Has GameStop Phenomenon Violated the Efficient Market Hypothesis? Verified with T-Test

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ABSTRACT
This paper examines a query upon the GameStop Phenomenon. In the work, the reasons of why the short squeeze occurred and the fluctuations varied dramatically are explained. Due to the uncertainty of the factors leading to the shorting of GME stocks, it may violate the efficient market hypothesis, also known as the null hypothesis. Meanwhile, this may simply be due to the events led by financial analysts and investors Keith Gill and Ryan Cohen that led to the short squeeze. Therefore, if the short squeeze has indeed violated the null hypothesis, there may be other potential possibilities besides the aforesaid events that caused the short squeeze. In order to prove whether the GameStop phenomenon violated the efficient market hypothesis, the P-value was calculated using T-Test based on the daily closing price of GME stocks from January 11th to January 28th, and as a result, the null hypothesis was rejected.

Keywords: *GameStop, Short Squeeze, Wallstreet Short Selling, Stock Fluctuation*

1. INTRODUCTION

The short squeeze of GameStop quickly broke into the public vision at the beginning of 2021 and was soon to be named as the "GameStop Phenomenon." This incident initially started on the subreddit called Wall-Streeters and was led by a financial analysist and investor called Keith Gill. As his posts about the observation and analysis of the shorting stock, GME, were becoming more and more popular on those social medias, more and more people began to pay attention on this GME stock and make investments with the "instruction" of Gill. [1] However, this phenomenon was not simply series of active fluctuations but a financial revolution between the retail investor and Wall Street. The paper mainly describes the events that affect GameStop's stock price, combines with charts and verifies whether the GameStop phenomenon violates the Efficient Market Hypothesis with statistical methods.

2. BACKGROUND INFORMATION

2.1. Cause of The Short Squeeze

Since the last century, GameStop had always conducted the business model of selling game software in retail stores. But with the rapid development of technologies, companies like Xbox, PlayStation, Nintendo eShop and Steam have made their headways in developing downloadable digital games, which had brought huge pressure on GameStop's business. And the emergence of Covid-19 made it even more difficult for them. In consequence, GameStop's stock price continued to fall in the past few years and was approaching bankruptcy. At the beginning of 2017, GameStop reported a 16.4% drop in sales for the 2016 holiday season, citing a sluggish industry, aggressive promotions from competitors, and reduced in-store traffic. Meanwhile, many Wall Street firms many Wall Street firms were confident that the stock price would continue decline and eventually go bankrupt, thus, they began to short the GME stock and waited for it to go bankrupt. On Jan. 20, Citron, a prominent short seller, went public with its bet that GameStop's stock, which was trading at nearly $40 at the time, would fall to $20.

However, Keith Gill stood out from the crowd for his posts of GameStop Stock analysis on Reddit (DeepFuckingValue), YouTube and Twitter (Roaring Kitty), which has attracted enormous attention from the public and brought huge impact in the subsequent events.

He found out that GameStop's falling destiny could be changed with appropriate managements and proved that the stock of GameStop was undervalued, that the demands of physical game discs are still huge and would not subside within a short period of time. The retail investors believed in his theories and analysis made investments following him. More importantly, the short selling movement that the Wall Street was implementing on GameStop immediately caught the attention of the retail investors in Wall-Streeters. [1] Many of the retail investors who pooled their money against Wall Street had lived through the subprime mortgage crisis that was erupted in 2008. Not surprisingly, after they knew that Wall Street's motive of short selling GME stock, they were unified to begin their financial revolution, therefore, they started buying in the shares of GME in order to rise the stock price and create great loss for those Wall Street firms.

Meanwhile, Ryan Cohen, Chewy's founder, owns nearly 10 percent of GameStop through his investment firm RC Ventures LLC, had joined the board of directors of GameStop in January 2021. In a letter to GameStop's board, Cohen said that GameStop's bricks-and-mortar business model was outdated and behind the industry. He urged the company to reduce the number of brick-and-mortar stores, turn the focus on improving e-commerce and explore other technology-driven opportunities in areas such as esports, mobile gaming and game streaming. [2] This news further encouraged the retail investors and caused a sharp rise of $400 of GME stock. The dramatic change during the entire incident was not a flash in a pan. The huge fluctuation appeared repeatedly as more events and news bechance.

2.2. Data Base

Figure 1 GameStop Stock-Price Fluctuation from December 1st, 2020, to April 15th, 2021

Figure 1 shows the fluctuation of GME stock from December 1st in 2020 to April 15th in 2021. [3] The red dots point out the peak and the turning points of dates. After a series of research, four major dates were chosen (labeled): January 11st, January 22nd, January 28th, and February 25th. According to the Figure 1, the first point is a sign of rising, the third point reaches the peak, and the last point was the beginning of the second surge also called the "Gamma Swarm." [4] Nevertheless, to verify whether there were influential events happening at the corresponding time that may affect the stock to have the unexpected fluctuation, more literature reviews and data information were needed.

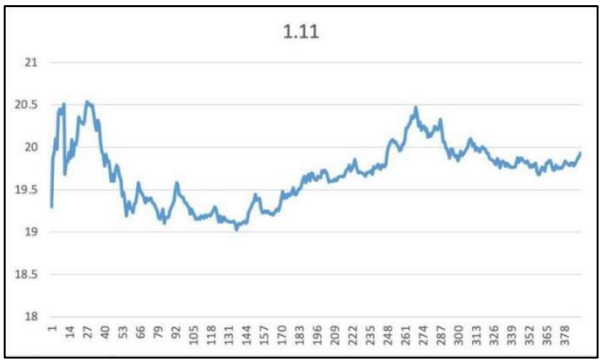

Figure 2 GameStop Stock-Price Fluctuation on January 11th, 2021

On January 11th, Ryan Cohen and two of his colleagues united the GameStop's board of directors. [2] In consequence of Cohen's former and latter achievements, dozens of the retail investors were optimistic about him and GameStop. [5] Thus, GME ushered in a drastic climb. Meanwhile, Cohen, as one of the major shareholders of GameStop, had released the letter of railing against the management pedantry and created the blueprint for the company. Overall, Cohen's convincing speech and action helped him to acquire trusts from the retail investors, which allowed GME's relatively stable stock to have surprising changes.

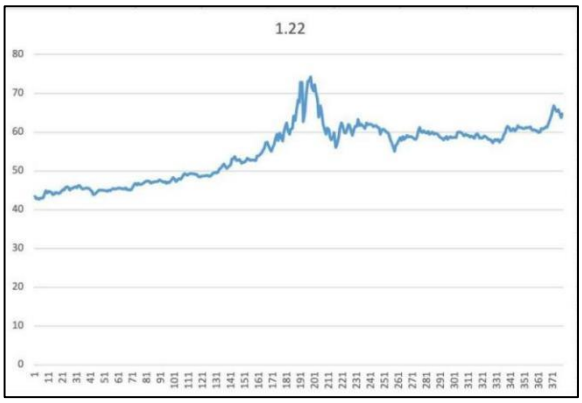

Figure 3 GameStop Stock-Price Fluctuation on January 22nd, 2021

As shown in Figure 3, on January 28th, the stock price reached the peak but followed with a slight decline. And this was caused by Robinhood's surprised restriction of transactions for certain securities to position closing only. [4] In other word, Robinhood only allowed selling the stocks but no buying the stock. Through this urgent measure, the restriction of demand for the stock caused the stock price to decrease at a terrific speed. But the stock price soon became stable again for a short period.

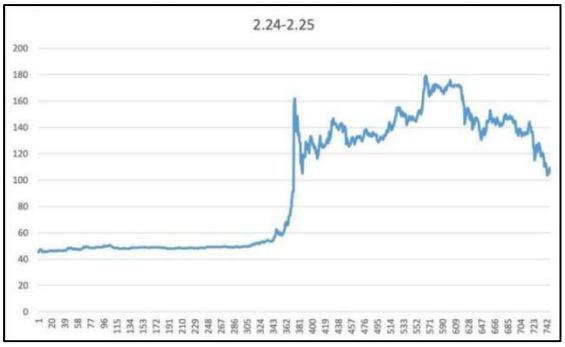

Figure 4 GameStop Stock-Price Fluctuation from February 24th to 25th, 2021

As shown in Figure 4, on February 25th, the stock appeared to have a second surge at 17:58, which was later to be called the "Gamma Swarm". People believed that the GameStop would have a bright future, and they restored the confidence. [4] There are multiple dimensions for this event. For one thing, on February 25th 2: 57 AM. Ryan Cohen tweeted a picture of a McDonald's ice-cream cone with a frog emoji. [6] And people wondered if it was an obscure message that Cohen would fix GameStop's business, like the fast-food business fixed its ice-cream machines. Also, on February 24th, GameStop announced the resignation of its CFO. Many considered this news as a great sign that RC ventures was bringing a change to the company in the aspect of trying to accelerate the shift to digital games. Due to Cohen's reappearance and the company's innovation and transformation, retail investors once again saw the company's prospects and continued to buy stocks, resulting in the stock price continuing to rise and experiencing a second surge.

2.3. Cause of The Short Squeeze

Samples of stock data from January 11 to January 28 are used to verify whether the aforesaid events are related to the fluctuations of GME stock market.

Figures 5-17 GME Stock Price from January 11 to January 28

Figure 5 GME Stock Fluctuation on Jan. 11

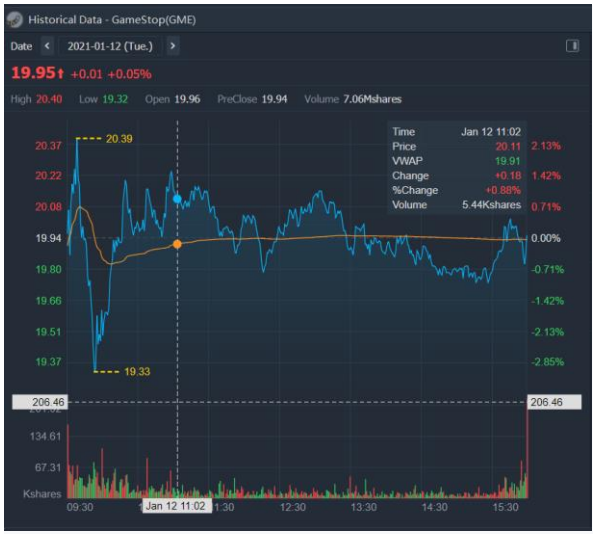

Figure 6 GME Stock Fluctuation on Jan. 12

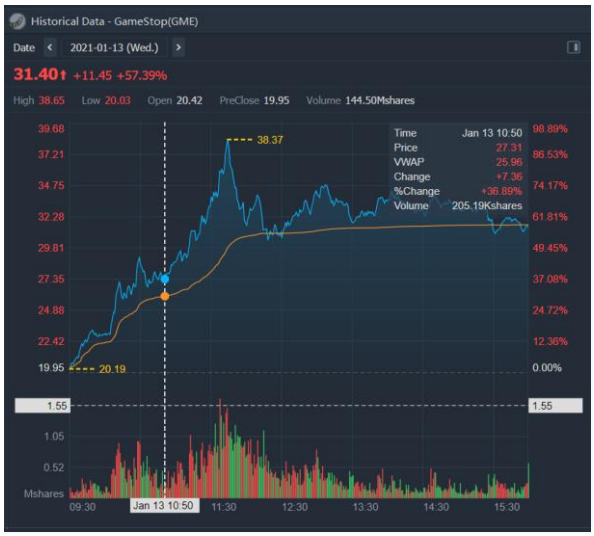

Figure 7 GME Stock Fluctuation on Jan. 13

Figure 8 GME Stock Fluctuation on Jan. 14

Figure 9 GME Stock Fluctuation on Jan. 15

Figure 10 GME Stock Fluctuation on Jan. 19

Figure 11 GME Stock Fluctuation on Jan. 20

Figure 12 GME Stock Fluctuation on Jan. 21

Figure 13 GME Stock Fluctuation on Jan. 22

Figure 14 GME Stock Fluctuation on Jan. 25

Figure 15 GME Stock Fluctuation on Jan. 26

Figure 16 GME Stock Fluctuation on Jan. 27

Figure 17 GME Stock Fluctuation on Jan. 28

T-test was used to verify, and the calculations are based on the closing prices of GME's everyday stock. Assume that the mean is equal to the closing price on day one

$$H0 = \mu 0 = 19.94$$

The alternative assumption is that the mean is not equal to the closing price on the first day.

$$Ha = \mu 0 \neq 19.94$$

With simple calculations, the average price from January 11th to January 28th was $84.5462

The sample standard deviation is 94.3868.

The sample size is equal to 13.

The significance level is equal to 0.05.

With all the information and calculations, P value resulted equal to 0.029605 (Less than the level of significance)

Figure 18 P Value Calculation on TI-nspire

Thus, this is a low probability event, and the null hypothesis is rejected and the alternative hypothesis plus was chosen.

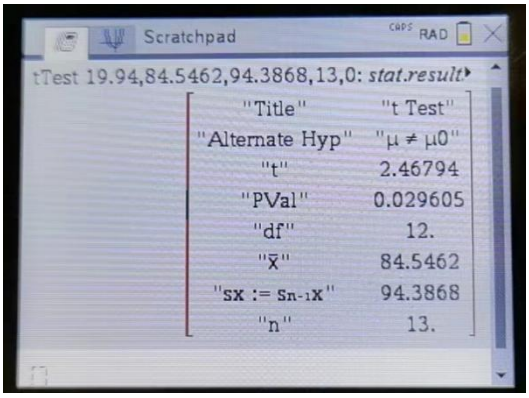

Figure 18 P Value Calculation on TI-nspire

3. CONCLUSION

Overall, with a series of examination, it is concluded that the short squeeze of GME stock has not violated the efficient market hypothesis, and thus, the factors that elicit the short squeeze can be attributed to the "signals" that was emitted primarily by Keith Gill and Ryan Cohen. While Gill's analysis gave the retail holders great insight about GameStop's prospect, Ryan Cohen had incited and attracted tons of people. The aspiration that people attached to GameStop eventually caused huge upward movement in the stock of GME, which completely surprised the Wall-Street. Soon, they started buying shares of GME to liquidate the stock, reducing their loss, which caused another rise. At the same time the evidence of Wall-Street shorting GME stock was attested. As Wall-Street has always been resented by people who endured great loss during the financial crisis, the rational stock investment soon became a "battle of justice." Retail holders are united together to stand against Wall-Street by buying GME stock, preventing GameStop to be shorted and also causing great loss for Wall-Street.

REFERENCES

[1] ColdFusion. (2021) Reddit vs Wallstreet - GameStop, The Movie. http://www.youtube.com/watch?v=YFQ-v1jCpF0. 28 Aug. 2021.
[2] Gilbert Ben. (2021) 'transformation' led by activist investor Ryan Cohen. http://www.businessinsider.com/gamestop-cfo-jim-bell-suddenly-resigning-2021-2.
[3] 3D Stats. (2021) Timelapse of GameStop Stock. http://www.youtube.com/watch?v=WhM2ZmJb8_0. Accessed 28 Aug. 2021.
[4] Calhoun George. (2021) GameStop, The Second Surge: Anatomy of A 'Gamma Swarm'. http://www.forbes.com/sites/georgecalhoun/2021/03/10/gamestop-the-second-surgeanatomy-of-a-gamma-swarm/?sh=b2f5caf42255.
[5] (2021) GameStop Short FTD Squeeze Timeline. http://www.gmetimeline.com/.
[6] Marksweny (2021) GameStop shares surge again as trading frenzy returns. http://www.theguardian.com/business/2021/feb/25/gamestop-shares-surge-more-than-100-as-trading-frenzy-returns.