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SPACs and IPOs: Consequences on Short-term and Long-term performance

Bachelor's thesis

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Declaration of Authorship

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Prague, May 1, 2023

Jan Svancara

Abstract

This thesis investigates disparities in stock exchange performance with regard to businesses that were unprofitable before becoming public. These firms were divided into two samples; the first sample was made up of firms that entered the market through an Initial Public Offering (IPO), while the second sample was composed of firms that accessed the market through a Special Purpose Acquisition Company (SPAC). Buy-and-hold Abnormal Returns (BHARs) and Cumulative Abnormal Returns (CARs) are two types of abnormal returns used to measure stock market performance. The performance was examined throughout four different time horizons, with two of them being considered short-term and the other two being long-term in this thesis. The results indicated that unprofitable SPACs significantly underperform unprofitable IPOs in every time horizon examined. Additionally, a model that forecasts whether a firm is more likely to go public through an IPO or a SPAC was developed. The findings implied that highly-priced companies with a greater debt are more likely to be selected by a SPAC.

JEL Classification	D22, G34, G15, G11, O51
Keywords	SPAC, IPO, unprofitable, performance, negative, income, loss, BHAR, CAR
Title	SPACs and IPOs: Consequences on Short-term and Long-term performance

Abstrakt

Tato práce zkoumá rozdíly v burzovním výkonu se zaměřením na společnosti, které byly před vstupem na burzu nevýdělečné. Tyto firmy byly rozdělené do dvou souborů, firmy z prvního souboru realizovaly Initial Public Offering (IPO), zatímco společnosti tvořící druhý vzorek využily Special Purpose Acquisition Company (SPAC). Buy-and-hold Abnormal Returns (BHARs) a Cumulative Abnormal Returns (CARs) jsou dva typy abnormálních výnosů, které se používají k měření výkonnosti akciového trhu. Výkonnost byla zkoumána ve čtyřech různých časových horizontech, přičemž dva z nich jsou v této práci považovány za krátkodobé a další dva za dlouhodobé. Výsledky ukázaly, že nevýdělečné SPACy jsou ve všech časových horizontech výrazně překonány neziskovými IPO. Dále byl vyvinut model, který předpovídá, zda firma vstoupí na burzu prostřednictvím IPO nebo SPAC. Ze zjištění vyplynulo, že výše naceněné společnosti s vyšším zadlužením budou s větší pravděpodobností volit SPAC oproti IPO.

Klasifikace JEL	D22, G34, G15, G11, O51
Klíčová slova	SPAC, IPO, neprofitabilní, výkonnost, negativní, příjem, ztráta, BHAR, CAR
Název práce	Následky krátkodobé a dlouhodobé výkonosti SPACů a IPO

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Contents

List of Tables

List of Figures

Acronyms

SPAC Special Purpose Acquisition Company

IPO Initial Public Offering

BHAR Buy-and-hold Abnormal Return

BHAAR Buy-and-hold Average Abnormal Return

CAR Cumulative Abnormal Return

CAAR Cumulative Average Abnormal Return

3m 3-month time period

6m 6-month time period

12m 12-month time period

24m 24-month time period

AME Average Marginal Effect

Bachelor's Thesis Proposal

Author	Jan Švancara
Supervisor	Mgr. Josef Kurka
Proposed topic	SPACs and IPOs: Consequences on Short-term and Long-term performance

Research question and motivation The research aims to answer a question whether a stock of zero-income company performs better (both in short-term and long-term) in case of regular Initial Public Offering (IPO) or when acquired by a Special Purpose Acquisition Company (SPAC). In light of the dramatically growing number of SPACs in recent years, we consider it very important and helpful to acknowledge weaknesses and strengths in performance of a company that enters the market via SPAC. Kolb and Tykvová (2016) measure the performance of firms after IPO versus the performance of companies after a SPAC merger. They conduct an event-time analysis, specifically they compare buy-and-hold abnormal returns (BHAR) adjusted for the market, size, book-to-market and for the industry. Moreover, they employ calendar-time portfolio analysis in form of five-factor regression models. The outcome of the research is that SPACs tend to appear more in volatile markets than IPOs, and that SPAC firms do significantly worse than IPOs. According to the researchers, market timing is key to regular IPO, whereas SPAC mergers are almost independent of market timing. Datar, et al, (2012) study fundamental, operational, and aftermarket characteristics of SPACs in comparison to IPOs. Firstly, key characteristics are compared using regressions, secondly, changes in operating performance over the course of the first year of their tenure as a public company are tracked. In both approaches, the stand-alone and industry adjusted results are compared. Thirdly, they compare post-merger and post-IPO stock returns over several holding periods in raw and market-adjusted form. They find that in the year of the merger, SPACs carry more debt, are smaller, invest less, and have lower growth opportunities than the firms that conduct a conventional IPO in the same year. According to the authors, going public using a reverse merger is associated with inferior performance. We will be building on these two papers, and we

will concentrate on the different consequences for no-income entities. Moreover, we will work with current data including COVID-19 pandemic period which may bring interestingly different behaviour on the financial markets.

Contribution Our research will bring another, arguably quite unique, scope onto the performance measurement of IPOs against SPACs, since we will only consider zero-income companies, e.g. companies that reported no net income prior of the entrance of a public market. Our thesis could be of a significant value for an investor, who considers investing his/her funds into stocks and is aware about the fundamental difference between an IPO and a SPAC.

Methodology An essential piece of our analysis will be buy-and-hold abnormal return (BHAR) analysis, in which we would regress the buy-and-hold abnormal returns onto other properties of a stock (as independent variables). We might also adjust BHAR against i) market; ii) size and book-to-market value; iii) industry. Our work will consist of both short-term and long-term analysis. While we are most likely going to work with stocks listed in the US, we might also include stocks listed in Europe. Another crucial point of our research could be survival analysis, which might be based on the Cox proportional hazard model. The data we are going to use will be manually picked up. In case the company will fit our criteria, we will save properties of its stock into our data set.

Outline

1. Introduction
2. Literature review
3. Methodology
4. Results
    - 4.1 Short-term consequences
    - 4.2 Long-term consequences
5. Conclusion

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Chapter 1

Introduction

Two major ways for a private company to become public are an Initial Public Offering (IPO) or use of a Special Purpose Acquisition Company (SPAC). IPO is the process of offering shares of a private corporation to the public in a new stock issuance for the first time, while SPAC is a company without commercial operations and is formed strictly to raise capital through an initial public offering (IPO), for the purpose of acquiring or merging with an existing company. IPOs are common and well established in the financial markets while SPACs have grown in popularity only recently. In light of the increasing popularity of SPACs, this thesis closely inspects their performance in the sample of negative net income companies that are connected with increased risk, but offer high potential returns.

SPACs are shell businesses that list on the stock exchange using a regular IPO. They only contain cash that was gathered from the company's investors (referred to as SPAC sponsors) before the IPO. Their purpose is to merge with or acquire an existing business, to make the registration and disclosure procedures for the company's entry into the public market substantially simpler (Burnett et al., 2022). If the management team finds an adequate target, the SPAC sponsors vote on whether it fulfils their preferences. In case of acceptance, the businesses merge (or the company is acquired), and the target goes public. If the SPAC sponsors decide against the merger, the management team will use the remaining time to select another suitable target.

The SPAC stops trading after the allotted period and is delisted from the exchange if the management team is unable to identify a target in time. In the late 2010s and early 2020s, SPACs surged in popularity on US stock

markets. SPACs accounted for around 55% of the market share of IPOs in 2020, which was their peak year (Reda, 2021). Furthermore, in 2022, the first SPAC in the history of the Prague Stock Exchange began trading.

The behaviour of SPACs is examined using the sample of unprofitable companies. According to Brown (2022), a surge in "easy money" was brought on by the Federal Reserve's loose monetary policy over the previous few years. Easy money encourages Venture Capital funds (VC) to greatly support new businesses (Janeway et al., 2021). The start-ups flourished as the support rose. And when a firm grows to a certain size, a VC fund's primary goal is to exit from it, possibly through an IPO or a private exit (Cumming and Johan, 2010). Thus, partially due to easy money, a record number of unprofitable start-ups chose to go public offering high-risk and high-reward investment opportunities. In times of a growing number of successful SPAC acquisitions, unprofitable companies are an interesting topic, as the SPAC managers may be able to pick the ones with high upside potential.

In academic literature, SPACs are frequently portrayed as a tool for less-than-stellar enterprises, as opposed to businesses that conduct conventional IPOs (described in more detail in Chapter 2). Prior studies have examined this issue from the perspectives of size, industry, and region, but there has not been a publication, that would filter the companies based on prior profitability. The objective of this thesis is to look at and compare the stock exchange performance of IPOs and SPACs from the perspective of unprofitable businesses. The performance is assessed based on abnormal returns in four different time horizons, covering both short-run and long-run. Moreover, models indicating predictors whether a company will go public via an IPO or a SPAC are created. Those models might provide information on how a company's operational and fundamental characteristics affect its decision to go public through a SPAC or IPO.

This thesis[1] adds to the academic literature by pairing two entities, unprofitable businesses and SPACs, while both frequently perform below their markets. Firms with negative net income make more investments and develop faster than profitable firms, while high-growth enterprises in the new economy frequently employ SPACs when entering the stock exchange. A company is considered unprofitable and taken into the sample if it reports negative net

[1]During the formation of this thesis, AI programmes were used to scan for grammatical errors (Grammarly) a to marginally help with code creation in R programming language (OpenAI).

income in two or more consecutive years prior to the IPO/SPAC merger. Returns of unprofitable IPOs and SPACs are compared to expected market returns represented by the S&P 500 index. Performance results of unprofitable firms are matched to previous results of profitable companies, to study a potential difference in performance. Unprofitable firms present a higher risk, but also potentially higher return on investment and SPAC managers might have the necessary qualities to be able to identify the desired attributes of a successful business better than IPO investors.

The remainder of the thesis is organized as follows: the theoretical basis is provided by Chapter 2, which discusses literature related to the subjects of stock exchange performance, unprofitable businesses, and SPACs and IPOs. In Chapter 3, a structure for the logit and probit model is shown along with a description of the approach for measuring abnormal returns. Chapter 4 comments on the results along with a comparison to related studies. This thesis is concluded in Chapter 5, which also offers proposals for additional research.

Chapter 2

Literature review

2.1 Unprofitable companies

Negative net income companies are an attractive topic to research because they invest more and experience a quicker development despite their operating losses while having higher cash flow sensitivity compared to non-cash constrained firms (Bhagat et al., 2005). The dynamics of healthy negative book equity organisations demonstrate that they expand their debt primarily driven by a need for capital to meet investment demands rather than to make payouts to shareholders, finance their operational losses, or swap equity for debt (Luo et al., 2021). As long as the unprofitable firms are presented with lucrative investment chances, their asset allocation is the same as that of profitable entities (Bhagat et al., 2005).

It is believed that a company with higher earnings is more likely to uphold implicit warranty and service agreements, in consequence, customers are willing to pay a higher price for items. Suppliers provide better conditions since the company is more likely to pay for existing purchases on time and because bigger future purchases are expected. Due to the company's lower likelihood of default or late payments, lenders are willing to give better terms. Moreover, it is less common for valuable workers to want higher pay in order to stay (Burgstahler and Dichev, 1997). Firms with somewhat negative premanaged earnings may choose to declare positive earnings in between 30% and 44% of such cases. Although higher earnings may not always be a desirable thing, e.g. during salary negotiations with unions, they are generally viewed as favourable (Burgstahler and Dichev, 1997; Hayn, 1995).

Firstly, companies manage earnings due to earnings smoothing, i.e. to

bring them to a level that is seen as normal[1] for the company. Such practice reduces observed earnings variation, which decreases the firm's borrowing costs (Trueman and Titman, 1988). Secondly, earnings are managed due to legal agreements between a lender and a borrower, which frequently include accounting-based covenants.[2] These covenants carry heavy penalties that take effect if terms are broken and therefore the company's management is incentivized to minimize the technical violations of the terms which are typically done by manipulating earnings (Bartov, 1993).

Stock exchange performance of unprofitable firms after going public is inferior in comparison with companies that have positive earnings at the time of offering. Further, investors could be overly optimistic about their prospects for the future, mostly because these businesses forecast very high levels of growth (Yi, 2001). There is far less indication of an overly optimistic valuation among the enterprises that go public with positive earnings. The proportion of businesses that outperform the market index after 1,2, and 3 years is noticeably higher for the firms with positive net income prior to the IPO, compared to the negative ones. Profitability seems to play a role only in the long-run[3], where positive abnormal returns are recorded by 34% of IPOs with positive earnings and only by 17% of IPOs with negative earnings (Yi, 2001).

Current earnings may not be a reliable predictor of future prospects for businesses in high-tech or growth sectors and are often irrelevant for them. The expensing of significant intangible assets may cause these companies' current earnings to be distorted, which might further prevent them from accurately reflecting their potential for future development. Although negative net income businesses are riskier than positive ones, losses are more likely to be viewed as transitory since shareholders always have the option to sell the business rather than endure other losses. Such a liquidation option has a positive impact on the stock price of the unprofitable company. As the probability of exercising a liquidation decreases, the stock price decreases accordingly, ceteris paribus. When a loss is reported, the stock price does not necessarily drop to zero nor decline proportionally to the change in earnings (Hayn, 1995).

Unprofitable companies are associated with a larger risk, in comparison with profitable ones, but the risk is balanced by the potential of extremely positive returns. Only businesses recording negative earnings for two or more

[1]Typically, the desired level of earnings is expressed in terms of EPS (Bartov, 1993).

[2]Such type of earnings management gives rise to the debt-equity hypothesis.

[3]As short-run, the author refers to 6 months horizon, as long-run, the author refers to 3 years horizon.

years in a row prior to an IPO or SPAC merger are considered for the sample of this thesis. According to the discussion above, there are not many incentives to manipulate earnings downward, thus the vast majority of the sample are companies with pre-managed net income being negative.

2.2 Differences between IPOs and SPACs

SPACs enter the market backed by a SPAC sponsor, whereas conventional IPOs have no connection to sponsors of any kind (Burnett et al., 2022). A management team of the SPAC searches for the sponsor and is motivated by receiving a financial reward if the contract is successfully completed. The management team normally has 18 to 24 months to select a suitable firm to merge with once the SPAC lists on a stock exchange. In case the team is unsuccessful in finding the target, the contract does not close and they do not receive any financial reward. The team of SPAC managers is highly incentivized to complete a transaction as they normally receive 20% of the equity in the SPAC at the time of offering, excluding the valuation of the warrants (Reda, 2021). Motivation to complete the transaction may lead the managers to undertake inferior bids when under time pressure (Rodrigues and Stegemoller, 2014).

Each SPAC sponsor is given the number of shares and warrants equal to their initial investment after the search for SPAC sponsors is complete. The sponsor can trade the shares on the stock exchange as soon as the firm starts trading, but warrants are often banned from trading for a predetermined amount of time, such as 90 days (Hale, 2007). The warrants cannot be exercised until after a business merger is completed. Each warrant typically permits the holder to buy one share of common stock at the initial price and is only eligible to be exercised when the business combination stock reaches a predetermined level, such as 120% of its initial value. Normally, the stock and warrant prices remain stable until the target is attained (Hale, 2007). The volume of SPACs compared to conventional IPOs was tremendous in 2020 where SPACs made up about 55% of the market share. The last peak year of SPACs before 2020 was 2008 at about 14% of the market share, i.e. SPACs recorded an increase of 41 percentage points in 2020, compared to the previous maximum (Reda, 2021).

Firms usually decide to go public when investors are willing to pay high multiples reflecting favourable valuations of net present value, which are frequently followed by deflated realisations of the next net cash flows causing bad aftermarket performance. There is both economically and statistically

significant evidence of inferior performance for companies after IPO controlled for size and industry (Ritter, 1991; Levis, 1993; Keloharju, 1993). If an investor purchases a stock of a firm at the end of the first day following the IPO and holds it for three years, on average he will only receive 83 cents for every dollar invested (Ritter, 1991).

SPACs consistently underperform the market, and their median performance declines with longer event periods, which is displayed by increasingly negative BHAR (Kiesel et al., 2022). Abnormal returns following the merger of a SPAC are still poor, but they have notably improved since 2010 which may suggest overall improvement in the SPAC market (Gahng et al., 2021). If the management team takes more than the average time to choose a target and get it ratified by the sponsors, the stock-exchange performance after the SPAC merger turns out to be worse (Kiesel et al., 2022; Klausner et al., 2022).

In terms of operational performance and stock returns, SPACs notably lag behind IPO firms. IPOs consistently overperform SPACs in terms of operating profit margin, return on assets, operating return on assets, operating cash flow to total assets, and sales per employee. For SPAC firms, these measures are typically around half as high as the ratio thresholds for IPOs. In terms of stock market performance in the first year after the new stock starts trading, the underperformance of SPAC-target combinations is noticeably more pronounced than in the case of the traditional IPO companies. While excess returns are unfavourable for both IPO and SPAC enterprises, SPAC firms perform significantly worse (Datar et al., 2012), whether performance is measured by long-run abnormal returns analysis or operating performance (Dimitrova, 2017).

In this thesis, the author matches two entities, unprofitable companies and SPACs, that tend to underperform the market. Given the specifics of unprofitable companies discussed above, the aim of this paper is to explore the returns-generating mechanism among negative income SPACs, and compare them to unprofitable IPOs. The outcomes of this thesis may then be compared with the abnormal returns of a sample where the unprofitability filter is not used, owing to earlier research.

2.3 Measuring performance

There is a variety of measures to apply when analysing a company's performance. Cumulative abnormal returns (CARs) are based on daily stock returns beginning with the first day following the IPO date. CARs are usually com-

puted one-, two-, or three-year post IPO/SPAC merger, and can be adjusted for various factors, for example, industry and size. CARs have been used to measure IPO performance (Ritter, 1991; Fan et al., 2007), and SPAC performance (Campagnoli, 2021). Buy-and-hold Abnormal Returns (BHARs) are designed for stocks that are typically held over a period longer than one year (Krishnan et al., 2011), and they should perform better in case of high volatility. BHARs are also based on daily stock returns, and are often adjusted, e.g. for market, size, book-to-market or industry. BHARs have been widely used to analyse the performance of SPACs (Kolb and Tykvová, 2016; Michielotto, 2017; Ladwein, 2022; Ragnvaldsen and Ragnvaldsen, 2021), and IPOs (Lyon et al., 1999; Ritter, 1991; Krishnan et al., 2011).

Fama (1998) and Mitchell and Stafford (2000) claimed that because CARs remove the compounding effect of one year's poor performance, they may be a more accurate and objective way to calculate long-horizon returns. Because single-period returns are aggregated, BHAR can magnify underperformance even if it happens in a single period (Gompers and Lerner, 2001). The new listing bias, the skewness bias, and the rebalancing bias all affect Buy-and-hold Abnormal Returns (BHARs) and all the biases can be considerably reduced by employing an approach that compares the BHAR inference estimates with estimates of a reference portfolio. As a result, test statistics based on the control firm approach are well specified (Barber and Lyon, 1997). As more assets are added to the portfolio, the benefits of buy-and-hold over portfolio rebalancing are diminishing (Cheng and Deets, 1971).

BHAR-created portfolios have a "diversification" effect that CAR-set portfolios do not have and almost all bias in the computed returns is eliminated by this "diversification" effect (Blume and Stambaugh, 1983). In contrast, CARs are a biased predictor of long-run BHARs, and as a result, long-term performance tends to be overestimated by CARs (Barber and Lyon, 1997). Three biases affect CARs: measurement bias, new listing bias, and skewness bias, as described in detail by Barber and Lyon (1997). The fact that CARs misread performance when returns are volatile is a significant drawback (Gompers and Lerner, 2001). Buy-and-hold portfolios also have the benefit of not requiring monthly rebalancing (Ou and Penman, 1989). Random walk theory claims that the buy-and-hold returns get superior to rebalancing portfolio returns as the dispersion of unobserved errors gets bigger. The superiority of buy-and-hold returns increases with the length of the investment horizon and also rises with the increased frequency of rebalancing portfolio.

The expected trading strategy heavily influences the decision between CARs and BHARs (Gompers and Lerner, 2001). The BHARs on a sample portfolio should be subtracted from the BHARs on a reference portfolio when calculating abnormal returns (Barber and Lyon, 1997). Preference for BHARs could be also based on the straightforward interpretation of this approach, as 10% mean annual BHAR can be understood as the extra return received from investing in a sample portfolio as opposed to a control portfolio over the year. A 12-month CAR of 10%, on the other hand, is more difficult to translate into an indicator of annual performance (Barber and Lyon, 1997). In long-term research, a buy-and-hold approach should be preferred (Kothari and Warner, 1997).

Alternatively, performance can be measured based on return on assets (ROA). This strategy is employed by Kao et al. (2009) and Krishnan et al. (2011), who use match-adjusted ROA. Sales growth, earnings growth, and the change in return on sales (ROS), or net income divided by sales, are comparable performance indicators (Fan et al., 2007). The market-to-book equity ratio (M/B) contrasts the company's market and accounting perspectives. Krishnan et al. (2011) adopt an alternative indicator named "listing survival" that takes the value of 1 if a company stays listed on the market for three years after its initial public offering (IPO), or if it is acquired or merged with another company, and 0 otherwise (bankruptcy, liquidation, defunct or going private). Also, market to book ratio is a helpful metric for companies with positive book value and negative earnings, while price to earnings ratio would not be very informative. Book value is a relatively stable and intuitive indicator. The comparability of this ratio is strongly dependent on the unity of accounting standards (Krishnan et al., 2011).

Difference-in-differences (DiD) is an econometric technique that is used to calculate SPAC pricing (Saengchote, 2021). Longitudinal data on groups both exposed and not exposed to intervention are required in DiD implementation. The key strength of the difference-in-differences approach is that the control group provides an estimate for the outcome of the treatment group if no intervention happened (Ryan et al., 2015). Another major benefit of the DiD model is that it allows us to differentiate the dependent variable across time for the same cross-sectional units (Wooldridge, 2012).

As a substitute for the projected return for each security, Lyon et al. (1999) utilise either the rebalanced return on a size/book-to-market reference portfolio, the buy-and-hold return on a size/book-to-market reference portfolio or the return on a size and book-to-market matched control firm. The

groups being examined can originate at various levels because the emphasis is on change rather than absolute levels. The approach focuses on altering variables other than the treatment or intervention under investigation. But if the comparison groups' results show divergent patterns, the approach should not be applied (Lyon et al., 1999).

Due to different specifics between CARs and BHARs, both techniques will be employed to calculate the abnormal returns over four different horizons, to ensure the robustness of the results. Furthermore, several aforementioned accounting-based metrics will be used as independent variables further in the thesis, where a model predicting a likelihood of a firm being acquired by a SPAC over IPO will be built.

Chapter 3

Methodology

3.1 Buy-and-hold, Cumulative Abnormal Returns

In the empirical part, CARs and BHARs were used to measure the performance of the sample firms. It is customary to utilize either monthly data or daily data for computing CARs and BHARs, in this thesis, daily data were used. $R_{i,t}$ was defined as the return of the stock i in time t, $E(R_t)$ as the expected return of an equally weighted market index in time t, and $AR_{i,t}$=$R_{i,t}$ − $E(R_t)$ as the abnormal return of the stock i in time t.

Then, CARs across T days were defined as

$$CAR_i = \sum_{t=1}^{T}(AR_{i,t}),$$

and BHARs across T days were defined as

$$BHAR_i = \prod_{t=1}^{T}(1 + R_{i,t}) - \prod_{t=1}^{T}(1 + E(R_{i,t})).$$

Abnormal returns always exist, but the key aspect is their statistical significance. For the sake of establishing statistical inference, the variance of abnormal returns was the sample variance, s_i^2

$$Var(AR_{i,t}) = s_i^2$$

and the standard deviation of abnormal returns was the sample standard deviation, s_i

$$SD(AR_{i,t}) = s_i$$

In most cases, researchers establish the average abnormal return of N securities by averaging the abnormal returns of all the N securities. That was the approach of this undergraduate thesis, too. The average abnormal returns (AAR_t), and variance of average abnormal returns were computed as

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

$$Var(AAR_t) = \frac{1}{N^2}\sum_{t=1}^{T}(s_i^2).$$

Further, cumulative average abnormal return (CAAR) was computed as

$$CAAR = \frac{1}{N}\sum_{i=1}^{N}(CAR_i).$$

Similarly buy-and-hold average abnormal return (BHAAR) was computed as

$$BHAAR = \frac{1}{N}\sum_{i=1}^{N}(BHAR_i).$$

It was necessary to approximate expected market returns before calculating abnormal returns. The expected returns were approximated by the Standard & Poor's 500 (S&P 500) market index. This index was selected for the purposes of this thesis since it is recognized as the primary index reflecting the US market, while all of the companies in this thesis sample were traded in the US. The index takes up about 80% of the market capitalization that is available, represented by 500 leading publicly traded US companies. CARs and BHARs were calculated from the IPO or the completion of SPAC acquisition ($t = 1$) until the end of the measurement period or delisting date ($t = T$).

The following hypotheses were formulated:

> H_0: There is no difference in the average stock exchange performance between unprofitable SPACs and unprofitable IPOs.
>
> H_1: There is significant difference in the average stock exchange performance between unprofitable SPACs and unprofitable IPOs.

To test the null hypothesis, daily CARs and daily BHARs were calculated. Due to the documented importance of time dynamics for the performance of SPACs and IPOs, the hypothesis were tested in 4 different horizons,

which are 3-month time period (3m), 6-month time period (6m), 12-month time period (12m) and 24-month time period (24m). It is important to examine the performance in different horizons, as persistence and investment horizon prove to be important attributes of the risk-return relationships in the financial markets (Bansal and Yaron, 2004; Bidder and Dew-Becker, 2016; Ortu et al., 2013). Additionally, the performance under consideration notably varies over time, particularly when the stocks are volatile, as was the case of this thesis sample (Yi, 2001). The first assumption of this thesis was that both samples are normally distributed and the second assumption was that the samples' variances are equal, which could be potentially violated. The Student's t-test would be used to test the null hypothesis if both assumptions held. Welch's t-test, which is robust to differences in variance, would be applied if the second assumption was violated.

3.2 Predictors of a SPAC acquisition

In excess of understanding the differences in the performance of SPACs and IPOs, it is important to realize which companies are targeted by SPAC management. A logistic regression model was applied to investigate the company- and market-level determinants of a SPAC acquisition for the firms in the sample. The dependent variable was $P(SPAC)_i$ which is binary and equals 1 for firms that used SPAC as a tool to enter the public stock exchange and 0 for businesses, that have undergone the standard IPO. The independent variables, which were reported in the fiscal year prior to the IPO/SPAC combination, are defined as follows:

Price to Book (P/B) - Market value of equity plus book value of total liabilities divided by the book value of equity and book value of total liabilities.

Debt Ratio (DR) - Total liabilities divided by total assets. Total liabilities contain accounts payable, accrued expenses, short-term borrowings, the current portion of long-term debt, long-term debt, minority interest and other liabilities.

Capital Expenditure Coverage Ratio (CECR) - Cash provided by operating activities divided by capital expenditures.

Return on Assets (ROA) - EBIT divided by total assets.

Size - Total assets.

Market Volatility (VIX) - Daily high level of the market volatility index (VIX).

The return on assets and price to book ratio can be perceived as proxies for firm quality. The former serves as a metric of current profitability, the latter proxies growth opportunities. These two ratios shall indicate a difference in the frequency of SPAC usage between lower and higher-quality businesses. The capital expenditure coverage ratio analyzes a business's cash flow and, along with total assets, should indicate how urgently the company needs to obtain capital. Since a SPAC speeds up the process of going public, companies with greater urgency for capital may select it over an IPO. Companies with significant debt may be too risky for IPO investors and may consider a different route of going public, therefore the Debt Ratio is considered in the model. Size is employed because smaller firms might find it easier to use SPAC than to undergo an IPO, specifically because smaller businesses have a harder time finding a reliable underwriter to handle the IPO process. Furthermore, IPO is linked to greater fixed expenses, which is an issue for smaller businesses (Kolb and Tykvová, 2016).

The only market-specific ratio considered is market volatility. A successful IPO's execution depends on market timing and high volatility lowers the chance of a successful offering (Ritter, 1991). In times when volatility is higher than its long-term average, IPO proceeds are lowered by 21% (Schill, 2004). Given that SPACs already have liquidity when looking for a target, market volatility should not be as big of a barrier to SPAC mergers as it is to IPOs. SPAC acquisitions, as opposed to IPOs, are frequently used by companies to go public in volatile market circumstances (Kolb and Tykvová, 2016).
The following logit model was estimated to determine the predictors of a SPAC acquisition

$$P(SPAC)_i = \frac{1}{1 + e^{\beta \mathbf{X_i}}},$$

where individual firms were indexed by i and $\mathbf{X_i}$ contained the list of explanatory variables listed above.

Logit model was estimated using the Maximum Likelihood estimator (MLE). Direct interpretation is not possible immediately after the estimation when using non-linear models. Furthermore, R squared has no natural interpretation, and goodness of fit is measured by the proportion of correctly predicted values for the dependent variable, a percentage of 70% or above is generally regarded as very good. The average marginal effects were computed to provide an interpretation of the effects of independent variables.

For the sake of robustness the predictors of a SPAC acquisition were also estimated using a probit model. The model was specified as

$$P(SPAC)_i = \Phi(\beta \mathbf{X_i})$$

where $\Phi(*)$ was the cumulative standard normal distribution function and individual firms were indexed by i. The same sequential strategy used for the logit model was used to estimate the probit model using MLE.

3.3 Data

The dataset consisted of 640 firms of which 530 were classified as "IPO companies", and 110 were classified as "SPAC companies". The first companies in the dataset started trading as early as 2003, but the vast majority started trading after 2015. The criterion required was that the firm must have experienced negative net income for at least two years prior to becoming public or merging with a SPAC. The sole sources for the data were American stock exchanges. Official sources were used to compile the list of all IPOs and SPAC mergers. Then, each company was manually analysed based on its income statement, which was obtained either from Yahoo Finance or Google Finance. Abnormal returns were computed based on those 640 companies. The stock price data did not require any further treatment.

To gather the data entering the logistic regression model, a premium third-party plugin to Google spreadsheets was used. The firm was discarded if any of the metrics used in the logistic regression were not available for a specific ticker. After data cleaning, 519 observations were gathered consisting of 427 IPOs and 92 SPACs. The collected dataset contained observations with frequently extreme ranges. The interquartile range (IQR) approach was applied to deal with the outliers. After the implementation of the cleaning of outliers based on IQR, 519 companies were reduced to 487 companies. The details of the data processing are available upon request.

Table 3.1 reports the division of the 487 companies by Sector. The first column shows the sectors, in which the companies operate, sorted from the most represented one to the least represented one. The second column displays the number of firms operating in the sector and the third column shows the number of firms operating in the sector, that merged with a SPAC. The fourth column displays the proportion of SPACs to all companies. The two sectors

Table 3.1: Decomposition of observations by Sector

*S*ector	Count	SPACs	Percentage of SPACs
Healthcare	241	12	5%
Technology	104	24	23%
Consumer Cyclical	46	14	30%
Communication Services	26	9	35%
Industrials	24	14	58%
Consumer Defensive	19	1	5%
Financial Services	8	1	13%
Real Estate	8	3	38%
Basic Materials	6	1	17%
Utilities	4	2	50%
Energy	1	0	0%
Total	487	81	17%

with the highest representation in the final sample, healthcare and technology, accounted for more than two-thirds of all businesses. Each of the six least represented sectors, which collectively accounted for little under 10% of the sample, could be categorized as an Old Economy sector. According to EY's Q1 2023 IPO report, Technology and Healthcare were the most represented sectors by IPOs in recent years. This was in line with the inference drawn from the sample under discussion.

Chapter 4

Results

4.1 BHARs and CARs

In this chapter, the short-term and long-term performance of SPAC firms and IPO firms is analyzed. Abnormal returns in a 3-month and 6-month period are labelled as short-term performance, while long-term performance is evaluated based on 12-month and 24-month abnormal returns. This is sorted according to accounting standards, where the distinction between the short-term and long-term is a period of one year. Results from both CARs and BHARs are reported for the sake of robustness.

Table 4.1: Different abnormal returns in all periods

	BHAAR			CAAR		
	SPAC	IPO	p-value	SPAC	IPO	p-value
3m	-0.232	-0.079	0.000	-0.139	-0.048	0.203
6m	-0.408	-0.181	0.000	-0.394	-0.126	0.001
12m	-0.555	-0.295	0.000	-0.800	-0.247	0.000
24m	-0.828	-0.386	0.000	-0.953	-0.199	0.019

Note: In the "p-value" columns, the p-values of Welch's t-test are presented.

4.1.1 Short-run performance

The stock exchange performance is tracked for a minimum of three months. Table 4.1 displays BHAARs and CAARs of unprofitable IPOs across all employed horizons. The left panel displays the BHAAR of SPACs and IPOs, and the right

panel displays the CAAR of SPACs and IPOs. The p-value column displays statistical inference for the difference between SPAC and IPO abnormal returns. The abnormal returns are presented in decimal numbers. The difference in the performance of unprofitable IPOs and unprofitable SPACs is statistically significant in every time horizon according to BHARs and in the 3 longest time horizons according to CARs. In the shortest period examined, SPACs significantly underperform IPOs when measured by BHARs. In the 6-month horizon, SPACs significantly underperform IPOs according to both BHAAR and CAAR. The lack of statistical significance in 3m performance when measured by CAAR might be because of the variance, which is at least twice as large for CARs when compared to BHARs for both IPOs and SPACs. Nevertheless, the fact that unprofitable IPOs outperform unprofitable SPACs based on both CARs and BHARs is in line with the author's expectation based on the literature study, which showed that SPACs consistently underperform IPOs (Datar et al., 2012; Dimitrova, 2017).

The specificity of this paper is that the companies examined were unprofitable before the stock exchange entrance and this special characteristic seems to play a role in the performance measured. As discussed in Chapter 2, unprofitable companies constantly underperform the market index. Compared with other studies, abnormal returns of IPOs and SPACs are much more negative in this paper. The worst performing SPACs in the 6-month time horizon were recorded by Kolb and Tykvová (2016), who reported that SPACs underperformed the market by 29% based on BHARs. However, the same metric in this thesis marks the underperformance of SPACs by 41%. Unprofitable companies are riskier than profitable ones, but the higher risk does not seem to pay off, according to this thesis's results.

Figure 4.1 displays BHARs (green points) and CARs (orange points) for unprofitable IPOs (on the left-hand side of the figure) and unprofitable SPACs (on the right-hand side of the picture) in the horizon of 6 months. Analysis of the individual returns provides a more in-depth understanding of the distribution of the returns than CAAR (or BHAAR) results do. As mentioned, the riskiness of unprofitable companies can be offset by high upside potential, and SPAC managers might be able to identify the businesses with the highest potential. The results indicate this is not quite the case by demonstrating that the majority of companies with extremely positive returns are included in the IPO sample.

Figure 4.1: 6m BHARs and CARs for all available firms

4.1.2 Long-run performance

In a 12-month horizon, BHARs and CARs demonstrate a statistically significant difference in performance between IPOs and SPACs as SPACs significantly underperform IPOs. This is in line with the findings of Kolb and Tykvová (2016), who report a statistically significant underperformance of SPACs compared to IPOs at that time horizon. Also, SPACs perform worse than IPOs during a 24-month period when measured by both metrics and the difference is statistically significant. BHARs seem to be a better alternative to CARs, as the returns are volatile and the holding period is longer than one year. The 24m BHAAR for the IPO sample is -38.6%, while the corresponding figure for the SPAC sample is -82.8%. Results of both samples show bigger underperformance than it was anticipated. The abnormal returns for the SPAC sample in 24m may not be perfectly reliable and representative due to the lower amount of observations. Nevertheless, the results are reported and the pattern of underperformance continues for the longest period examined. Furthermore, the p-value being almost indistinguishable from zero shows that the underperformance is significant beyond any reasonable doubt. In the literature under discussion, Ritter (1991)

recorded the poorest stock-exchange performance of IPOs evaluated by CARs after 24 months. He calculated two-year IPO CARs to be -17%, however, the findings of this thesis indicate the two-year IPO CARs to be -20%. Similarly, the worst reported two-year IPO BHARs were -21% (Kolb and Tykvová, 2016), while the results concluded above show two-year IPO BHARs to be -39%. Similarly to IPOs, SPACs also show more inferior performance than reported by prior papers. The design of this thesis sample could be a contributing factor to the results obtained. Over 70% of all firms in the sample operate in the technology and healthcare sectors. According to Hayn (1995), current earnings may not be a reliable indicator of future prospects for businesses in the two sectors. The long-run performance of this sample seems to suggest that the current earnings might have predicted the future prospects for SPACs rather fairly, as they on average lose more than 80% of their initial value at the merger. Together with the short-term results, the long-term findings suggest that trading SPAC will result in a loss, that is statistically and economically significant over any time horizon.

Figure 4.2: 12m BHARs and CARs for all available firms

Figure 4.2 displays BHARs (green points) and CARs (orange points) for unprofitable IPOs (on the left-hand side of the figure) and unprofitable SPACs

(on the right-hand side of the figure) in the time horizon of 12 months. In the sample of unprofitable IPOs, there are firms, that outperform the market by more than 800%, while the performance of individual unprofitable SPACs is inferior, with only one firm with abnormal returns over 200%. This figure helps to explain the statistically significant underperformance of SPACs in the long-run when compared to SPACs.

In general, two types of businesses should be represented by unprofitable companies. The first group are distressed companies, whose business model might not be as efficient as was expected by the management and as a result, they record losses from operations. The other group consists of businesses that made substantial investments in prior years, which had an impact on their net income, but whose business models are expected to be sufficiently effective to provide positive net income after the investment phase is finished. The first group will underperform the market in log-run, while the latter may present a viable investment opportunity. Since SPAC targets are selected by the management team of a SPAC, the targets probably need to fulfil pre-set qualities. Similarly, unprofitable IPOs need to persuade the underwriter that they possess qualities, which should make them a good investment. Neither the SPAC management team nor the IPO underwriter would want the unprofitable company to be the distressed company from the first group. One possible explanation for the underperformance of unprofitable SPACs relative to unprofitable IPOs is that the management team of the SPAC has incentives to finish the transaction under any circumstance, which may result in inferior choices of theirs, picking the wrong firms, which underperform the market in both the short-run and a long-run.

It is important to note that the average performance of unprofitable companies in the sample is worse than the market performance in any time horizon. In the IPO subsample, a few companies offer extremely positive returns, but the SPAC sample does not offer much at all. Such a relationship is summed up by Figure 4.3 and Figure 4.4 which show the BHAARs and CAARs, respectively, over the whole measured time horizon. In both figures, IPOs are represented by the blue line and SPACs are represented by the red line. Figures 4.3 and 4.4 clearly illustrate that while both unprofitable IPOs and unprofitable SPACs underperform the market, the performance of SPACs is vastly inferior in the sample of this thesis.

Figure 4.3: Comparison of BHAARs

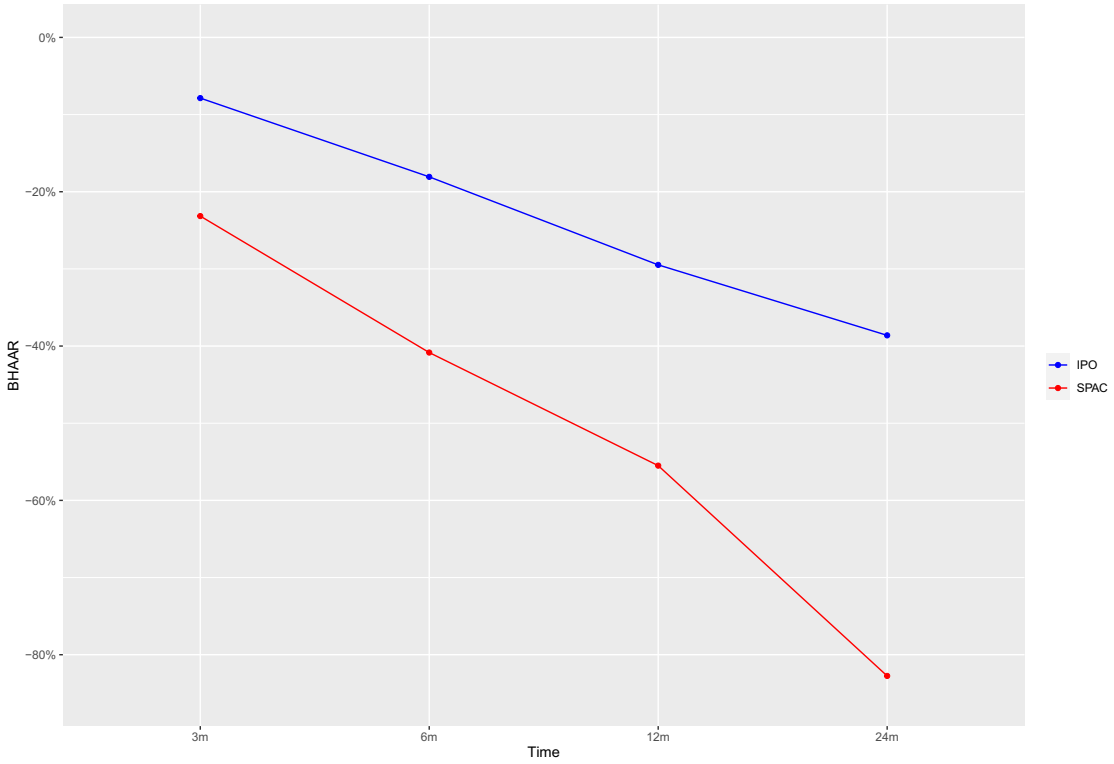
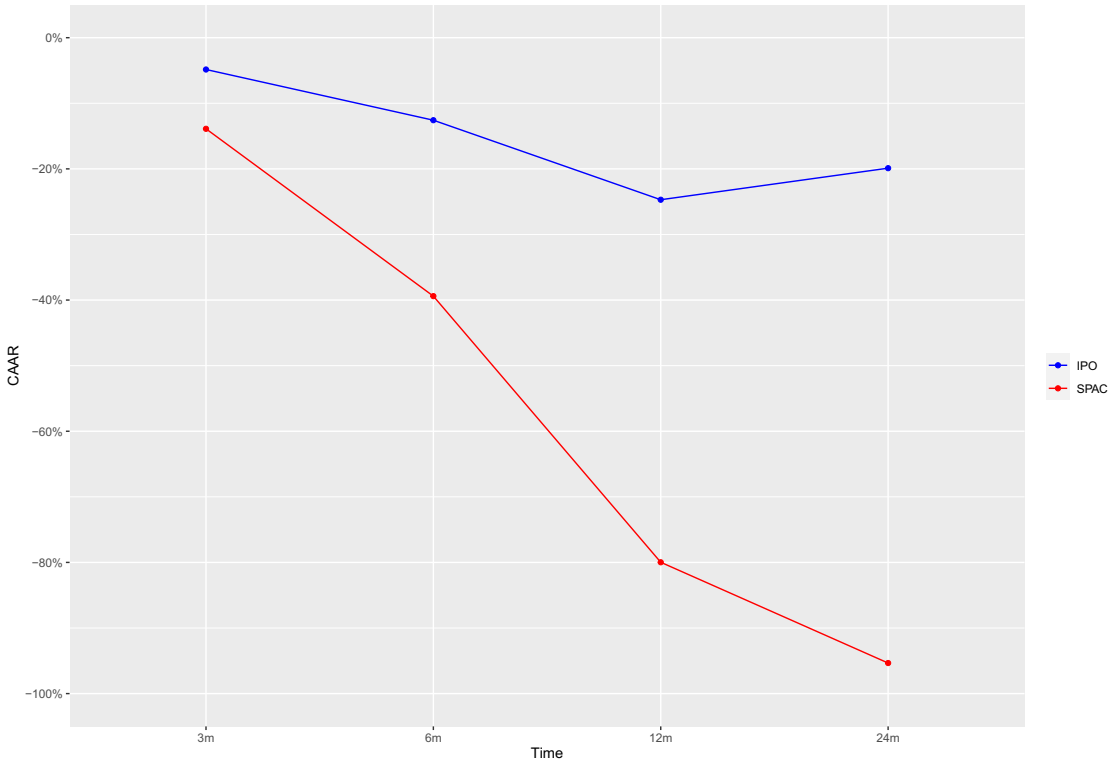


Figure 4.4: Comparison of CAARs



4.2 Predictors of a SPAC acquisition

After removing outliers using a method based on the interquartile range (IQR), 519 companies' worth of data were reduced to 487, including 81 SPACs and 406 IPOs. The following approach was used to attain balanced group sizes in the logistic regression and retain the unconditional probability of 0.5. The dataset was divided into 5 subsamples at random, each of which includes all of the SPACs from the original sample as well as an equal number of IPOs with no overlap in terms of IPO businesses.[1] Such approach still makes it possible to interpret the significance of the individual variables across different subsamples, while it also makes the model more robust to noise in the data on the IPO side. Moreover, attaining the unconditional probability of 0.5 is crucial to building models producing more reasonable predictions of P(SPAC). Models from #1 to #5 use the subsampled data, with every model having its own dataset, and model #0 uses the complete dataset.

Table 4.2: All logit model Average Marginal Effects (AMEs). Note: *, **, *** and **** indicate statistical significance at the 10%, 5%, 1% and 0.1% levels, respectively.

	P/B	CECR	DR	ROA	lTS	VIX
Logit #0	0.001***	0	0.030**	-0.055*	0.001	0.005*
Logit #1	0.001	0**	0.104**	-0.002	-0.003	0.006
Logit #2	0.003*	0	0.427****	-0.090	-0.035	0.006
Logit #3	0.001**	0	0.217***	-0.017	-0.048	0.003
Logit #4	0.001*	0	0.015	-0.179**	-0.042	0.011*
Logit #5	0.001*	0	0.105*	-0.121	-0.007	0.004

Table 4.2 displays the Average Marginal Effects (AMEs) of all independent variables corresponding to every estimated logit model. Interpreting any logit model is only possible after calculating marginal or partial effects since the model is non-linear. The results are very consistent across the 5 subsamples, that have the same number of IPOs and SPACs. The most consistent variables are P/B and DR, which are also the only significant variables. The P/B and DR are positively related to the probability of being targeted by SPAC acquisition, results from other variables are not statistically significant, which means

[1] There are 405 IPOs altogether among the five samples, with one IPO business being eliminated.

that there is insufficient evidence that they have an effect on the likelihood of a company merging with a SPAC.

The assumption that SPAC managers are drawn to companies that offer a larger growth prospect than IPOs is supported by the marginal effect of price to book ratio, which has a positive sign. The positive sign of the debt ratio implies an increased probability that a more levered company will use the SPAC route instead of the IPO route. Regarding the only market-specific variable, although it is not statistically significant across all models, a positive sign of the AME of Market volatility might imply that during increased market volatility, it might be more difficult to access the public market via the IPO compared to the SPAC.

The results of this thesis correspond to Kolb and Tykvová (2016) in the following way. The reported Average Marginal Effect (AME) of debt ratio in Kolb and Tykvová's thesis (0.137) and this thesis (0.149 on average) is very close. The average marginal effect of Return on Assets estimated above differs only in magnitude between the theses. The estimated effects of market volatility and firm size are comparable among the theses, but the results above are not significant, whereas Kolb and Tykvová's results are. The predicted effect of Price to Book ratio is quite different among the theses, the aforementioned authors state that the average marginal effect is -0.033, although the findings of this thesis point to a positive and rather minor effect. This difference may be caused by specific attributes of unprofitable companies, namely the balance sheet might have different characteristics (e.g. negative equity and disproportionally smaller assets to liabilities). Those attributes might cause the price to book ratio to function differently for the sample of unprofitable companies. A further justification that could apply is that the market players might interpret this ratio differently for profitable and unprofitable enterprises.

Regarding the magnitude of AME, in the case of Logit #2, a 100 percentage point increase in the company's debt ratio would on average increase the likelihood of using a SPAC by 43 percentage points, keeping the other variables fixed at the level corresponding to marginal effect at the average. Similarly, a 100 percentage point increase in the company's price to book ratio would on average increase the likelihood of going through a SPAC process by 0.3 percentage points. Sign of each estimate fits the theory suggesting that companies with poor operational performance seek to go public through a SPAC rather than an IPO and that the usage of SPACs is higher when the market volatility is higher.

Table 4.3: Predicted values of all logit models.

	Logit #0		Logit #1		Logit #2		Logit #3		Logit #4		Logit #5	
	0	1	0	1	0	1	0	1	0	1	0	1
0	401	5	63	18	68	13	69	12	57	24	68	13
1	72	9	33	48	33	48	39	42	32	49	39	42
%	84.19%		68.52%		71.60%		68.52%		65.43%		67.90%	

Table 4.3 presents goodness of fit of all logit models. The true sample values are presented in the first column, while the model's prediction is described in the second row. The last row of the table reports the accuracy of each model. The reported accuracy, or the percentage of correctly predicted values, is around 70% for each model working with a partitioned dataset, which is good. The sensitivity indicates the percentage of true positives (SPACs) that were successfully identified, and the result is not very good, as the model predicts only about 60% positives correctly when using the partitioned dataset. A specificity, or percentage of true negatives (IPOs) that were correctly recognized, is over 80% for the five partitioned samples, which is excellent. These results suggest that the models are effective at recognizing IPOs, but struggle to recognize SPACs well. The Logit #0 model predicts that only 9 out of 81 firms would use SPAC when the original sample is not divided into 5 subsamples, however, this is because the sample's mean value for the variable SPAC is 0.125. Regarding IPOs, it properly recognizes 401 of them and misidentifies just 5.

A probit model, which is using the same explanatory variables as the logit model, is employed due to robustness. Table A.1 in Appendix A displays the Average Marginal Effects (AMEs) of all independent variables corresponding to every estimated probit model. Table A.2 in Appendix A presents the goodness of fit of all probit models. The true sample values are presented in the first column, while the model's prediction is described in the second row. The last row of the table reports the accuracy of each model. Once more, the only variables that are statistically significant and therefore have an impact on the chance of employing a SPAC are DR and P/B. Each variable's predicted direction of effect of any probit model is the same as for the corresponding logit model, therefore the interpretation would match up. The probit models support the hypothesis that SPACs may act as a harbour for highly-priced businesses with higher debt. The accuracy, sensitivity, and specificity of the

probit models are qualitatively very similar to the logit models. Similarly, probits accurately predict IPOs but have difficulty identifying SPACs. The Probit #0 model makes the same prediction about the percentage of businesses using SPAC as the Logit #0 model stated above.

Chapter 5

Conclusion

In this thesis, the short- and long-term differences in stock exchange performance between unprofitable IPOs and unprofitable SPACs are explored. The performance is measured based on abnormal returns, concretely Buy-and-hold Abnormal Returns (BHARs) and Cumulative Abnormal Returns (CARs). Unprofitable companies are an interesting category, because they invest more and experience quicker development, despite their operating losses. Naturally, they perform worse on the stock exchange compared to profitable companies, but they also offer the possibility of extremely positive returns. This bachelor thesis contributes by matching SPACs, a vehicle for less-than-stellar firms, with the aspect of negative net income. Generally, SPACs perform worse than IPOs while both underperform the market, thus unprofitable SPACs might underperform the market and unprofitable IPOs even more heavily. On the other hand, SPAC managers could do a better job than IPO investors in picking high-potential companies from the sample of negative net income firms. Moreover, predictors of a SPAC acquisition are estimated for unprofitable companies based on recent data, and compared to the results of previous studies.

The findings of this thesis are consistent with earlier findings. According to past studies comparing these two entities in question, SPACs underperform IPOs over the long and short horizons. Results of this study covered in Chapter 4 demonstrate that unprofitable SPACs underperform unprofitable IPOs in both the short-run and the long-run, and the difference is statistically significant based on both BHARs and CARs. The results of this thesis demonstrate a greater performance gap between SPACs and IPOs than was observed by earlier studies, which can be likely linked to the unprofitability. Analysis of individual abnormal returns reveals that companies attaining exceptionally

positive abnormal returns are companies from the IPO sample, while the frequency of extreme abnormal returns is likely attributable to the specificity of unprofitability. Further, the aspect of unprofitability amplifies the underperformance to market of both SPACs and IPOs, when the results are compared with those of previous studies. Because they have higher growth potential, unprofitable SPACs and IPOs may be valued higher than they actually are, but as more and more fail to achieve the anticipated expansion, their valuations plummet.

Moreover, a model explaining the likelihood of a SPAC acquisition is estimated using both logit and probit methodology. The model contains six explanatory variables including Price to book ratio, Debt ratio or market volatility. In accordance with previous research, the Debt ratio is found to positively influence the likelihood of a SPAC acquisition. On the other hand, the positive suggested relationship between Price to Book ratio and the likelihood of a SPAC acquisition contradicts previous results. A balance sheet of unprofitable companies may have specific attributes (e.g. negative equity and disproportionally smaller assets to liabilities), that cause a different mechanism related to the price to book ratio. Another possible explanation is that the market participants might interpret this ratio differently for profitable and unprofitable companies. This ratio advocates that SPAC businesses are more likely to be valued higher than IPO companies. According to previous findings, SPAC is a tool for businesses with higher debt loads, but also stronger growth, which is demonstrated by the security's price. The results of this thesis suggest a similar relationship.

The identification of statistically significant disparities in the stock exchange performance of unprofitable companies fulfilled the author's objective for the thesis's content. Other unique characteristics of companies and their performance on the stock exchange can be the focus of future research. In particular, comparing SPACs versus IPOs backed by venture capital may be a fascinating research direction.

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Appendix A

Additional Figures and Tables

Figure A.1: 3m BHARs and CARs for all available firms

Figure A.2: 24m BHARs and CARs for all available firms

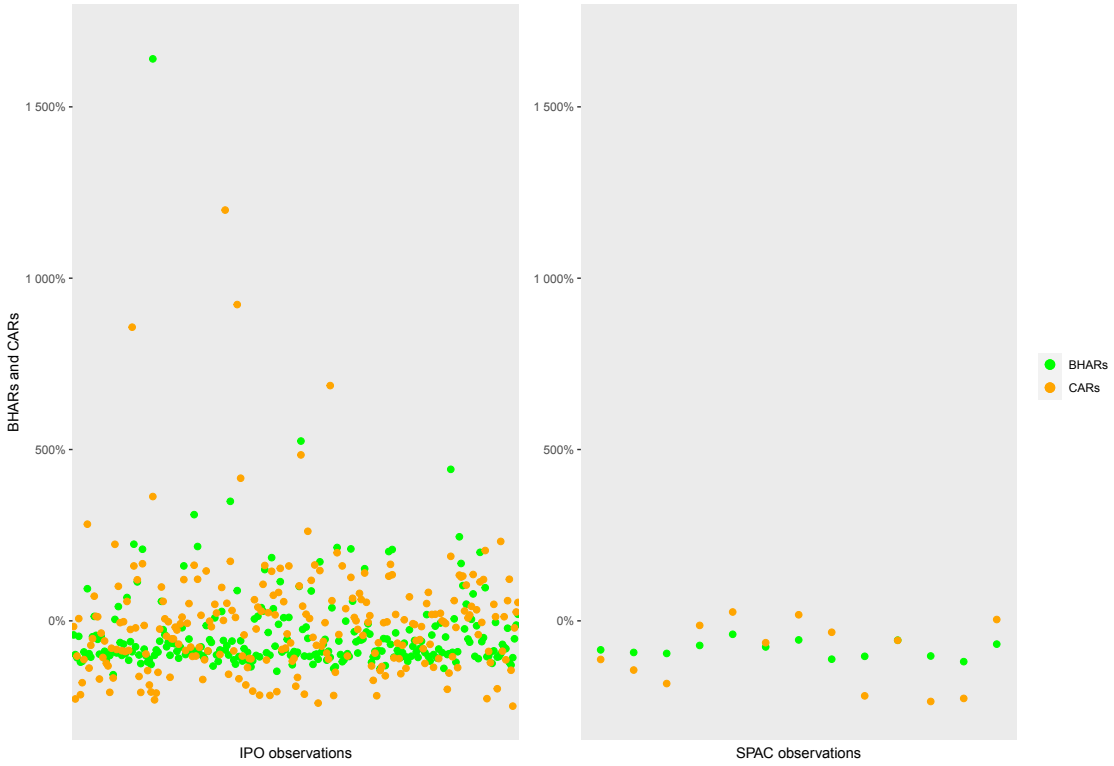

Table A.1: All probit model Average Marginal Effects (AMEs). Note: *, **, *** and **** indicate statistical significance at the 10%, 5%, 1% and 0.1% levels, respectively.

	P/B	CECR	DR	ROA	lTS	VIX
Probit #0	0.001***	0	0.025**	-0.049*	0	0.004*
Probit #1	0	0**	0.041*	-0.010	-0.001	0.004
Probit #2	0.002**	0	0.288****	-0.060	-0.024	0.004
Probit #3	0.001**	0	0.136***	-0.017	-0.033	0.002
Probit #4	0.001*	0	0.009	-0.113*	-0.027	0.007*
Probit #5	0.001*	0	0.047*	-0.085	0	0.003

Table A.2: Predicted values of all probit models

	Probit #0		Probit #1		Probit #2		Probit #3		Probit #4		Probit #5	
	0	1	0	1	0	1	0	1	0	1	0	1
0	401	5	59	22	69	12	69	12	57	24	70	11
1	72	9	32	49	33	48	38	43	32	49	42	39
%	84.19%		66.67%		72.22%		69.14%		65.43%		67.28%	