Louvain School of Management

Activist short sellers: what are their performances?

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Abstract

Short selling has existed since the inception of the stock markets and has continued to develop over the years. More recently, this practice became popular following the Enron scandal in 2001 and the Great Financial Crisis of 2008. However, thanks, among other things, to the development of the media, we have seen the emergence of activist short campaigns in recent years. The objective is to publicly disclose a short selling position to convince investors that certain companies are overvalued or subject to potential fraud. Activist short selling campaigns have been multiplying since then. The objective of this paper is to evaluate the performance of these activist short sellers. To achieve this purpose, we conducted an event study on 247 companies shorted by 17 US activist short sellers between the 1st of January 2010 and the 31st of December 2020. This allowed us to analyse the abnormal returns of the companies targeted by the activists and we obtain a cumulative abnormal return of -14.82%. A classification of our shares has allowed us to find that the most successful activist campaigns are those targeting American or Asian stocks and generally having small market capitalisations. We finally completed our analysis by conducting two semi-structured interviews and one structured interview with two American activist short sellers and one European long activist.

Acknowledgements

First and foremost, I would like to sincerely thank my thesis supervisor, Professor Anh Nguyen, for his support throughout the development of this research. I would also like to thank him for his innumerable advice and insights that pushed me to improve myself.

I would then like to express my gratitude to all the interviewees who agreed to answer my questions. Their generosity and their time allowed me to bring a real added value to my thesis. Thanks to their knowledge and expertise, I was able to learn a lot about short selling.

Finally, I would like to thank my family for their immeasurable support and patience. I would also like to thank Antoine, for his patience in solving all my programming errors, his precious advice and his support. Without them, this thesis would not have been possible.

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1 | Introduction

"As of today, Citron Research will no longer be publishing what can be considered as short-selling reports (...)". This is what Andrew Left, founder and owner of the hedge fund Citron Research, said in a video posted on YouTube after his missed bet on GameStop, last January. Indeed, the practice of short selling, especially done in an activist manner, carries many risks. Nevertheless, the trend of this approach has been increasing over the past few years, especially thanks to the advent of the media. In 2019 alone, the number of campaigns increased by 18% compared to the previous year. Short selling is a practice as old as the stock market itself. It consists of selling forward a stock that you do not own, and that you have therefore had to borrow. Unlike long positions, the investor makes a profit when the stock loses value. Let's take an example. One decides to borrow a stock with a value of $100. After a while, the share price drops to $20. He will then return the stock to the borrower at its value, i.e. $20, and will therefore pocket a profit of $80. Most investors use short selling positions because they suspect that a stock is overvalued or that the company in question is susceptible to fraud and therefore try to expose them. There are two main approaches to this practice. Either the short sellers do it on their own (passive short sellers) or they decide to announce their positions publicly, which is more commonly known as activist short sellers.

We might therefore ask what the performance of those activists who have chosen to publicly disclose their short positions is, compared to discrete short sellers. This is the question that this thesis will attempt to answer, with the research question being the following: *"Activist short sellers: what are their performances?"*.

To answer this question, we will start by reviewing the literature on this topic through two main axes. First, in Chapters 2 and 3, we will focus on the practice of short selling in general and then we will narrow our research to the activist form of this practice. In Chapter 4, we will study the performance of 17 US activist short sellers on 247 stocks and aggregate our results based on the short seller, the geographic area and the market capitalisation of the shorted company. We will then complete our results with two semi-structured and one structured interview with professionals in the field. Finally, in Chapter 5, we will conclude and answer our research question as well as identifying the limitations of our work.

2 | Short Selling

2.1 Types of stock market positions

Generally, in stock markets, investors build up a portfolio of assets to increase their invested capital. The portfolio of assets is the sum of all their positions. As investors take positions in the market, it means that the investor chooses an investment direction. There are two types of market positions. The investor can expose himself to the evolution of his asset either by buying it, in a long position or by selling it, in a short position (SEC 2021).

When investors hold long positions, this implies that they buy the shares at a certain price in the hope of selling them later at a higher one. They are the owners of the shares. An investor "goes long" as he expects that the stock will appreciate. This position defines a bullish point of view. A major advantage of this type of position is that it limits the losses incurred by the investor. Indeed, the investor can lose at most the amount invested in the asset. For example, let's say that an investor would like to "go long" in the "Apple" share since he expects the share price to rise as the technology sector develops. He, therefore, decides to buy 100 shares at a price of $100. If the situation is favourable, his gain can be unlimited, if the share price continues to rise. In the opposite situation, the share could lose its value and even if it reaches very low levels, the investor will only lose the amount invested, i.e. \$100 multiplied by the number of shares (100), thus a total amount of \$10,000.

On the contrary, when we "go short", we look to benefit from a drop in the share price. We don't own the stock, we borrow it. Investors borrow a certain number of shares of a company from a broker and later sell them at the current market price. When the price falls, the investor can buy back the share at a lower price and make a profit on that difference (Reed 2013).

However, this practice is riskier and implemented by more experienced investors since it requires a technical and precise analysis of the target company and an excellent understanding of the stock markets. Through the reverse process, unlike long buyers, short sellers experience a limited gain but an unlimited loss. This concept will be further developed in the next section. These two strategies, with opposing but potentially complementary approaches, achieve different outcomes and can be combined in the investor's portfolio to create debt and hedge against potential losses. For the purpose of this thesis, we will only focus on short sales.

2.2 Origin of short selling

"Sell high today and buy low tomorrow", here is the strategy followed by short sellers. Short sellers are those who bet against the market (Bagel 2019). The practice consists of selling shares, which the investor has previously borrowed from a broker, at the current market price, in the attempt to cover the short position by buying it later at a lower price than the one at which the investor borrowed it. There are two main ways to replicate the payoff of a short position for an investor. He can either use the traditional method by borrowing shares on the stock lending market, or he can synthetically replicate this position by using derivatives contracts such as options or stock futures (CSA 2020).

We might think that short selling is a technique invented on Wall Street in line with other complex assets such as derivatives. However, the practice originated in the Netherlands in the 17th century (Shi et al. 2018). The first company to introduce short selling was The United East India Company (the Vereenigde Oostindische Compagnie) to finance the spice market in 1602. The directors set up a system where investors could buy and sell company shares among each other. This event launched the first stock market. One of the founders of the company, Isaac Le Maire, found himself in conflict with the other members, which led to a lawsuit and Mr Lemaire's exit from the company. To take his revenge, he concluded forward contracts with a diamond dealer, agreeing to sell him shares in the company within a year. If the price fell below the fixed price before the end of the year, Mr Le Maire could buy them on the market at a lower price and then make a profit by selling them back at the original price. To do this, he spread rumours about the company to drive down its share price. The shares fell, but the company took action by calling the Dutch government, which banned Le Maire's practice (O. Staley 2021). Nevertheless, the practice has continued throughout history, somehow trying to be suppressed by the authorities.

The practice of short selling became widespread in 2001, during the Enron scandal. This company, specialized in the production and transport of gas, was dismantled due to frauds and financial manipulations. It gave rise to new standards in terms of corporate governance, accounting and auditing. This event led to the growth of short selling, emphasised by the Financial Crisis of 2008. But nowadays, the increase in short selling is due to the uncertain environment in which we live. This uncertainty, combined with traditional positions, increases interest in short positions. In addition, the media, in whatever form, and especially with the advent of the Internet, have allowed short sellers to express themselves publicly without any filter, which served to popularize this trading strategy (Holmes 2002).

2.3 Mechanics of short selling

As short sellers sell shares that do not belong to them, they must find a party who would agree to lend them these specific stocks. These transactions take place in the equity lending market, which is a decentralized market in the United States. For that, the investor needs to open a margin account in the brokerage firm. Indeed, the borrower will have to pay a fee and put up collateral in that margin account in exchange for the desired shares, to act as a buffer to ensure that he is able to buy back the stock in the future. According to Regulation T, the collateral provided by the investor amounts to 150% of the size of the position, referred as the initial margin requirement (SEC 2018). This requirement is composed by the value of the shorted stock and an additional 50% of that value provided by the short seller. It is important to note that a minimum margin of 25% of the shorted share price must remain on the brokerage margin account at any point in time to keep the short position open. This requirement is known as the maintenance margin (SEC 2018).

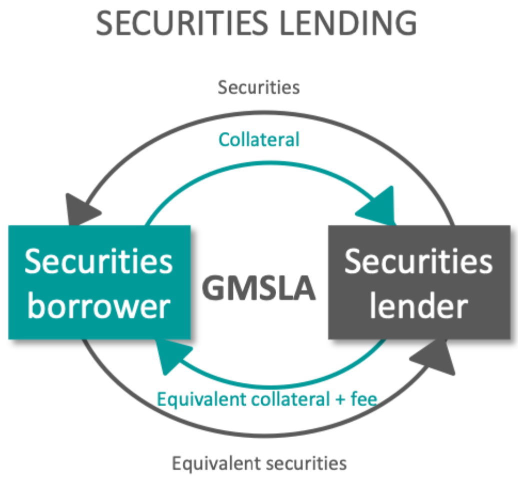

Figure 2.1: Mechanics of securities lending (ISLA 2016)

We can illustrate this process by the following example. An investor decides to place a short sale order through an online brokerage account after declaring it. On the broker's side, he will try to borrow the shares from several sources. After the stocks have been borrowed or "located" by the broker, they are sold in the market and the sale revenues are deposited in the investor's margin account. Let's suppose that a margin account has \$5,000 from the short sale of 100 shares at \$50, and more \$2,500, corresponding to 50% required as an initial margin deposit. So, the total margin requirement amounts of \$7,500. If we suppose that, after one month, the share rises to \$55, the market value is now 5,500 (because we have 100 shares of \$55). We have to compute the maintenance margin on this new value, i.e. 25% of 5,500, which means \$1,375. Our total now stands at \$6,875. As this amount does not exceed our initial value of \$7,500, no contribution is required. However, if the share increases to \$65, the maintenance margin equals \$1,625 (i.e. 25% of $6,500). The total therefore comes to $8,125, resulting in a difference of $625 compared to the initial situation. This amount must be added by the short seller if he wants to keep his position (Langager 2021).

A part of this collateral will be invested by the lenders. One part of this earned interest returns to the borrower in the form of a "rebate rate", which is determined by supply and demand in the equity lending market (Reed 2013).

Once a short seller has opened a position, the loaned share may be called back at any time by the lender. If the short seller is unable to find another lender, he is obliged to close out his position.

2.4 Advantages and disadvantages of short selling

The controversial practice of short selling has many advantages, as opposed to what many might think. In fact, one of the main benefits is that this practice contributes to the efficient treatment of information in financial markets (Jain et al. 2013). It allows adding liquidity to the market. Indeed, bringing liquidity to the market reduces the bid-ask spread and lowers the transaction costs for the investor, which increases efficiency in the financial markets (Angel and McCabe 2009). It also contributes to the price discovery process by allowing negative opinions to be reflected in the price of a security and therefore limits biased prices and overvaluation. By preventing the overvaluation of stocks, we avoid the losses of other, less-informed investors (Angel and McCabe 2009). Short sellers play an important role in detecting not only excessive prices but also fraud. The perceptions and analyses are carried out by shorts who do a lot of research, get to know the target company's customers and suppliers to get to know it as well as possible (Holmes 2002). Short selling strategies are also usually used to hedge other equities. They offer investment diversification and bearish protection in challenging market conditions, reducing overall market exposure (Strauss 2018). In summary, although this practice is often criticized, it has many advantages, such as contributing to market efficiency, providing liquidity, avoiding overvaluation of assets and being a hedging and diversification tool.

Nevertheless, playing an unusual role in the financial markets, short selling is considered unethical, risky or even speculative (K. F. Staley 1996). It is therefore essential to mention its negative aspects. Short sellers can create downward pressure, which can lead to temporary adjustments on prices, creating doubt among investors of the targeted company (Shi et al. 2018). As they are often seen as a threat that affects management decisions to a greater or lesser extent, managers can use many methods to prevent short sales, such as legal threats, investigations, lawsuits and many others that can create short sale constraints (Lamont 2012). If a targeted company decides to take anti-shorting actions, short sellers will spend money and a lot of time handling these lawsuits and investigations, making it expensive and difficult to maintain their short positions. We will elaborate on the risks of short selling in the next section.

2.5 Risks of short selling

As mentioned earlier, short selling involves many unique risks that make the strategy difficult to implement. Firstly, short sellers have to manage quite substantial borrowing costs. All the fees asked of the short seller reduce his potential profit. If the costs of short selling rise, the number of short positions will decrease, having a direct impact on the market efficiency, leading to biased prices. Secondly, because short sellers typically hold their positions for varying lengths of time, they incur changes in borrowing costs and the risk that the stock loans can be recalled at any time (Engelberg et al. 2017). Moreover, a short seller can face margin calls situations. In fact, when the price of the shorted security rises, the collateral on the brokerage account may not be sufficient enough to cover the 25% imposed by the maintenance margin rule, leading to the closure of the short sale position sooner than expected. Those risks can reduce short selling, resulting in lower price efficiency and, as a result, lower returns. It, therefore, has an impact on the arbitration activity as a whole (Engelberg et al. 2017). Finally, short sellers can face what is called a "short squeeze". This situation occurs when short sellers are forced to close their positions in a hurry because their bearish expectations were wrong. This causes prices to rise sharply and subsequently additional margin calls, resulting in large losses of money for the short seller (Lamont 2012). A well-known example of a short squeeze is the case of the Volkswagen company in 2008, which in the space of 48 hours saw its share price rise from €210 to €1,000, leading to huge losses for short sellers.

2.6 Abusive methods in short selling

Although there are more and more restrictive regulations on short selling, this does not prevent new abusive short selling techniques from emerging. Short selling is a beneficial practice for companies and investors if used properly. However, in recent years there have been numerous situations where traders have deliberately spread false information and plausible rumours about a company to drive its price down and make large gains on the fall. Indeed, once the rumour has spread and the price starts to fall, investors close their short positions and make a profit, sometimes within only a few hours (Hamilton 2019). These campaigns of "Short and Distort" have multiplied further following the expansion of social networks which allow "predatory shorts" to get their messages and misinformation across more quickly and to a wider audience. An example of a "short and distort" campaign is the case of the real estate investment firm Farmland Partners Inc, in 2018. After an anonymous short seller, under the name "Rota Fortunae", published on the well-known financial website Seeking Alpha, falsely claiming that the company was "non-investible", the company's shares fell by almost 40% in a matter of hours (Reuters 2019).

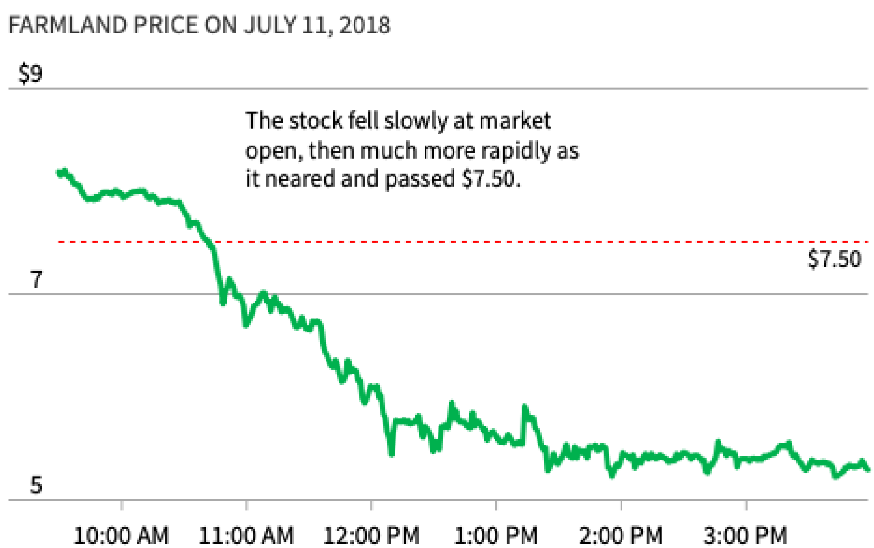

Figure 2.2: The decrease of Farmland price (Reuters 2019)

Abusive short sellers can severely damage a company's reputation and do so quickly. Because it is a challenge for regulators to deal with such situations, it is essential to continue to tighten restrictions and impose additional transparency (Holmes 2002).

Another abusive and even illegal practice is the "naked" short selling. A short seller sells shares without borrowing those first or ensuring they could be borrowed, which increases the risk of delivery failures. This abuse of the flexibility of the equity settlement system may affect the liquidity of securities in the market. There are four main reasons why stock delivery failures can occur. The first concerns routine failures, i.e. all elements that unintentionally delay the delivery of actions. For example, a signature is missing on a document. The second reason covers the long failures. The seller plans to deliver the stocks when the other securities become available and fails in the meantime. Take the example of a convertible note holder. Due to conversion delays, he is allowed to sell the shares and may fail to deliver them at the scheduled time. The third concerns economic failures, when he makes a voluntary economic decision to fail rather than borrow the shares. For example, when the interest earned on the short sale process is lower than the cost of borrowing. The last reason is related to manipulative fails, where the seller may intentionally fail to deliver in the context of manipulation, to lower the price. Not all settlement failures are the result of intentional naked short selling (Angel and McCabe 2009).

3 | Activism Short Selling

3.1 Activism in the financial markets

3.1.1 Concept

Taking a position in the market can be practised by two profiles of investors. Either we take positions but we do so discreetly, i.e. we do not publicly disclose our positions. We investigate the company on our own and we try not to draw attention to ourselves. We are waiting for other investors to become aware of the company's problems, thus causing the share price to fall, in the case of short positions. We can also simply buy a company's shares in the hope that the price will rise in the case of a long position. This behaviour is adopted by "non-activist" investors. Conversely, we can decide to take positions and go "public", i.e. we will publicly disclose the fact that we are going to take a short or a long position and we will explain the reasons for taking the position by publishing detailed reports on the targeted company. This second strategy is practised by investors known as "activists", which this thesis will focus on (Luc Paugam and Gendron 2020).

3.1.2 Activism in long positions

Shareholder activism is becoming a widely used investment strategy. In general, an activist shareholder has the willingness to initiate changes in companies and to influence management decisions (Filatotchev and Dotsenko 2015), by buying a significant percentage of the shares' company (generally, 5% or more of a company's voting class shares) (SEC 2017). Hedge funds, wealthy individuals or private equity firms are usually the profiles of investors who typically act as activist shareholders. Activist investors can take the form of hedge funds, individual investors or operate as private equity firms. As the objective is to generate a higher return than the market, they can employ many strategies to do so. Hedge funds are generally unregulated and therefore subject to a lot of controversies and are more expensive to invest in (CFI 2021). These include in particular TCI, MCD Capital and Pershing Square Capital. As we can see in the graph below, we can observe a general upward trend in activist campaigns by hedge funds, which generate a higher total return than the average of hedge funds (Pikovsky 2019).

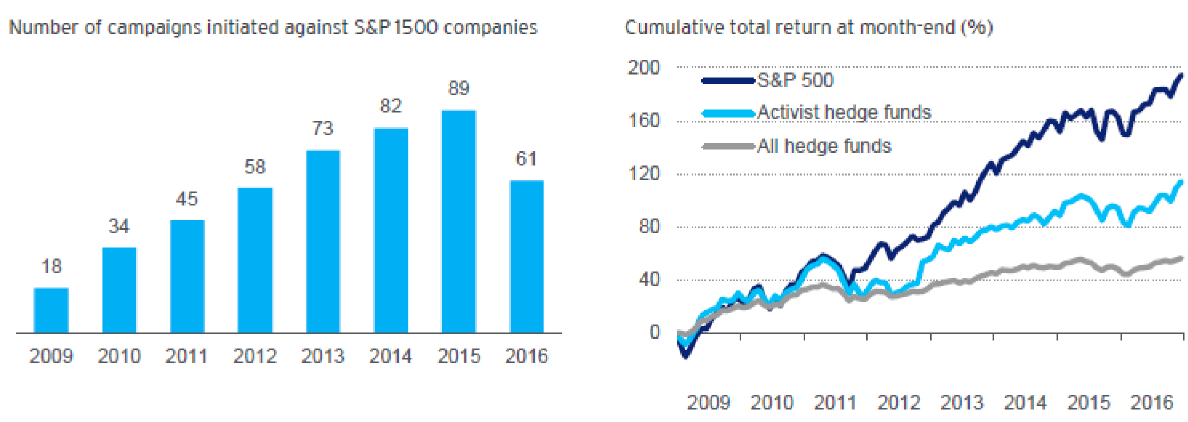

Figure 3.1: Evolution of activist campaigns by hedge funds (Pikovsky 2019)

Individual activist investors, usually well known in the financial sector, use their influence to bring structural changes to a company's strategy. They use their wealth to buy a large number of shares in a company in order to obtain sufficient voting rights on the board and thus influence the strategy of the targeted company. They generally seek to add value to the company, but can also destroy it if they do not share the same objectives or vision as other shareholders. Carl Icahn, founder of Icahn Enterprises, or the famous Bill Ackman, founder and managing director of Pershing Square Capital Management, are examples of well-known activist investors. Finally, activist investors, in the form of private equity firms, use many different strategies such as leveraged buyouts or distressed investments and usually taking over a public company with the intention of privatising it. One example is the company Blackstone. In addition to bringing value, private equity firms provide access to liquidity and capital for many companies. However, this is time-consuming (CFI 2021). As a matter of fact, activist shareholders supervise and bring leadership in companies and have the means to limit the selfish behaviour of managers. Given the importance of their major shareholdings in companies, their inclusion among the company's investors provides *"an important driver of 'good' corporate governance that should lead to efficiency gains and improvement in performance"* (Filatotchev and Dotsenko 2015). Shareholder activism does not operate in the same manner in all countries and may have different degrees of effectiveness but it can contribute to beneficial effects on the company. In recent years, this type of strategy has become increasingly common.

3.2 Activism in short positions

In contrast to long activist campaigns where investors seek to create value and thus increase the share price of the company, the activist short seller seeks to expose potential fraud or irregularities in the financial statements, and drive the share price down to correct the overvaluation of the company. The difference with so-called "passive" short selling is that the activist short seller will publicly expose misstatements after a considerable amount of investigative work. Besides stating the problem encountered, the activist short seller needs to state the reasons behind their accusation in order to convince stakeholders. Two examples of reports written by activist short selling funds can be found in Appendices 1 and 2. By doing it publicly, they, therefore, seek to get the company's shareholders to react. Indeed, if the accusations are well-founded and the activists succeed in convincingly disclosing them, this can have serious consequences for the targeted company. Take the well-known example in 2014 of the Spanish company Let's Gowex, shorted by Gotham City Research. After filing a report explaining that the company was committing massive accounting fraud, Let's Gowex filed for voluntary insolvency five days later (Paugam and Stolowy 2020). Nevertheless, this practice is highly controversial and some of them are even disliked on Wall Street.

Since the origin of the stock market, short selling used to be a quiet activity. It was regulators, analysts or the media themselves that decided to expose overvalued companies, not bearish investors. Since 2010, due to the emergence of social networks and an uncertain but generally bullish stock market, activist short selling campaigns have been on the rise (Reuters 2019).

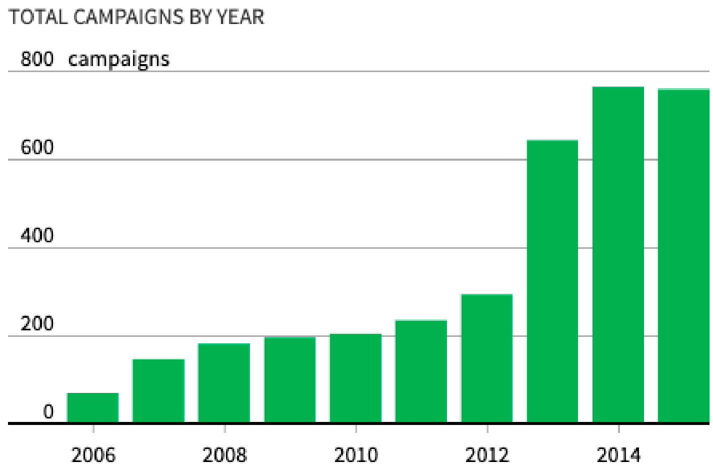

Figure 3.2: Evolution of activist short campaigns (Reuters 2019)

Social networks have been a great catalyst for this increase in activist campaigns because they allow a larger amount of people to be informed at a faster rate (CSA 2020). According to the Breakout Point's article, in 2019, activists campaigns increase by 18% compared to 2018, leading to a decrease in targeted actions of 7.7% on average. In 2019, the United States was the country with the companies most targeted by short sellers but also with the largest activist funds such as Muddy Waters Research, Gotham City Research or even Citron Research. It is followed by China with 11% of short calls and Canada with 4% (BreakoutPoint 2019).

Many investors have made this practice popular. Among them, Andrew Left, founder of the online investment newsletter "Citron Research" or the hedge fund manager, Bill Ackman.

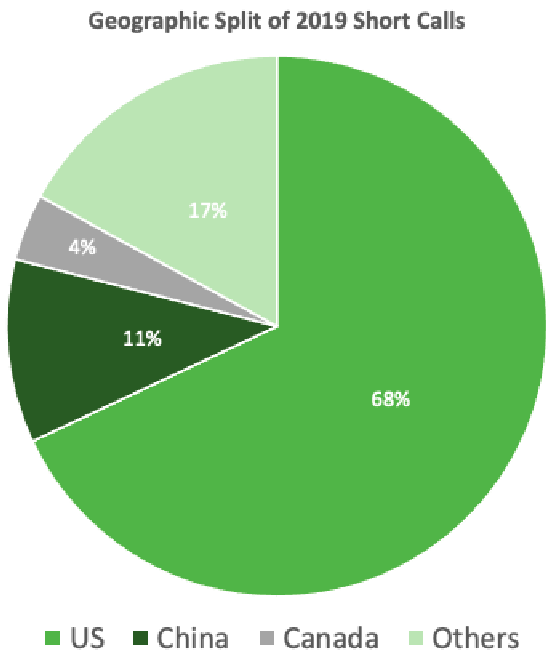

Figure 3.3: Geographic split of 2019 short calls (BreakoutPoint 2019)

3.3 Advantages and disadvantages of activist short sellers

Activist short sellers are professionals with extensive stock market experience doing considerable research on targeted companies, writing accurate and detailed reports and having numerous contacts in the markets. As considered to be market regulators, their analyses create real value for stock markets by ensuring that market prices reflect the fundamental value of shares (CSA 2020). These analyses provide investors with a better understanding of what is going on in companies where problems may be hidden and not reflected in the financial statements. By trying to correct this mispricing and bringing transparency they help markets become more efficient (Ljungqvist and Qian 2016). Activist short sellers play a complementary role to the monitoring activity of the state and some other institutions such as the Securities and Exchange

Commission (SEC) in the United States. They are therefore generally perceived as the "watchdogs" of the financial markets (TradingSkeptic 2018). However, as mentioned earlier, short selling, and especially doing it in an activist way, is a controversial practice. Activist campaigns do lead to movements in share prices and generally to falls, which often accuse them of market manipulation. Indeed, some activists may profit from spreading false information and rumours about targeted companies and make a profit from the loss of them (Reuters 2019). Take the example of the "short & distort" campaign led by the promoter Nicholas Marsch against the housebuilder, Lennar Corp. According to the court, Nicholas Marsch's business partner pressured Lennar to pay the developer's claims. He allegedly shorted Lennar's shares and then published false information about the company through press releases, the internet, emails and even YouTube videos in order to artificially drive down the price of Lennar's shares. Indeed, after these various publications, Lennar's market capitalisation fell by almost 500 million dollars. Eventually, the company was able to defend itself and the scheme was discovered (Weiner et al. 2017).

Nonetheless, these "short and distort" campaigns represent a minority of the cases of activist campaigns. Moreover, despite their extensive research and experience, activist short sellers are not always right. They may claim that a company is fraudulent when it is not. In this case, even if the firm demonstrates that no fraud exists, as soon as the short sellers make their official disclosure, the company's stock goes down and its reputation suffers.

3.4 Risks and difficulties for activist short sellers

As stated previously, short selling is a risky business and even riskier if it is done publicly. This unwelcome practice is coming under increased scrutiny by company managers as well as regulatory authorities. In contrast to "passive" short sellers, activists, when making an official public announcement, put their persons, firms and reputations on the line, which can have serious consequences for them in the long run (Melih 2020). In addition to putting their identities and businesses at risk, activists face other types of threats. Firstly, they face a whole host of increasingly strict regulations, sometimes including bans on short selling in certain countries or bans on taking short positions during certain periods on certain stocks (Luc Paugam and Gendron 2020). Then, in order to take a short position on a stock, it must be available for borrowing, which is not always the case for many reasons (Ljungqvist and Qian 2016). For instance, because some institutions do not have share lending programs or for fear of driving down the price of the shares, shareholders may refuse to lend them (Lamont 2012).

In addition to the difficulties discussed above, there is also a significant financial exposure, if their predictions are erroneous. The first point is that the short seller may be forced to pay more than they did initially because there is an increase in borrowing costs (Schultz 2020). Moreover, in order to hold their short positions for a certain period of time, short sellers face what is called the "recall risk". The "recall risk" is the *"risk is that borrowed shares may be recalled and the short will be unable to find another source of shares"* (Schultz 2020), which forces them to close their positions. If this is the case, the shares must be returned to the lender and the short sellers must therefore buy them back. If a large number of short sellers are in the same position at the same time, this buyback will increase the price of the share and may lead to a disastrous situation for them, the "short squeeze" (Luc Paugam and Gendron 2020). This is one of the reasons for the exceptional increase in Tesla's share price in mid-2020.

According to data from S3 Partners, in 2020, short sellers who bet on Tesla would have suffered losses of more than $38 billion in market value (Bloomberg 2020).

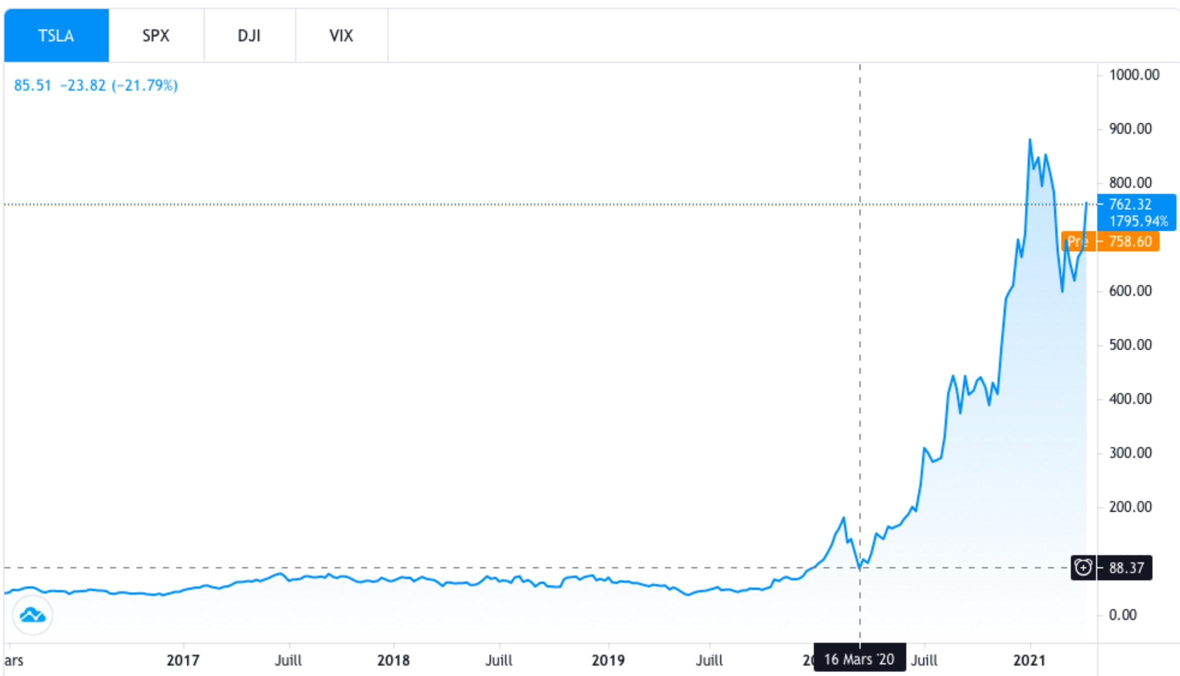

Figure 3.4: Graph of Tesla Inc.'s share price evolution (TradingSkeptic 2018)

When a stock price starts to rise significantly, short sellers are forced to buy shares at a loss to cover their short positions. When an investor covers a short sale, it refers to the repurchase of borrowed securities in order to close out an open short position at a profit or loss. This operation is also called "buy to cover" (Figlewski and Webb 1993). This creates additional demand, which drives the share price up again, forcing other investors to do the same and causing further increases in the share price. In February only, after a 20% rise in the stock, short sellers would have lost nearly $3.2 billion in one day (Limited 2020).

Until now, the biggest loss was Apple Inc. stock, which lost less than $7 billion. With its shares up more than 730%, Tesla has become the stock with the biggest losses to short sellers (Bloomberg 2020).

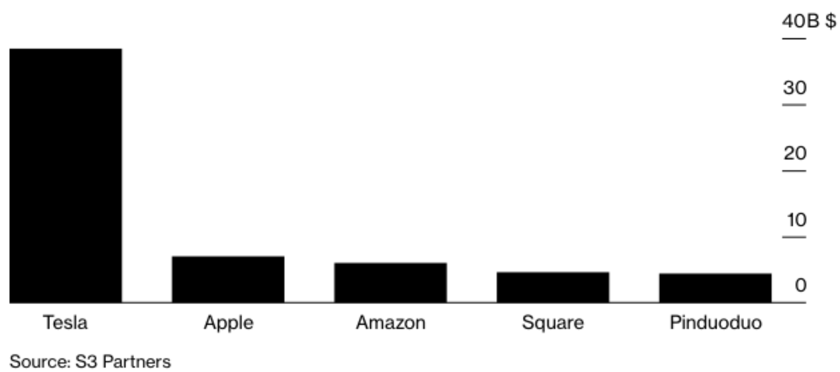

Figure 3.5: Tesla short losses (Bloomberg 2020)

This example illustrates how activist short sellers can lose significant amounts of money in a very short period of time.

3.5 Methods of disclosure for activist investors and role of the media

"The louder they scream, the better the short", this is the method followed by activist short sellers (Lamont 2012). The official announcement of a short sale goes through several steps. Short sellers start by identifying a potential target using signals, usually public. They then proceed with in-depth investigations by analysing documents, financial statements, interviewing people who can provide some information. They may also contact the management of the target company to clarify certain unanswered questions. These procedures take time and can take up to weeks of investigation. Once activists have gathered enough information and clear evidence, and management does not respond clearly or follow up on their questions, short sellers issue a report explaining their reasons for doubting the target company. Activists face many difficulties in these proceedings. Since activists attract more attention than silent short sellers, they are therefore more likely to be confronted with regulators and the public. It may be difficult to obtain evidence and may be met with resistance from the company's management. Some even face the risk of being sued (Ljungqvist and Qian 2016).

To appear as credible as possible to the long investors of the targeted firm, the way activists' reports are written is of great importance. Narratives are important and play a major role in shaping public opinion, including the opinion of investors, who are the ultimate target audience for activists. That is why the use of rhetorical strategies increases the persuasiveness of claims made in research reports and other media. According to Luc Paugam and Gendron 2020, the credibility of activists' reports contains, for the most part, five major attributes:

1. Expertise: Activists demonstrate the mobilisation of industry knowledge, statistical language, data collection efforts and the availability of a network of important contacts.

2. Reliability: Activists aim to provide factual arguments to investors. Reports must be accurate, supported by figures and graphs. They also refer to the work of another activist to support their arguments.

3. Benevolence: Activists need to show that they care about the public interest and that they cannot remain silent in the face of financial abuse.

4. Dynamism: Headlines can give a sense of dynamism. Therefore, reports often have catchy headlines in order to attract the attention of investors but also the attention of the SEC and the stock markets. Activists do not hesitate to use a straightforward style in their reports.

5. Personal attraction: Naming several activists is a way to engage the audience.

Although traditional channels used to disseminate the reports such as word of mouth and traditional media play an influential role in society, social networks have significantly increased the number of short-seller activist campaigns. Digital platforms for reporting have proliferated, allowing activists to reach a wider audience more quickly than was possible with traditional media. Some platforms are dedicated specifically to short selling such as Seeking Alpha and Activist Insight.

3.6 Regulations in short selling

Like all stock market strategies, there is a wide range of international rules restricting short selling and stock lending. Regulators have the responsibility to provide appropriate and sufficient rules to control short selling activities. As a matter of fact, short selling can be used for self-interested purposes and can create incentives for illegal behaviours such as the diffusion of false information. For this reason, regulations are essential to be put in place (Angel and McCabe 2009). In the United States, the SEC established in 1938, the "Uptick Rule", which states that once a share is sold, it must be higher than the price at which the previous sale was made. This rule prevents short sellers from speeding up the downward dynamics of an already falling stock price. This regulation was banned in 2007 but the SEC found an alternative that was implemented in 2010. The 2010 alternative uptick rule (Rule 201) allows investors to exit long positions before short sales occur. The rule is initiated when a share price falls by at least 10% in one day (SEC 2015). This measure is intended to support market stability. Short selling has been the subject of several recent regulatory changes, even more so when regulators face periods of recession or crisis, going so far as to ban completely the practice for a certain period of time (Jain et al. 2013). Taking the 2008 financial crisis as an example, many regulators banned short selling or imposed restrictions on such transactions, in order to stem the market's downward spiral by reducing volatility. Indeed, some believe that this practice can destabilise markets by increasing market volatility. Although the incentive for the ban is often clear, the success of the measure is much less so. Further bans on short selling were again put in place in 2011 in some countries (Jain et al. 2013). Regulations have a significant effect on the use of the practice. Countries with the most restrictions reduce short selling-related stock borrowing by 45% on average (Jain et al. 2013). More recently, following the expansion of activist short selling, new regulations on the publication of short positions have emerged. In Europe, an uniform rule (No 236/2012) was adopted by all the member states of the European Union. This provision requires the public disclosure of any net short position, on the following day of the occurrence of that position, that reaches a threshold of 0.5% of the issued share capital of shares sold short. If the short position reaches 0.2%, investors must submit a confidential notification (Jank et al. 2021). The disclosures must contain:

- Name ;
- ISIN ;
- Identifier of the shorted stock ;
- Identity of the short seller ;
- Date ;
- Magnitude of the position, reported as a percentage of the issued share capital.

In the situation where it is conducted in an activist way, it is important to have a regulatory compromise for short selling. If the restrictions are too present and restrictive, this could suppress the beneficial effects of short selling. Otherwise, if there is a severe lack of regulation, it could encourage dishonest short sellers to conduct so-called "Short & Distort" campaigns (CSA 2020). As indicated by Coffee 2020, The level of regulatory restrictions should depend on the level of market transparency. In an opaque market, such as China, the role of short sellers is paramount in order to expose possible fraud or market abuse. In a reverse situation, such as the United States where the market is more transparent, the regulations need to be a bit stronger (Coffee 2020). Regardless of the intensity of short selling regulations, the practice remains essential and represents one of *"the best way for the SEC to uncover fraud"* (Project 2020).

3.7 Ethics in activist short selling

Since the early 17th century, the practice of short selling has been a controversial issue. Many people consider short selling unethical since short sellers profit from the loss of other investors due to falling share prices. As we have seen before, some traders may spread misinformation or rumours about companies in order to drive down the price and benefit from the loss of others. This practice can therefore lead to campaigns of "Short & distort". Some also argue that short selling can be used as a means to drive prices down, and thus decrease efficiency in the markets. Considered a speculative strategy, it could also increase stock market volatility (Angel and McCabe 2009). Nevertheless, others consider that there is nothing unethical in the act of short selling itself and that it even contributes to increasing liquidity in the market and giving more accurate information on prices, even in times of bull market (Strauss 2018).

As with any controversial topic, some investors will think that short selling is a fair practice because it contributes to market efficiency, while others think the opposite for all the reasons mentioned above. It all depends on the investor's perspective, his investment strategy and his beliefs (J. and E. 2012).

3.8 Known cases of activist short selling

We will elaborate on two cases of short selling campaigns that led to very different conclusions and endings illustrating the risk incurred by short sellers.

Wirecard AG

The first example concerns the case of Wirecard AG in 2020. Founded in 1999, Wirecard AG was a financial technology and services company. The company's core business was risk management, credit card production and transaction processing services. The firm, based in Germany, was in direct competition with PayPal and Western Union. The company almost disappeared during the "dot-com" bubble in the early 2000s. Thanks to the capital injection of Markus Braun, who became the CEO of Wirecard AG, the company was able to relaunch itself and, in 2006, was listed on the TecDAX index of the German stock exchange. In 2015, Wirecard AG completes the acquisition of Great Indian Retail including a 60% stake in GI Technology. Mr Braun's company was included in the DAX in 2018 and was valued at €24bn.

Already in 2004, the company was suspected of accounting and financial irregularities involving small amounts. However, rumours of fraud only emerged in 2015 and the stock has been moving steadily since 2018. At the beginning of 2019, the publication of 3 articles by the Financial Times raises suspicions of falsification of documents in violation of Singaporean laws, a major pole of their business in Asia. The possibility of fraud thus provokes attacks on Wirecard's share by short sellers. BaFin (Bundesanstalt für Finanzdienstleistungsaufsicht), the German Federal Financial Supervisory Authority, bans short selling on those shares in February 2019, which was widely criticised. Eight months later, Wirecard's supervisory board asks KPMG to carry out an independent audit, in order to curb speculation on the stock market value and to reassure some investors. In March 2020, Wirecard announces that no anomalies have been identified by KPMG. However, a few weeks later, the audit firm finally announced that it could not reach a conclusion because it had not been able to consult sufficiently conclusive documents. In June 2020, Ernst & Young refused to certify Wirecard's accounts. As a result of all these events, the company files for insolvency after the revelation of the "disappearance" of 1.9 billion euros, leading to the dismissal of its CEO (Jo et al. 2021).

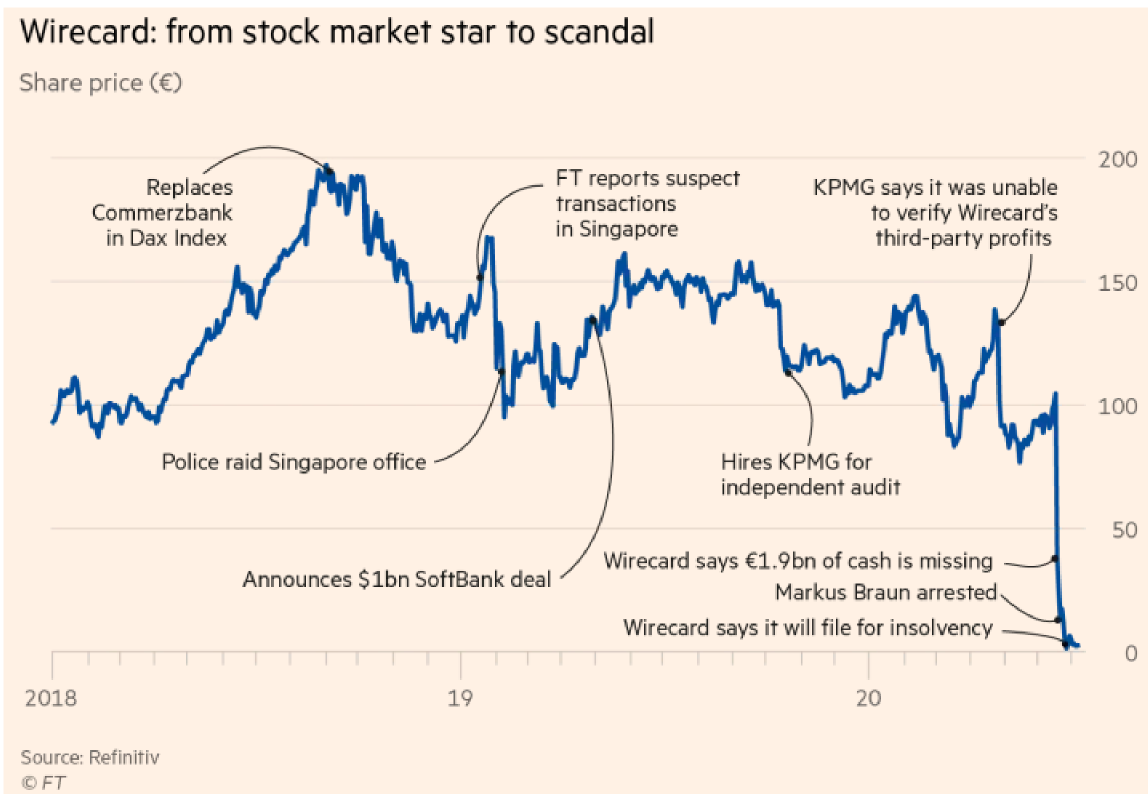

Figure 3.6: Evolution of the Wirecard's stock price (McCrum 2020)

This situation, resulting in the dissolution of a fraudulent business, and therefore positive for short sellers, illustrates how long it takes them to dismantle a business when they have a suspicion of fraud and the problems encountered.

Herbalife Nutrition

The second case we will develop is about the Herbalife company and Bill Ackman's famous short, probably one of the best known short sellers. Herbalife Nutrition, founded in the United States in 1980, is a company whose main activity is to sell food supplements promoting fitness and weight loss. In addition to these dietary supplements, the company also offers body and face care products. The company went public in 2004. Herbalife Nutrition is built on a multi-level sales system and is based on network marketing. It was this system that led to the suspicions of fraud by the notorious short seller, Bill Ackman. Indeed, he accuses the company of being a pyramid scheme, which is a prohibited business method.

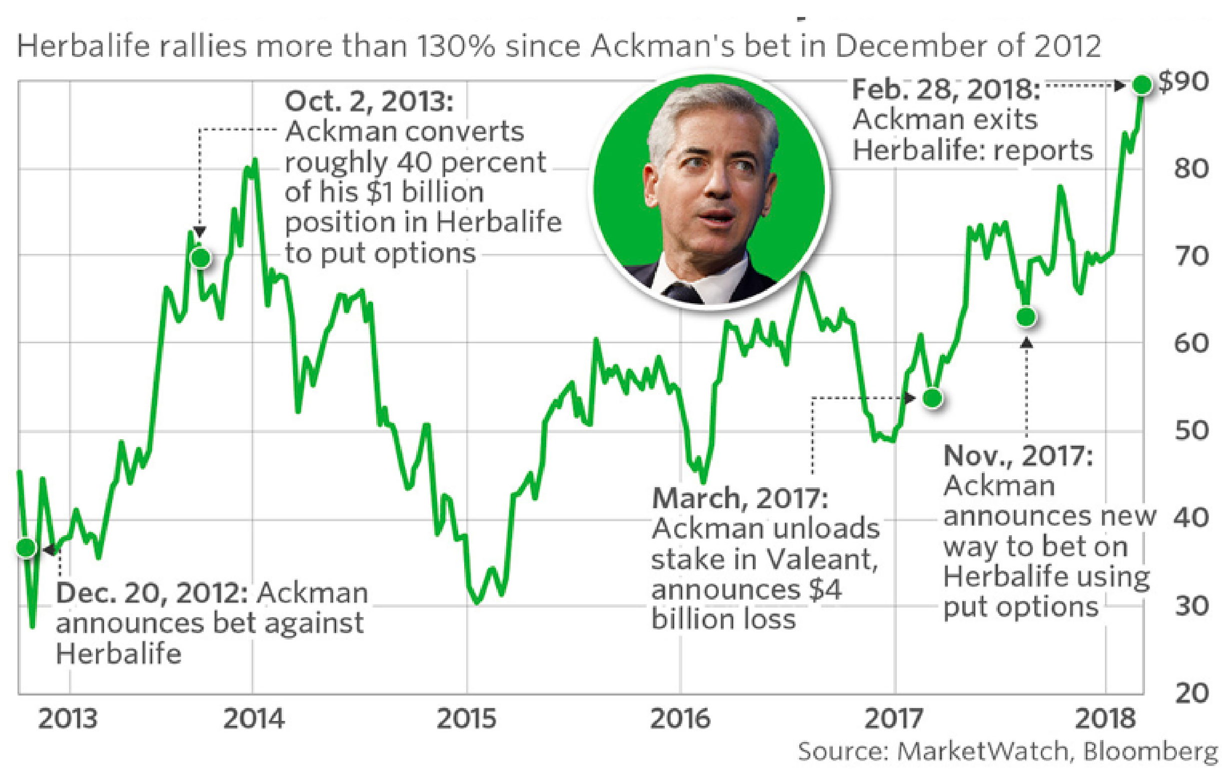

Figure 3.7: Evolution of the Herbalife's stock price (DeCambre 2018)

In 2012, he decided to start his campaign against the company (C. M. Matthews 2015).

The short seller made a series of public presentations to explain his statements and ideas, to which the company defended itself by saying that he was merely manipulating the share price. At that point, Herbalife shares dropped by 20% in a few days before rising again. Indeed, Ackman expected the stock to fall further over time. However, this strategy was reversed when investors, including billionaire Carl Icahn, established bullish positions, taking a 26% stake in the company, openly criticizing Bill Ackman's position. In November 2017, the share price of Herbalife surged 51% over the year, forcing the short seller to change his strategy. He converted his short position into a put position, as he had already done in part in 2013 when he realised that the stock was rising steadily (Chang 2019). In 2018, after having lost billions of dollars, Bill Ackman finally decided to close all his short positions in the company. This case has an entirely different outcome than most short trades, making it one of Wall Street's best-known failed short sale stories.

These two cases show us the risks incurred by short sellers. When publicly announcing short sales, activists can lose huge amounts of money if the share price rises, and it can take a long time for investors to react. In addition to this, the reputation of the short seller is greatly impacted as we have seen in this example.

4 | Performances of activist short sellers

To complement our literature review mentioned above, we conduct an empirical study to examine the performance of activist short sellers. To achieve this purpose, we must first define the notion of performance. Indeed, we want to compare the realized performance of a passive short seller with the one of a short seller who openly publishes his position to the public. However, collecting data on passive short sellers is extremely difficult as they sell short anonymously, not disclosing their positions publicly, which is the whole point of passive short selling. We will therefore change our approach and analyse the performance of the activist short seller only by looking at the performances of the stocks targeted by their public campaigns. This will allow us to understand the reaction of the stock after the disclosure and therefore find out whether or not the campaign was a success for the activist short seller and estimate their returns. Generally, the willingness to publicly disclose short positions is combined with negative abnormal returns (Christophe et al. 2004). Abnormal returns correspond to the difference between the actual return of a security and its expected return. According to the authors of the scientific article: "Short and Report ", formerly known as "Public Short Selling by Activist Hedge Funds", abnormal returns decrease on average by -7% around the publication date (Appel et al. 2018).

We believe our results will contribute to the scientific literature on different aspects. First of all, our research is related to the literature on short selling, especially on the activist side of short selling and will complement it with a classification of shorted companies and aggregate results on this categorization. Indeed, we will aggregate our outcomes based on 3 segmentation:

1. By the short seller;

2. By the geographical area;

3. By the market capitalisation of the shorted stock.

Moreover, while most of the work done on the subject is based on an empirical study, analysing databases, our work contributes by providing another component directly linked to fieldwork. In fact, we had the chance to interview three activists specialising in their fields, two in short selling and one activist on long positions, which allows us to have a direct view of the work of activist short sellers and their performance.

4.1 Data and sample

To accomplish the first part of our empirical study, after several searches on the Internet and financial websites, we have initially listed the largest American activist short-selling funds. We decided to focus on US funds as there are very few if no European activists short sellers. We, therefore, found 17 US activist funds engaged in short selling, whose data was available for our research and which we will mention below:

– Kerrisdale Capital ;

- Spruce Point Capital Management ;
- Kynikos Associates LP ;
- Citron Research ;
- Viceroy Research ;
- Muddy Waters Research ;
- Bonitas Research ;
- Gotham City Research LLC ;
- Blue Orca Capital ;
- Richard Pearson ;
- Marcus Aurelius Value ;
- Jcapital Research ;
- Wolfpack Research ;
- Hindenburg Research ;
- White Diamond Research ;
- Prescience Point Capital Management ;
- Mako Research.

Then, after searching each of their respective websites or, for those who didn't have one, on the famous financial blog, Seeking Alpha, we collected all the current and past short positions of these funds from January 2010 until December 2020. This effectively gives us a fairly wide window of opportunity for the performance analysis that we will carry out. We, therefore, listed all the short positions, collected the publication dates of each report concerned by the activist short sellers and gathered the tickers of their respective positions. We have thus not taken into account shares sold short with a publication date before January 2010 and whose tickers were no longer available on Bloomberg. Finally, for the sake of simplicity of data processing, when a stock has been the target of several funds or if a fund has published several reports on it at different dates, we have attributed to the stock only the date of the first publicly disclosed report, because we assume that the first report is the one that creates the most impact on the public and the share price. After deleting all duplicates, we obtain a database of 247 shares sold short in an activist manner by 17 US activist funds (details can be found in Appendix 3). Once our sample of companies was completed, we collected their daily closing prices on Bloomberg taking the period between 4 January 2010 and 19 March 2021. In addition, for each share, we have compiled the value of their respective benchmark over the same period as well as the associated risk-free rate. We have taken the S&P500 (GSPC), the EURO STOXX 50 (SX5E) and the Hang Seng Index (HSI) as benchmarks for American, European and Hong Kong stock markets respectively. Finally, for the risk-free rate, we took as a reference the 10-year Treasury rate of the geographical area concerned. Our empirical study was carried out using the Python programming language.

4.2 Event Study

To assess the performance of activist short sellers, we will observe the impact of a company's value after the public release of its short sell report. To do this, we will carry out an event study, which is a statistical method evaluating the impact of an event on the value of a company and in particular its stock. As mentioned by MacKinlay 1997, *"Event studies have been applied to a variety of firm-specific and economy-wide events"*. This type of study will help us to observe the behaviour of the share price of a company during a specific event, whether it is positive or negative for it. Although this method could be biased, it remains an often used and sometimes even preferred approach (Rosa 2011). Before detailing the approach followed, we will define some essential elements for a good understanding of our analysis. Firstly, the two key elements to compare the performance of shorted stocks are the abnormal returns and the expected returns. The expected return of a stock is defined as the return an investor expects to receive on an investment, whether positive (profit) or negative (loss). The difference between the effective return and the expected one corresponds to the abnormal return, as defined above. These are associated with a direct change in the market capitalisation of a company. In our study, we will calculate the abnormal returns on a daily basis. The main element of our analysis is the cumulative abnormal return, which is directly related to the abnormal returns because it corresponds to the sum of the daily abnormal returns found previously over a given period (Koch and Fenili 2013).

To start our event study, we first need to perform a linear regression in order to estimate our expected returns. To accomplish this task, we had to deduce from our previously selected stock prices, the risk-free rate, both extracted from the Bloomberg database, to obtain the excess returns used in our linear regression. Since we want to avoid events that could bias our parameters and subsequently our abnormal returns, we chose to take a large window of more than 120 days before the date of the event to perform our linear regression. Indeed, we followed the study of MacKinlay 1997, which indicates that the parameters of the market model are often estimated 120 days before the event for an event study based on daily data. In addition, it is important to define the event date and the event window, i.e. the period for which we will analyse our data, for the rest of the event study. This period of time is generally divided into 3 segments:

- **The estimation window**: This period provides the information that determines the expected returns of the stock under study. It is consequently over this period that the linear regression will be conducted. It will be calculated more than 120 days before the date of the event, to be sure not to take into account potential events occurring before the announcement of the short sale that could bias the parameters of the regression.

– **The event date**: This window corresponds to the date of the event. In our case, the event date is the publication date of the first public report about a company targeted by an activist short seller. Therefore, this date will vary for each company. As mentioned earlier, we have limited our choice of companies to those sold short between 2010 and 2020.

– **The event window**: It is over this period that the abnormal returns will be calculated, based on the excess returns and the expected returns provided by the linear regression. It allows us to determine the short-, medium- or long-term effects on the targeted share price and, consequently, its performance. This period varies greatly from one study to another. In our case, we decided to take 135 days, i.e. 15 days before the event occurred, representing a buffer for a potential period gap between the opening of the short position and the publication date of the corresponding report and 120 days after the event date, to study the mid-term effects.

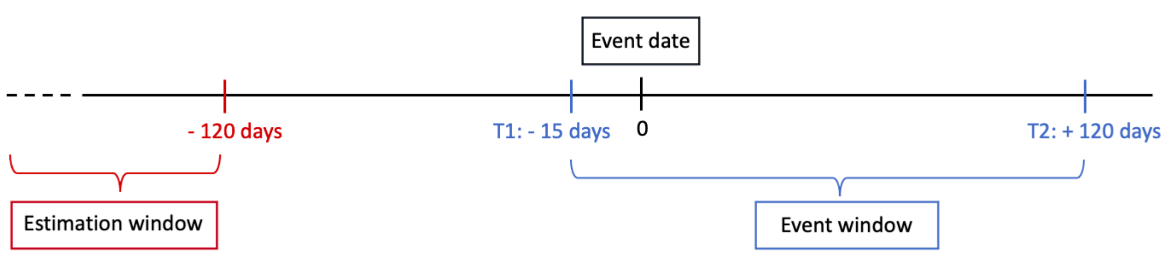

Figure 4.1: Event study timeline

Through our linear regression, we will obtain the alpha and beta values for each company shorted. Effectively, for each share sold short, we will apply a capital asset pricing model (CAPM), which will allow us to calculate our expected returns for each of the respective share. The Capital Asset Pricing Model (CAPM) explains the interaction between the expected returns of assets and their systematic risks. This model intends to assess whether a stock is fairly valued when comparing these two elements (Fama and French 2003). This approach is widely used in finance and can be described by the following formula:

$$R_i = R_f + \beta_i(R_m - R_f) \tag{4.1}$$

Where: R_i is the expected return of investment

R_f is the risk free rate

β_i is the beta of the investment

$(R_m - R_f)$ is the market risk premium

However, the limitation of this model is that the CAPM only explains the return of an equity portfolio correlated to market risk. Therefore, to be more accurate, we will use a variant of this model, including an intercept, α, that allows us to add a component not related to the general market movement, and is consequently described as follows:

$$R_i = R_f + \alpha + \beta_i(R_m - R_f) \tag{4.2}$$

Where: R_i is the expected return of investment

R_f is the risk free rate

α is the intercept, which is the excess return compared to the market

β_i is the beta of the investment, which measures the volatility of the investment

$(R_m - R_f)$ is the market risk premium

Once the regression was completed, we collected the alpha and beta for each action, which will allow us to calculate the abnormal returns for each shorted stock (see Table 4.1).

Ticker	**Alpha**	**Beta**
PLUG US EQUITY	0.001	1.355
FUBO US EQUITY	0.080	-1.204
TTCF US EQUITY	0.001	0.148
ATRC US EQUITY	0.001	0.966
MRTX US EQUITY	0.002	1.639
CDNA US EQUITY	0.002	0.897
TCX US EQUITY	0.001	0.691
IRTC US EQUITY	0.002	0.941
QCOM US EQUITY	0.000	1.138
JOE US EQUITY	0.000	0.822
QNST US EQUITY	0.001	1.361
KODK US EQUITY	-0.002	1.392
PRTA US EQUITY	0.002	2.117
VSAT US EQUITY	0.000	1.025
PLSE US EQUITY	0.003	-0.021

Table 4.1: Linear regression parameters for the first fifteen stocks

Once these parameters were determined, we were able to calculate the abnormal returns as well as the cumulative abnormal returns for each stock. This finally gives us the average cumulative abnormal return for all actions combined. The latter amounts to -0.1482, meaning that, on average, an activist short sell campaign made the share price of the targeted company decrease by **14.82%** over a period of 135 days. This result is consistent with the article of Appel et al. 2018, in which the authors arrive at a decrease of -12% over an estimation window between -10 days and +100 days from the date of the event. As their time period (110 days) is shorter than that of our research (135 days), it is, therefore, plausible to have a moderately higher result.

Before proceeding with our study, it is necessary to ascertain the significance of our data and more specifically of our cumulative abnormal returns. To do, we will perform a t-test on CARs of every short position in our sample. As we are dealing with a parametric test, we will assume that our abnormal returns are normally distributed. Following the study of Serra (2002), we will define the test framework as shown below:

$$H_0 : E(CAR_i) = 0 \tag{4.3}$$

$$H_1 : E(CAR_i) \neq 0 \tag{4.4}$$

Where $E(CAR_i)$ is the mean of the cumulative abnormal return of one shorted stock i.

If this value is equal to zero, it means that the event had no impact on it. We will therefore try to find out whether the average of our values is indeed different from zero, and if so, whether this is significant. Under these assumptions, we will perform the test statistic for the cumulative abnormal returns of each of the stocks sold short to find the p-value of these tests, according to the following formulas:

$$t_{CAR_i} = \frac{CAR_i}{S_{CAR_i}} \tag{4.5}$$

$$S^2{}_{CAR_i} = L_2 S^2{}_{AR_i} \tag{4.6}$$

$$L_2 = T_2 - T_1 \tag{4.7}$$

Where: S_{CAR_i} is the standard deviation of CAR_i

$S^2_{CAR_i}$ is the variance of CAR_i

L_2 is the event-window length

T_1 is the first day of the event window

T_2 is the latest day of the event window

The p-value represents the probability of observing the results obtained or a more extreme result, assuming that the null hypothesis is true. Two limits to this value are often used: 0.05 and 0.10. If our p-value is lower than either boundary, then we can reject the null hypothesis. We will verify our values for both limits.

If we use the first threshold, a p-value of 0.05, 103 campaigns out of 247 have their p-values lower than this limit, i.e. 42%, which means that we can reject the null hypothesis and that 42% of our values are significant. If we extend our threshold to a p-value of 0.01, 53% of our values (132 campaigns out of 247) are below this limit, allowing us to reject the null hypothesis and be significant for our study (see detailed tables in the Appendix 7). We finally observe that almost half of the stocks sold short have significant abnormal returns. The activist campaigns, therefore, seem to have been significant for more than half of the targeted companies.

Once our data has been tested, we can complete and detail our analysis. Hence, we will aggregate the results into three distinct categories. The first concerns the aggregation of cumulative abnormal returns on the activist short sellers. Our data sample is based on reports from 17 US activists, thus we have 17 average CARs. We can easily observe that activist short sellers Kerrisdale Capital and Viceroy Research are the best performers, since they have the lowest CARs.

Detailed figures can be found in Appendix 4.

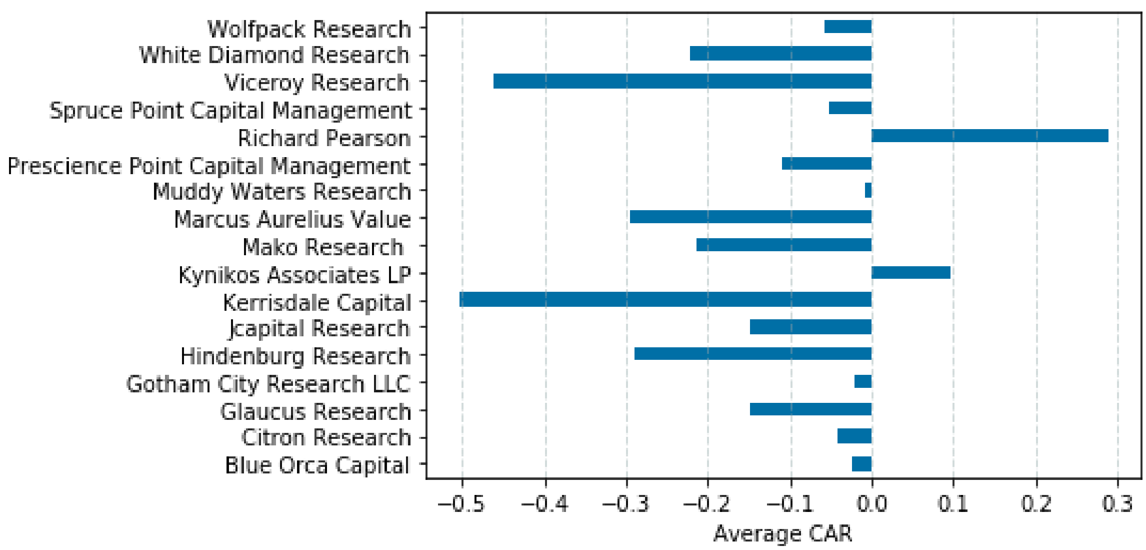

Figure 4.2: Classification of the average Cumulative Abnormal Return by short seller

Kerrisdale Capital has taken strong short positions in several companies, including its short position in FuboTV (FUBO), where the stock fell nearly 9% after the public announcement of short accusing the company of having valuations *"completely unmoored from reality"* (Kiesche 2020).

Regarding Viceroy Research, it has taken strong short positions in many companies, particularly on Pareteum Corporation (TEUM), which has a CAR of -1.059. After announcing its position on June 26, 2019, the stock fell drastically one month later, as we can see on the chart shown below.

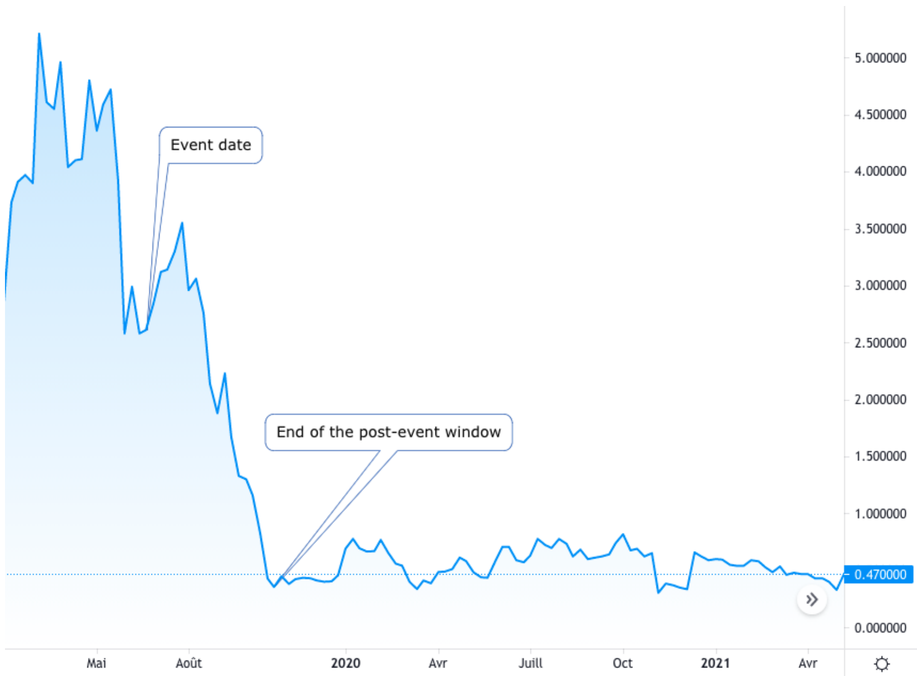

Figure 4.3: Evolution of the price of Pareteum Corporation during the event window period (TradingView, May 2021)

The second classification is based on the geographical area of the companies sold short by activists. Our 247 actions are divided into three different regions:

– **North America**, composed exclusively of companies located in the United States. In fact, our dataset, predominantly American, includes 221 stocks traded on the US market.

– **Europe**, composed largely of German and English companies, consists of only 10 shares.

– **Asia**, composed mainly of stocks from the Hong Kong stock exchange, includes 16 stocks traded on Asian markets.

We can readily observe on the chart that activist short sellers outperform in the US and Asian markets, compared to the European exchanges (see details in Appendix 5). It is known that short selling is a predominantly American practice, supported also by the fact that the largest activist funds are American. It is therefore normal to observe that their respective stocks react more strongly and that activist short sellers have performed better, compared to shorts made on European exchanges for example. Despite our limited database for European stocks, this shows us that activist short sellers have a lower tendency to sell short in the European market. The main reason for this decrease in performance could be due to the fact that European markets are more fundamentally regulated markets and are becoming increasingly regulated concerning short selling. The US and Europe indeed have many common elements in their regulations regarding short selling. However, even though the US has a wider range of measures, Europe is stricter than the US in some areas such as on the restriction of short selling on sovereign debt and in the utilization of naked sovereign credit default swaps (CDS) to perform a short sale. As mentioned in the article of Howell 2016, *"EU provisions significantly limit the practice of short selling"*. Moreover, this topic was discussed during our interviews with one of our respondents who worked for a US hedge fund. The latter explains that the practice of short selling, especially in an activist way, is a strongly American practice because of its "aggressiveness" but also because going bankrupt is not considered injurious in the American mentality. Many American personalities have gone bankrupt and have risen to start again. Whereas in Europe, the vision is not quite the same, bankruptcy is generally frowned upon. So attacking a company publicly in Europe has a completely different impact than attacking an American company. This difference in culture and mentality could therefore be another reason why European companies are less shorted.

Nevertheless, we observe that activist short sellers, despite the limited number of short sales in the Asian market, perform almost as well as in US stocks. As a matter of fact, one of the main reasons that could explain this phenomenon is the fact that it is more difficult to obtain accurate information on Asian companies than on European and American ones. Although some Asian countries have made progress in terms of transparency, the Asian market remains, as a rule, a very opaque market (Catriona Purfield and Jobst 2008). This can leave more room for fraud, on the part of companies, and inevitably more short selling opportunities leading to better performance for activists betting on those companies.

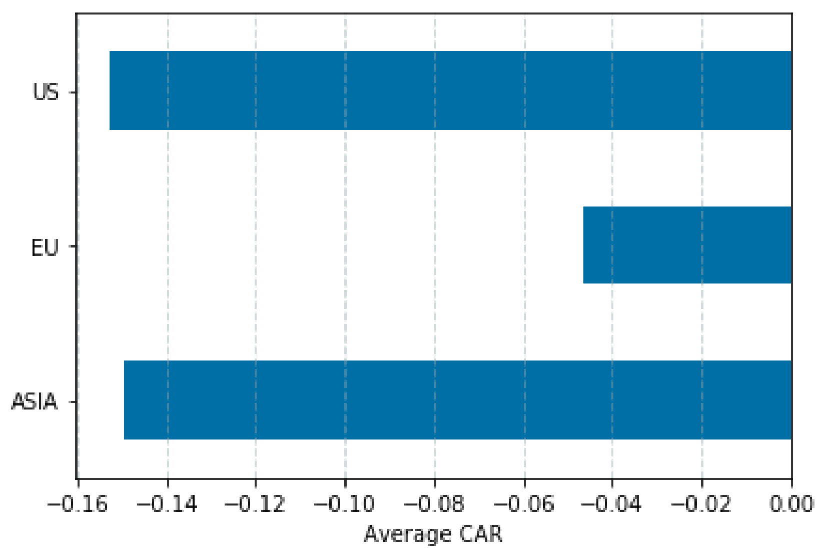

Figure 4.4: Classification of the average Cumulative Abnormal Return by geographical area

Finally, our last categorisation is based on the market capitalisation of companies targeted by activist short sellers. Before analysing our results, we defined the different market capitalisation categories within the shorted companies. According to the

Bloomberg database, we have defined the small caps in our data set as companies with less than \$2 billion in market capitalization, the mid-caps as companies having between \$2 billion and \$10 billion in market capitalization and the large caps as companies having more than \$10 billion in market capitalization.

The graph above clearly demonstrates higher results for companies with small market capitalisation than for medium- and large-cap companies.

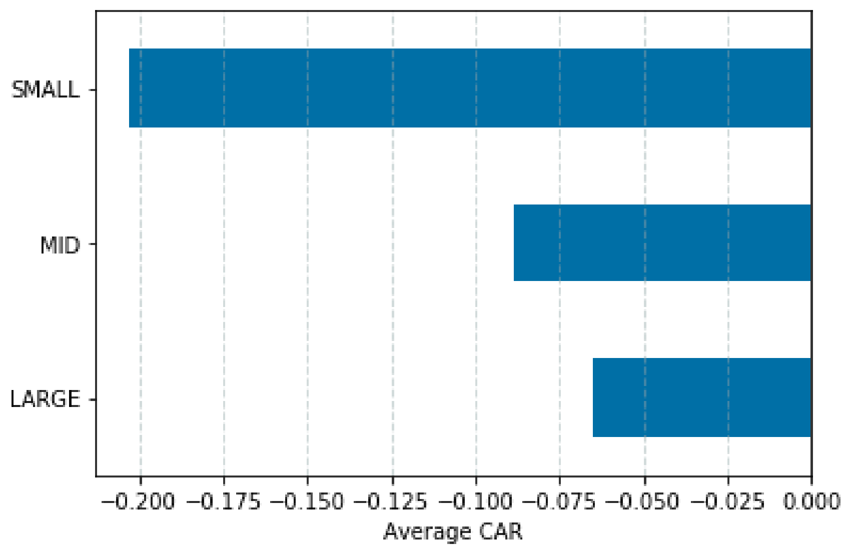

Figure 4.5: Classification of the average Cumulative Abnormal Return by market capitalization

This result seems to us to be both logical and consistent with what is reported in the literature. Intuitively, companies with a large market capitalisation are generally more liquid in the market and therefore their shares are less volatile. Conversely, small-cap companies are less liquid, riskier and therefore more volatile. In addition, they are often less transparent, as they are less supervised by regulators than large market capitalisations, which could more easily lead to fraudulent behaviour, and consequently, be the target of short sellers. In the literature, however, we can see that short interest is, on average, higher for large caps. Furthermore, as small caps are more illiquid, it is more difficult to find a lender willing to lend certain stocks to a short seller (Jones and Lamont 2002). Nevertheless, they also argue that there is a greater short-term overreaction for small-cap stocks and that short sellers will therefore prefer this overreaction (Karl B. Diether and Werner 2009). Our results could then reflect this higher short-term reaction (see details in Appendix 6).

4.3 Interviews

To complete our research on the subject and to get a direct view of those in the field, we conducted two semi-structured interviews and one structured interview. We contacted 14 activist short sellers and one activist long investor by email or through contact forms directly on their websites, presenting our study. Two activist short sellers responded to our invitation as well as the long activist investor. We did not receive responses from the other activists. Due to the health situation and for reasons of convenience (two of them are located in the US), we conducted the two semi-structured interviews by video conference and the structured interview was answered in writing by the activist short seller who wished to remain anonymous using our interview guide. The interviews were completed on 12, 18 and 25 January 2021 and were recorded with the agreement of the respondents. For the video-conference interviews carried out in English, they were guided by the interview guide as a guideline to ensure that all the main themes were covered. After the respective presentations of the interviewee and the interviewer, we addressed three main topics: short selling, stock market activism and the methods used, whose main responses will be developed hereafter.

Activist short sellers

We started the interviews with activist short sellers, both of which are part of the hedge funds analysed in the first part of our empirical study. One of them preferred to remain anonymous and therefore answered our questions in writing. To mention it in our research, we will call it X. The other answered us live and is part of the research company White Diamond Research. We will therefore review the issues discussed with them by starting with the concept of short selling in general. As stated earlier, short selling is a practice beneficial to the stock markets. In addition to a verification and exposure role, as mentioned by X, short selling increases market efficiency, confirmed by our second interviewer:

> ***"Yes, it increases liquidity, it makes more shares outstanding and they help to have more trading and less, you know, when the spread is too high, it makes spreads lower and people get better prices for long and short."***(White Diamond Research, our interview).

This highly controversial practice is often considered unethical because short sellers take advantage of someone's lost earnings to profit themselves. However, this view was not shared by our interviewees, one of whom argued:

> ***"I would say that's not true because the stock should be at a certain price, it should be priced what it worth's because every company has something to offer to the society. When they sell something that society wants to have and the more the society wants it or needs it, so the more the company can make. If this money in the company is worthing more than it likes it's something that people don't really want or need, then, that capital (...) should be put somewhere else. That money should be allocated where it's needed the most, where it's deserved most.***

(...) That's why I think short sellers do a good thing because they make money when a stock is overvalued. They are helping to know that money should be here or should be somewhere else. That's why I think that short selling is just as useful than as useful as longs." (White Diamond Research, our interview).

We then turned to the theme of activism more specifically. Our two respondents unanimously agree that being an activist, i.e. publicly disclosing their ideas, leads to better performance and reactions than so-called passive short sellers:

"Yes, it definitely can. (...). If you short a stock for a reason, I think it's fine to tell the world about it." (White Diamond Research, our interview).

Like any practice, it has advantages and disadvantages. In terms of benefits, what stood out the most was that activism speeds up the process. Indeed, when a report is published on a company deemed to be fraudulent, the price will adjust more quickly than when the market is not aware of it. However, as well as causing a lot of stress, as X told us, it can take time, months or even years, to prove that a company is fraudulent. In addition, another argument put forward by one of the respondents is that the reputation of the activist short seller is at stake and often a large amount of money:

"If you write a bearish report on a stock, you might feel like you have to keep the short position. You don't wanna get rid of the position, you wanna close the position (...). For example, a famous short seller, like let's say, you know, Bill Ackman who shorted Herbalife, had to keep shorting because of his reputation. But maybe if he didn't say anything, he maybe could just cover and not lose so much money." (White Diamond Research, our interview).

We have also seen in our research that it is important to have concrete doubts and reasons for selling short and reporting it publicly. One of our respondents mentioned that it is not enough to sell short when you think a stock is overvalued. It goes far beyond that. And to reach a wider audience and make the market react, the credibility of the statements made by activist short sellers is essential, as we have already noticed in the article of Luc Paugam and Gendron 2020. What matters, says our respondent from White Diamond Research, is the content of the report. It doesn't matter how reputable the activist is if the report is not qualitative or convincing in its content. In addition, X informs us that it is important to document reports clearly to make them more understandable to readers. For this purpose, *"the media coverage is important and good"*.

Once targeted by activist reports, companies have the opportunity to respond to these accusations by way of a press release, by going to the media to defend themselves or directly to the activist in question. Our interviewees agree on the fact that companies only turn to them in very few cases and that in those cases, it is mainly the companies with the most weaknesses or the most at fault:

> ***"The more corrupt they are, the more likely they are to litigate and the less likely to respond to specific allegations. Generally speaking, companies bluster and threaten but do nothing because they fear further exposure."*** (X, our interview).
>
> ***"Usually no, they either publish like a PR, like saying why the report is wrong. Or usually, they do not anything because they do not want to do anything to call changes in the report. They would rather just people forget about it. (...) But usually, the companies that contact me about it, those are the worst companies, I mean those who had the***

big weakness. The weakest companies are the ones that contact me." (White Diamond Research, our interview).

Finally, to close our meeting, we discussed the future of the practice of short selling, especially in an activist way. Once again, they are convinced that activist short selling is not about to end. Despite a growing number of regulations, short selling will continue to help and protect stock markets:

> ***"Well, I think it's pretty clear that short selling helps companies. Because the problem is, like with, usually with short sellers, they short and then they cover again and come back again (...). You know like in a crisis situation or in a recession, as just people selling, but nobody's buying but with short sellers, they will actually buy it. Once the stock reaches a certain level, then the short sellers buy. So that's why I think it's a good thing and also I don't think regulations will gonna stop the activism because it's just more information out there. (...) If you publish something that you think it's true then other people might think the same thing that is true and that's a good thing for the market to have more information out there. That's why I don't think it's gonna be a serious threat and I also think that Europe, they prevent short selling in the Covid-19 crisis but I think short selling would make things better because like I said, people who short, they buy the stock after it goes low, so it's kind of a cushion like if the stock goes too low, then the short seller would buy it and it's a good back up."*** (White Diamond Research, our interview).

Activist long investor

We were also lucky enough to be able to interview an activist investor who is positioned on the other side, namely on long positions. Working for an activist investment management company, he preferred to remain anonymous as well. As before, to quote him in our paper, we will mention him by Y.

This interview, made in French, was carried out by video conference, using a similar approach to the interviews done for activist short sellers, while asking some different questions specific to long positions. We started with broad topics of activism and in particular the topic of advantages and disadvantages, previously discussed, but this time on long positions. The main advantage, common with short positions, is that the activist investor has control over the company, can take matters into his own hands and demand changes, as Y explains:

> ***"The advantage is that when you are an activist, you take things in hand and you don't have the destiny of the company because you don't manage the company but you control the situation much more because you are the one who wants to decide if the company should sell such and such an asset or close such and such an asset or refocus or sell itself. So in a way, you control the process much more."*** (Y, translated from French).

However, one point that has not been raised so far is that an activist, in addition to pressure from the target company and possibly the risk of legal action, may face political pressure if they take especially on large-cap companies. Indeed, demands for change can lead to job losses or the dismissal of the CEO, and in the case of big decisions, the state can intervene. Like short sellers, Y is unanimous that being an activist leads to much higher returns:

> ***"Theoretically, you are more efficient, because if your analysis is right, (...), it will create value if your analysis was interesting. (...). If the position hadn't been disclosed, you wouldn't have been able to put pressure on it and it wouldn't have passed, so yes, it allows you to perform better if you're right. And normally, this is often the case because you have spent a lot of time and energy and effort and money to have a very fine analysis of the situation."*** (Y, translated from French).

We then discussed the similarities and differences between short and long positions. Unlike activist investors on long positions, activist short sellers will generally be up against long shareholders and do not have the same interests as the latter. This is much more difficult, especially as short activists are generally less well perceived.

In addition, as with activist short sellers, we were able to discuss the credibility needed by activist investors and their relationship with the media. As raised earlier, credibility is important and Y adds a different argument to those discussed. Indeed, credibility is measured by the number of successful campaigns and is reflected in the share price:

> ***"It's the number of campaigns you've done. You have 10 campaigns, how many were successful, how many failed. That's what we call your track record. Credibility is your track record, so it's very simple to quantify. (...) Your credibility is also reflected in the stock price on the day you make it public."*** (Y, translated from French).

In agreement with activist short sellers, the media are, in general, beneficial for activist investors. Nevertheless, they can have an unfavourable role for the investor in some cases, as our respondent explains:

> ***"It is obviously beneficial (...). It can be through Bloomberg, through the media, through journalists, it can be through TV, etc. And you need***

it to make yourself heard and to make sure that all the shareholders know what's going on. (...) Afterwards, it can be unfavourable if the company on the other side, against which you are doing an activist action, has a lot of power and is very powerful. If it is very close to the media, it can be unfavourable because the guys can do a smear campaign." (Y, translated from French).

We concluded the interview by discussing the role of short selling in the stock market. Y is unanimous on the fact that the practice is necessary and plays a regulatory role, as he mentions:

> ***"It's a regulatory role. (...) The role of short selling is to create liquidity. Because in fact, when a stock collapses, if you're short, at some point you're going to have to buy it back. (...) So that's why the role of a short sale, you create liquidity, it creates fluidity in the market."*** (Y, translated from French).

5 | Conclusion

The purpose of this thesis was to analyse the performance of short sellers who operate in an activist manner. We thus attempted to answer the following research question: *"Activist short sellers: what are their performances?"*.

5.1 Results of the research

We began by reviewing the literature on this subject. In general, the authors support the idea that public disclosure of their reports leads to a greater reaction in the company's share value. In order to verify these statements, we decided to carry out an "event study". Indeed, in the context of our research, this statistical analysis of the impact of an event on the financial performance of a stock or company seemed the most appropriate. In our case, we analysed the impact of the first date of publication of a short seller's report on the share of the targeted company. As in the literature, we obtained an average negative cumulative abnormal return, amounting to -14.82%, working with a database containing 247 shares. To learn more about the data obtained, we made a classification with three different dimensions. We first classified our data according to the short seller involved in the sale. For this first category, two short sellers easily stood out from the others: Kerrisdale Capital and Viceroy Research. In particular, through their bets on FuboTV (FUBO) and Pareteum Corporation (TEUM) respectively. The second categorisation divided the shares sold short according to the geographical area in which they were located. We have stocks spread over three geographical areas: the United States, Europe and Asia. Activist short campaigns in the US and Asia tend to perform better than in Europe. There are several reasons for these results. First of all, short selling, a rather American practice, is more difficult to establish in Europe due to the numerous regulations concerning it. Moreover, Americans are more likely to accept this practice, which can lead to the failure of a company, than Europeans. This is because the notion of failure and bankruptcy is unequal from one culture to another. With regard to the Asian continent, due to the lack of transparency and information on these markets, and therefore the possibility of potential fraud, short selling opportunities are also greater for short sellers in this region of the world. The third and final category is based on the market capitalisations of companies targeted by activist short sellers. The results obtained for this distinction are straightforward. The lower the market capitalisation, the greater the reaction of the target stocks. Small caps tend to be riskier and, therefore, more volatile, allowing for greater share price reactions than large caps, which are more liquid and often more monitored by regulators.

To supplement our empirical analysis, we conducted three interviews with professionals in the sector, two with activist short sellers and one with an activist on long positions.The interview started with the short sellers, who emphasised that short selling plays an essential role in the stock markets, not only in providing liquidity but also in protecting investors from possible fraud or overvaluation of shares. Both short sellers are convinced that short selling being done in an activist way leads to better performances and, because of that, the media has a central role in publishing reports that are designed to be credible and impactful. Finally, both are convinced that this controversial practice will continue to help and protect the markets, supervisory institutions such as the SEC, but also and above all investors. We then discussed with a long position activist who explained the difference in interests between long and short activists and explained that whatever position is taken, the media is essential for activism but can also be detrimental in certain situations. Finally, he also believes that short selling is necessary for markets because of its important regulatory role.

5.2 Limitations

As with any study, there are some limitations to our research that we will elaborate on in this section.

First of all, the limitations of this work mainly concern the constitution of the data collected. Indeed, we chose to take only the first report published by an activist short seller on a targeted company because we made the hypothesis that the first report is the one that has the greatest impact on the price of the share concerned. In making this assumption, we, therefore, set aside all other reports on the same company. As a result of this approach, we did not take into account the fact that several activists could sell short the same share. This excluded data could potentially change some of the results.

Then, to carry out the event study, we took the date of publication of the short sellers' reports on their respective websites. However, this date might not be exactly the same, give or take a few days, as the official knowledge of the report among companies and the public. These potential discrepancies could eventually bias some of our results. Moreover, due to the difficulty in finding the data, our sample remains relatively small to be able to express general conclusions.

Finally, we assessed the performance of activist short sellers by looking only at changes in share prices. However, we did not take into account the costs associated with short selling as well as any potential costs associated with the publication of their reports, such as the costs of lawsuits or litigation if the target company decides to take action against the activist. All these costs can impact the performance of activist short sellers.

5.3 Short selling in the Covid-19 crisis

Like all previous downturns, the coronavirus crisis has not exempted short selling. The fact is, due to the global Covid-19 pandemic, on February 27, 2020, the American (Dow Jones), German (DAX) and French (CAC40) indices fell by an average of 4%, followed directly by other indices. A few days later, on March 12, 2020, these indices suffered their worst daily losses with -12.2% for the DAX and -12.3% for the CAC40 (Nunn and Kulam 2021). After noticing the fall in stock markets, regulators once again decided

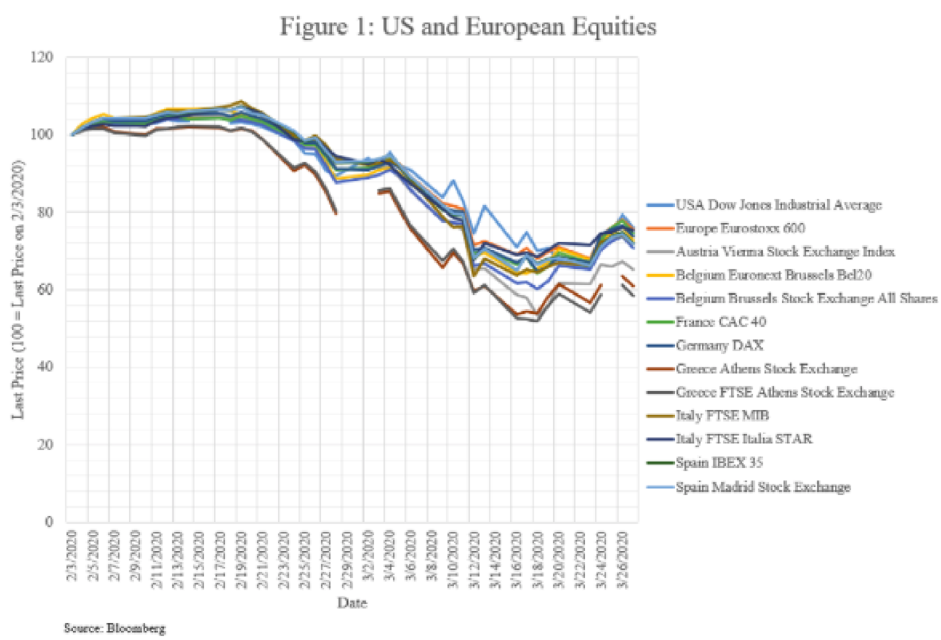

Figure 5.1: Evolution of the US and European indices from February to March 2020

to restrict short selling activities (Nunn and Kulam 2021). Many uncertainties have arisen because of quarantine measures, travel bans, widespread teleworking, measures for business activities and many others. The authorities, therefore, decided to suspend short selling for several months, as they had done before, in order to reduce the instability of the stock markets. Some regulators have banned the practice, while others have simply limited their uses. As prices fell drastically on the markets and volatility soared, the authorities preferred to take measures to preserve financial stability and confidence in the stock markets. In Europe, the European Securities and Markets Authority (ESMA) coordinated the restrictions in collaboration with the national authorities from the member states of the European Union. ESMA requires owners of net short positions in shares to notify the relevant national competent authority *"if the position reaches or exceeds 0.1% of the issued share capital"*. This temporary measure is more restrictive as its threshold is lower than the 0.2% threshold in normal circumstances. The decision was initially in force until 16 June 2020 but was subsequently extended on numerous occasions until 19 March 2021 (T. Matthews et al. 2021). In contrast, no additional regulations to those already put in place by the US have been added (Cao and Schwartz 2020).

5.4 Future of activist short selling

Even though restrictions are likely to become tighter over the years, short selling remains an essential practice within the stock markets. In addition to being a hedging and diversification tool for investors, this practice contributes to market efficiency by preventing overvaluation and providing liquidity in the markets. In an activist way, it is mainly used to detect fraud. But like any strategy, the practice will have to develop and adapt to new increasingly restrictive regulations and new ways of investing by investors. Indeed, sustainability is becoming increasingly important in the investment portfolio of investors. Socially responsible investment is based on financial criteria but also on extra-financial criteria (environmental, social or governance), as explained by Mr Etienne de Callataÿ, during a conference on ESG Finance organised by the LSM Investment Club this past April 28. This new way of investing will therefore also impact short selling. This is because, a sustainability investor, who values ESG criteria, will go long on stocks that have excellent sustainability criteria. On the contrary, these investors will go short on companies that do not have sufficiently high ESG scores (Strauss 2018). This investment development will consequently bring a new component to short selling. As we know, short selling is a risky and dangerous practice, which can lead to huge losses, as we saw with Citron Research recently, which has decided to stop publishing reports outlining their short position choices.

Nevertheless, despite all the new constraints, the practise of short selling still has a long way to go.

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6 | Appendices

Appendix 1a: Example of an extract from a report by an activist short seller (Muddy Waters Capital)

MUDDY WATERS CAPITAL

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Director of Research: Carson C. Block, Esq.

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Appendix 1b: Example of an extract from a report by an activist short seller (Muddy Waters Capital)

When Genius Fails

Report Date: December 16, 2015	**Estimated Value (€):** 6.91 / share
Company: Groupe Casino Guichard-Perrachon SA	**Stock Price (€):** 48.97
	Market Cap (€): 5.66 billion
Ticker: CO FP	**Float**: 56.5m
Industry: General Retail	**Avg Volume**: 724,000

Groupe Casino (CO FP) is one of the most overvalued and misunderstood companies we have ever come across.[1] The basic problem with Casino is that its financial statements are literally meaningless to understanding the company's (poor) health. They do not distinguish between what Casino owns and what it owes. (Spoiler: we estimate Casino's LTM leverage ratio at 8.9x.)

Casino's controlling shareholder Jean-Charles Naouri is a genius. He won first prizes in France's high school Latin and Greek exams, completed his baccalaureate degree at 15, and earned a PhD in math in only one year. Like the geniuses who founded the hedge fund Long-Term Capital Management, which spectacularly collapsed, Mr. Naouri has an affinity for leverage. One would expect Casino to be a relatively boring hypermarket retailer; however, together with its parent, Rallye SA (RAL FP), Casino increasingly resembles a highly levered hedge fund. One example is Casino's total return swaps on listed equities, which we estimate have a mark-to-market loss of approximately €500 million.

Appendix 2: Example of an extract from a report by an activist short seller (Viceroy Research)

Grenke – For Your Fraud Financing Needs

Viceroy puts the spotlight on Grenke's **chicanery**; **swindling** small businesses, **laundering money** for criminals, & **accounting fraud**.

GRENKE®

We finance your business.

September 14, 2020 - Viceroy Research is short Grenke AG (XTRA: GLJ).

Grenke's global expansion through the purchase of dozens of undisclosed related party franchises is a fraudulent scheme perpetrated on a mass scale, designed to either hide fake cash or siphon off millions of euros to undisclosed related parties, or both.

Grenke's banking division has been a conduit for the proceeds of crime and money laundering, and could face the loss of its banking license.

Grenke's leasing model facilitates and encourages rampant fraud from resellers, resulting in bad debt, protracted legal disputes and the defrauding of small businesses, the government, and charities. Legitimate leasing of small ticket tech is becoming increasingly redundant, in outdated and fast diminishing business segments.

Grenke AG		
Exchange		XETRA
Ticker		GLJ
Shares outstanding	000's	46,354
Share price*	€	55.0
Market Cap	€m	**2,549**
P/E	X	26
EV/Sales	X	13.9
EV/EBITDA	X	36.8
* Price at Sep 14, 2020		

Viceroy Research believes Grenke AG's stock is ***uninvestable*** *due to blatant* ***accounting fraud****, including* ***dozens of undisclosed related party transactions****, and the* ***complete lack of internal controls****, right down to individual due diligence on customers.*

Grenke's bonds are hovering above junk territory due to capital adequacy stemming from its banking business, which we believe is ***hiding fake cash****, and is actively used to* ***launder money*** *for* ***binary options scams, crypto scams****, and* ***fraudulent unregulated trading platform****.*

The Red Flags

Grenke AG is a German based asset leasing company with operating divisions and subsidiaries across the globe. Its main activity is offering finance leases to businesses, but it also operates a banking business through a bank subsidiary, which serves SMEs and entrepreneurs. We commenced an investigation into Grenke on observation of the following red flags:

- The widespread fraud and predatory practices facilitated by Grenke's business model
- Grenke's habitual practice of buying underperforming franchisee businesses in questionable circumstances, and the failure to disclose that these franchisee purchases are transactions with related parties.
- The hoarding of excessive amounts of cash on Grenke's balance sheet while Grenke continues to frequently tap the capital markets
- Anomalies in Grenke's financial accounts, including:
  - The suspiciously low level of impairments recognized in Grenke's financial statements
  - The widespread fraud and predatory practices facilitated by Grenke's business model
  - Apparent round tripping of assets and moving NPLS off balance sheet through a network of finance arrangements.
  - Aggressive accounting practices on valuing "assets" – is a €500 dollar printer on a €10,000 contract really a €10,000 asset? Is a €9,500 service contract really a service contract if Grenke does not service any of its leased assets?
- Over 70% of Grenke's lease finance segments are outdated and diving into redundancy and deflation, including printing, open license software, and telecommunication hardware. **Breakdowns of Grenke's loan book contracts show a complete disconnect between the items leased, the categories of clients leasing them and the value of the leases.**
- The make-up and high turnover of Grenke's board and audit committee

Viceroy Research Group 1 viceroyresearch.org

Appendix 3: List and characteristics of shares sold short

Ticker	Company name	CAR	Short Seller	Event Date	MarketCap	Geo Area
PLUG US EQUITY	Plug Power, Inc,	-0.107	Kerrisdale Capital	1/20/21	LARGE	US
FUBO US EQUITY	fuboTV Inc,	-7.207	Kerrisdale Capital	12/30/20	SMALL	US
TTCF US EQUITY	Tattooed Chef, Inc,	0.112	Kerrisdale Capital	11/19/20	SMALL	US
ATRC US EQUITY	AtriCure, Inc,	-0.056	Kerrisdale Capital	9/30/20	SMALL	US
MRTX US EQUITY	Mirati Therapeutics, Inc,	-0.627	Kerrisdale Capital	4/21/20	MID	US
CDNA US EQUITY	CareDx, Inc,	-0.286	Kerrisdale Capital	7/16/19	SMALL	US
TCX US EQUITY	Tucows Inc,	-0.148	Kerrisdale Capital	6/26/19	SMALL	US
IRTC US EQUITY	iRhythm Technologies, Inc,	-0.171	Kerrisdale Capital	3/13/19	SMALL	US
QCOM US EQUITY	Qualcomm Incorporated	-0.014	Kerrisdale Capital	1/23/19	LARGE	US
JOE US EQUITY	The St, Joe Company	0.016	Kerrisdale Capital	4/24/18	SMALL	US
QNST US EQUITY	QuinStreet, Inc,	-0.101	Kerrisdale Capital	4/11/18	SMALL	US
KODK US EQUITY	Eastman Kodak Company	0.404	Kerrisdale Capital	2/7/18	SMALL	US
PRTA US EQUITY	Prothena Corp, PLC	0.346	Kerrisdale Capital	11/8/17	MID	US
VSAT US EQUITY	ViaSat Inc,	0.013	Kerrisdale Capital	6/13/17	MID	US
PLSE US EQUITY	Pulse Biosciences, Inc,	-0.366	Kerrisdale Capital	5/9/17	SMALL	US
NAK US EQUITY	Northern Dynasty Minerals Ltd,	-0.315	Kerrisdale Capital	2/14/17	SMALL	US
AG US EQUITY	First Majestic Silver Corp,	-0.427	Kerrisdale Capital	9/1/16	MID	US
DISH US EQUITY	DISH Network Corporation	0.032	Kerrisdale Capital	5/11/16	LARGE	US
SAGE US EQUITY	Sage Therapeutics, Inc,	-0.251	Kerrisdale Capital	3/23/16	SMALL	US
BVNRY US EQUITY	Bavarian Nordic	-0.644	Kerrisdale Capital	8/3/15	MID	US
ACM US EQUITY	AECOM	-0.024	Spruce Point Capital Management	8/16/16	MID	US
ALGN US EQUITY	Align Technology, inc,	-0.302	Spruce Point Capital Management	4/10/20	LARGE	US
AMCR US EQUITY	Amcor PLC	0.192	Spruce Point Capital Management	3/10/20	LARGE	US
AVAV US EQUITY	AeroVironment	-0.023	Spruce Point Capital Management	11/8/17	SMALL	US
BLDP US EQUITY	Ballard Power Systems Inc,	-0.084	Spruce Point Capital Management	1/25/18	SMALL	US
BURL US EQUITY	Burlington Stores	-0.111	Spruce Point Capital Management	11/3/16	MID	US
CECE US EQUITY	CECO Environmental	0.079	Spruce Point Capital Management	2/13/17	SMALL	US
CHD US EQUITY	Church & Dwight Co,, Inc,	-0.098	Spruce Point Capital Management	9/5/19	LARGE	US
CRESY US EQUITY	IRSA And Cresud	-0.085	Spruce Point Capital Management	11/19/15	SMALL	US
CSTE US EQUITY	Caesarstone	0.019	Spruce Point Capital Management	8/19/15	MID	US
CTAS US EQUITY	Cinta	-0.073	Spruce Point Capital Management	11/13/19	LARGE	US
DBX US EQUITY	Dropbox	-0.048	Spruce Point Capital Management	2/6/20	MID	US
DXCM US EQUITY	DexCom	-0.102	Spruce Point Capital Management	3/22/19	LARGE	US
ECHO US EQUITY	Echo Global Logistics	-0.003	Spruce Point Capital Management	9/8/16	SMALL	US

GNTX US EQUITY	Gentex	-0.023	Spruce Point Capital Management	7/14/17	MID	US
HSIC US EQUITY	Henry Schein	0.005	Spruce Point Capital Management	9/26/18	LARGE	US
KTOS US EQUITY	Kratos Defense & Security Solutions, Inc,	-0.151	Spruce Point Capital Management	3/16/18	SMALL	US
MATW US EQUITY	Matthews International	-0.012	Spruce Point Capital Management	1/11/18	SMALL	US
MGPI US EQUITY	MGP Ingredients, Inc,	-0.232	Spruce Point Capital Management	1/12/17	SMALL	US
MRCY US EQUITY	Mercury Systems	-0.142	Spruce Point Capital Management	4/19/18	MID	US
NCR US EQUITY	NCR Corp,	0.057	Spruce Point Capital Management	4/24/15	MID	US
O US EQUITY	Organically and Faces	-0.030	Spruce Point Capital Management	2/7/18	LARGE	US
PHB US EQUITY	Prestige Consumer Healthcare	0.020	Spruce Point Capital Management	6/30/20	SMALL	US
PLNT US EQUITY	Planet Fitness	0.082	Spruce Point Capital Management	3/9/16	SMALL	US
PTC US EQUITY	PTC Inc,	-0.039	Spruce Point Capital Management	3/23/17	MID	US
RLGT US EQUITY	Radiant Logistics, Inc,	0.002	Spruce Point Capital Management	6/8/17	SMALL	US
SABR US EQUITY	Sabre Corp,	-0.170	Spruce Point Capital Management	4/13/16	MID	US
TSEM US EQUITY	Tower Semiconductor	-0.121	Spruce Point Capital Management	1/14/16	SMALL	US
WDFC US EQUITY	WD-40 Company	-0.047	Spruce Point Capital Management	4/2/20	MID	US
WIX US EQUITY	Wix,com	-0.155	Spruce Point Capital Management	4/19/17	MID	US
WMK US EQUITY	Weis Markets	0.006	Spruce Point Capital Management	9/5/18	SMALL	US
ABBV US EQUITY	AbbVie	-0.020	Citron Research	7/25/18	LARGE	US
ADS US EQUITY	Alliance Data Systems	0.061	Citron Research	8/19/16	LARGE	US
AMBA US EQUITY	Ambarella	0.378	Citron Research	6/24/15	MID	US
APHA US EQUITY	Aphria Inc,	0.002	Citron Research	12/19/18	MID	US
AXDX US EQUITY	Accelerate Diagnostics	-0.435	Citron Research	3/11/15	SMALL	US
BHC US EQUITY	Valeant (Bausch Health Companies Inc,)	-0.464	Citron Research	9/28/15	LARGE	US
CC US EQUITY	Chemours	0.187	Citron Research	6/6/16	SMALL	US
EXAS US EQUITY	EXACT Sciences Corp,	-0.259	Citron Research	5/16/17	MID	US
SHOP US EQUITY	Shopify	-0.301	Citron Research	3/28/18	LARGE	US
FLT US EQUITY	FleetCor	0.020	Citron Research	4/4/17	LARGE	US
GBTC US EQUITY	GBTC	1.132	Citron Research	9/6/17	LARGE	US
HLG US EQUITY	Hailiang Education	-0.107	Citron Research	4/10/18	SMALL	US
INGN US EQUITY	Inogen	-0.173	Citron Research	5/27/18	MID	US
JCOM US EQUITY	J2 Global	-0.124	Citron Research	3/11/16	MID	US
LCI US EQUITY	Lannett	0.071	Citron Research	1/18/17	SMALL	US
LGND US EQUITY	Ligand Pharmaceuticals	-0.114	Citron Research	1/17/19	MID	US
LL US EQUITY	Lumber Liquidators	0.166	Citron Research	3/11/15	SMALL	US
MDXG US EQUITY	MiMedx	-0.023	Citron Research	10/25/17	SMALL	US
MNST US EQUITY	Monster Beverage Corporation	-0.086	Citron Research	2/1/16	LARGE	US
MSI US EQUITY	Motorola Solutions	-0.013	Citron Research	2/7/17	LARGE	US
NFLX US EQUITY	Netflix	-0.133	Citron Research	6/14/18	LARGE	US

NVDA US EQUITY	Nvidia	-0.339	Citron Research	6/11/17	LARGE	US
SNAP US EQUITY	Snap Inc,	0.223	Citron Research	6/3/18	LARGE	US
TDG US EQUITY	TransDigm	-0.074	Citron Research	1/20/17	LARGE	US
TWOU US EQUITY	2U	-0.523	Citron Research	10/13/15	SMALL	US
UI US EQUITY	Ubiquiti	-0.040	Citron Research	9/26/17	MID	US
W US EQUITY	Wayfair	-0.141	Citron Research	9/1/15	MID	US
AMD US EQUITY	AMD	-0.393	Viceroy Research	3/13/18	MID	US
ATNX US EQUITY	Athenex	-0.096	Viceroy Research	10/10/19	SMALL	US
EBIX US EQUITY	Ebix	-0.148	Viceroy Research	12/3/18	MID	US
TEUM US EQUITY	Pareteum	-1.059	Viceroy Research	6/26/19	SMALL	US
PVG US EQUITY	Pretium	-0.034	Viceroy Research	9/6/18	MID	US
SRNE US EQUITY	Sorrento Therapeutics	-2.437	Viceroy Research	5/20/20	SMALL	US
SYAAF US EQUITY	Syrah Resources	-0.174	Viceroy Research	12/23/16	SMALL	US
YY US EQUITY	Joyy Inc,	-0.006	Muddy Waters Research	11/18/20	LARGE	US
MPLN US EQUITY	MultiPlan Corp,	-0.261	Muddy Waters Research	11/11/20	SMALL	US
EHTH US EQUITY	eHealth Inc,	-0.048	Muddy Waters Research	6/2/20	MID	US
GSX US EQUITY	GSX Techedu Inc,	-0.523	Muddy Waters Research	5/18/20	LARGE	US
NMHLY US EQUITY	NMC Health plc	0.684	Muddy Waters Research	12/17/19	SMALL	US
PPTDF US EQUITY	PeptiDream, Inc,	-0.263	Muddy Waters Research	8/7/19	MID	US
MFC US EQUITY	Manulife Financial Corporation	0.054	Muddy Waters Research	10/4/18	LARGE	US
TAL US EQUITY	TAL Education Group	-0.376	Muddy Waters Research	6/13/18	LARGE	US
OSIS US EQUITY	OSI Systems, Inc,	-0.024	Muddy Waters Research	12/6/17	SMALL	US
MAWHF US EQUITY	Man Wah Holdings Limited	-0.139	Muddy Waters Research	6/15/17	MID	US
NJDCY US EQUITY	Nidec Corp,	-0.068	Muddy Waters Research	12/12/16	LARGE	US
NOBGY US EQUITY	Noble Group Ltd	0.877	Muddy Waters Research	4/8/15	LARGE	US
HYLN US EQUITY	Hyliion	-0.661	Glaucus Research	10/16/20	SMALL	US
HTHT US EQUITY	Huazhu	-0.109	Glaucus Research	9/21/20	LARGE	US
JKS US EQUITY	JinkoSolar	0.142	Glaucus Research	3/4/20	MID	US
EVER US EQUITY	Everquote	-0.154	Glaucus Research	12/11/19	SMALL	US
FIZZ US EQUITY	National Beverage	-0.204	Glaucus Research	9/28/16	MID	US
ITOCY US EQUITY	Itochu Corporation	-0.027	Glaucus Research	7/27/16	LARGE	US
CRTO US EQUITY	Criteo SA	0.076	Gotham City Research LLC	9/15/17	MID	US
MDCA US EQUITY	MDC Partners	-0.110	Gotham City Research LLC	4/29/16	SMALL	US
CORT US EQUITY	Corcept Therapeutics	0.092	Blue Orca Capital	2/5/19	SMALL	US
GDS US EQUITY	GDS Holdings	-0.092	Blue Orca Capital	7/31/18	LARGE	US
VUZI US EQUITY	Vuzix Corporation	-0.129	Richard Pearson	3/16/18	SMALL	US
ABEO US EQUITY	Abeona Therapeutics Inc,	-0.223	Richard Pearson	2/15/18	SMALL	US
EEFT US EQUITY	Euronet Worldwide, Inc,	-0.043	Richard Pearson	2/1/18	MID	US

SSTI US EQUITY	ShotSpotter, Inc,	0.113	Richard Pearson	11/21/17	SMALL	US
CETX US EQUITY	Cemtrex, Inc,	-0.319	Richard Pearson	2/22/17	SMALL	US
YRD US EQUITY	Yiren Digital Ltd,	-0.743	Richard Pearson	1/31/17	MID	US
LIVE US EQUITY	Live Ventures Incorporated	0.213	Richard Pearson	1/6/17	SMALL	US
OFIX US EQUITY	Orthofix Medical Inc,	-0.084	Richard Pearson	12/16/16	SMALL	US
NYMX US EQUITY	Nymox Pharmaceutical Corporation Equity	-0.575	Richard Pearson	8/9/16	SMALL	US
OSUR US EQUITY	OraSure Technologies, Inc,	0.023	Richard Pearson	6/30/16	SMALL	US
RVNC US EQUITY	Revance Therapeutics, Inc,	-0.276	Richard Pearson	11/20/15	SMALL	US
OMER US EQUITY	Omeros Corporation	-0.374	Richard Pearson	8/31/15	SMALL	US
FTK US EQUITY	Flotek Industries, Inc,	0.310	Richard Pearson	7/29/15	SMALL	US
SXC US EQUITY	SunCoke Energy, Inc,	0.429	Richard Pearson	6/16/15	SMALL	US
FNRG US EQUITY	ForceField Energy Inc,	6.017	Richard Pearson	4/15/15	SMALL	US
BANC US EQUITY	BANC	-0.060	Marcus Aurelius Value	10/18/16	SMALL	US
PME US EQUITY	Pingtan Marine	-0.370	Marcus Aurelius Value	5/10/17	SMALL	US
CIA US EQUITY	Citizens, Inc,	0.021	Marcus Aurelius Value	3/8/17	SMALL	US
KGJI US EQUITY	Kingold Jewelry, Inc,	-0.548	Marcus Aurelius Value	11/21/16	SMALL	US
PETS US EQUITY	PetMed	-0.074	Marcus Aurelius Value	8/23/17	SMALL	US
EGBN US EQUITY	Eagle Bancorp	-0.052	Marcus Aurelius Value	12/1/17	MID	US
ACHC US EQUITY	Acadia Healthcare	0.078	Marcus Aurelius Value	10/11/18	MID	US
VNDA US EQUITY	Vanda	0.005	Marcus Aurelius Value	2/11/19	SMALL	US
INS US EQUITY	INS	-0.167	Marcus Aurelius Value	5/24/19	SMALL	US
PAYS US EQUITY	Paysign, Inc,	-1.056	Marcus Aurelius Value	11/21/19	SMALL	US
NBIX US EQUITY	Neurocrine Biosciences	-0.054	Marcus Aurelius Value	12/11/19	MID	US
INMD US EQUITY	InMode	-1.468	Marcus Aurelius Value	3/4/20	SMALL	US
PEN US EQUITY	Penumbra Inc,	-0.087	Marcus Aurelius Value	12/28/20	MID	US
BTBT US EQUITY	Bit Digital, Inc,	-0.133	Jcapital Research	1/11/21	SMALL	US
CBAT US EQUITY	CBAK Energy Technology, Inc,	-0.099	Jcapital Research	12/18/20	SMALL	US
TPIC US EQUITY	TPI Composites	-0.207	Jcapital Research	12/3/20	SMALL	US
ACMR US EQUITY	ACM Research	-0.463	Jcapital Research	10/8/20	SMALL	US
STAA US EQUITY	Northern Dynasty	-0.155	Jcapital Research	8/11/20	MID	US
IDEX US EQUITY	STAAR Surgical	0.078	Jcapital Research	6/24/20	SMALL	US
NG US EQUITY	Ideanomics	-0.022	Jcapital Research	5/28/20	MID	US
LKNCY US EQUITY	NovaGold	0.282	Jcapital Research	2/12/20	LARGE	US
ENPH US EQUITY	ENPH	-0.698	Jcapital Research	10/25/19	MID	US
WTCHF US EQUITY	WiseTech	-0.649	Jcapital Research	10/16/19	MID	US
BGNE US EQUITY	BeiGene, Ltd,	-0.208	Jcapital Research	9/5/19	LARGE	US
AOS US EQUITY	A,O, Smith Corporation	-0.028	Jcapital Research	5/16/19	LARGE	US
UXIN US EQUITY	Uxin Limited	-0.278	Jcapital Research	4/24/19	LARGE	US

FANH US EQUITY	Fanhua Inc,	-0.170	Jcapital Research	1/17/19	MID	US
MARK US EQUITY	Remark Holdings	-0.265	Jcapital Research	2/6/18	SMALL	US
YRIV US EQUITY	Yangtze River Port and Development	0.461	Jcapital Research	3/12/18	SMALL	US
INSP US EQUITY	Inspire Medical Systems	-0.504	Wolfpack Research	4/22/20	SMALL	US
IQ US EQUITY	iQIYI, Inc,	-0.282	Wolfpack Research	4/6/20	LARGE	US
QTT US EQUITY	QTT	0.360	Wolfpack Research	12/10/19	MID	US
SGH US EQUITY	SMART Global Holdings, inc,	-0.152	Wolfpack Research	9/25/19	SMALL	US
GTT US EQUITY	GTT Communications, Inc,	0.293	Wolfpack Research	6/5/19	SMALL	US
PTE US EQUITY	PolarityTE	-0.320	Hindenburg Research	10/7/17	SMALL	US
RIOT US EQUITY	Riot Blockchain	-0.448	Hindenburg Research	1/9/18	SMALL	US
BE US EQUITY	Bloom Energy	0.042	Hindenburg Research	9/17/19	SMALL	US
HFFG US EQUITY	HF Foods	-0.544	Hindenburg Research	3/23/20	SMALL	US
PRED US EQUITY	Predictive Technology	-1.670	Hindenburg Research	7/11/19	SMALL	US
WORX US EQUITY	SCWorx	-0.635	Hindenburg Research	4/17/20	SMALL	US
GNUS US EQUITY	Genius Brands	0.634	Hindenburg Research	6/5/20	SMALL	US
WINSF US EQUITY	Wins Finance	1.507	Hindenburg Research	6/17/20	MID	US
NKLA US EQUITY	Nikola	-0.479	Hindenburg Research	9/10/20	LARGE	US
GP US EQUITY	GreenPower Motor Company	-0.228	White Diamond Research	12/8/20	SMALL	US
EXPI US EQUITY	eXp World Holdins, Inc,	-0.275	White Diamond Research	10/22/20	MID	US
CLSK US EQUITY	CleanSpark, Inc,	-0.170	White Diamond Research	10/8/20	SMALL	US
ATOM US EQUITY	Atomera Incorporated	-0.040	White Diamond Research	8/26/20	SMALL	US
MVIS US EQUITY	MicroVision, Inc,	0.059	White Diamond Research	8/3/20	SMALL	US
BSGM US EQUITY	BioSig Technologies, Inc,	0.429	White Diamond Research	4/23/20	SMALL	US
DYAI US EQUITY	Dyadic International, Inc,	0.430	White Diamond Research	3/5/20	SMALL	US
CODX US EQUITY	Co-Diagnostics, Inc,	2.742	White Diamond Research	2/18/20	SMALL	US
NNVC US EQUITY	NanoViricides, Inc,	1.360	White Diamond Research	2/3/20	SMALL	US
ATEC US EQUITY	Alphatex Holdings, Inc,	-0.159	White Diamond Research	1/29/20	SMALL	US
ENOB US EQUITY	Enochian Biosciences, Inc,	-0.539	White Diamond Research	11/19/19	SMALL	US
RESN US EQUITY	Resonant Inc,	-0.054	White Diamond Research	10/9/19	SMALL	US
UEEC US EQUITY	United Health Products, Inc,	-0.458	White Diamond Research	8/27/19	SMALL	US
AERG US EQUITY	Applied Energetics, Inc,	-1.555	White Diamond Research	6/18/19	SMALL	US
TRCH US EQUITY	Torchlight Energy Resources, Inc,	-0.114	White Diamond Research	4/29/19	SMALL	US
CFMS US EQUITY	Conformis, Inc,	0.355	White Diamond Research	4/11/19	SMALL	US
AMSC US EQUITY	American Superconductor Corporation	-0.049	White Diamond Research	3/25/19	SMALL	US
TTOO US EQUITY	T2 Biosystems, Inc,	0.156	White Diamond Research	3/5/19	SMALL	US
APYX US EQUITY	Apyx Medical Corporation	-0.116	White Diamond Research	2/21/19	SMALL	US
NBEV US EQUITY	NewAge, Inc,	-0.574	White Diamond Research	2/6/19	SMALL	US
HUGE US EQUITY	FSD Pharma Inc,	-3.889	White Diamond Research	1/25/19	SMALL	US

HSDT US EQUITY	Helius Medical Technologies, Inc,	-0.314	White Diamond Research	1/22/19	SMALL	US
NXTTF US EQUITY	Namaste Technologies Inc,	-0.724	White Diamond Research	10/16/18	SMALL	US
VEND US EQUITY	Generation Next Franchise Brands	-0.620	White Diamond Research	6/27/18	SMALL	US
VIVE US EQUITY	Viveve Medical, Inc,	-0.114	White Diamond Research	6/12/18	SMALL	US
YCBD US EQUITY	cbdMD, Inc,	0.696	White Diamond Research	5/15/18	SMALL	US
AMPE US EQUITY	Ampio Pharmaceuticals, Inc,	0.084	White Diamond Research	1/9/18	SMALL	US
CLIR US EQUITY	ClearSign Technologies Corporation	0.122	White Diamond Research	1/5/18	SMALL	US
MBII US EQUITY	Marrone Bio Innovations, Inc,	0.368	White Diamond Research	12/5/17	SMALL	US
MRAM US EQUITY	Everspin Technologies, Inc,	-0.665	White Diamond Research	10/12/17	SMALL	US
DCTH US EQUITY	Delcath Systems, Inc,	-0.755	White Diamond Research	7/12/17	SMALL	US
MTNB US EQUITY	Matinas BioPharma Holdings, Inc,	-1.029	White Diamond Research	3/24/17	SMALL	US
MNKD US EQUITY	Mannkind Corporation	0.329	White Diamond Research	3/30/16	SMALL	US
RWLK US EQUITY	ReWalk Robotics Ltd,	0.984	White Diamond Research	12/30/15	SMALL	US
VBLT US EQUITY	Vascular Biogenics Ltd,	-1.308	White Diamond Research	5/19/15	SMALL	US
ICLD US EQUITY	InterCloud Systems, Inc,	-0.326	White Diamond Research	5/5/15	SMALL	US
BLDR US EQUITY	Builders FirstSource, Inc,	-2.207	White Diamond Research	4/13/15	SMALL	US
MIDD US EQUITY	MIDDLEBY CORP,	0.034	Prescience Point Capital Management	4/15/20	MID	US
MDLA US EQUITY	MEDALLIA, INC,	0.112	Prescience Point Capital Management	1/16/20	MID	US
BRMK US EQUITY	BROADMARK REALTY CAPITAL INC,	-0.352	Prescience Point Capital Management	12/10/19	SMALL	US
K US EQUITY	KELLOGG COMPANY	0.061	Prescience Point Capital Management	4/26/18	LARGE	US
CMCM US EQUITY	CHEETAH MOBILE	-0.188	Prescience Point Capital Management	10/26/17	MID	US
STMP US EQUITY	STAMPS,COM	-0.355	Prescience Point Capital Management	7/14/16	SMALL	US
ULTA US EQUITY	ULTA SALON, COSMETICS & FRAGRANCE	-0.074	Mako Research	2/18/16	LARGE	US
AERI US EQUITY	Aerie Pharmaceuticals	-0.041	Mako Research	7/15/19	SMALL	US
AKTS US EQUITY	Akoustis	-0.349	Mako Research	8/9/17	SMALL	US
APPS US EQUITY	Digital Turbine	-0.297	Mako Research	9/2/15	SMALL	US
CTSO US EQUITY	Cytosorbents	0.028	Mako Research	8/15/19	SMALL	US
CYRX US EQUITY	Cryoport	-0.209	Mako Research	8/23/19	SMALL	US
FLXN US EQUITY	Flexion	0.005	Mako Research	10/17/18	SMALL	US
IPIX US EQUITY	Cellceutix	-0.573	Mako Research	8/6/15	SMALL	US
LXRX US EQUITY	Lexicon	-0.138	Mako Research	9/30/19	SMALL	US
MNOV US EQUITY	MediciNova	0.118	Mako Research	3/3/16	SMALL	US
MPAA US EQUITY	Motorcar Parts Of America	0.031	Mako Research	9/5/19	SMALL	US
VRAY US EQUITY	ViewRay	0.165	Mako Research	7/20/17	SMALL	US
WKHS US EQUITY	Workhorse Group	-1.302	Mako Research	4/27/16	SMALL	US
ALM LN Equity	Allied Minds	-0.791	Kerrisdale Capital	9/22/15	SMALL	EU
ASC LN Equity	Axcelis Technologies	-0.070	Kynikos Associates LP	11/1/12	SMALL	EU
OCDO LN Equity	OCADO Group PLC	0.263	Kynikos Associates LP	11/20/12	SMALL	EU

GLJ GR Equity	Grenke AG	-0.004	Viceroy Research	9/15/20	MID	EU
WDI GR Equity	Wirecard	0.190	Viceroy Research	7/3/20	LARGE	EU
9BFA GR Equity	Burford Capital Ltd,	0.076	Muddy Waters Research	5/11/20	MID	EU
IQE LN Equity	IQE plc	-0.092	Muddy Waters Research	2/8/18	SMALL	EU
PETS LN Equity	Pets At Home Group	0.090	Glaucus Research	5/12/20	SMALL	EU
IPO LN Equity	IP Group	0.006	Jcapital Research	2/2/18	SMALL	EU
BOO LN Equity	Boohoo,com	-0.133	Jcapital Research	6/14/17	SMALL	EU
3836 HK Equity	China Harmony Auto	-0.030	Glaucus Research	11/12/20	MID	ASIA
3998 HK Equity	Bosideng	0.154	Glaucus Research	6/24/19	LARGE	ASIA
1044 HK Equity	Hengan	0.045	Glaucus Research	12/12/18	LARGE	ASIA
607 HK Equity	Fullshare Holdings	-0.258	Glaucus Research	4/4/17	LARGE	ASIA
931 HK Equity	China LNG Group Limited	-0.389	Glaucus Research	7/14/15	LARGE	ASIA
2014 HK Equity	Ozner Water Intl,	-0.174	Glaucus Research	2/16/15	MID	ASIA
2233 HK Equity	West China Cement	-0.511	Glaucus Research	8/8/12	MID	ASIA
2018 HK Equity	AAC Technologies Holdings	-0.028	Gotham City Research LLC	5/11/17	LARGE	ASIA
6186 HK Equity	China Feihe	-0.668	Blue Orca Capital	7/8/20	LARGE	ASIA
867 HK Equity	China Medical System Holding	-0.122	Blue Orca Capital	2/6/20	LARGE	ASIA
496 HK Equity	Kasen International Holdings Ltd	1.810	Blue Orca Capital	11/21/19	MID	ASIA
1717 HK Equity	Ausnutria Dairy Corp Ltd	-0.286	Blue Orca Capital	8/15/19	LARGE	ASIA
1360 HK Equity	Mega Expo Holdings Ltd	-0.492	Blue Orca Capital	5/9/19	MID	ASIA
1910 HK Equity	Samsonite	-0.144	Blue Orca Capital	5/24/18	MID	ASIA
1259 HK Equity	Prince Frog International Holdings Ltd	-0.312	Blue Orca Capital	10/16/13	MID	ASIA
1636 HK Equity	China Metal Resources Utilization	-0.986	Hindenburg Research	5/17/20	MID	ASIA

Appendix 4: Details of aggregation by short seller

Short Seller	# shorts	CAR
Blue Orca Capital	9	-0.024
Citron Research	27	-0.042
Glaucus Research	14	-0.149
Gotham City Research LLC	3	-0.021
Hindenburg Research	10	-0.290
Jcapital Research	18	-0.149
Kerrisdale Capital	21	-0.504
Kynikos Associates LP	2	0.097
Mako Research	12	-0.213
Marcus Aurelius Value	13	-0.295
Muddy Waters Research	14	-0.008
Prescience Point Capital Management	7	-0.109
Richard Pearson	15	0.289
Spruce Point Capital Management	31	-0.052
Viceroy Research	9	-0.462
White Diamond Research	37	-0.221
Wolfpack Research	5	-0.057

Appendix 5: Details of aggregation by geographical area

Geo Area	# shorts	CAR
ASIA	16	-0.149
EU	10	-0.046
US	221	-0.153

Appendix 6: Details of aggregation by market capitalization

MarketCap_Feature	# shorts	CAR
LARGE	48	-0.065
MID	60	-0.089
SMALL	139	-0.203

Appendix 7: Details of CAR t-tests

Ticker	CAR t-test	P-value
PLUG US EQUITY	-0.419	0.338
FUBO US EQUITY	-3.560	0.000
TTCF US EQUITY	0.315	0.377
ATRC US EQUITY	-7.366	0.000
MRTX US EQUITY	-3.010	0.002
CDNA US EQUITY	-6.858	0.000
TCX US EQUITY	-1.930	0.028
IRTC US EQUITY	-11.578	0.000
QCOM US EQUITY	-0.307	0.380
JOE US EQUITY	1.041	0.150
QNST US EQUITY	-0.727	0.234
KODK US EQUITY	2.291	0.012
PRTA US EQUITY	0.810	0.210
VSAT US EQUITY	3.355	0.001
PLSE US EQUITY	-0.658	0.256
NAK US EQUITY	-1.441	0.076
AG US EQUITY	-3.218	0.001
DISH US EQUITY	3.782	0.000
SAGE US EQUITY	-1.177	0.121
BVNRY US EQUITY	-1.820	0.036
ACM US EQUITY	-0.291	0.386
ALGN US EQUITY	-2.049	0.022
AMCR US EQUITY	2.145	0.017
AVAV US EQUITY	-1.285	0.101
BLDP US EQUITY	-0.898	0.186
BURL US EQUITY	-46.426	0.000
CECE US EQUITY	2.278	0.012
CHD US EQUITY	-1.726	0.044
CRESY US EQUITY	-2.193	0.015
CSTE US EQUITY	0.589	0.279
CTAS US EQUITY	-14.534	0.000
DBX US EQUITY	-0.295	0.384
DXCM US EQUITY	-3.237	0.001
ECHO US EQUITY	-5.596	0.000
GNTX US EQUITY	-2.018	0.023
HSIC US EQUITY	0.236	0.407
KTOS US EQUITY	-1.115	0.134
MATW US EQUITY	-3.555	0.000
MGPI US EQUITY	-4.975	0.000
MRCY US EQUITY	-11.363	0.000
NCR US EQUITY	0.639	0.262
O US EQUITY	-0.468	0.320
PHB US EQUITY	0.746	0.229
PLNT US EQUITY	2.605	0.005
PTC US EQUITY	-2.936	0.002
RLGT US EQUITY	0.152	0.440
SABR US EQUITY	-21.606	0.000
TSEM US EQUITY	-1.429	0.078
WDFC US EQUITY	-0.610	0.272
WIX US EQUITY	-6.940	0.000

WMK US EQUITY	0.141	0.444
ABBV US EQUITY	-1.831	0.035
ADS US EQUITY	6.033	0.000
AMBA US EQUITY	1.099	0.137
APHA US EQUITY	0.007	0.497
AXDX US EQUITY	-1.726	0.044
BHC US EQUITY	-11.715	0.000
CC US EQUITY	0.524	0.301
EXAS US EQUITY	-1.470	0.072
SHOP US EQUITY	-2.899	0.002
FLT US EQUITY	0.391	0.348
GBTC US EQUITY	1.264	0.105
HLG US EQUITY	-0.497	0.310
INGN US EQUITY	-101.144	0.000
JCOM US EQUITY	-10.481	0.000
LCI US EQUITY	0.427	0.335
LGND US EQUITY	-2.438	0.008
LL US EQUITY	0.282	0.389
MDXG US EQUITY	-0.162	0.436
MNST US EQUITY	-1.366	0.088
MSI US EQUITY	-0.591	0.278
NFLX US EQUITY	-1.551	0.062
NVDA US EQUITY	-6.540	0.000
SNAP US EQUITY	112.414	0.000
TDG US EQUITY	-3.148	0.001
TWOU US EQUITY	-4.427	0.000
UI US EQUITY	-1.702	0.046
W US EQUITY	-0.602	0.274
AMD US EQUITY	-2.300	0.012
ATNX US EQUITY	-1.445	0.076
EBIX US EQUITY	-4.414	0.000
TEUM US EQUITY	-1.733	0.043
PVG US EQUITY	-0.108	0.457
SRNE US EQUITY	-1.300	0.098
SYAAF US EQUITY	-0.390	0.349
YY US EQUITY	-0.704	0.242
MPLN US EQUITY	-0.604	0.274
EHTH US EQUITY	-0.457	0.324
GSX US EQUITY	-6.287	0.000
NMHLY US EQUITY	0.337	0.368
PPTDF US EQUITY	-1.429	0.078
MFC US EQUITY	1.457	0.074
TAL US EQUITY	-4.452	0.000
OSIS US EQUITY	-1.272	0.103
MAWHF US EQUITY	-0.405	0.343
NJDCY US EQUITY	-5.656	0.000
NOBGY US EQUITY	2.580	0.006
HYLN US EQUITY	-1.054	0.147
HTHT US EQUITY	-7.285	0.000
JKS US EQUITY	0.274	0.392
EVER US EQUITY	-1.274	0.103
FIZZ US EQUITY	-11.078	0.000
ITOCY US EQUITY	-3.962	0.000

CRTO US EQUITY	1.036	0.151
MDCA US EQUITY	-2.981	0.002
CORT US EQUITY	0.420	0.338
GDS US EQUITY	-0.306	0.380
VUZI US EQUITY	-1.139	0.129
ABEO US EQUITY	-80.155	0.000
EEFT US EQUITY	-2.843	0.003
SSTI US EQUITY	0.559	0.289
CETX US EQUITY	-1.571	0.060
YRD US EQUITY	-1.816	0.036
LIVE US EQUITY	1.245	0.108
OFIX US EQUITY	-1.877	0.032
NYMX US EQUITY	-1.290	0.100
OSUR US EQUITY	1.333	0.093
RVNC US EQUITY	-78.695	0.000
OMER US EQUITY	-0.820	0.207
FTK US EQUITY	0.538	0.296
SXC US EQUITY	41.679	0.000
FNRG US EQUITY	0.689	0.246
BANC US EQUITY	-0.506	0.307
PME US EQUITY	-0.917	0.181
CIA US EQUITY	0.245	0.403
KGJI US EQUITY	-1.651	0.051
PETS US EQUITY	-0.650	0.259
EGBN US EQUITY	-1.411	0.081
ACHC US EQUITY	1.566	0.060
VNDA US EQUITY	0.155	0.439
INS US EQUITY	-0.542	0.294
PAYS US EQUITY	-3.834	0.000
NBIX US EQUITY	-0.339	0.368
INMD US EQUITY	-14.001	0.000
PEN US EQUITY	-7.623	0.000
BTBT US EQUITY	-0.859	0.196
CBAT US EQUITY	-0.356	0.361
TPIC US EQUITY	-1.410	0.081
ACMR US EQUITY	-8.311	0.000
STAA US EQUITY	-4.628	0.000
IDEX US EQUITY	0.357	0.361
NG US EQUITY	-0.048	0.481
LKNCY US EQUITY	0.682	0.248
ENPH US EQUITY	-2.079	0.020
WTCHF US EQUITY	-2.509	0.007
BGNE US EQUITY	-2.136	0.018
AOS US EQUITY	-1.134	0.130
UXIN US EQUITY	-0.362	0.359
FANH US EQUITY	-36.613	0.000
MARK US EQUITY	-1.056	0.147
YRIV US EQUITY	0.502	0.309
INSP US EQUITY	-3.999	0.000
IQ US EQUITY	-0.922	0.179
QTT US EQUITY	0.718	0.237
SGH US EQUITY	-1.078	0.142
GTT US EQUITY	1.026	0.154

PTE US EQUITY	-22.048	0.000
RIOT US EQUITY	-1.392	0.084
BE US EQUITY	0.393	0.348
HFFG US EQUITY	-0.594	0.277
PRED US EQUITY	-2.112	0.019
WORX US EQUITY	-0.615	0.270
GNUS US EQUITY	0.614	0.270
WINSF US EQUITY	0.874	0.192
NKLA US EQUITY	-0.795	0.214
GP US EQUITY	-0.814	0.209
EXPI US EQUITY	-4.117	0.000
CLSK US EQUITY	-0.290	0.386
ATOM US EQUITY	-2.218	0.014
MVIS US EQUITY	0.307	0.380
BSGM US EQUITY	0.946	0.173
DYAI US EQUITY	0.677	0.250
CODX US EQUITY	1.624	0.054
NNVC US EQUITY	1.466	0.073
ATEC US EQUITY	-0.407	0.342
ENOB US EQUITY	-5.777	0.000
RESN US EQUITY	-1.405	0.082
UEEC US EQUITY	-0.682	0.248
AERG US EQUITY	-3.757	0.000
TRCH US EQUITY	-161.562	0.000
CFMS US EQUITY	1.316	0.096
AMSC US EQUITY	-3.710	0.000
TTOO US EQUITY	1.473	0.072
APYX US EQUITY	-0.325	0.373
NBEV US EQUITY	-3.078	0.001
HUGE US EQUITY	-3.730	0.000
HSDT US EQUITY	-1.356	0.089
NXTTF US EQUITY	-1.289	0.100
VEND US EQUITY	-0.903	0.184
VIVE US EQUITY	-1.966	0.026
YCBD US EQUITY	2.447	0.008
AMPE US EQUITY	0.592	0.277
CLIR US EQUITY	2.286	0.012
MBII US EQUITY	1.968	0.026
MRAM US EQUITY	-4.998	0.000
DCTH US EQUITY	-1.042	0.150
MTNB US EQUITY	-2.567	0.006
MNKD US EQUITY	3.083	0.001
RWLK US EQUITY	1.654	0.051
VBLT US EQUITY	-2.896	0.002
ICLD US EQUITY	-0.305	0.381
BLDR US EQUITY	-1.627	0.054
MIDD US EQUITY	2.180	0.016
MDLA US EQUITY	0.324	0.373
BRMK US EQUITY	-0.687	0.247
K US EQUITY	1.109	0.135
CMCM US EQUITY	-0.896	0.186
STMP US EQUITY	-8.588	0.000
ULTA US EQUITY	-1.832	0.035

AERI US EQUITY	-0.333	0.370
AKTS US EQUITY	-0.883	0.190
APPS US EQUITY	-1.260	0.105
CTSO US EQUITY	0.419	0.338
CYRX US EQUITY	-7.842	0.000
FLXN US EQUITY	0.028	0.489
IPIX US EQUITY	-0.964	0.169
LXRX US EQUITY	-0.790	0.216
MNOV US EQUITY	0.974	0.166
MPAA US EQUITY	52.096	0.000
VRAY US EQUITY	0.514	0.304
WKHS US EQUITY	-1.463	0.073
ALM LN Equity	-3.025	0.002
ASC LN Equity	-1.841	0.034
OCDO LN Equity	3.416	0.000
GLJ GR Equity	-0.071	0.472
WDI GR Equity	1.903	0.030
9BFA GR Equity	0.271	0.393
IQE LN Equity	-0.367	0.357
PETS LN Equity	0.485	0.315
IPO LN Equity	0.043	0.483
BOO LN Equity	-0.933	0.177
3836 HK Equity	-1.360	0.089
3998 HK Equity	2.147	0.017
1044 HK Equity	0.876	0.192
607 HK Equity	-1.599	0.057
931 HK Equity	-3.960	0.000
2014 HK Equity	-6.345	0.000
2233 HK Equity	-32.746	0.000
2018 HK Equity	-0.321	0.374
6186 HK Equity	-24.366	0.000
867 HK Equity	-1.955	0.027
496 HK Equity	0.666	0.254
1717 HK Equity	-1.308	0.097
1360 HK Equity	-2.490	0.007
1910 HK Equity	-1.267	0.104
1259 HK Equity	-3.225	0.001
1636 HK Equity	-1.294	0.099

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