 - 26/3/2021 to examine the short squeeze of the GameStop stock. The role of volume and the interest of investors were used to gather information regarding the GME. The use of a Google trend index with terms relative to the GME case was used to present interest in the GME quantitatively. There is empirical evidence showing strong bidirectional causality between GME trading volume and GME performance; we also find a solid one-way basis running from Google searches to GME returns. A GARCH (1,1) model is used to provide empirical evidence showing that increases in trading volume and GME Google searches have a positive and significantly significant impact on GME prices. Our dataset outlines and shows the importance of the information arrival speed. The Google index available with a 1-hour lag is also used, and the examination of this shows that this lag harms GME performance.

Platform coordination can be one of the reasons leading to instability in financial markets. With the right conditions for it (the short squeeze in the GME), a group of investors may coordinate and drive a stock to an irrationally high price. It is up to the regulators to examine how the system's financial stability is to be protected. The argument is that the short sale in stock markets can be put forward, and, in many cases, it is not irrational, but it is a market discipline tool and nothing else. For the naked short squeeze, the short sellers bear a significant risk and should, therefore, accept their losses, or the rules of short sales should be revised for the case. "Should the regulators monitor investment groups in social platforms?" is very relevant in today's world. The GME provides an example to learn from for any new day traders or anyone involved in financial markets. Policymakers should strive for a stable, transparent, and reliable financial system. In this age of social media, further research must be carried out in search of tools and mechanisms that draw information from Twitter, Google Searches, etc. This can contribute provide us with accurate estimations.

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