CHAPTER I

INTRODUCTION

1.1 Background

For many years, GameStop stores were small havens for avid gamers. GameStop Corporation was at one point deemed the world's biggest video game retailer, its popularity gaining many investors' interest. Since the mid-2010s, however, GameStop has been seeing a steady decline in its stock value. Due to the emergence of online stores, the digitization of console games, and the company's inability to evolve to cater to their customers' needs, GameStop's annual revenues have dropped from $9.5 billion in 2012 to $6.4 billion in 2020 [1]. Online shopping is now easier than ever, and with the huge surge in Covid-19 cases, people became reluctant to go to physical stores. This decline in sales is reflected in GameStop's stock price. In April 2020, GameStop's stock price hit an all-time low of $2.57 from around $10 just one year prior [2].

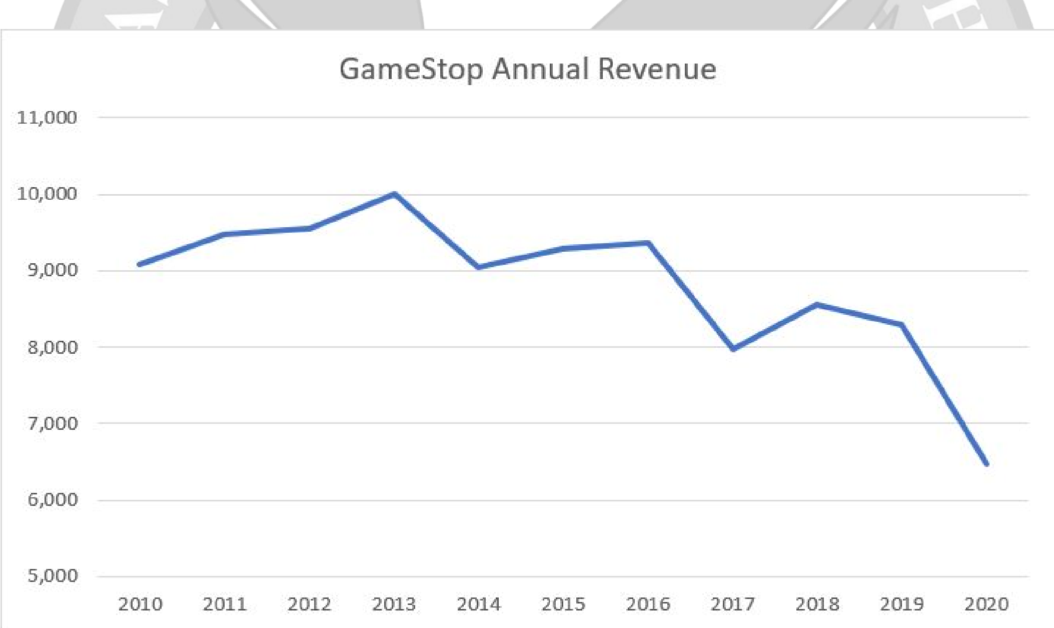

Figure 1.1: GameStop annual revenue in millions of US dollars
Source: Macrotrends [1]

While this was bad news for the shareholders, short-sellers saw this as an opportunity to make some profits. Believing online video game downloads will overtake GameStop's business model, hedge funds placed a bet against GameStop and sold their stocks short. In October 2020, 70,340,000 out of 51,030,000 public float had been sold short [3], meaning there were more stocks being short than there were stocks available.

Table 1.1: GameStop's short interest history [3]

Report Date	Total Shares Sold Short
1/29/2021	21,410,000 shares
1/15/2021	61,780,000 shares
12/31/2020	68,130,000 shares
12/15/2020	68,130,000 shares
11/30/2020	67,980,000 shares
11/15/2020	67,450,000 shares
10/30/2020	66,810,000 shares
10/15/2020	70,340,000 shares
09/30/2020	68,630,000 shares
09/15/2020	66,410,000 shares

Source: GameStop Short Interest Ratio and Short Volume [3]

Meanwhile, an online community known for discussions around high-risk stock transactions, subreddit r/wallstreetbets, discovered that GameStop Corp. was undervalued and heavily shorted. Still bitter towards Wall Street hedge funds for their role in the 2008 financial crisis, these redditors drove up the price of GameStop stocks by buying shares in large numbers, triggering a short squeeze. On January 27, 2021, the price hit an all-time high of $347.51, and Melvin Capital, one of the hedge funds that shorted massive amounts of GameStop stocks, incurred a loss of $4.5 billion in assets value [4]. Apart from GameStop, many other heavily shorted securities such as AMC Theatres, Bed Bath & Beyond, BlackBerry, Nokia, and Tootsie Roll also saw increases in prices.

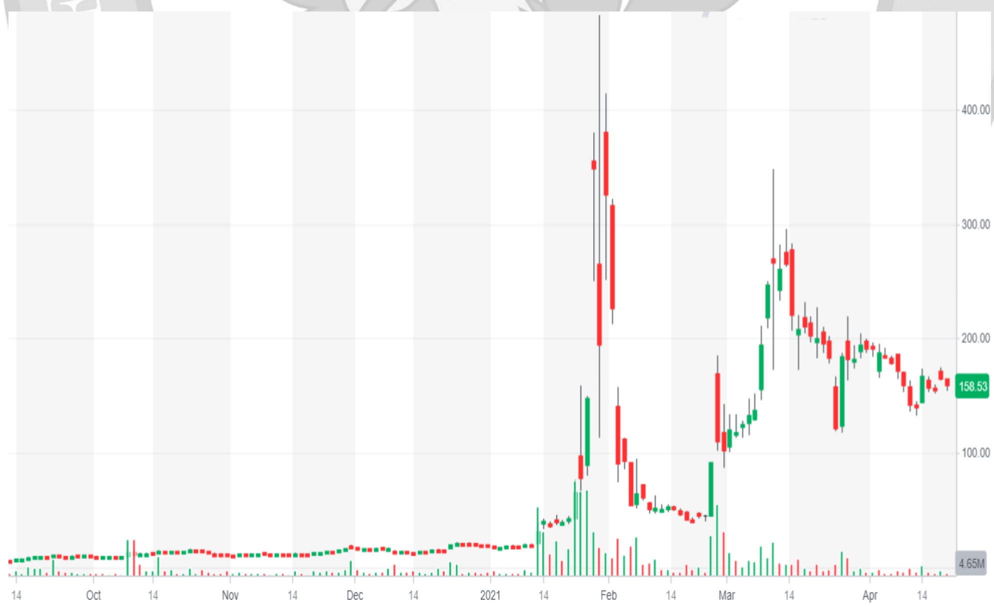

Figure 1.2: GameStop stock price history
Source: Yahoo Finance [5]

While slim, the chances of another short squeeze happening is not zero. We want to know if this event could have been predicted beforehand. Detecting the emergence of such an event early on might save investors a lot of money and give the SEC a warning of possible market manipulation. While future prices can be predicted through fundamental or technical analysis, we want to know if it is possible to detect the early onset of a squeeze using merely empirical data—the trade prices, trade volumes, and the order book of bids and asks. There has also been a conversation around another possible GameStop squeeze happening in a future date due to several catalysts. Fundamental and technical analyses are useful for identifying the forces that may cause a price to move, but they are less useful for forecasting the timing. A statistical approach, quantitative analysis, may be more effective and faster at identifying when market conditions begin to change [6]. This can give traders a time advantage to exit the short position before a squeeze happens and allow the SEC to take preventive measures if necessary.

In this thesis, five methods, three of which are traditional quantitative analysis methods, are used to try and detect an abnormal behavior in GameStop stocks using merely empirical data available online. While log-scaling daily volume of trades, graphing the intraday cumulative volume, and boxplot outlier detection method have been used widely in the past, the Coefficient of Variation Method that is based off of the regional price variation and the breakdown of the Law of One Price is a relatively new method proposed by Godfrey in 2016. Another method that is used is Simple Linear Regression with the number of tweets containing the keyword 'GameStop' as the predictor and GameStop's stock price as the outcome. This method is chosen because unlike the case of Volkswagen, the GameStop short squeeze is heavily influenced by social media posts and it is believed that there is a relationship between GameStop's popularity on social media especially Twitter and its stock price.

1.2 Problem Statement

The main problem that will be discussed in this thesis is whether or not the GameStop short squeeze could have been predicted beforehand using empirical data and how. With that being said, the specific research problems are as follows:

1. Could the GameStop short squeeze have been predicted using empirical data?
2. Which method is best at detecting the onset of a short squeeze using empirical data?

1.3 Objectives

The main objectives of this thesis are:

1. Determine whether the GameStop short squeeze could have been predicted using empirical data,
2. Determine which method is best at detecting the onset of a short squeeze using empirical data

1.4 Limitations

Several key remarks concerning the limitations of our problems to cap the complexity and focus of this thesis are as follows:

1. The trading data used in this thesis are of American and German markets, taken during trading hours. The data on extended hours are not considered.
2. All time zones are converted to Greenwich Mean Time (GMT).

1.5 Benefits

The benefits of this research can be categorized into practical and theoretical benefits.

1. Theoretical Benefit Helps future researchers to develop better indicators that can better detect abnormal market behaviors, in particular the early onset of a short squeeze.

   For further research
2. Practical Benefit

   Provides an alternative approach for stock analysts to detect abnormal market behaviors that would otherwise go undetected using technical analysis and traditional quantitative analysis. Choosing the right method can alert traders sooner to anomalous market conditions and therefore give them more time to make appropriate decisions.

1.6 Thesis Structure

The writing structure of this thesis is as detailed below.

1. Chapter I describes the background, problem statements, objectives, limitations, and benefits, both theoretical and practical, of the study.
2. Chapter II describes the theoretical framework used to support this study. This will help readers gain some preliminary knowledge required to comprehend this study.

3. Chapter III describes the data sets that will be used in this study as well as a step-by-step procedures of the methods used in order to answer the research questions.

4. Chapter IV describes the results of each method, compares, and analyzes the performances of each method.

5. Chapter V summarizes and draws conclusions from the results, and proposes ideas and improvements for further research.