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The Ups and Downs of SPACs

An analysis of abnormal returns for recent SPACs during its different stages

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Abstract

As Special Purpose Acquisition Companies (SPACs) are becoming the increasingly popular method of taking a company public, the lack of research on abnormal returns for this asset class since its introduction to the major exchanges validates a reason to expand the investigation. This thesis examines the potential abnormal returns found in different stages of recent SPACs lifecycle, dividing the SPACs into its three major events. 1. The SPAC IPO, 2. The Definitive Agreement (DA) 3. The Merger. Event studies are then used to calculate abnormal returns both for short-term (Cumulative Abnormal Returns) and long-term (Buy-and-hold Abnormal Returns) around, between, and after the DA and the merger event. Additional focus is put on analyzing the period between the DA and the merger. The significance of the abnormal returns is then tested using T-tests and Wilcoxon signed rank test. The data sample for the paper includes 96 still active SPACs that completed their merger between the start of 2019 to February 11th, 2021. The results indicate positive abnormal returns after the DA in the short term and negative abnormal returns after the merger in the long run which is in line with previous studies. When analyzing the long-term returns between the DA and the merger, increasingly positive abnormal returns are found up until around 60 days post DA where it then starts to decline. This result is then further investigated by dividing the SPACs into two groups depending on how quickly they complete the merger after the DA. A two-sample t-test reports a significant difference between the means of the two groups and suggests that the faster group performs better both in the short term and the long term from the DA.

Keywords: SPACs, Special Purpose Acquisition Company, Event Study, Agency Theory, Abnormal Returns, CAR, BHAR.

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Table of Contents

1. Introduction

A SPAC (Special Purpose Acquisition Company) is according to the SEC (the U.S. Securities and Exchange Commission) (n.d.) an entity whose sole objective is to raise capital through an IPO (Initial Public Offering) for the purpose to acquire or merge with an existing private company yet to be identified, within a certain timeframe. Since there is no actual business operation taking place in a SPAC it is commonly called a "Blank check company" or a "Shell company". SPACs are not completely unknown and were introduced in 2003 where they were increasingly popular up until the financial crisis in 2008 before almost completely disappearing. In recent years Wall Street has again seen a rise in the amount of SPAC IPOs and after the extremely volatile market following the aftermath of the covid-19 breakout, the interest in SPACs was soaring.

The massive popularity surge for SPACs makes it one of the latest and hottest trends on Wall Street and an interesting and relevant topic to investigate. To date, there is a clear lack of research on SPACs compared to their popularity on the market and the limited amount that does exist are mostly a few years old and uses a sample of SPACs mainly from before the financial crisis. So, since its almost revival in recent years and that the SPAC structure has changed over the years as reported by D'Alvia (2019) this makes modern SPACs interesting to study.

Berger (2008) shows that many international firms used the SPAC mechanism to go public since these may tend to be priced out of the traditional IPO market and a SPAC gives them a feasible alternative to going public. Datar, Emm, and Ince (2012); Kolb and Tykvová (2016) conclude that firms that use SPAC vehicles have in general low profitability, low growth opportunities, are small and quite levered. They also show that these firms have lower abnormal returns after the merger[1] is done which may be explained by lower quality. It also may be the case that firm owners use SPAC vehicles as an exit route and require a higher price than they do in an IPO. It is often difficult to liquidate the entire ownership share in IPOs because of lock-up agreements and negative signaling (Bradley, Jordan, Yi & Rotten, 2001; Brau, Francis & Kohers, 2003; Field & Hanka, 2001). On the other hand, American studies have not proven that owners use a SPAC vehicle as an exit.

[1] The merger is the event where the entire acquisition process is completed (For SPACs this is sometimes also called reverse-merger or deSPAC), including the general meeting voting through the acquisition and in connection with it, the acquisition is listed instead of the SPAC itself.

Since a SPAC has several stakeholders such as investors and sponsors with different interests, agency costs for shareholders can arise which can be explained by the agency theory. Agency theory was developed by Jensen and Meckling (1976) and addresses several organizational problems, in a SPAC context there is asymmetric information between the investors and the sponsors. According to Dimitrova (2017), the SPAC contract probably creates incentives for sponsors to make bad acquisitions instead of no acquisition at all, which is explained by sponsors receiving fees and equity compensations. Clearly, agency costs arise for shareholders because the investors prefer a good acquisition followed by no merger at all. While the sponsors prefer a good acquisition followed by a bad acquisition instead of no merger at all which probably partly distorts sponsors' actions in the interests of shareholders.

Earlier studies have investigated long-run abnormal returns after the merger event, respectively short-run abnormal return around the definitive agreement[2] (DA) event. Gleason, Jain, and Rosenthal (2008) find that underpricing is significantly lower for reverse mergers than for firms that go public through a traditional IPO, which indicates that the SPAC is valued at the firm's market value before the merger event. Additionally, Tran (2010) concluded that SPACs have a higher three-day abnormal return upon the definitive agreement than other public acquisitions which implies that the acquisition is better than the shareholders expected in the short run. On the other hand, Dimitrova (2017) proves that the short-term positive returns around DA are driven only because they have managed to find an acquisition and the average SPAC acquisition is value-destroying anyway which is in line with their long-term post-merger result.

Previous literature is missing both the long-run abnormal return between the definitive agreement event and the merger respectively the short-term abnormal returns around the merger event which gives us the opportunity to fill a knowledge gap. However, the purpose of this thesis is to investigate abnormal returns for different stages of the SPACs life-cycle where the main investigation takes place between the definitive agreement and the merger event. Additionally, our results seem to show that there is a negative relation between the time to complete the merger and the abnormal returns after the definitive agreement. Furthermore, this thesis is dividing the sample into two subsamples, a subsample for fast SPACs respectively a subsample for slow SPACs, to investigate if there are any concrete differences regarding short and long-term abnormal returns around and after the definitive agreement for the two groups.

[2] The definitive agreement is the event where the founders of the SPAC sign a definitive merger agreement with the targeted company announcing the business combination to the public and the market.

Additionally, abnormal returns for the short-term around the merger are also being investigated which is not too common in past literature unlike short-term abnormal returns around the definitive agreement and long-term abnormal returns after the merger event, which is more common and will be used as a comparison.

For the results, event studies are used to measure abnormal returns for American SPACs in different event windows and then trying to support the outcome by using the efficient market hypothesis and the agency theory. Abnormal returns are measured through the adjusted market model which is the difference between actual return for the sample and an index used as a proxy for the expected return which for this paper will be the Russel 2000 index.

The remaining parts of the study have the following outline: Theory and previous studies are reported in Chapter 2. In Chapter 3 collected data and the chosen method are discussed and presented. The results of the study are presented in Chapter 4. In Chapter 5 our results are analyzed, and Chapter 6 reports our conclusions.

2. Literature Review and Theoretical Framework

2.1. Special Purpose Acquisition Companies

Special Purpose Acquisition Companies or SPACs for short have had a history in the US market for decades, in the earliest stages referred to as blank check companies as they had no operational business. It was first introduced as SPACs which it is known by today, in 2003. Here the financial asset gained increasing momentum up until the financial crisis in 2008 where it completely disappeared. After the financial crisis, D'Alvia (2019) documents the changes that took place for the future of the SPAC market, starting off with the two giant exchanges NASDAQ and NYSE offering to start allowing the listing of SPACs on their markets. Prior to this, SPACs had only been listed on capital markets with less regulated listing requirements. After the SEC approved the offer, SPACs were now permitted to start getting listed on these exchanges. However, NASDAQ and NYSE are a lot more regulated, and the listing rules had stricter requirements for the SPACs concluding in a more cohesive and stricter legal framework for SPACs to operate. Two years later, SPACs were back again and have since then started to increase in popularity once more. Still, it was only very recently since the start of last year in 2020 that the subject became extensively popular and increasingly discussed in financial newspapers and research papers.

Suggested by the numerous legal modifications for regulation and structure for the asset class over the years and the poor history of fraud for blank check companies, previous academic research on these types of companies is not exclusively aimed financially, a wide selection of the previous papers focuses on the legal part of the asset class (D'Alvia, 2019; Heyman, 2007; Sjostrom, 2007).

This paper focuses on the "modern" SPAC defined as the current structure circulating on NASDAQ and NYSE that became active after the financial crisis in 2008. In short, the lifetime of a SPAC will have three major events that are going to be a central premise in this paper.

1. SPAC IPO is formed and listed on an exchange.
2. Definitive Agreement (DA), the targeted company is announced.
3. Merger completion/Liquidation

Starting with the initial public offering where the SPAC is listed on an exchange with an

overwhelming majority being on either NASDAQ or NYSE (Passador, 2021). Initially, investors are given the opportunity to purchase a unit that consists of a share and some portion of a warrant. The most common price for this unit is $10.00, After about 45 days the shares and warrants are enlisted on the exchange separately. Since the unit purchase includes both a share and some fraction of a warrant the starting price for the share is usually a bit under $10. A full warrant allows the investor to buy a stock in the future at a fixed price. SPACs has around 18-24 months to find a target and complete a merger after the SPAC IPO formation (Lewellen, 2009). After the initial stage of forming the SPAC IPO, the longest phase begins which revolves around the SPAC trying to find a target company to complete the acquisition with. during this, up to 24 months-long process, a search and negotiations take place up until the ending of the stage which ends with a definitive agreement. The SPAC and the targeted company announce a definitive agreement of a merger. This leads to the last stage which takes place between the announcement (DA) and the actual merger lasting for about three to four calendar months in our sample. Here, final negotiations take place as well as the very important shareholder voting at the general meeting, where the shareholders vote if the SPAC should merge with the company or not. If shareholders reject the merger plans or if the SPAC does not manage to find a company to merge with the SPAC faces liquidation and the money invested that has been placed in a trust fund is refunded to the investors. A simple description of the SPACs timeline is illustrated below.

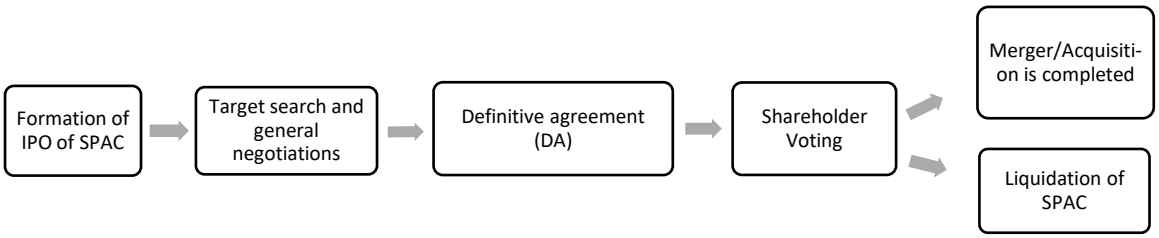

Figure 1 illustrates the simplified 18–24-month long timeline for the SPACs from start to end.

While bringing up previous literature studying SPACs performance for the last decades it is important to note that more than half of all SPACs ever-existing have been founded since the beginning of 2020. This was also the year were for the first time ever the number of total IPOs in the majority came from SPAC IPOs (Go 2021). Go and his team further report that for the first quarter of 2021, SPACs represented 75% of all IPOs and 69% of the total proceeds. Going

back just five years these numbers were 10% and 14% respectively. The recent growth suggests that a revisit of SPAC performances is sensible, to compare with previous studies and to examine other angles of approach to the asset's performances.

The escalating number of SPACs and enthusiasm around them also proposes the question of why firms and other parties involved might prefer this way of going public instead of the traditional way?

2.2. Agency Theory and Their Different Reasons for Backing the SPAC Structure.

In reality, the SPAC IPO gives investors a unique opportunity to invest in a company before it goes public, an opportunity that in the United States is given to private equity firms which are not publicly available for retail investors. For this reason, Lewellen (2009) proposes that the SPAC has become a proxy for private equity firms and the global financial markets. It also allows them to co-invest with successful sponsors. He further explains that another attractive side of the SPAC for the investors is its similarity to a risk-free asset in the initial phases as the investors are given downside protection until the acquisition of the targeted company. If they are unable to find a suitable company or the target company gets voted down at the general meeting which resulting in that SPAC faces liquidation and SPAC IPO investors get refunded.

For the founders or sponsors of the SPAC, it gives them an easier path to raise capital as they reach a larger base compared to trying to receive funding privately. The possibility of having more than one SPAC, a trend described by Lakicevic and Vulanovic (2013) where multiple SPAC sponsors have had successors after their first completed SPAC IPO. Jog and Sun (2007) report a massive return on investment of 19 times the founder's initial investment awaiting them by completing an acquisition, clearly being a substantial incentive for the sponsors' determination in founding a SPAC.

Targeted companies receive another way of going public and thereby accessing public markets and capital to raise funds and improving possibilities for further growth, which Röell (1996) reports is the most vital reason for private companies to go public. As previously stated Heyman (2007) suggested that in times of market instability SPACs are an attractive asset in these times

which indicates that in those times where it might be more difficult for private businesses to go public, the SPAC offers these companies a path to go public in volatile times.

Agency theory draws attention to the problem of asymmetric information as described by Eisenhardt (1989). The fundamental idea behind the agency theory is that two parties have an economic relationship where one party, the principal, employs the other party, the agent, who has the task of performing a desired assignment on behalf of the principal. It may be the case that the agent's goals differ from the principal's interests, which creates agency costs since that the agent knows more about his actions than the principal. If the two parties have different interests, the principal's benefit can be affected by the agent hiding his actions and thus increasing his own benefit. The principal can also not observe all the agent's actions during the contract period. On the other hand, if the agent's actions would have a major impact on the outcome, the principal would observe the outcome of the agent's actions, but not the actions themselves.

Agency theory was developed by Jensen and Meckling (1976) but has its roots in previously published studies by Berle and Means (1932) and Coase (1937). The agency problem is often related to the difficulty for investors to know that their investment does not have a positive opportunity cost. Agency theory addresses several costs that arise in the case of distributed ownership. In companies such as sole proprietorships where the owner and the management are the same person, no conflicts of interest arise and thus there are no agency costs (Ang, Cole & Lin, 2000). If, on the other hand, control and ownership are instead separated, which takes place at a SPAC, agency costs can arise.

Since a SPAC has several stakeholders such as investors and sponsors with different interests, agency costs can arise. In a SPAC context, there is asymmetric information between the investors and the sponsors. Shareholders do not know what kind of company the SPAC will acquire or merge with and what amount they will pay for it. According to Dimitrova (2017), the SPAC contract probably creates incentives for sponsors to make bad acquisitions instead of no acquisition at all, which is because sponsors receive fees and equity compensations. Clearly, agency costs arise because the investors prefer a good acquisition followed by no merger at all. While the sponsors prefer a good acquisition followed by a bad acquisition instead of no merger at all which is expected to partly interfere with sponsors' actions in the interests of shareholders.

In a theoretical way, the sponsor could try to find a good acquisition since it is the best outcome for both the sponsor and the investors. But it is not the case with reference to previous studies' negative conclusions about firm characteristics and negative post-merger abnormal returns in the long run. To find a very good acquisition requires solid work on the part of the sponsor, which means that it is not a matter of course that a good acquisition will be made.

From a theoretical point of view, we can measure work effort as a transaction cost hence a less skilled sponsor requires a higher transaction cost to find a good acquisition. However, for the sponsor to make a good acquisition, it is required that the transaction cost be less than the extra return on the sponsor's ownership share that a good acquisition will provide because the sponsor receives fees and equity compensation regardless of the qualities of the acquisition. This theoretical point of view reflects the incentive scheme that is to the clear advantage of the sponsors found in a SPAC because it is impossible to know in reality if the transaction cost is less than the extra return on the sponsor's ownership share that a good acquisition will provide.

Sponsors get fees and equity compensations if they complete a merger, and the SPAC contract creates incentives for sponsors to make bad acquisitions instead of no acquisition at all. A result of this scheme is that the sponsors probably buy more shares to get through the merger even though it is judged to be a bad one. This is in line with Jenkinson and Sousa (2011) because they find in their subsample that few owners buy a relatively large part of the shares a couple of weeks before the General Meeting. This is explained by the fact that the acquisition is more difficult to vote through at the General Meeting and therefore should be a bad acquisition. We are investigating this further and believe that a longer period of time than three to four calendar months is required for bad acquisitions. Sponsors need to own a larger part of the shares to get through a bad acquisition at the General Meeting and therefore we believe that buying enough stocks takes additional time.

Empirically, hypothesizing that there is a negative relation between the required time to complete the merger and the abnormal return. Further, for those companies that are slowest to complete the merger, a significantly lower abnormal return is expected.

2.3. Efficient Market Hypothesis.

The efficient market hypothesis is the most common theory that many studies refer to regarding fluctuations in the stock market. The theory has its roots in a previously published study by Fama (1970) and the fundamental idea is that all available information will more or less be

directly incorporated into the asset price. On the other hand, the efficient market hypothesis has never been fully accepting and in addition, many have criticized the theory in recent years (Malkiel, 2003; Subramanian, 2010).

The efficient market hypothesis is often divided into three different forms depending on what information is assumed to be included in the asset prices. The different forms are mentioned as strong form, semi-strong form, and weak form.

Strong form implies that no market participants have information advantage through a monopolistic position and every information is available simultaneously to all market participants (Fama, 1970). The strong form is not supported in the literature because insiders have superior information compared to most market investors. For semi-strong form, all public information is available for all participants and is incorporated into the asset price and has been prevalent in most of the previous research. In contrast, for the weak form historical prices are fully incorporated into the asset prices and this form is fully supported in the research.

To capture the entire effects in short-term event studies, the event window has been extended to 1 to 5 days around the event. A delayed effect can be explained by it taking several days for the market to understand and analyze new complex information. Also, effects before the event could be explained by insiders that have superior information compared to most of the market investors or due to leak information (MacKinlay, 1997).

By the efficient market hypothesis, a hypothesis is formulated for the short-term abnormal return around the merger event. Believing that the market knows if the merger will go through on the general meeting several days in advance of the merger event, which means that this event has no sudden effect on the value of the SPAC. From the theoretical point of view, the event does not contain any new information and deeming that this event has not a price-affecting effect in any direction. The hypothesis is therefore that the short-term abnormal return for the merger event will not be statistically significantly different from zero.

2.4. Performance Between the Stages of a SPAC.

Return performances have been a major part of analyzing the SPACs in past literature and throughout the years. All previous studies point in the same direction for long-term returns after the merger, the average outcome for SPACs yields a negative return and underperforms as an asset class (Datar, Emm & Ince, 2012; Dimitrova, 2017; Jenkingson & Sousa, 2011; Jog and Sun, 2007; Klausner, Ohlrogge & Ruan, 2020; Kolb & Tykvová, 2016;). For example, 6 months after the merger Jenkinson and Sousa (2011) states negative returns of -24% which is similar to Datar, Emm and Ince (2012) who report -21% negative returns for the same period. Going up to a year post-merger they report further decreases in returns reporting -55% and -38% respectively.

Klauser, Ohlrogge, and Ruan (2020) suggest that the incredible deal the structure of the SPACs is for the sponsors and targets comes at the cost of the SPAC shareholders when examining the post-merger performance for the different parties. They found that the SPAC has on average 33.33 % lower cash per share when the merger takes place in comparison to when the IPO event takes place. Additionally, they show that there is a high correlation between dilution and negative post-merger returns implying that the shareholders are bearing the cost of dilution.

Studies for short-term returns around the definitive agreement event have found positive results. For example, Lakicevic and Vulanovic (2013) find abnormal returns of the day of the announcement to be 0.85% and Dimitrova (2017) find abnormal returns of the announcement to be 1%. On the other hand, Dimitrova proves that the positive returns are driven only because they have managed to find an acquisition and the average SPAC acquisition is value-destroying anyway which is in line with his long-term post-merger result.

Figure 2 and 3 illustrates the different returns for the SPACs between the three major events, where IPO-DA is the first day the common stock is available on the market until the day when the acquisition is announced. DA-ME includes the day from the announcement until the day when the merger is completed, including that it has been voted through at the general meeting. IPO-ME contains all day from the first day on the stock market until the day when the merger is completed. It can be seen from the two figures that there is a lot of value fluctuation from the IPO phase until the merger and that most of these returns are developed between the definitive agreement and the merger event while the price movement of the SPAC is minimal in the initial

phase up to the definitive agreement which is the longest stage. Strengthening the reasoning to go more in-depth in analyzing the DA to merger stage of the SPAC for this paper using event studies as a method of checking potential abnormal returns under this phase.

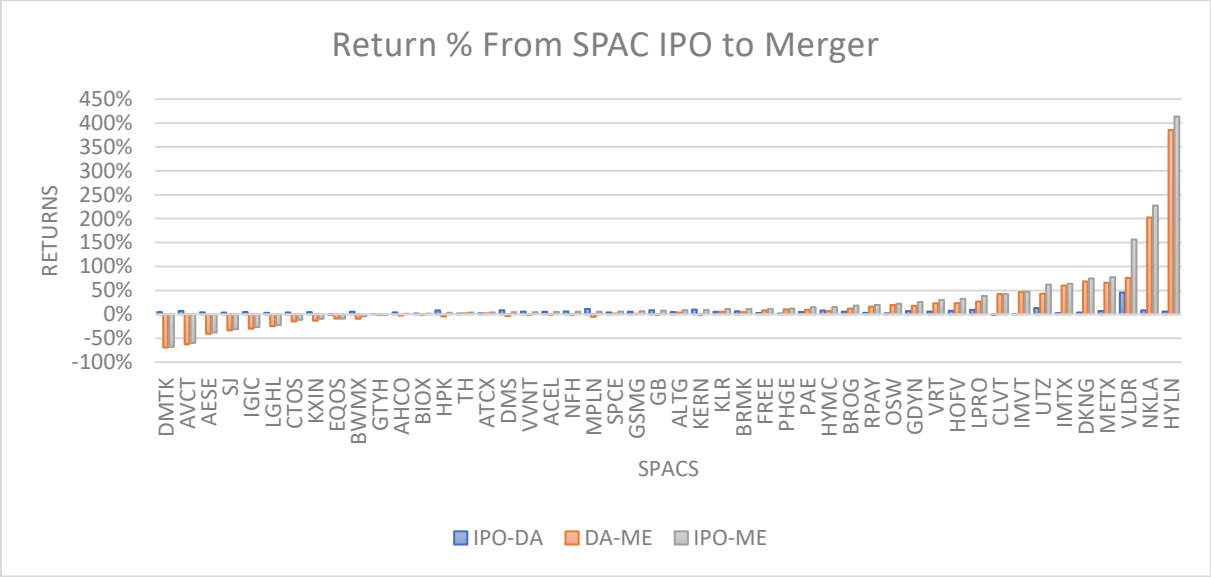

Figure 2 display the return of the SPACS between the stages from the SPAC IPO to the Merger on the first 48 SPACs of the sample.

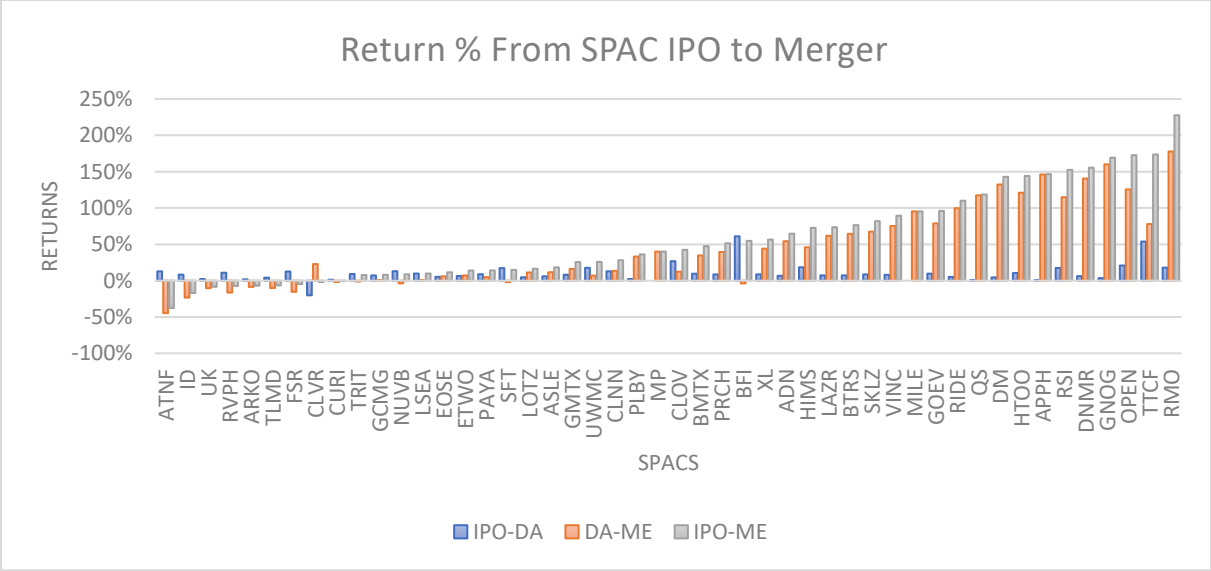

Figure 3 display the return of the SPACS between the stages from the SPAC IPO to the Merger on the last 48 SPACs of the sample.

3. Methodology and Data

3.1. Event Study Methodology

Stock price reactions following firm events such as acquisitions and mergers for operational business companies are not a new topic in the literature to study. But as mentioned earlier, there are knowledge gaps to fill in the research area for SPACs, especially for reporting a longer period than a few days of abnormal returns after the definitive agreement event. However, Fama Fisher, Jensen, and Roll (1969) introduced event studies and found that they provide evidence of how stock return responds to different information flows that potentially affect an industry or an individual company which is applicable for SPACs.

Event studies are a frequently used methodology that helps to get a better understanding of the financial effects of firm and industry-specific behavior in both the short and long run (Barber & Lyon, 1997; Campbell, Lo & MacKinlay, 1997). The fundamental idea behind the methodology is to test if abnormal returns for an industry or a group of firms after an event are statistically significantly different from zero or not. If post-event abnormal returns are statistically different from zero, it would conclude that SPAC returns are inconsistent with the strongest form of the efficient market hypothesis, especially for long-run abnormal returns (Brown & Warner, 1985; Fama, 1998; Kothari & Warner, 2008). However, events such as acquisition or merger stock returns are usually analyzed by event studies.

Event studies are divided into short- and long-term depending on the time horizon of the measurement period. A long-term horizon post-event study focuses on analyzing how asset returns evolve, normally over 1 to 5 years after an event, but could also be applicable for a couple of months. In contrast, short-term periods are often more reliable than long-term periods due to other events than the acquisition taking place over time possibly affecting the returns in the long run which makes it harder to estimate the exact impact of a specific event (Campbell, Lo & MacKinlay 1997; Kothari & Warner, 2008). However, a SPAC is generally isolated from other types of events as it lacks operational activities prior to the acquisition, which is expected to make our post definitive agreement long-term results more reliable.

The event window will be expressed by estimating daily return data and this assumption is in line with Campbell, Lo, and MacKinlay (1997). Also, in order to ensure that the entire effect of

the event is captured, the long-term event window is decided to start at the daily closing price the day before the event and 1 to 5 days around the event for our short-term investigation.

3.1.1. Models for Estimating Abnormal Returns

In general, abnormal returns are used to measure financial performance for events in both the short and long run. In the literature, there are several different approaches to measure abnormal returns and test statistical hypotheses. The market model is the most common one in the literature which could be explained by the fact that the model gives similar results to other more complex models (Brown & Warner, 1985). Campbell, Lo and MacKinley (1997) show that the market model is given by the following equation:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (1)$$

Where:

$R_{i,t}$ = Return of firm *i* at time *t*

α_i = Excess return after adjusting for market-related volatility and stochastic fluctuations for firm *i*

β_i = The extent of the firm´s stock price responsiveness to benchmark movements

$R_{m,t}$ = Benchmark return at time *t*

$\varepsilon_{i,t}$ = Abnormal return (residual return) for firm *i* at time *t*

Campbell, Lo and MacKinley (1997) also show that abnormal return is therefore given by:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t}) \quad (2)$$

In contrast, Barber and Lyon (1997) argue that the adjusted market model should be used. Abnormal returns in these models are instead calculated as the difference between the firm-specific return and return for a benchmark such as a market index. The Russell 2000 will be used as a benchmark in this study since Russell 2000 is a small-cap index and our sample is largely represented by firms with small market cap. Additionally, earlier studies also use this

benchmark index (Dimic, Lawrence & Vulanovic. 2020; Dimitrova, 2017; Klausner, Ohlrogge & Ruan, 2020; Kolb & Tykvová, 2016).

Mathematically, in the adjusted market model, α_i and β_i is equal to zero respectively one which is the most suitable for our study as SPACs do not have any operational business and it makes no sense to estimate a "bag" with money through the market model. It can be calculated by the following equation:

$$AR_{i,t} = R_{i,t} - R_{m,t} \quad (3)$$

Lusyana & Sherif (2016) show that if abnormal returns across firms in the sample is assumed to be independent the average abnormal return (AAR) could be calculated using arithmetic average:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{i,t} \quad (4)$$

Where:

AAR_t = Average Abnormal Return at time *t*

$AR_{i,t}$ = Abnormal Return for firm *i* at time *t*

N = Number of observations/firms

3.1.2. Short-Term Abnormal Returns

In this study, cumulative abnormal returns (CAR) will be used to estimate abnormal returns for 1 to 5 days around the definitive agreement event respectively around the merger event which is in line with earlier studies (Lakicevic & Vulanovic, 2013; Tran, 2010). Thus, in the analysis, results given in this paper for modern SPACs could be compared with earlier studies` results.

Barber & Lyon (1997) shows that cumulative abnormal return (CAR) can be calculated by the same approach as used on AAR. In words, CAR is calculated by the sum of all abnormal returns in the event window from T1 to T2:

$$CAR_{i,T1,T2} = \sum_{i=T1}^{T2} AR_{i,t} \quad (5)$$

Where:

$CAR_{i,T1,T2}$ = Cumulative Abnormal Return for firm *i* between *T1* to *T2*.

Thus, the average cumulative abnormal return can be calculated using the following formula:

$$CAAR_{T1,T2} = \frac{1}{N}\sum_{i=1}^{N} CAR_{i,T1,T2} \quad (6)$$

Where:

$CAAR_{T1,T2}$ = Cumulative Average Abnormal Return *T1* and *T2*.

Rani, Yadav & Jain (2016) shows that by using Student's t-distribution a null hypothesis can be formulated, whether the average cumulative abnormal return is different from zero or not for the sample of n observations/firms:

$$t_{CAAR} = \frac{CAAR_{T1,T2}}{\hat{\sigma}_{CAR_{T1,T2}}/\sqrt{N}} \quad (7)$$

Where:

t_{CAAR} = Test statistics for the cumulative average abnormal return

$\hat{\sigma}_{CAR_{T1,T2}}$ = Estimated standard deviation of cumulative abnormal return between *T1* and *T2*

Rani, Yadav & Jain (2016) also shows that the estimated standard deviation is calculated by the square root of the following estimated variance:

$$\hat{\sigma}^2_{CAR_{T1,T2}} = \frac{1}{N-1}\sum_{i=1}^{N}(CAR_{i,T1,T2} - CAAR_{T1,T2})^2 \quad (8)$$

Where:

$\hat{\sigma}^2_{CAR_{T1,T2}}$ = Estimated variance of cumulative abnormal return between T1 and T2.

3.1.3. Long-Term Abnormal Returns

This study uses buy-and-hold abnormal return (BHAR) to estimate abnormal returns from one month to several post-definitive agreement event respectively post-merger event. As mentioned, the post-definitive agreement window is the primary result in terms of originality in this research area. While the post-merger period could be compared with previous studies where they do not include SPACs after 2014 which is solely done here.

According to Barber and Lyon (1997), buy-and-hold abnormal return is estimated by the difference between the compounded return for a sample firm and an appropriate benchmark which is a proxy for the expected return, which in this study will be the Russell 2000 index. In contrast, cumulative abnormal return is used to measure short-term abnormal return, daily returns were summed up, while for long-term abnormal returns, the product for each cross-sectional unit is used:

$$BHAR_{i,\tau} = \prod_{t=1}^{\tau}[1 + R_{i,t}] - \prod_{t=1}^{\tau}\left[1 + E\left(R_{i,t}\right)\right] \quad (9)$$

Where:

$BHAR_{i,\tau}$, = Buy-and-hold abnormal return for firm *i* at time.

$E(R_{i,t})$ = Expected return / benchmark returns of firm *i* at time *t*

So, the average buy-and-hold abnormal return is computed with:

$$BHAAR_{\tau} = \frac{1}{N}\sum_{i=1}^{N} BHAR_{i,\tau} \quad (10)$$

Where:

$BHAAR_{\tau}$ = Buy-and-hold average abnormal return at time

Mitchell and Stafford (2000) point that the buy-and-hold abnormal return can be interpreted by the difference between investing in a specific firm that has completed an event relative to

investing in a similar non-event firm. Barber and Lyon (1997) prefer BHAR instead of CAR because the method captures the true return under the holding period.

It is important to choose an appropriate benchmark because it will affect the buy-and-hold abnormal return for our sample. Generally, a benchmark is often subject to new listing bias (survivor bias), rebalancing bias, and skewness problems. New listing bias is explained by firms that are included and excluded from the benchmark subsequent to the event day. Russell 2000 that will be used here is rebalanced frequently while the compounded returns for sample firms will not be rebalancing. However, the long-term event study is only a few months long, which limits new listing bias and rebalancing bias.

Rani, Yadav & Jain (2016) shows that as in the same fashion as for the CAAR the null hypothesis can be formulated using the student's t-distribution, whether the average buy-and-hold abnormal return is different from zero or not for the sample of n observations/firms:

$$t_{BHAAR} = \frac{BHAAR_{\tau}}{\hat{\sigma}_{BHAR_{\tau,}}/\sqrt{N}} \tag{11}$$

Where:

t_{BHAAR} = Test statistics for the average buy-and-hold average abnormal return

$\hat{\sigma}_{BHAR_{\tau,}}$ = Estimated standard deviation of buy-and-hold abnormal return at time

Finally, Rani, Yadav & Jain (2016) the estimated standard deviation is calculated by the square root of the following estimated variance:

$$\hat{\sigma}^2_{BHAR_{\tau}} = \frac{1}{N-1}\sum_{i=1}^{N}(BHAR_{i,t} - BHAAR_{\tau})^2 \tag{12}$$

Where:

$\hat{\sigma}^2_{BHAR_\tau}$ = Estimated variance of buy-and-hold abnormal return between at time

3.2. Wilcoxon Signed Rank Test

Empirical studies showed that long-term abnormal returns such as BHAR are positively skewed and hence the test statistic will be biased (Barber, Lyon & Tsai, 1999). Additionally, Fama (1998) points out that it is impossible to perfectly estimate the expected return because a model is influenced by several theoretical assumptions that cannot be anchored in reality. Practically, it may result in inconsistent abnormal returns, which in a worst-case scenario distort the statistical inference and thus the conclusion of the results.

To ensure more robustness in our test results, the nonparametric Wilcoxon signed rank test will be complementing the parametric T-test.
Compared to the most common form of a sign test (Cowan, 1992) which considers the importance of the amount of the signs for the abnormal returns, the Wilcoxon test (Wilcoxon, 1945) incorporated the magnitude of these abnormal returns as well. This makes it a popular test for event studies as the event are assumed to be volatile for market returns.

The reasoning for supplementing with a nonparametric test method is since this type of method has a better performance when the distribution of the returns is highly skewed and non-normally distributed (Kolari & Pynnönen, 2010; MacKinlay, 1997). By comparing the median and the mean for the sample the skewness can be identified as a bigger difference between the two points to a higher skewness for the abnormal returns. If this is the case, testing the median has a higher performance in correctly identifying statistical significance as medians are less vulnerable to extreme scores and are a more robust statistic for central tendency whether the null hypothesis that the median is statistically significantly different from zero. To certify more effective results complementing the parametric T-test with a non-parametric test is common practice (Kolari & Pynnönen, 2010).

The Wilcoxon signed-ranks test is computed by turning all the abnormal returns into absolute values, after this they are ranked based on their distance from zero. Closest receives the rank 1 and the furthest away receives the highest rank. The sum of the ranks with a positive difference and negative difference is then defined as $\sum R_+$ and $\sum R_-$ respectively. The z-score of the test is then found by calculating the mean and standard deviation based on the number of observations (n):

$$\bar{x}_T = \left(\frac{n(n+1)}{4}\right) \tag{13}$$

$$\sigma_T = \sqrt{\frac{n(n+1)(2n+1)}{24}} \tag{14}$$

$$z^* = \frac{T-\bar{x}_T}{\sigma_T} \tag{15}$$

Here the T is the lowest number of as $\sum R_+$ and $\sum R_-$ and the z* is the z-score that is then used to determine statistical significance (Corder & Foreman, 2014).

3.3. Two-Sample T-Test

Snedecor and Cochran (1989) describes the two-sample t-test that is used to investigate if two different sample means are equal or not.

To be able to do a test, it is necessary to consider two assumptions. Firstly, the data sample is either paired or not paired, paired means that there is a correspondence between each data point in both samples, a so-called one-to-one relationship. Secondly, the variance for the respective sample is either assumed to be the same or not.

Here, a two-sample t-test for unpaired data with an unequal variance will be performed which is defined as:

$$T = \frac{\mu_1 - \mu_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}} \tag{16}$$

Where:

T = Test statistics for two-sample-test

μ_1 & μ_2 = Mean for subsample 1 & 2

S_1^2 & S_2^2 = Variance for subsample 1 & 2

N_1 & N_2 = Number of observations for subsample 1 & 2

3.4 Data and Delimitation

While the SPAC structure is spreading and getting more interest all over the globe, most of today's active and completed SPACs are still to be found in the US, and as reported by D'Alvia (2019); Ignatyeva, Rauch, and Wahrenburg (2013) the structure and regulations for the SPACs in other corners of the world are not identical to the ones in the US. For this reason and simplicity, only SPACs in America are included in the sample.

Furthermore, since previous literature has reviewed related topics for SPACs active and completed nearly a decade ago, the decision here was to study more recent SPACs. While their initial SPAC IPO process at the earliest started in late 2016 and 2017 the decision for this study was to sample all completed mergers between the start of 2019 and February 11th, 2021, to maintain that a three-month period of post-merger returns can be included for all SPACs in the sample. In this timeframe, a total of 102 SPACs completed a business combination. Information about the number of SPACs that did not complete a merger and instead got liquidated is harder to come by. According to SPACInsider (2021), since 2018, which can be thought of as the earliest a SPAC in our sample hits its two-year deadline, only two SPAC IPOs failed to merge and were liquidated. A few SPACs also get removed from the sample since they have been delisted or that complete data for the SPAC was unable to be retrieved.

*Table 1 shows the total number of completed SPACs between the period of 2019-01-01 to 2021-02-11, which is set as the period for our sample to analyze, the active column suggests active SPACs that has no missing data. *According to SPACInsider (2021) from 2018 to May 2021*

SPACs	completed	still active	not active	missing data	liquidated before merger
Observations	102	96	4	2	2*

This paper includes the 96 active SPACs that have no missing data, for the sample the historical daily return data for each SPAC was collected through Thomas Reuters DataStream. When setting/controlling for the different event days such as SPAC IPO date, definitive agreement (DA) date, and the day of the acquisition, the dates for these have all been manually checked by going through the forms filed by the SPACs in the SEC's database: The Electronic Data

Gathering Analysis and Retrieval (EDGAR), and a full list of reference for the events SEC filings are found in Appendix B. The starting date for the SPAC IPO has been set as the day the common stock was first publicly put on an exchange according to DataStream. For the merger or acquisition date, this has been put as the day a filing confirming a completed business combination was declared in EDGAR. Table 2 reports some descriptive statistics on the timeframe between the SPACs' different stages/events for our sample.

Table 2 documents some descriptive statistics on the average calendar days between the stages of the SPACs in the sample. The number of market days between the stages are denoted in brackets.

	Days			
Stage	Mean	Median	Max	Min
IPO-DA	397,6 (282,2)	396,0 (280,0)	1124 (804)	15 (12)
DA-Merger	131,3 (94,6)	113,0 (82,0)	450 (323)	59 (45)
IPO-Merger	528,8 (376,6)	526,5 (376,0)	1228 (879)	92 (67)

In the results and analysis, the returns for the SPACs are compared with a benchmark that was previously explained to be the Russel 2000 index, daily closing prices for this index were also retrieved using DataStream and are used for market-adjusted returns in the event study to calculate abnormal returns.

3.5. Event Window

The event windows are the days surrounding the event, the length of the window depends on what the objective of the measure is, in the short term it is common to set it to a few days before the event and ending it a few days after to be sure to include the full effect of the event. Reasoning to start the event window before the event itself can be referred to MacKinlay (1997) as he argues that event information may leak out to the market before the day of the event. Another factor to consider is that although there has been a very careful process to pinpoint the exact day of the event and announcement, the exact time of the event day is not known. So, to be sure to include the event whether it takes place before, during, or after the market's opening hours, the event window starts at least one day before the event.

For the short-term event study based on cumulative abnormal returns three different event windows are selected: a three-day event window going from the day prior to the day after the event [-1,1], a seven-day event window going from three days before the event to three days after [-3,3] and an eleven-day window spanning from five days before to five days after [-5,5]. The reasoning behind these is based on popularity in previous research as well as to see if there are any abnormal returns leading up to the event.

For the long-term event study based on buy and hold abnormal returns, the initial thought was to have a 60-day BHAAR for both post-definitive agreement and post-merger. Since the most recent SPACs in the sample were completed a little more than 60 trading days ago, however for the period between the definitive agreement and merger events some SPACs complete the merger before 60 trading days. Instead, an event window of around 100 days to calculate BHAAR for both events is constructed starting with the closing price the day before the event to ensure inclusion of the event, within this 100-market day period several different points are targeted to test statistical significance for the abnormal returns. Selecting 30, 60, 90, and 100 days to test for the merger BHAAR.

While the points selected for the merger BHAAR are even and straightforward, selecting what days to choose for definitive agreement is not as simple, the length of the event window here was based on getting as close to the merger for as many of the SPACs as possible. More event windows here are tested as this is a focus point of the paper and to closer see where significance ends.

4. Results

4.1 Short-Term Results (CAR)

In the short term cumulative abnormal returns were calculated for each SPAC, cumulative average abnormal returns were then fixated on around the event day. The event day (0) for the CAR event study is defined as the day that the definitive agreement or the merger was made public through a filing on SEC or a press release. The exact date for this for all included SPACs is disclosed in Appendix B. A total of three different event windows were used including some days before and some days after the event day to ensure that the price reaction from the event is included.

The tables include the mean, median, and standard deviation for the cumulative average abnormal returns for the event window as well as two tests, the T-test controlling significance for the mean value and the Wilcoxon test controlling the significance for the median value.

4.1.1 Definitive Agreement

The short-term results start off with the cumulative average abnormal returns around the definitive agreement and is displayed in table 3

Table 3 reports the Cumulative Average Abnormal Returns for three specific event windows around the merger completion. The table includes the mean, median, and standard deviation for the CAAR as well as two tests for significance, the T-test for the mean and the Wilcoxon signed rank test for the median. Day 0 here is the day of the event. Significant results are marked in bold.

Cumulative Average Abnormal Returns (Definitive Agreement)

Event Window					
[-1, 1]	Mean	T-test	Std dev	Median	Wilcoxon Z
-1	**1,09%**	**2,300****	0,046	**0,15%**	**-2,726*****
0	**3,36%**	**3,369*****	0,098	**0,53%**	**-3,040*****
1	**5,62%**	**3,820*****	0,144	**0,94%**	**-3,731*****
[-3, 3]	Mean	T-test	Std dev	Median	Wilcoxon Z
-3	0,04%	0,152	0,025	-0,23%	-1,411
-2	-0,16%	-0,515	0,030	-0,34%	-1,498
-1	0,93%	1,579	0,058	0,00%	-0,548
0	**3,20%**	**3,108*****	0,101	**0,42%**	**-2,218****
1	**5,46%**	**3,686*****	0,145	**1,04%**	**-3,289*****
2	**6,02%**	**3,473*****	0,170	**1,23%**	**-3,081*****
3	**5,81%**	**3,353*****	0,170	**1,65%**	**-2,956*****
[-5, 5]	Mean	T-test	Std dev	Median	Wilcoxon Z
-5	-0,07%	-0,290	0,023	-0,08%	-1,199
-4	0,22%	0,476	0,045	-0,26%	-1,334
-3	0,26%	0,438	0,057	-0,21%	-1,297
-2	0,06%	0,128	0,045	-0,27%	-0,946
-1	**1,15%**	**1,698***	0,066	0,22%	-0,497
0	**3,42%**	**2,748*****	0,122	**0,58%**	**-1,864***
1	**5,68%**	**3,411*****	0,163	**0,82%**	**-2,452****
2	**6,24%**	**3,273*****	0,187	**0,49%**	**-2,152****
3	**6,03%**	**3,207*****	0,184	**1,56%**	**-2,280****
4	**5,95%**	**3,181*****	0,183	**1,14%**	**-2,028****
5	**5,81%**	**3,012*****	0,189	**1,32%**	**-1,780***

Note: Statistical Significance levels are defined as follows: *** 1%, ** 5%, * 10%.

Table 3 demonstrates the CAAR event study for the definitive agreement and displays highly significant results from the day of the event and onwards for all included event windows. The 3-day CAAR event window from the day before to the day after the event reports abnormal returns from the Russel 2000 benchmark with a statistical significance of 1% on all days for both the mean and the median except for the mean the day before the event which displays a 5% significance level being close to the 1% cutoff. For the seven-day CAAR from -3 to 3 the significant results remain high starting on the day of the event to the end of the window.

Winding-up with the final CAAR event window of 11 days from 5 days prior to 5 days after the mean continues to show 1% significant results while the Wilcoxon test shows a slight decrease but still significant on a 5% level for the median on the days following the event.

4.1.2. Merger

The same CAAR procedure is done for the merger event demonstrated in table 4 below.

Table 4 reports the Cumulative Average Abnormal Returns for 3 specific event windows from the merger completion. The table includes the mean, median and standard deviation for the CAAR as well as two tests for significance, the T-test for the mean and the Wilcoxon signed rank test for the median. Day 0 here is the day of the event. Significant results are marked in bold.

Cumulative Average Abnormal Returns (Merger)

Event window					
[-1, 1]	Mean	T test	Std dev	Median	Wilcoxon Z
-1	-0,29%	-0,281	0,100	-0,69%	-1,520
0	-1,01%	-0,658	0,150	0,07%	-0,778
1	-3,50%	-1,479	0,232	-1,37%	-1,341
[-3, 3]	Mean	T test	Std dev	Median	Wilcoxon Z
-3	-0,12%	-0,155	0,074	0,00%	-0,223
-2	0,93%	0,701	0,130	**0,68%**	**-1,699***
-1	0,64%	0,374	0,167	1,04%	-1,074
0	-0,08%	-0,038	0,206	0,17%	-0,183
1	-2,57%	-0,878	0,287	-2,09%	-0,479
2	-1,21%	-0,276	0,429	-2,23%	-1,305
3	-3,13%	-0,674	0,454	**-5,44%**	**-2,361****
[-5, 5]	Mean	T test	Std dev	Median	Wilcoxon Z
-5	0,24%	0,609	0,038	-0,09%	-0,164
-4	0,81%	0,991	0,080	-0,40%	-0,190
-3	0,69%	0,567	0,120	-0,21%	-0,490
-2	1,74%	1,032	0,165	-0,09%	-1,020
-1	1,45%	0,717	0,198	0,00%	-1,049
0	0,73%	0,313	0,228	1,27%	-1,166
1	-1,77%	-0,571	0,303	-0,52%	0,000
2	-0,40%	-0,090	0,435	-2,21%	-0,720
3	-2,32%	-0,493	0,460	**-3,24%**	**-1,984****
4	-3,84%	-0,824	0,457	**-5,97%**	**-2,207****
5	-4,96%	-1,078	0,451	**-7,10%**	**-2,207****

Note: Statistical Significance levels are defined as follows: *** 1%, ** 5%, * 10%.

Unlike the positive mean and median results shown for the definitive agreement event short term the CAAR for the merger in table 4 displays negative mean and median results following the event day that increases by the day. However, the T-test and the Wilcoxon test showed less statistical significance for the event windows as a whole but the further the days go from the event the significance increases most clearly illustrated in the eleven-day CAAR for the days 3-5 after the event showing statistical significance on the median of the abnormal returns on a 5% level.

4.2 Long-Term Results (BHAR)

For long-term results, a buy and hold abnormal return event study was conducted. An average for all firms starting with the closing prices of the day before the event and a specific number of days after the event was compounded. The number of days after the event was decided around how many SPACs could be included in the sample.

4.2.1 Definitive Agreement

Since our SPAC with the quickest definitive agreement announcement to merger took 45 days our first BHAAR event window is 46 days starting with the closing price of the day before the event. In this event window, all 96 SPACs in the sample could be included. Further on the length of the event window was based on getting as close to the merger for as many of the SPACs as possible. So, the reason why the event windows sometimes have uneven numbers such as 67, 82, 103, and so on instead of even numbers is that there were a lot of SPACs merging after the uneven number of days and trying to maintain as big of a sample as close to the mergers as possible for each BHAAR window. The most common length between the definitive agreement and the merger was between 55-85 market days including around half of our sample.

Table 5 reports the Buy & Hold Average Abnormal Returns for 7 specific event windows from the Definitive Agreement announcement. The table includes the mean, median and standard deviation for the BHAAR as well as two tests for significance, the T-test for the mean and the Wilcoxon signed rank test for the median. The event window starts with the closing price of the day before the event and ends at the day stated in the event window column. Significant results are marked in bold.

Buy & Hold Average Abnormal Returns (Definitive Agreement)

Event Window	Mean	T-test	Std dev	Median	Wilcoxon Z	N
BHAAR 45	**6,28%**	**2,215****	0,278	0,83%	-1,268	96
BHAAR 60	**15,59%**	**2,674*****	0,547	2,07%	-1,614	88
BHAAR 67	**10,43%**	**1,705***	0,540	-0,86%	-0,615	78
BHAAR 75	8,43%	1,260	0,547	-1,14%	-0,094	67
BHAAR 82	1,46%	0,350	0,298	-0,94%	-0,450	51
BHAAR 90	5,70%	1,320	0,273	-0,14%	-0,645	40
BHAAR 103	-0,51%	-0,130	0,213	-1,56%	-0,465	29

Note: Statistical significance levels are defined as follows: *** 1%, ** 5%, * 10%.

Table 5 reports significant results for the mean on a 5% and 1% level for the two shortest event windows peaking at the event window going from the day prior to the event until 60 days after here the mean and the significance deteriorates. The Wilcoxon test does not reaffirm these results as it fails to find significance for any given event window. As the event window increases and the sample size decreases the mean and median show decreased abnormal returns as well. For the remaining 29 SPACs not having completed their business combination within 103 days the mean and median are -0.51% and -1.56% respectively. Compared to BHAAR 60 that displays a mean and median of 15.59% and 2.07% correspondingly. A full timeline for the BHAAR overtime from DA is illustrated in figure 4 below where a positive trend up to the 60-day mark is shown before it starts to decline.

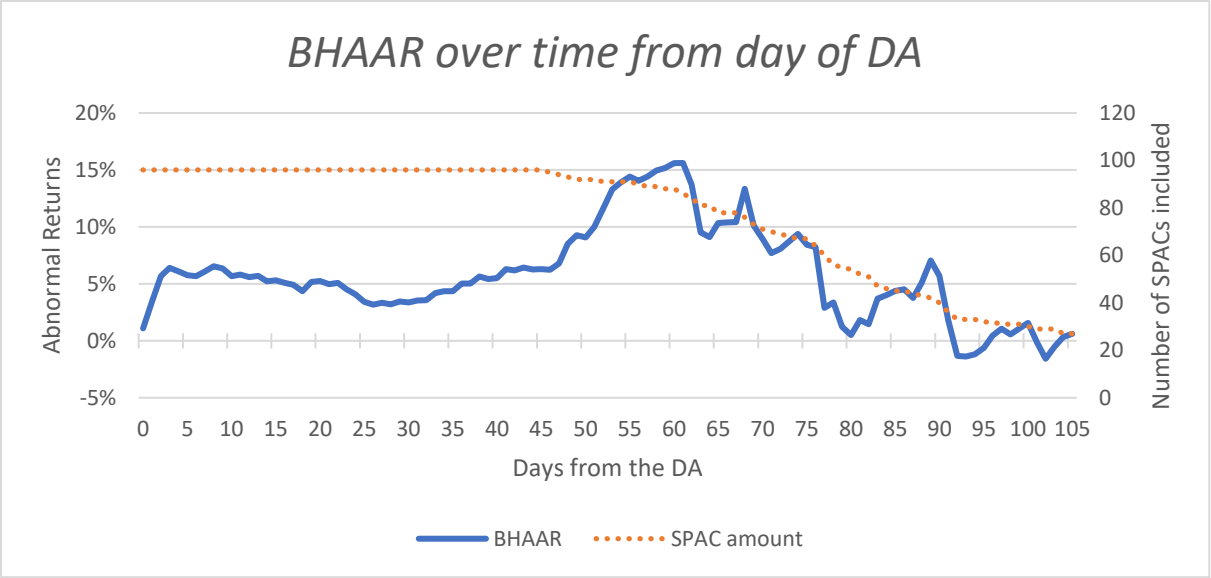

Figure 4: The graph displays the Buy and Hold Average Abnormal Returns overtime starting off with the closing price of the day before the event. On the left axis abnormal returns are measured with the blue line. The orange line follows the right axis and demonstrates the number of SPACs meaning that it declines when a SPAC has completed the merger and is therefore removed from the sample and data after that day.

4.2.2. Merger

For the buy-and-hold event study regarding the merger, the same approach was taken as the BHAAR for the post-definitive agreement. Starting off with the closing prices of the day before the event a post-merger abnormal return study was constructed. As stated earlier the SPACs were chosen such that they had completed the acquisition around three months prior to this study to be able to have at least 60 market days of post-merger returns. This means that for the first two event windows the whole sample is included. As the event window increases a few SPACs are excluded as there are not enough return days available for these ones yet.

Table 6 reports the Buy & Hold Average Abnormal Returns for 4 specific event windows from the merger completion. The table includes the mean, median and standard deviation for the BHAAR as well as two tests for significance, the T-test for the mean and the Wilcoxon signed rank test for the median. The event window starts with the closing price of the day before the event and ends at the day stated in the event window column. Significant results are marked in bold.

Buy & Hold Average Abnormal Returns (Merger)

Event window	Mean	T-test	Std dev	Median	Wilcoxon Z	N
BHAAR 30	-4,71%	-0,903	0,511	**-17,01%**	**-2,872*** **	96
BHAAR 60	-7,62%	-1,214	0,615	**-18,25%**	**-3,081*** **	96
BHAAR 90	-10,24%	-1,455	0,641	**-27,01%**	**-2,488** **	83
BHAAR 100	**-14,01%**	**-1,911***	0,627	**-34,09%**	**-2,521** **	73

Note: Statistical significance levels are defined as follows: *** 1%, ** 5%, * 10%.

The buy and hold average abnormal returns for the merger noticeably illustrate a negative trend for the SPACs after their business completion is done. The mean and median are decreasing the longer the post-merger window goes and the significance for the mean is increasing in the same period. The median sees significance in all event windows post-merger. 100 market days after the merger the mean is -14,01% while the median is -34,09%, the mean shows a significance level of 10% while the median reports a significance level of 5% for negative abnormal returns under this event window.

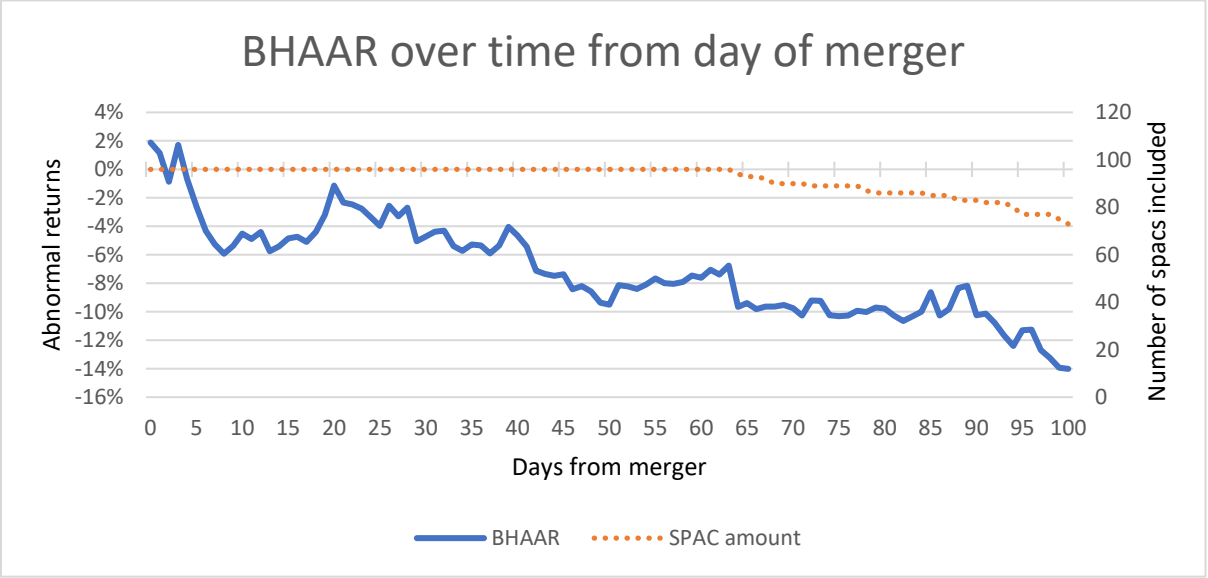

Figure 5 displays the Buy and Hold Average Abnormal Returns over time after the merger is complete starting off with the closing price of the day before the event. On the left axis abnormal returns are measured with the blue line. The orange line follows the right axis and demonstrates the number of SPACs meaning that it declines when a SPAC has not enough post-merger return days and is therefore removed from the sample and data after that day.

4.3 Slow or Fast SPACs

In the beginning, a hypothesis is stated where it is assumed that SPACs that after their announcement of finding a target (DA) complete the merger faster indicates a better outcome. Hence, the SPACs are split evenly at the median depending on the length of the stage between definitive agreement and merger to test this. The 48 SPACs that were the quickest, completed the merger 45-82 trading days after the definitive agreement while the 48 slowest took 83-323 trading days.

The table below presents the results between the groups divided into fast or slow SPACs defined

by their length between definitive agreement and merger, in the table only the end of the event window for [-1,1], [-3,3], and [-5,5] are displayed and compared to each other. The full event window illustrating all the days in it as seen in previous CAAR tables is found in Appendix A.

Table 7 reports the Cumulative Average Abnormal Returns around the Definitive Agreement for the two different groups consisting of fast and slow SPACs. The table includes the mean, median and standard deviation for the CAAR as well as two tests for significance, the T-test for the mean and the Wilcoxon signed rank test for the median as well as a Two-sample t-test for differences between the two subsamples. Significant results are marked in bold.

Cumulative average abnormal returns (Definitive Agreement)

Event Window						
[-1,1]	Mean	T-test	Std dev	Median	Wilcoxon Z	N
Fast	**8,78%**	**3,384*****	0,180	2,54%	**-3,272*****	48
Slow	**2,46%**	**1,948***	0,088	0,50%	-1,580	48
Two-sample t-test between the groups:						2,188**
[-3,3]	Mean	T-test	Std dev	Median	Wilcoxon Z	N
Fast	**8,94%**	**2,895*****	0,214	**4,13%**	**-2,974*****	48
Slow	**2,68%**	**1,815***	0,102	-0,04%	-0,646	48
Two-sample t-test between the groups:						1,830*
[-5,5]	Mean	T-test	Std dev	Median	Wilcoxon Z	N
Fast	**9,57%**	**2,850*****	0,233	**3,95%**	**-2,287****	48
Slow	2,05%	1,153	0,123	-0,38%	-0,144	48
Two-sample t-test between the groups:						1,979*

Note: Statistical Significance levels are defined as follows: *** 1%, ** 5%, * 10%.

Table 7 demonstrates significant results on the 1% level for both the mean and median for almost all the results of the fast SPACs, the slow SPACs show less significant results, none for the median and only significant at the 10% level for the mean in the first two event windows. The two-sample t-test confirms that the difference between the two groups are statistically significant

For the long-term returns, two sets of tables and graphs are made, the first set of tables and graphs depicts the BHAAR from the definitive agreement and the other from the merger. Both also compare the difference between the two groups at a few selected event windows. Table 8 illustrates the BHAAR from the DA, for the median no significant results are found, for the mean the first event window that includes the whole sample sees a higher mean for the fast group as well as significant results for the t-test but not for the two-sample t-test. For the second event window, 60 days after DA the mean is still substantially greater for the fast group and is now significant at the 5% level, the slow group report significance of 10% for the same period.

Through the two-sample t-test, the results show significant differences between the groups at the 10% level.

Table 8 reports the Buy & Hold Average Abnormal returns from the Definitive Agreement for the two different groups consisting of fast and slow SPACs. The table includes the mean, median and standard deviation for the BHAAR as well as two tests for significance, the T-test for the mean and the Wilcoxon signed rank test for the median as well as a Two-sample t-test for differences between the two subsamples. Significant results are marked in bold.

Buy & Hold Average Abnormal Returns from DA (Fast vs Slow)

Event Window

BHAAR 45	Mean	T-test	Std dev	Median	Wilcoxon Z	N
Fast	**8,8%**	**1,743***	0,350	-0,7%	-0,523	48
Slow	3,8%	1,445	0,181	1,2%	-1,385	48
Two-sample t-test between the groups:						0,883
BHAAR 60	Mean	T-test	Std dev	Median	Wilcoxon Z	N
Fast	**27,5%**	**2,270****	0,766	5,1%	-1,290	40
Slow	**5,7%**	**1,851***	0,213	1,9%	-0,974	48
Two-sample t-test between the groups:						1,745*

Note: Statistical Significance levels are defined as follows: *** 1%, ** 5%, * 10%.

The BHAAR development over the whole event window for the two groups from DA are illustrated in figure 6.

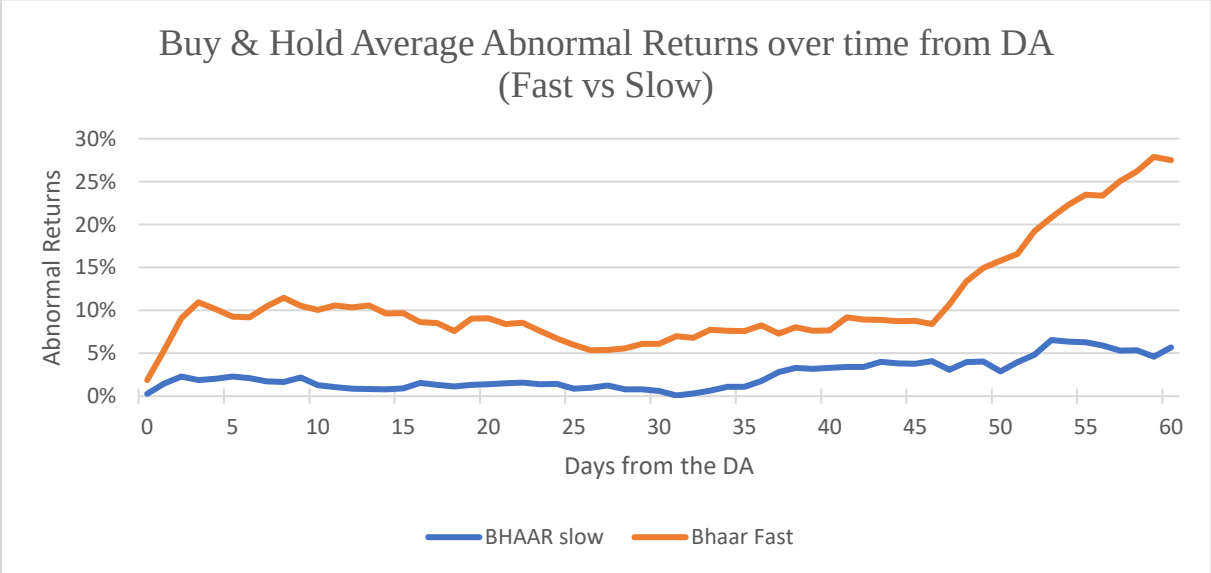

Figure 6: The graph displays the Buy and Hold Average Abnormal Returns over time from the Definitive agreement separately for the two groups starting off with the closing price of the day before the event. The blue line represents the 48 SPACs that took the longest to merge after DA. The orange line represents the 48 SPACs that were the quickest to merge after DA.

The same process is then made between the two groups and their long-term performance post-merger. Here the Wilcoxon test show significance for most observations but not the t-test

Table 9 reports the Buy & Hold Average Abnormal returns from the merger for the two different groups consisting of fast and slow SPACs. The table includes the mean, median and standard deviation for the BHAAR as well as two tests for significance, the T-test for the mean and the Wilcoxon signed rank test for the median as well as a Two-sample t-test for differences between the two subsamples. Significant results are marked in bold.

Buy & Hold Average Abnormal Returns from Merger (Fast vs Slow)

Event Window

BHAAR 30	Mean	T-test	Std dev	Median	Wilcoxon Z	N
Fast	-0,59%	-0,069	0,589	-13,18%	-1,559	48
Slow	-8,83%	-1,455	0,420	**-22,32%**	**-2,533****	48
Two-sample t-test between the groups:						0,788
BHAAR 60	Mean	T-test	Std dev	Median	Wilcoxon Z	N
Fast	-8,56%	-1,004	0,591	**-17,61%**	**-2,297****	48
Slow	-6,68%	-0,718	0,645	**-20,27%**	**-2,082****	48
Two-sample t-test between the groups:						-0,149
BHAAR 100	Mean	T-test	Std dev	Median	Wilcoxon Z	N
Fast	-12,92%	-1,157	0,670	**-36,23%**	**-1,791***	36
Slow	-15,08%	-1,553	0,590	**-34,09%**	**-1,788***	37
Two-sample t-test between the groups:						0,146

Note: Statistical Significance levels are defined as follows: *** 1%, ** 5%, * 10%.

The BHAAR development over the whole event window for the two groups from the merger are illustrated in figure 7.

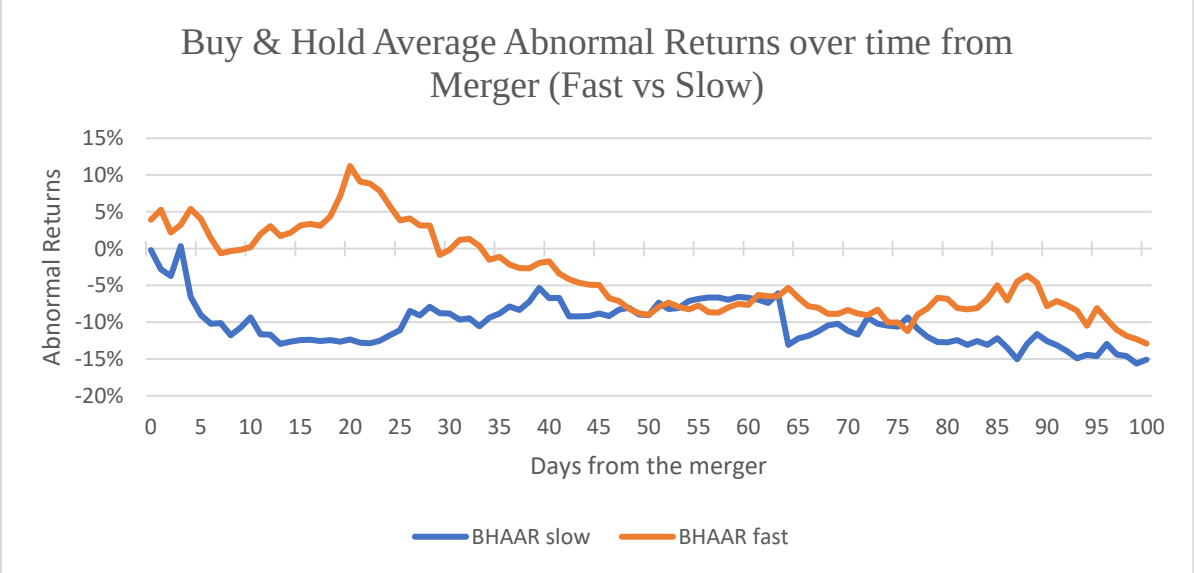

Figure 7: The graph displays the Buy and Hold Average Abnormal Returns over time from the merger separately for the two groups starting off with the closing price of the day before the event. The blue line represents the 48 SPACs that took the longest to merge after DA. The orange line represents the 48 SPACs that were the quickest to merge after DA.

Finally, we divide the SPACs into groups depending on how long they took to announce a business combination from their initial SPAC IPO formation. The SPACs are divided into four groups, the days shown to the left in this table are calendar days, we previously stated that the SPACs have around 18-24 months to find a target and complete a merger after the SPAC IPO. Which roughly translates to 548-730 calendar days.

Table 10 reports the Buy & Hold Average Abnormal Returns from both the definitive agreement and the merger and 60 days forward, depending on the timeframe it took between the SPAC IPO until the DA. The table includes the mean, median and standard deviation for the BHAAR as well as two tests for significance, the T-test for the mean and the Wilcoxon signed rank test for the median. Since eight firms completed their merger from the DA before 60 days, they have been excluded in this result and table. Significant results are marked in bold.

BHAAR 0-60 from DA and ME depending on time from IPO to DA

Days between IPO and DA						
0-200	Mean	T-test	Std dev	Median	Wilcoxon z	N
BHAAR DA	12,39%	1,571	0,370	6,04%	-0,958	22
BHAAR Merger	20,24%	1,116	0,851	-2,79%	-0,568	22
201-400	Mean	T-test	Std dev	Median	Wilcoxon z	N
BHAAR DA	7,80%	1,666	0,214	2,85%	-1,199	21
BHAAR Merger	**-29,82%**	**-3,662*** **	0,373	**-35,68%**	**-2,937*** **	21
401-600	Mean	T-test	Std dev	Median	Wilcoxon z	N
BHAAR DA	27,18%	1,481	0,899	-0,82%	-0,400	24
BHAAR Merger	-13,69%	-0,990	0,677	**-18,85%**	**-2,429** **	24
600+	Mean	T-test	Std dev	Median	Wilcoxon z	N
BHAAR DA	13,50%	1,554	0,398	0,62%	-0,991	21
BHAAR Merger	**-13,65%**	**-1,832***	0,341	**-12,89%**	**-1,860***	21

Note: Statistical Significance levels are defined as follows: *** 1%, ** 5%, * 10%.

The table showcase very fluctuating results and some very extreme standard deviations, for the BHAAR connected to the definitive agreement event, no significance can be found for either the mean or median depending on the time it takes from its initial phase to the DA. For the BHAAR linked to the merger event, some significance can be found, and most strongly significant for the period between 201-400 days. The median is significant for three of the four periods for the merger BHAAR, only the fastest period 0-200 days show no significant negative abnormal returns here.

5. Result Discussion

In this part we will investigate whether our theoretical hypotheses agree with the empirical evidence we have found in this study, we also discuss the results and their comparison to previous studies on SPACs. The theories that we used were efficient market hypothesis and agency theory, which intended to explain some of the outcomes of short-term abnormal returns respectively the long-term abnormal returns.

5.1 Short-Term Result Discussion

When comparing the results to previous research in the short term around the definitive agreement, very similar results to those from Dimitrova (2017), Lakicevic and Vulanovic (2013), and Tran (2010) are found. The definitive agreement yields positive abnormal returns around the event which can be explained by the new information given at this announcement and that the acquisition may create value or at least is better than the shareholders had expected. In this stage, the investors react to the qualities of the acquisition, the probability that the acquisition will be voted through, and the potential dilution at the merger event. Our results also reflect that the average is higher than the median which indicates that there are a few SPACs that see very high abnormal returns, while there is a slightly milder reaction for the vast majority.

The cumulative average abnormal returns around the definitive agreement event show statistically significant positive abnormal returns at the 1 % level for all three different time periods as presented by the t-test. The same can be concluded for the cumulative median abnormal return at the 1 % level for the [-1, 1] and [-3, 3] windows. For [-5, 5] it is statistically significant at 10 percent, based on the robustness test which is the Wilcoxon signed rank test. The positive cumulative abnormal returns experienced for both the mean and the median could mean that the acquisitions are perceived as value-creating by the shareholders. On the other hand, Dimitrova proves that the positive returns are driven only because they have managed to find an acquisition and that the average SPAC acquisition is value-destroying anyway which is in line with the previous long-term post-merger result. However, our results point that the acquisitions are on average better than the shareholders expected at least in the short-run reaction.

Another interesting result found is the statistically significant positive abnormal returns one day before the definitive agreement for the period [-1, 1] which confirms the idea behind the semi-strong assumption of insider information. That, information about the acquisition possibly leaked out to some investors before the public announcement which enables the possibility of arbitrage profits for certain investors. The strong-form assumption which is a reference point of the efficient market hypothesis is therefore challenged by our results which also is in line with Malkiel (2003) and Subramanian (2010).

The cumulative average abnormal returns around the merger event are not statistically significantly different from zero at any level for all three different time periods around the event. On the other hand, the median shows abnormal results statistically significantly different from zero, 3 days after the event at 10% level for [-3, 3] respectively 3 to 5 days after at 5% level for [-5, 5]. These results imply that there are a few SPACs with bigger positive abnormal returns that drive up the value for the mean at the merger, but most reactions are still negative as suggested by the median. The negative significant results found for the median a few days after the merger event can be explained by the same reasons for the negative abnormal returns in the long run. The shares get more diluted after the merger and sponsors might sell after they completed the merger because the incentive was only to complete the merger in order to get fees and other compensations for equity. This will be further explained in the long-term result discussion.

A possible explanation to why the CAAR result for the definitive agreement sees more abnormal returns than the result for the merger is because, for the definitive agreement, this announcement is new information, before this announcement, if or when the definitive agreement will take place is unknown. When the merger event is taking place is known prior to the date of the completion, which can explain why there are not the same sudden reactions to this event. This is in line with the market efficient hypothesis founded by Fama (1970) that was used in the theoretical framework.

By the efficient market hypothesis, the conclusion can be drawn that our empirical results agree with the hypothesis for the average abnormal returns around the merger. The short-term cumulative abnormal return for a couple of days around the merger shows that the event does not provide the investors with more information than they knew before the merger event. Concluding that the shareholders will at least know at the general meeting if the merger will go

through if not earlier and therefore the SPAC can be valued at the acquired market value before the merger event.

The median abnormal returns that are statistically significantly different from zero, three to five days after the event is not in line with the hypothesis but can be explained by findings in previous research regarding long-term returns after the merger.

5.2 Long-Term Result Discussion

Analyzing the long-term abnormal returns between the definitive agreement and the merger was the main reasoning for the choice of topic and is the gap we tried to fill in previous literature.

The results in figure 4 display a buy-and-hold approach spanning from the day of the event and onward until the remaining number of SPACs that have not completed a merger yet goes under the quantity of 30. Including a longer timeline than this would not be more effective as the volatility increases when the amount of SPACs declines. The figure displays an upward trend starting off at the beginning of the event straight after the definitive agreement announcement and afterward it slows down for a bit before it steadily increases to around the 60 market-day spots. Around the 60 market-day, more and more of the SPACs start to finalize their merger and as they are completed, they are removed from the data. Hence, we can sometimes see big drops in the graph explained by well-performing SPACs completing their business combination and being removed. Around half of the 96 SPACs in the sample completed their business combination between 45-85 market days after them announcing it. The standard parametric T-test reveals statistically significant positive abnormal returns for the first three event windows, BHAAR 45, BHAAR 60, and BHAAR 67, peaking at BHAAR 60.

Our results for the long-term after the definitive agreement suggest that SPACs that take a longer time to finalize their merger see a decline in abnormal return either from the peak or that SPACs who see good performance up until this time has an easier time completing their merger. These results point in the direction of a possible optimal buy and hold strategy that revolves around buying SPACs on the day of the merger announcement and holding until around 60 market days in. Our robustness test, the Wilcoxon test weakens this assumption a bit as it does not find the same significant result. Just like for the short-term DA results the average here is

much higher than the median which indicates that there might be a few SPACs that holds most of the positive abnormal returns. While the median still is positive for the three significant event windows the overall reaction is somewhat milder for the vast majority.

It is important to highlight the fact that our robustness test does not reaffirm this result, while a trend can be seen for the median there is no statistical significance for this measure and that the difference between the mean and the median can be slightly skewed because of some extreme values that also are reflected when looking at the standard deviation for some periods of the long-term abnormal returns for this stage. A bigger sample could lower the standard deviation and significance could be seen for the median as well which would add more consistency to this result.

If the sponsor has found a bad acquisition, the fixed fees, and equity compensations will create an incentive for the sponsor to buy more shares to get through the acquisition even though it is judged to be a bad one. It is in line with agency theory where agency costs arise due to that the incentive scheme is to the clear advantage of the sponsors found in a SPAC. The further this timespan develops the more it should signal to investors that it might be a bad acquisition resulting in that buy-and-hold abnormal returns would decrease as the period between the event extends.

The relationship of these results also falls in line with the hypothesis based on agency theory suggesting a negative result between the buy-and-hold average abnormal returns and the number of days for the SPAC to complete its merger if it does not adhere to the interval of 2-3 market-months. Possibly caused by the difference in agency incentives as the sponsor prefers a bad merger over none at all and might go to great lengths to complete it which is not ideal for the investor.

When it comes to post-merger results our thesis complies with previous research. Like previously reported, the post-merger results for SPACs are simply not good. After 30 market days, the average abnormal return is -4.71% which continues to decline as time passes. After 100 market days, this return has reached -14.01% and is statistically significant at 10% level, the median being at -34,04% after the same period is significant at the 5% level. The negative returns post-merger is comparable to those of Datar, Emm, and Ince (2012) and Jenkinson and Sousa (2011) who report 6 months post-merger returns of -21% and -24%. While it is not as bad as those results, the event window is also a bit shorter as 100 market days is a bit less than 6 calendar months, but the significant negative results remain.

Berger (2008) points that firms that use SPAC vehicles are in general risky firms. Datar, Emm, and Ince (2012); Kolb and Tykvová (2016) conclude that firms that use SPAC vehicles have low profitability, low growth opportunities, are small, and quite levered. Although this study does not examine firm riskiness or characteristics of the merged firms, we can at least conclude that the above is not disproved by our huge negative post-merger abnormal return.

In the long run, our results indicate that there are on average some significant positive returns after the definitive agreement while the results also show significant negative returns on average after the merger. At first glance, this seems paradoxical if not more irrational from an investor perspective. Sponsors probably sell after they completed the merger because the incentives were only to complete the merger in order to get fees and other compensations for equity. Klauser, Ohlrogge, and Ruan found that the SPAC has on average 33.33% lower cash per share when the merger takes place in comparison with when the IPO event takes place. Additionally, they show that there is a high correlation between dilution and negative post-merger returns which implies that the shareholders are bearing the cost of dilution which is a reasonable cause for our results. Another possible explanation for this result in line with agency theory is that the sponsors sell their holdings after they completed the merger as their perhaps clearest incentive was to claim the fees and compensations connected with completing a merger.

5.3 Slow or Fast SPACs Result Discussion.

As previously discussed for the long-term results, the buy-and-hold average abnormal returns steadily increase up until around 60 days after the definitive agreement event. After this, the abnormal returns decline, at the same time more and more SPACs start completing their mergers. Suggesting that SPACs that take a longer time to complete their business combination after it is announced see a decline when this stage takes excessively long. Implying that these SPACs may have more difficulty completing their merger where one possible reason is that the sponsors are unsure if the business combination will be voted through at the general meeting or not. We tested this theory by dividing the SPAC sample into 2 subsamples. The 48 SPACs that have the shortest time between the two events are selected into the “Fast” subsample and the 48 SPACs that take the longest time to complete the merger after the DA are put into the “Slow” subsample.

First, we conducted a cumulative abnormal return approach for the short-term to investigate if investors can spot out the fast vs the slow already at the time of the definitive agreement. In

Table **7** we can see that for the fast SPACs the mean and median is greater than the slow SPACs for all event windows. At the end of the selected event windows, the fast subsample obtains strong significant results at the 1 percent level for both the mean and the median. The slow group only shows a significance of 10% for the mean at the first two event windows, the robustness test of the median does not back these results up. Additionally, we can conclude through our two-sample t-test that there is a significant difference between the subsamples regarding cumulative abnormal return at 5% level for [-1, 1]. This suggests that SPACs that have a more positive response at the time of the definitive agreement announcement will be able to complete their merger earlier. These acquired firms are probably of higher quality than those in the slower subsample or at least they were better than the market expected which seems to result in higher returns.

The main reason to further investigate potential differences for the fast and slow SPACs was that our results in chapter 4.2 indicate there is a negative relation between the time to get through the merger and the abnormal return after the definitive agreement. However, our expanded results through the two-sample t-test show that there is a statistically significant difference between the subsample at the 10% level. The results also show that the standard deviation in the fast sample is quite high which is the reason why we can only see a certain significance in the results despite the fact that the mean value for fixed is considerably higher. This result is partly in line with our hypothesis that those companies that are slowest to complete the merger should have significantly lower abnormal returns.

We continue our analysis by taking a look at the post-merger results for the two groups in table 9 and figure **7**, in the early stages of post-merger it seems like the fast group starts off by continuing their relatively better performance over the slow group. However, as time goes on the BHAAR for the faster group meets the same faith as the slower group and our long-term results as a whole, which points towards negative returns in comparison to our benchmark. Hence, we can conclude that abnormal returns do not differ significantly between fast and slow SPACs 100 days after the merger. Explanations for this result can partly be due to, that the dilution in shares that take place after the merger is more than the investors expected. Additionally, perhaps the investors have learned from history that post-merger returns are negative on average and therefore the stocks post-merger obtain a herd instinct to sell-off which might further increase the negative market reaction.

Lastly, we checked if the length of the initial phase has any effect on the other two stages. We divide the time between the SPAC IPO formation and the DA into four groups. There is a time

limit on how long the sponsors have, to complete the whole process and the sponsors have a huge incentive of monetary gain to complete any deal. For this reason, there is reason to believe that perhaps as the time from the initial SPAC IPO goes on and comes closer to reach the deadline that the sponsors might get desperate in finding a target and disregard the quality of the targeted company.

For the impact on post DA returns, the length of the IPO phase gives no significant results, looking at the post-merger returns, the length of this stage shows significant results for the median for all groups but the quickest group. The fastest group 0-200 is also the only one to show positive buy and hold average abnormal returns for post-merger although it is not statistically significant. It is valuable to state that the groups have very small samples and that the standard deviation is very high in some cases as well as the median and mean differ a lot indicating that a few SPACs can stand for a lot of the positive/negative trends.

6. Conclusion

The objective of the essay was to analyze and compare SPACs performance through its different stages of life, placing extra focus on the long-term results between the announcement of the definitive agreement and up to the completion of the merger. The analysis has been done using event studies which is a popular method when dealing with abnormal returns, the abnormal returns were then tested both for the mean and the median using the t-test and Wilcoxon signed rank test, respectively. Then attempting to connect the results from the study with related theories in agency theory and efficient market hypothesis. As well as comparing the results in this paper with previous studies to see if the performance of SPACs has seen any changes since its introduction back in 2003.

In general, the results suggest that the SPACs perform a lot better pre-merger than it does post-merger, something that is consistent with previous studies. However, when digging deeper in the different stages a clear pattern between the definitive agreement and the merger completion is found. SPACs see statistically significant positive abnormal returns from the definitive agreement event in the short run and these positive abnormal returns continue in the long term up until around 60 days post the event. Here the abnormal returns start to decline and are further reduced as more and more SPACs start to complete their mergers, suggesting that SPACs that complete their merger faster perform better during this stage than the slower ones. This is then controlled by dividing the SPACs into two groups between these two events, concluding that the 48 fastest perform a lot better than the 48 slowest. These two groups are then also checked if they convert these performances to the post-merger stage and while the faster SPACs perform better right after the merger it is not until long before they start to decline and end up with the overall poor performance SPACs see post-merger.

If investing in SPACs, this paper implies an optimal strategy of holding the SPACs from the DA to around 60 market days after the event and if the merger completion is not in sight, it might be sensible to look for a way out of the SPAC. This has been the trend that our results give for the SPACs that has been completed since the start of 2019. It is however important to highlight the fact that the robustness test used does not reaffirm this result. Indicating that the results for this test might be somewhat skewed by extreme values as seen in the standard deviation and the difference between the mean and median.

Regarding other long-term investments, holding the SPAC from its start at the SPAC IPO phase comes at the cost of the alternative cost of not having it invested in anything else as the initial

phase of the SPAC is very static return wise, and after the merger, our paper suggests the same poor results for the recent SPACs long-term as the SPACs studied a decade ago.

This means that even after the regulation and structure changes, SPACs went through to be listed on the bigger exchanges: NASDAQ and NYSE, some of the same struggles for the asset class persist. The post-merger results are very poor compared to other benchmarks and for the SPACs to not slow down its recent enormous growth and keep being the most popular way of going public this trend will have to change otherwise we believe investors will start looking elsewhere to put their savings into.

So, as we see some ups and downs for this so-called asset class during its different stages, it will be interesting to see how the SPACs develop in the near future when the aftermath of the 2020-2021 SPAC phenomena gets clearer and the sample size available is several times larger. A more sizeable sample could decrease the standard deviation and the possible effect of extreme values. This may then alter the outcome of the robustness test for our most focused period between the DA and the merger, adding more reliability to the findings suggested in this paper. This is something we encourage future researchers to investigate.

Reference List:

Ang, J. S., Cole, R. A., & Lin, J. W. (2000). Agency Costs and Ownership Structure. *Journal of Finance*, vol. 50, no. 1, pp. 81-106. https://doi.org/10.1111/0022-1082.00201

Barber, B. and Lyon, J. D. (1997). Detecting long-run abnormal stock returns: the empirical power and specification of test statistics, *Journal of Financial Economics*, vol. 43, no. 3, pp. 341-372. https://doi.org/10.1016/S0304-405X(96)00890-2

Barber, B., Lyon, L and Tsai,C-L. (1999). Improved Methods for Tests of Long-Run Abnormal Stock Returns, *American Finance Association*, vol. 54, no. 1, pp. 165-201. https://doi-org.ludwig.lub.lu.se/10.1111/0022-1082.00101

Berle, A., & Means, G. (1932) The modern corporation and private property. New York: Harcourt, Brace, & World.

Berger, R., 2008. SPACs: an alternative way to access the public markets. J. Appl. Corp. Finance 20, 68–75. https://doi.org/10.1111/j.1745-6622.2008.00194.x

Bradley, D.J., Jordan, B.D., Yi, H.-C., Roten, I.C., (2001). Venture capital and IPO lockup expiration: an empirical analysis. *Journal of Financial Economics*, vol. 24, no. 4, pp. 465–493. https://doi-org.ludwig.lub.lu.se/10.1111/j.1475-6803.2001.tb00826.x

Brau, J.C., Francis, B., Kohers, N., (2003). The Choice of IPO versus Takeover: Empirical Evidence. *The Journal pf Business*, vol. 76, no. 4, pp. 583–612. https://doi.org/10.1086/377032

Brown, S. J. and Warner, J. B. (1985). Using daily stock returns: the case of event studies, *Journal of Financial Economics*, vol. 14, no. 1, pp. 3-31. https://doi.org/10.1016/0304-405X(85)90042-X

Campbell, J. Y., Lo, A. W. & MacKinlay, A. C. (1997). The Econometrics of Financial Markets, NJ: Princeton University Press.

Coase, R. H. (1937). The Nature of the Firm. *Economica*, vol. 4, no. 16, pp. 386-405 https://doi.org/10.1111/j.1468-0335.1937.tb00002.x

Corder, G. W., & Foreman, D. I. (2014). *Nonparametric Statistics: A Step-by-Step Approach*, 2nd edn, Wiley. pp. 40

D'Alvia, D. (2020). The international financial regulation of SPACs between legal standardised regulation and standardisation of market practices. *Journal of Banking Regulation*, vol. 21, pp. 107–124 https://doi.org/10.1057/s41261-019-00100-5

Datar, V., Emm, E., & Ince, U. (2012). "Going public through the back door: A comparative analysis of SPACs and IPOs". *Banking & Finance Review*, vol. 4, no. 1, pp. 17-36

Dutta, S. & Jog, V. (2009). The long-term performance of acquiring firms: A re-examination of an anomaly, *Journal of Banking and Finance*, vol. 33, no. 8, pp. 1400-1412. https://doi.org/10.1016/j.jbankfin.2009.02.004

Dimic, N., Lawrence, E. R. & Vulanovic, M. (2020). The Determinants of IPO Withdrawals: Evidence from SPACs". http://dx.doi.org/10.2139/ssrn.3538671

Dimitrova, L. (2017). Perverse incentives of special purpose acquisition companies, the "poor man's private equity funds." *Journal of Accounting & Economics*, vol. 63, no. 1, pp. 99-120 http://dx.doi.org/10.1016/j.jacceco.2016.10.003

Eisenhardt, K. M., (1989). Agency Theory: An Assessment and Review, *The Academy of Management Review*. vol. 14, no. 1, pp. 57-74. https://doi-org.ludwig.lub.lu.se/10.2307/258191

Fama, E. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance*, vol. 5, no. 2, pp. 383-417.https://doi-org.ludwig.lub.lu.se/10.2307/2325486

Fama, E. F., (1998). Market efficiency, long-term returns, and behavioral finance, *Journal of Financial Economics*, vol. 49, no. 3, pp. 283-306. http://dx.doi.org/10.2139/ssrn.15108

Fama, E. F., Fisher, L., Jensen, M. C. & Roll, R. (1969). The adjustment of stock prices to new information, *International Economic Review*, vol. 10, no. 1, pp. 1-21. http://dx.doi.org/10.2139/ssrn.321524

Field, L., Hanka, G., (2001). The expiration of IPO share lockups. *The Journal of Finance*, vol. 56, no. 2, pp. 471–500. https://doi-org.ludwig.lub.lu.se/10.1111/0022-1082.00334

Gleason, K.C., Jain, R., & Rosenthal, L., (2006). Alternatives for Going Public: Evidence from Reverse Takeovers, Self-Underwritten Ipos, and traditional Ipos. http://dx.doi.org/10.2139/ssrn.890714

Go, P. (2021-04-15) "Global IPO trends: Q1 2021" *EY,* Available online: https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/ipo/ey-global-ipo-trends-2021-q1-v1.pdf [Accessed 17 May 2021]

Heyman, D. K. (2007). "From Blank Check to SPAC: The Regulator's Response to the Market, and the Market's Response to the Regulation, *Entrepreneurial Business Law Journal*, vol. 2, no. 1, pp. 531-552. http://hdl.handle.net/1811/78301

Ignatyeva, E., Rauch, C., & Wahrenburg, M. (2013). Analyzing European SPACs, *Journal of Private Equity*, vol. 17, no. 1, pp. 64–79. http://dx.doi.org/10.3905/jpe.2013.17.1.064

Jenkinson, T., & Sousa, M. (2011). Why SPAC Investors Should Listen to the Market, *Journal of Applied Finance*, vol. 21, no. 2, pp. 38-57. https://ssrn.com/abstract=2691586

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, vol. 3, no. 4, pp. 305-360 https://doi.org/10.1016/0304-405X(76)90026-X

Jog, V. M. & Sun, C. (2007). "Blank Check IPOs: A Home Run for Management" http://dx.doi.org/10.2139/ssrn.1018242

Klausner, M. D., Ohlrogge, M. & Ruan, E. (2020) "A Sober Look at SPACs" *Yale Journal on Regulatio*n, Forthcoming, Stanford Law and Economics Olin Working Paper No. 559, NYU Law and Economics Research Paper No. 20-48, European Corporate

Governance Institute – Finance Working Paper No. 746/2021, http://dx.doi.org/10.2139/ssrn.3720919

Kolari, J. W., & Pynnönen, S. (2010). Event Study Testing with Cross-sectional Correlation of Abnormal Returns, *The Review of Financial Studies,* vol. 23, no. 11, pp. 3996-4025, https://www.jstor.org/stable/40961306

Kolb, J. & Tykova, T. (2016). Going public via special purpose acquisition companies: Frogs do not turn into princes, *Journal of Corporate Finance,* vol 40, pp. 80-96. https://doi.org/10.1016/j.jcorpfin.2016.07.006

Kothari, S. P. & Warner, J. B. (2008). Econometrics of Event Studies, *Handbook of Corporate Finance*, vol 1, Edited by Eckbo, B. E.

Lakicevic, M. & Vulanovic, M. (2013). A Story on SPACs, *Managerial Finance*, vol. 39, no. 4, http://dx.doi.org/10.2139/ssrn.1958238

Lewellen, S, (2009). SPACs as an Asset Class. http://dx.doi.org/10.2139/ssrn.1284999

Lusyana, D. & Sherif, M. (2016). Do mergers create value for high-tech firms? The hounds of dotcom bubble, *Journal of High Technology Management Research*, vol. 27, no. 1, pp. 196-213. https://doi.org/10.1016/j.hitech.2016.10.009

MacKinlay, A. C., (1997). Event Studies in Economics and Finance. *Journal of Economic Literature*, vol. 35, no. 1, pp. 13-39. http://www.jstor.org/stable/2729691.

Malkiel, B. The Efficient Market Hypothesis and Its Critics, *The Journal of Economic Perspectives*, vol. 17, no. 1, pp. 59–82, www.jstor.org/stable/3216840.

Mitchell, M & Stafford, S. (2000). Managerial Decisions and Long-Term Stock Price Performance. *The Journal of Business,* vol. 73, no. 3, pp. 287-329. http://dx.doi.org/10.1086/209645

Passador, M. L. (2021). "In Vogue Again: The Re-Rise of SPACs in the IPO market". *Bocconi Legal Studies Research Paper* No. 3820957. https://ssrn.com/abstract=3820957

Rani, N., Yadav, S. & Jain, P. (2016). Mergers and Acquisitions: A Study if Financial Performance, Motives and Corporate Governance, Singapore: Springer Science+Business Media.

Röell, A. (1996). "The decision to go public: An overview" *European Economic Review,* vol. 40, no. 3, pp. 1071-1081. http://dx.doi.org/10.1016/0014-2921(95)00114-X.

Snedecor, G. W., & Cochran, W. G., (1989). *Statistical Methods*, 8th edn, Iowa State University Press

Subramanian, K. (2010) Efficient Market Hypothesis: The Model That Failed, *Economic and Political Weekly*, vol. 45, no. 31, pp. 20–22, www.jstor.org/stable/20764358.

SPACInsider. (2021) SPAC Status by Year of IPO. Available online: https://spacinsider.com/stats/ [Accessed 21 May 2021]

Tran, A., (2010). Blank check acquisitions. http://dx.doi.org/10.2139/ssrn.2070274

U.S. Security and Exchange Commission. (n.d.) Blank Check Company. Available online: https://www.investor.gov/introduction-investing/investing-basics/glossary/blank-check-company [Accessed 20 May 2021]

Appendix A: Additional Tables

Table A

Cumulative average abnormal returns (Definitive Agreement) 48 fastest					
Event window					
[-1, 1]		Mean	T.test	Stdev	Median	Wilcoxon Z
	-1	**1,90%**	**2,107****	0,063	**0,30%**	**-3,026*****
	0	**5,00%**	**2,923*****	0,119	**1,61%**	**-2,738*****
	1	**8,78%**	**3,384*****	0,180	**2,54%**	**-3,272*****
[-3, 3]		Mean	T.test	Stdev	Median	Wilcoxon Z
	-3	0,14%	0,374	0,026	-0,19%	-0,646
	-2	-0,17%	-0,373	0,031	-0,14%	-0,441
	-1	**1,74%**	**1,711***	0,070	0,89%	-1,621
	0	**4,84%**	**2,837*****	0,118	**1,41%**	**-2,708*****
	1	**8,61%**	**3,360*****	0,178	**3,61%**	**-3,374*****
	2	**9,74%**	**3,081*****	0,219	**3,07%**	**-3,015*****
	3	**8,94%**	**2,895*****	0,214	**4,13%**	**-2,974*****
[-5, 5]		Mean	T.test	Stdev	Median	Wilcoxon Z
	-5	0,33%	0,874	0,026	0,33%	0,482
	-4	1,06%	1,265	0,058	-0,18%	0,082
	-3	1,21%	1,174	0,071	-0,01%	0,236
	-2	0,90%	1,290	0,048	0,08%	0,933
	-1	**2,80%**	**2,481****	0,078	**0,87%**	**-2,492****
	0	**5,90%**	**2,744*****	0,149	**2,72%**	**-2,800*****
	1	**9,68%**	**3,324*****	0,202	**4,03%**	**-3,036*****
	2	**10,80%**	**3,119*****	0,240	**2,93%**	**-2,677****
	3	**10,00%**	**2,994*****	0,231	**4,08%**	**-2,677****
	4	**9,59%**	**2,939*****	0,226	**3,29%**	**-2,523****
	5	**9,57%**	**2,850*****	0,233	**3,95%**	**-2,287****

Table B

Cumulative average abnormal returns (Definitive Agreement) 48 slowest

Event window

[-1, 1]	Mean	T.test	Stdev	Median	Wilcoxon Z
-1	0,27%	1,109	0,017	0,05%	-1,036
0	**1,72%**	**1,737***	0,068	0,23%	-1,118
1	**2,46%**	**1,948***	0,088	0,50%	-1,580

[-3, 3]	Mean	T.test	Stdev	Median	Wilcoxon Z
-3	-0,06%	-0,178	0,025	-0,28%	-1,385
-2	-0,15%	-0,352	0,030	**-0,49%**	**-1,785***
-1	0,12%	0,209	0,041	-0,58%	-1,118
0	1,56%	1,391	0,078	-0,45%	0,236
1	2,31%	1,683	0,095	0,08%	-0,810
2	**2,31%**	**1,834***	0,087	0,37%	-1,046
3	**2,68%**	**1,815***	0,102	-0,04%	-0,646

[-5, 5]	Mean	T.test	Stdev	Median	Wilcoxon Z
-5	**-0,47%**	**-1,760***	0,018	**-0,52%**	**-2,421****
-4	**-0,63%**	**-1,988***	0,022	**-0,35%**	**-1,928***
-3	-0,69%	-1,298	0,037	**-0,76%**	**-1,980***
-2	-0,78%	-1,383	0,039	**-0,95%**	**-2,492****
-1	-0,51%	-0,757	0,047	-1,22%	-1,744
0	0,93%	0,799	0,081	-0,45%	-0,513
1	1,68%	1,174	0,099	-0,80%	-0,103
2	1,68%	1,246	0,093	-0,60%	-0,092
3	2,05%	1,312	0,108	-0,07%	-0,113
4	2,32%	1,349	0,119	-0,68%	-0,092
5	2,05%	1,153	0,123	-0,38%	-0,144

Appendix B: SPACs Analyzed in the Paper.

Ticker	Post-SPAC Company Name	DA date	Merger complete date
NUVB	Nuvation Bio Inc.	2020-10-20	2021-02-10
PLBY	PLBY Group, Inc.	2020-09-30	2021-02-10
MILE	Metromile, Inc.	2020-11-24	2021-02-09
GMTX	Gemini Therapeutics, Inc.	2020-10-15	2021-02-05
ETWO	E2open Parent Holdings, Inc.	2020-10-14	2021-02-04
ADN	Advent Technologies Holdings, Inc.	2020-10-12	2021-02-04
APPH	AppHarvest, Inc.	2020-09-28	2021-01-29
LOTZ	CarLotz, Inc.	2020-10-21	2021-01-21
UWMC	UWM Holdings Corporation	2020-09-22	2021-01-21
HIMS	Hims & Hers Health, Inc.	2020-09-30	2021-01-20
BTRS	BTRS Holdings Inc.	2020-10-18	2021-01-12
CLOV	Clover Health Investments, Corp.	2020-10-05	2021-01-07
LSEA	Landsea Homes Corporation	2020-08-31	2021-01-07
BMTX	BM Technologies, Inc.	2020-08-06	2021-01-04
CLNN	Clene Nanomedicine, Inc.	2020-09-01	2020-12-30
RMO	Romeo Power, Inc.	2020-10-05	2020-12-29
DNMR	Danimer Scientific, Inc.	2020-10-03	2020-12-29
RSI	Rush Street Interactive, Inc.	2020-07-27	2020-12-29
GNOG	Golden Nugget Online Gaming, Inc.	2020-06-28	2020-12-29
VINC	Vincera Pharma, Inc.	2020-09-25	2020-12-23
PRCH	Porch Group, Inc.	2020-07-30	2020-12-23
ASLE	AerSale Corporation	2020-09-08	2020-12-22
ARKO	ARKO Corp	2020-09-08	2020-12-22
XL	XL Fleet Corp	2020-09-17	2020-12-21
GOEV	Canoo Holdings	2020-08-17	2020-12-21
OPEN	Opendoor Technologies Inc.	2020-09-15	2020-12-18
CLVR	Clever Leaves Holdings, Inc.	2020-07-25	2020-12-18
BFI	BurgerFi International	2020-06-29	2020-12-17
SKLZ	Skillz	2020-09-01	2020-12-16
RVPH	Reviva Pharmaceuticals Holdings, Inc.	2020-07-20	2020-12-14
DM	Desktop Metal Inc.	2020-08-26	2020-12-10
HTOO	Fusion Fuel Green PLC	2020-06-06	2020-12-10
LAZR	Luminar Technologies, Inc.	2020-08-24	2020-12-02
QS	QuantumScape	2020-09-02	2020-11-27
ID	PARTS iD, Inc	2020-09-18	2020-11-20
UK	Ucommune International Ltd	2020-06-29	2020-11-17
GCMG	GCM Grosvenor Inc.	2020-08-02	2020-11-17
MP	MP Materials Corp.	2020-07-15	2020-11-17
EOSE	Eos Energy Enterprises, Inc.	2020-09-07	2020-11-16

TRIT	Triterras, Inc	2020-07-29	2020-11-10
ATNF	180 Life Sciences Corp.	2020-07-25	2020-11-06
TLMD	SOC Telemed, Inc.	2020-07-29	2020-10-30
FSR	Fisker Inc.	2020-07-10	2020-10-29
RIDE	Lordstown Motors Corp.	2020-08-01	2020-10-23
PAYA	Paya Holdings Inc.	2020-08-03	2020-10-16
TTCF	Tattooed Chef, Inc	2020-06-11	2020-10-15
CURI	CuriosityStream Inc.	2020-08-10	2020-10-14
SFT	Shift Technologies	2020-06-29	2020-10-13
MPLN	MultiPlan Corporation	2020-07-12	2020-10-08
HYLN	Hyliion	2020-06-18	2020-10-01
EQOS	Diginex Limited	2019-07-09	2020-10-01
VLDR	Velodyne Lidar, Inc	2020-07-02	2020-09-29
UTZ	Utz Brands, Inc	2020-06-05	2020-08-28
GB	Global Blue Group	2020-01-16	2020-08-28
HPK	HighPeak Energy, Inc.	2020-05-04	2020-08-21
DMS	Digital Media Solutions, Inc.	2020-04-23	2020-07-15
IMTX	Immatics N.V.	2020-03-17	2020-07-01
HOFV	Hall of Fame Resort & Entertainment Company	2019-09-16	2020-07-01
FREE	Whole Earth Brands Inc	2019-12-19	2020-06-25
LGHL	Lion Group Holding Ltd	2020-03-10	2020-06-16
LPRO	Open Lending Corp.	2020-01-05	2020-06-10
NKLA	Nikola Corporation	2020-03-02	2020-06-03
HYMC	Hycroft Mining Holding Corporation	2020-01-13	2020-05-29
SJ	Scienjoy Holding Corp	2019-10-28	2020-05-07
DKNG	DraftKings Inc	2019-12-22	2020-04-23
AVCT	American Virtual Cloud Technologies	2019-07-24	2020-04-07
METX	Meten EdtechX Education Group	2019-12-12	2020-03-30
IGIC	International General Insuranc Hldgs Ltd	2019-10-10	2020-03-17
BWMX	Betterware De Mexico	2019-08-02	2020-03-13
GDYN	Grid Dynamics Holdings, Inc	2019-11-13	2020-03-05
GSMG	Glory Star New Media Group	2019-09-06	2020-02-15
ALTG	Alta Equipment Group Inc	2019-12-12	2020-02-14
ATCX	Atlas Technical Consultants	2019-08-12	2020-02-14
PAE	PAE Inc	2019-11-01	2020-02-10
VRT	Vertiv Holdings Co	2019-12-10	2020-02-07
VVNT	Vivint Smart Home	2019-09-15	2020-01-17
BROG	Brooge Holdings Limited	2019-04-15	2019-12-20
NFH	New Frontier Health	2019-07-30	2019-12-19
IMVT	Immunovant Inc.	2019-09-29	2019-12-18
KLR	Kaleyra, Inc.	2019-02-22	2019-11-25
ACEL	Accel Entertainment Inc	2019-06-13	2019-11-20
BRMK	Broadmark Realty Capital Inc.	2019-08-09	2019-11-14

AHCO	AdaptHealth	2019-07-08	2019-11-08
PHGE	BiomX	2019-07-16	2019-10-28
SPCE	Virgin Galactic Holdings Inc	2019-07-09	2019-10-25
DMTK	DermTech Inc	2019-05-29	2019-08-29
AESE	Allied Esports Entertainment	2018-12-19	2019-08-09
CTOS	Nesco Holdings, Inc.	2019-04-07	2019-07-31
RPAY	Repay Holdings Corporation	2019-01-21	2019-07-11
KERN	Akerna	2018-10-10	2019-06-17
CLVT	Clarivate Analytics Plc	2019-01-14	2019-05-13
KXIN	Kaixin Auto Holdings	2018-11-02	2019-04-30
OSW	OneSpaWorld	2018-11-01	2019-03-19
TH	Target Hospitality Corp	2018-11-13	2019-03-15
BIOX	Bioceres Crop Solutions Corp	2018-11-08	2019-03-14
GTYH	GTY Technology Holdings Inc	2018-09-12	2019-02-19