Erasmus University Rotterdam

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Bachelor Thesis

# Does Underwriter Rank Affect the Underpricing of Special Purpose Acquisition Companies?

A study evaluating the role of underwriters in the trend of Special Purpose Acquisition Companies

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# Abstract

In this paper, a recent trend of Special Purpose Acquisition Companies (SPACs) going public is studied. Specifically, 297 U.S. (2019-2020) SPAC initial public offerings (IPOs) are examined based on their underwriter(s) rank and underpricing (after the first trading day). An OLS regression analysis with several (dummy) variables that influence underpricing is performed for estimations. According to relevant literature, underpricing is a recurring phenomenon in IPOs. Also, the relationship between underwriter rank and underpricing in IPOs is a widely studied topic. However, it is not known how underwriter rank affects underpricing in SPACs. Thus, the main purpose of this paper is to explore the relationship between underwriter rank and underpricing in terms of U.S. Special Purpose Acquisition Companies. The results suggest that underwriter rank significantly affects underpricing in 2019-2020 U.S. SPACs and that specific (popular) SPAC industries significantly show more underpricing than standard. Given recent SPAC popularity and the limited knowledge about this phenomenon, these findings contribute to the existing knowledge on SPACs in the U.S. market.

**Keywords**: *Special Purpose Acquisition Company, SPAC, IPO, underpricing, underwriter score*

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# 1. Introduction

What do electric vehicle manufacturer Nikola, fantasy sports platform DraftKings and Richard Branson's aerospace company Virgin Galactic have in common? All three companies went public through a Special Purpose Acquisition Company (also known as SPAC).

This relatively new investment opportunity is one of the most recent trends in modern day stock markets. But what is a SPAC and what elements contribute to the large upraise of this phenomenon? The U.S. Securities and Exchange Commission (SEC) defines a SPAC as "*…a company in development stage that has no specific business plan or purpose and has indicated that its business plan is to engage in a merger or acquisition with an unidentified company"* (SEC, n.d.). A SPAC is also known as a 'blank cheque company' or an 'empty shell company'. Whenever an empty shell company merges with a private company, the private company takes the SPAC's place in the stock market and is therefore officially listed on an exchange (Santilli and Ramkumar, 2021). The synonym 'blank cheque company' originates from investors that put their money in an empty shell, without the initial knowledge of expected returns that their investment will generate. The initiators of the SPAC are called sponsors and are most often highly influential (business) (wo)men. The sponsors raise funds through an IPO, the proceeds of which are deposited in a trust account. After the SPAC goes public, the sponsors customarily have 24 months to find a private company to merge with using the proceeds of the initial public offering. When a potential company is identified, shareholders have the right to vote in order to (dis)approve the merger. If the SPAC was not in the ability to find a company to merge with within 24 months, the proceeds from the trust account are refunded to the investors (Rodrigues and Stegemoller, 2013).

According to Riemer (2007), SPACs already existed on various U.S. exchanges during the eighties, where it was a corrupt vehicle that plagued the securities markets. Back then, these companies were common instruments of fraud, especially in the penny stock market. The reputation of SPACs did not improve over the years. Jog and Sun (2007) for example, refer to blank check IPOs as a home run for management, as median management return was about 1900% in their sample. Also, Heyman (2007) argues that investing in SPACs is 'betting on a jockey'. In order words, betting on the expertise of the SPAC sponsors. For this reason, the sponsors are often high-profile people that are likely to attract investments.

Despite this criticism, SPACs emerged over the last years due to numerous reasons. First of all, interest rates have decreased to an historically low point and are sometimes even negative, forcing investors to seek alternative methods to successfully invest their capital.

SPACs popularity could also be attributed to high-profile investors, hedge funds, venture capital, private equity firms and athletes (e.g., Bill Ackman, Michael Klein, Shaquille O'Neil and Serena Williams) whose generally well-known profile and moves into SPACs contributed to the large publicity. Besides that, it is much quicker and cheaper for private companies to go public via a SPAC. IPOs are costly and could possibly require up to three years to close, whereas SPAC mergers can be completed in three months (Holmes, 2021).

Thereafter, the COVID-pandemic also contributed to the SPAC boom. To illustrate this, companies did not have to perform expensive roadshows like regular IPOs as they already had been approached by the SPAC and were aware of what they were worth in the eyes of the empty shell company and the expected financial proceeds (Kolb and Tykvová, 2016). According to Ritter (1991), IPO success depends on market conditions, whereas SPACs do not depend on external investors (Gleason et al., 2005). In addition to this, the financial influx a private company would receive from a SPAC was negotiable, thus decreasing the insecurity of the offering. The extreme market volatility caused by the COVID-pandemic also triggered the SPAC boom. This volatility resulted in many companies postponing their IPO due to fear for the market to spoil their stock's market debut (Huddleston Jr, 2021). However, other companies chose an alternative route to go public and used a SPAC. This provided certainty during times in which investor sentiment was very volatile. Also, the number of private investors rose as a consequence of the COVID-pandemic. People had more time, exchanges flourished and investing in a SPAC provided private investors the opportunity to participate in a venture capital like environment, which normally requires millions of dollars (Zandbergen, 2021). Thus, this shortcut for going public is popular during COVID-19. For this reason, Kelly (2021) accurately described SPACs in *InvestmentNews* as the investment darling of the pandemic.

Similar to a regular IPO, a SPAC will hire an underwriter that guides the company in becoming listed on an exchange. However, in the case of a SPAC, the company does not possess any assets nor operations: it is an empty shell. Merely a couple of features are known, namely the management team (sponsors), the exchange on which they will get listed and sometimes the target sector.

In this thesis, the short-term performance of 297 U.S. SPACs in 2019-2020 will be researched by computing the underpricing at the end of the first trading day, classified by underwriter ranking. I foresee that SPACs with higher ranked underwriters will reveal more underpricing compared to SPACs with lower ranked underwriters. As mentioned above, most of the times only the sponsors of a SPAC are known. When a high ranked underwriter is hired, another piece of information regarding the SPAC is available. This is a positive signal and will, as I expect, drive share prices upwards at the first trading day. Therefore, upon summarizing the aforementioned facts, the following question guiding this research can be composed:

*'Will high (low) ranked underwriters cause more (less) underpicing at the end of the first trading day for U.S. Special Purpose Acquisition Companies going public in 2019-2020?'*

The structure of the paper is as follows: In Chapter 2, the relevant literature on SPACs, underpricing, underwriter rank and the combination of underpricing and underwriter rank will be explored. In Chapter 3, the hypotheses guiding this research will be presented, whereafter Chapter 4 will contain a discussion of the data and methodology. Chapter 5 covers the results and discusses all the hypotheses, followed by Chapter 6 which contains conclusions, limitations and suggestions for further research.

# 2. Literature review

## 2.1. SPAC IPOs

There have been several studies about SPACs. For example Berger (2008), who describes SPACs as an alternative way to access the public markets and as a "hybrid between an IPO and M&A transaction" (p. 2). He concludes that the traditional IPO will remain the favorable way to go public, but SPACs continue to thrive as a solution for companies to access the capital markets in special circumstances. Hale (2007) gives another explanation, namely that SPACs are used as a financing tool with something for everyone. The reason for this description is that the merger with a private company using the proceeds of the IPO benefits the management, investors and the target company. In other words, it provides benefits to all the stakeholders involved. Another positive insight is given by Riemer (2007), who concluded that SPACs provide economic benefit to the U.S. economy.

Contrarily, Kolb and Tykvová (2016), are more sceptic towards SPACs. They conclude that SPAC acquisitions allow private firms to go public during difficult times. However according to them, firms going public through a SPAC are not as appealing as firms going public through a regular IPO. Also, Dimitrova (2017) concludes that SPACs significantly underperform various benchmarks. One of the reasons for this underperformance, is that perverse incentives may encourage sponsors to make bad decisions.

In his paper, Cumming et al. (2014) merely focused on the success factors for taking firms public with SPACs. They concluded that younger SPAC sponsors have a higher deal approval probability and that higher level of funds in the trust account, might signal operational efficiency. Another interesting conclusion is that deal approval probability is affected by the "glamorousness of underwriters" (p.1). Also, hiring more than one underwriter decreases deal approval probability, as it indicates a riskier deal. Another paper by Blomkvist and Vulanovic (2020) examined the pattern of U.S. SPAC IPOs since their emergence in 2003 until 2019. They concluded that SPACs shifted the IPO landscape, already fulfilling 50% of U.S. IPOs in 2020. Also, SPACs react more strongly to market-wide uncertainty and time-varying risk aversion.

## 2.2. Underpricing

A general problem effecting many companies going public is something called 'underpricing'. According to Ljungqvist (2007), underpricing is estimated as the percentage difference between the price at which IPO shares were sold to investors and the price at which the shares subsequently trade in the market. Thereafter, Ljungqvist (2007) argues that underpricing should increase in the ex-ante uncertainty about the value of the IPO.

In addition to this, Ibbotson (1975) and Ritter (1984) both concluded that IPOs are on average underpriced. This is also present in the work by Ritter and Loughran (2004), who concluded that IPO underpricing changed over time between the 1980s and 1990-2000s, mainly due to underwriter sentiment. Baron (1982) created a model on IPO underpricing, which relied on information asymmetries between issuers and underwriters. The underwriters have better information regarding the (state) of capital markets, which consequently results in lower offer prices than without this information asymmetry. Muscarella and Vetsuypens (1989) tested Baron's model by examining self-marketed IPOs, which are offerings of underwriters who market their own securities. They concluded that self-marketed offerings are characterized by statistically significant underpricing, which is inconsistent with Baron's model arguing that underwriters have better information and thus results in lower offer prices and less underpricing. Another explanation for IPO underpricing is given by Booth and Chua (199). They attributed underpricing to the issuer's demand for ownership dispersion, because setting a low offer price promotes oversubscription, broad initial ownership and secondary-market liquidity.

Besides the traditional explanations (asymmetric information and risk) for IPO underpricing, Ellul and Pagano (2006) also complement these by aftermarket liquidity. High underpricing is caused by less liquid aftermarkets and therefore the less predictable liquidity. Ritter (1987) argues that underpricing is a cost component of going public, besides the cost of hiring an underwriter. Hanley (1993) however, argues that issues with positive revisions and good information revealed are significantly more underpriced than other IPOs, which suggests that underwriters and issuing firms prefer underpricing over increased allocation.

There are also several studies attributing underpricing to willingness to avoid lawsuits. For example, Hughes and Thakor (1992) examined the role of litigation risk in IPO pricing, where there is a trade-off between current revenue against future litigation costs. Besides that, Hensler (1995) argued that an entrepreneur faces the threat of litigation because investors have an incentive to seek compensation via tort law and/or the Securities Act of 1933 whenever a

stock price falls subsequent to their IPO price. This causes a trade-off between underpricing and potential litigation costs. Drake and Vetsuypens (1993) however, concluded that underpricing the IPO is not a sufficient condition to avoid lawsuits because litigation was driven by aftermarket declines long after the IPO. Another explanation for underpricing is provided by Shu and Lowry (2002), who examined the relation between risk and IPO underpricing. They concluded that firms with higher litigation risk underprice their IPOs by significantly greater amounts.

On the other hand, Allen and Faulhaber (1989) concluded that firms with the most favourable prospects underprice their IPO, because investors know that only the best companies can deal with the cost of this signalling method. Grinblatt & Wang (1989) and Welch (1992) also argue that underpricing is used as a signalling method. In contrast to this, Rock (1986) argues that underpricing is necessary to guarantee that uninformed investors will purchase the issue, which is called the asymmetric information hypothesis. Keloharju (1993) elaborates on the concept of the winner's curse by Rock (1986), stating that new issues must be, on average, underpriced, in order to provide uninformed investors with positive returns. If not, informed investors will crowd out uninformed.

Because SPACs go public through an IPO, there is high possibility of underpricing. According to Griffin (2018), who examined first-day returns of SPACs compared to traditional IPOs, SPAC IPOs were on average underpriced to a more significant degree than traditional IPOs. He attributes his findings to the uncertainty regarding the value of a SPAC. On the other hand, Boyer and Baigent (2008) concluded that SPACs were less underpriced than regular IPOs. They examined 87 SPACs that went public from 2003-2006.

### 2.3. Underwriter reputation

The investment banks that underwrite the IPO (or SPAC) play an important role in underpricing, since they decide for what price the stock will be traded. The reputation of an underwriter is important and attracted quite some academic interest over the years. Beatty and Ritter (1986) argued that underpricing is enforced by investment bankers, who have reputation capital at stake. Carter and Manaster (1990) and Carter et al. (1998) concluded that the marketing underwriter's reputation reveals the expected level of informed activity, where prestigious underwriters are associated with lower risk offerings. Carter et al (1998) also concluded that IPOs managed by more reputable underwriters were associated with less short run underpricing. However, the study by Logue, Rogalski, Seward and Foster-Johnson (2002) provided a different explanation by examining the interaction between underwriter reputation and market activities during IPOs. This contradicts the findings of Allen and Faulhaber (1989) and Rock (1986), who viewed underwriters as a passive participant in the IPO process. Neupane and Thapa (2013), who studied underwriter reputation of Indian IPOs, concluded that the underwriter reputation has an effect on the success of the IPO offering. According to them, high reputation underwriters appeared to be concerned about their reputation and were more likely to set a price which incorporates the information produced during the offer period.

### 2.4. Underpricing and underwriter reputation

The combination of underwriter reputation and underpricing is a widely studied subject. Dimovski, Philavanh and Brooks (2011) examined 358 Australian IPOs from 1994 to 1999 and concluded that there occurred more underpricing in IPOs that engaged underwriters than those that did not engage underwriters. Also, they concluded that more prestigious underwriters are associated with a higher level of underpricing.

On the other hand, Kirkulak and Davis (2005), who measured underwriter reputation and underpricing in the Japanese IPO market, concluded that when there is high (low) demand for a stock, there is a positive (negative) and significant relationship between underwriter reputation and the level of underpricing.

Another explanation for underpricing and underwriter reputation is given by Booth and Smith II (1986), who developed a theory about the role of the underwriter in certifying risky issues. They concluded that underpricing reflects potential adverse inside information. Helou and Park (2001) however, examined the effect of underwriter reputation on abnormal returns. They concluded that the reputation of an underwriter reduced the amount of asymmetric

information and therefore decreased the negative announcement effect of seasoned equity issues.

On the other hand, Johnson and Miller (1988) concluded that there is a negative relationship between the level of banker (underwriter) prestige and the degree of IPO underpricing. However, this disappears once returns are adjusted for risk. Also, Logue (1973); Beatty and Ritter (1986); Carter and Manaster (1990); Megginson and Weiss (1991); Michaely and Shaw (1994) find that underwriter reputation decreases underpricing.

# 3. Hypotheses development

## 3.1. SPAC vs IPO underpricing

Most studies on SPACs cover the period from 2003 (start of the new SPAC wave) until 2016, except from Blomkvist's and Vulanovic' (2020) study. However, this paper will cover SPACs going public in 2019-2020, since SPAC activity surged from 2019 and both years show high SPAC activity.

As mentioned earlier, underpricing is a common phenomenon involved in the process of publicizing companies, SPACs included. However, these studies did not include the SPACs and IPOs going public in both 2019 and 2020. This results in the formulation of the first hypotheses that focusses on the difference in underpricing between SPACs and regular IPOs in 2019-2020

***Hypothesis 1****:* SPACs experience lower underpricing than regular IPOs in 2019-2020.

This hypothesis is in line with the findings of Boyer and Baigent in their 2008 paper, stating that SPAC IPOs from 2003-2006 were less underpriced than regular IPOs. The expectation is that the share price of SPACs will not rise, on average, as much at the end of the first trading day compared to regular IPOs. The share price will rise or fall when new information regarding the SPAC is published (e.g., a target company is announced). Prior to this, the SPAC is just an empty shell directed by management with often a target industry.

## 3.2. Underpricing and underwriter rank

As the second part of the literature review points out, underwriters play an important role in underpricing, as they decide the offer price. This is a widely studied topic in the IPO field. However, there is little evidence for underpricing and underwriters with respect to SPACs. As mentioned earlier, limited information is known about SPACs when they go public. Most of the time, only the management is acknowledged. For this reason, it is expected that the choice for a specific underwriter reveals another piece of information regarding the SPAC and therefore affects underpricing. In other words, it is a course of action that signals value to investors. Sundarasen, Khan and Rajangam (2018) examined the signalling roles of prestigious underwriters in an emerging IPO market. They concluded that underwriter reputation reduces

asymmetric information and signals firm value to potential investors. The effect of this extra piece of information on SPAC underpricing is evaluated by testing the second hypothesis:

> ***Hypothesis 2:*** SPAC public offerings with higher (lower) ranked underwriters are more (less) underpriced in 2019-2020.

As seen in hypothesis *2*, the relationship between underwriter rank and underpricing is forecasted to be positive. This stems from the fact that a higher ranked underwriter signals more positive information regarding a SPAC compared to an underwriter with a lower rank. More information on underwriter rank can be found in the data section. In contrast to SPACs, companies filing for a regular IPO contain considerably more information. According to Ritter (2021), the median IPO age was 9 years in 2020. In other words, these companies have a track record of multiple years. Most research on underwriter rank and underpricing in IPOs conclude that hiring a superior underwriter will cause less underpricing. However, this relates to companies with a track record of many years where underwriter rank is a little piece of information. As for SPACs, underwriter rank is one of the few pieces of information available and as a consequence, SPAC IPOs with higher ranked underwriters are expected to be more underpriced.

### 3.3. Underpricing and market value

Ljungqvist (2007) concluded that small issue size is associated with higher uncertainty and therefore severe underpricing. Similar to regular IPOs, SPACs differ in size. While some companies issue only five million shares, others issue over fifty million. Beatty and Ritter (1986) and Michaely and Shaw (1994) also concluded that IPO size identifies uncertainty and therefore underpricing. Because all three papers only took regular IPOs into account, its conclusion regarding issue size, risk and underpricing is tested on the 2019-2020 U.S. SPACs, allowing for the formulation of the third hypothesis:

> ***Hypothesis 3:*** In 2019-2020, U.S. SPACs with higher market value were less underpriced than SPACs with lower market value due to higher uncertainty.

The market value is computed by multiplying the number of shares offered and the offer price and is used as a proxy for risk.

### 3.4. Underpricing per industry

According to Weatherhead (2021), SPACs are keen on growing sectors when trying to find a private company to merge with, and according to Bartels (2021), the U.S. tech industry keeps on growing. According to Chahine (2008), (hi-)tech IPOs are more likely to be risky and also have higher underpricing than non-(hi-)tech companies. In the data used to answer the hypothesis, different forms of tech are covered: biotech, fintech, TMT (Technology, Media, Telecom), insure tech, industrial tech, medical tech, property tech (real estate) and consumer tech.

Brau and Holloway (2009) studied first-day underpricing in the health care sector. They concluded that participants in health care IPOs should anticipate on underpricing after the first trading day. In their sample containing 345 health care IPOs from 1970-2008, the first day return was 16.69% on average. Multiple forms of healthcare are covered in the data: healthcare, biopharmaceutical, biomedical, financial services healthcare, industrial healthcare, fintech healthcare, medical tech, senior healthcare and therapeutics. Medical tech belongs to both tech and healthcare.

Due to their large appeal, the two aforementioned sectors will be explored, and the following hypotheses will serve as main thread to accomplish this:

> ***Hypothesis 4.1:*** SPACs targeting the healthcare industry will experience more underpricing in 2019-2020.

> ***Hypothesis 4.2:*** SPACs targeting the tech industry will experience more underpricing in 2019-2020.

# 4. Data and methodology

This chapter will discuss the data and methodology used to answer the hypotheses presented in Chapter 3. In the first part, all the data resources and selection methods are explained. whereafter the second part elaborates on the statistical tests and regressions performed.

## 4.1. Data

For this quantitative research, a large pool of data is required to ensure high validity and generalizability. In order to test the hypotheses, a file containing all U.S. IPOs from January 1975 until February 2021 was derived from Ritter's page on the Warrington College of Business website (2021). According to the Warrington College of Business, Jay R. Ritter is also known as "Mr. IPO" (Warrington College of Business, n.d.), because of his work on initial public offerings. Primarily, the data of 1975 until 2018 was cleared, because only the last two years are of interest. According to Ritter (2021), the median IPO age (year of the IPO minus the year of founding) was 10 years in 2019, exceeding the 9 years in 2020. The data was filtered for company's founded between 2015 and 2020, in other words, companies that went public after zero to five years after their founding date. The reason for this is that 'normal' companies need years to prove their concept, idea or technology before it goes public. However, the SPAC has 24 months to prove itself after the IPO, since prior to this it is an empty shell with no operations nor assets. This enables the blank cheque company to go public quickly after the founding date.

Thereafter, every single IPO company was examined on Bloomberg.com to filter out the SPACs and eventually 297 companies remained. The underwriter per company, SPAC target industry and prominent leadership were retrieved from SPAC Track (2021), a platform allowing investors to track the overall SPAC market. Whenever data was missing, the S-1 SEC filing of the specific company was read carefully to find the missing pieces of information. In the sample, many SPACs focused on the tech (81) and healthcare (42) sector to find a company to merge with.

The offer price and first day closing price were obtained from the IPOscoop (2021) database, containing all IPOs from 2000 until 2020. The IPOscoop file contained data until September, so Yahoo Finance and Stockanalysis.com provided the missing offer- and first day closing prices per company.

Ritter's IPO Underwriter Reputation Rankings (1980-2020), containing 1193 underwriters, is used to allocate a score per underwriter. Ritter ranked every underwriter by giving it a score between 1,001 (low) and 9,001 (high). Ritter used the Carter and Manaster (1990) method for underwriter ranking, namely by examining an underwriter's relative position in IPO tombstone announcements. According to Chen (2020), a tombstone is an advertisement of a public offering, placed by the bank that underwrites the issue. As reported by Carter and Manaster (1990), a more prestigious underwriter received a more lucrative position on the tombstone than lower bracket counterparts. Thus, a high score in Ritter's underwriter rankings means that the underwriter had lucrative positions on tombstone announcements. For the statistical analyses, the term 'underwriter score' is used, where a high score means a high ranking and vice versa. The majority of underwriters involved in SPACs, had a score available for the period 2019-2020. However, eight companies did not have a score for this specific period, so the underwriter reputation score from the last available period was examined. Three underwriters did not appear in Ritter's database: JonesTrading, OdeonCapitalGroup and PJT Partners. Because of this, these underwriters were removed from the data. Most companies that hired the aforementioned underwriters, had joint bookrunners for their IPO. In other words, the score of the remaining underwriter(s) was used. Unfortunately, Seven Oaks Acquisition Corp hired JonesTrading as a sole bookrunner for its offering and is therefore removed from the data.

### 4.2. Methodology

The variable of interest is underpricing, calculated according to the following formula:

$$UPi = \frac{(Pi, t - Ei, t)}{Ei, t} * 100$$

UP$i$ represents the underpricing of the specific share ($i$). P is the price after the first trading day (first day closing price) of the share ($i$), and E is the offer price of the share ($i$). The offer price is the price at which shares got issued at the IPO, computed in accordance with an underwriter. To calculate underpricing, the offer price is subtracted from the first day closing price, then divided by the offer price. The result is multiplied by 100, because underpricing is defined as a percentage change.

As mentioned in the data section, underwriters are ranked using the IPO Underwriter Reputation Rankings (1980-2020) by Ritter. The underwriter score varies from 1,001 (low) to

9,001 (high). The number of underwriters hired per SPAC differed. Some only hired one, but numerous hired two or even more. The formula in order to calculate the underwriter score per SPAC is the following:

$$Score, i = \frac{Score\ Underwriter1 + Score\ Underwriter2 + Score\ Underwriter\ 3 + \dots}{N}$$

Score,*i* represents the score assigned to the underwriter(s) of a SPAC. Score Underwriter is the score that Ritter attributes to an underwriter in his rankings file. In many cases, more than one underwriter is hired to underwrite the offering. It is plausible that the score from Ritter's IPO Underwriter Ranking differs between companies underwriting the same issue. For this reason, the total score in the numerator of the equation is divided by N, which represents the number of underwriters in a SPAC offering.

### 4.3. Variables

Besides the variable of interest underpricing and the underwriter rank, more explanatory variables are put into the regression formula in order to test the hypotheses.

*Ln (market value)*

The first variable is Ln (market value), because according to Kirkulak and Davis (2005), this is an indication of the size of the issue. The choice for a logarithmic scale instead of the absolute market value, is to minimize skewness towards large values (Robbins, 2012). With respect to SPACs, market value differs from 40 million to 4 billion dollars. Small issue size is associated with higher uncertainty and therefore, as Ljungqvist (2007) mentioned, severe underpricing. Market value is computed by multiplying the number of shares offered by the opening. The number of shared offered are found in the S-1 filing documents in the EDGAR Company Filings database. The S-1 filing is the general form for registration of securities under the Securities Act of 1933 (SEC, n.d.). The offer price per share was already extracted from the IPOscoop database as mentioned in the data section.

*Target industry dummy*

The second variable is the target industry dummy. As aforementioned in Chapter 3, both the tech and healthcare industry are popular with SPACs. For this reason, a dummy variable with a value of 1 if the target industry is tech and a value of 0 otherwise is added. Also, a dummy variable with a value of 1 if the target industry is healthcare and a value of 0 otherwise is added.

*Prominent leadership dummy*

The third variable is the prominent leadership dummy, with a value of 1 if the SPAC sponsor(s) were prominent/famous (business) (wo)men, or 0 if not. Examples of prominent leadership are (former) CEOs/CFOs of well-known companies, founders of well-known companies, board members of well-known companies or famous athletes like Serena Williams, Shaquille O'Neal and Stephen Curry (Katje, 2021). In the sample, 161 SPACs had prominent leaders. As mentioned earlier, SPACs are blank check companies that rely heavily on the expertise of management. Because prominent leaders have a tremendous track record and expertise in business, investors may trust them more with the blank check. To limit the influence of prominent leadership on underpricing, a dummy variable is added to the regression.

*Number of underwriter's dummy*

The fourth variable is the number of underwriter's dummy (0 or 1), with a value of 1 if the SPAC hired more than one underwriter, or 0 if one underwriter was hired.

*Year of IPO dummy*

The fifth variable is the year of IPO dummy (0 or 1), with a value of 1 if the SPAC IPO took place in 2019, or 0 if 2020. 2019 formed the beginning of the COVID-19 pandemic and this may have a different effect on SPACs and underpricing compared to 2020.

To answer the hypotheses, ordinary least squares (OLS) regression models combined with multiple tests are performed using the data mentioned in the data chapter. The regression model is as follows:

$$\text{Underpricing} = \beta 0 + \beta 1 * Underwriter\ Score + \beta 2 * Ln(Market\ Value) + \beta 3 * Tech + \beta 4 * Healthcare + \beta 5 * Prominent\ Leadership + \beta 6 * IPO\ Year + \beta 7 * Number\ of\ Underwriter's + \varepsilon$$

The β's are unknown parameters and $\varepsilon$ is assumed N ~ (0, $\sigma^2$).

### 4.4. Descriptive statistics

Table 1 provides the descriptive statistics of the dataset. The second row shows winsorized statistic values for underpricing, which will be explained when the hypotheses are answered in the next chapter.

Table 1: Descriptive statistics variables

| | *Mean* | *Std. Dev.* | *Min* | *p5* | *p25* | *Median* | *p75* | *p95* | *Max* |
|---|---|---|---|---|---|---|---|---|---|
| Underpricing (%) | 1.349 | 2.887 | -4 | -1.1 | 0 | 0.5 | 2 | 6 | 21.5 |
| Underpricing (%, winsorized) | 1.098 | 1.857 | -4 | -1.1 | 0 | 0.5 | 2 | 6 | 6 |
| Underwriter Score | 7.207 | 1.838 | 1.001 | 3.501 | 6.001 | 8.001 | 8.501 | 9.001 | 9.001 |
| Market Value (million $) | 275.758 | 278.456 | 40 | 75 | 150 | 225 | 300 | 600 | 4000 |
| Ln(Market Value) (million $) | 19.213 | .644 | 17.504 | 18.133 | 18.826 | 19.232 | 19.519 | 20.212 | 22.101 |
| Healthcare | .282 | - | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Tech | .544 | - | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Leadership | .540 | - | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| # Underwriters | .465 | - | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| IPO Year | .185 | - | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

Note: *N*= 297

# 5. Results and discussion

This chapter covers the empirical results of the research, which will allow for a substantiated analysis of the hypotheses. The statistical tool used for this analysis is STATA, and multiple OLS regressions as well as other statistical tests were performed using this tool.

To compare U.S. SPAC underpricing and regular IPO underpricing in 2019-2020, multiple tests are performed. First, a Kernel Density Plot of underpricing in IPOs vs SPACs in 2019-2020 is created to visualize the distribution of the data, in this case underpricing. The results of this plot are shown in Table 1 of the Appendix. The Kernel Density Plot represents the distribution of both SPAC and IPO underpricing. As seen in Table, the density of SPAC underpricing is much smaller than IPO underpricing. The narrow plot for SPAC underpricing shows that most observations lie around 0%, whereas the wide plot for IPO underpricing displays that the spread of underpricing in IPOs is larger.

The next step is to test whether SPACs are on average less underpriced than regular IPOs in 2019-2020, following the first hypothesis. The data on regular IPOs is also extracted from Ritter's database and the IPOscoop database. According to the database, 2019-2020 had 426 regular IPOs, exceeding the 297 SPAC IPOs in the same time span. Because the database contained data until September 2020, the remainder of regular IPOs is extracted from Ritter's IPO database. Yahoo Finance provided the missing information, because Ritter's database did not show offer and first day closing price. In order to test the hypothesis, two different statistical tests are performed. First, a two-sample t-test with unequal variances, the result of which can be found in Table 2 of the Appendix. The average underpricing for IPOs was 17.26% in 2019-2020, for SPACs 1.529%. The corresponding t-stat is 7.35, which is significant at the 0.05 level given that $|t| \geq 1.96$. Because the number of regular IPOs is higher than the number of SPACs, another test is performed that takes into account this difference in magnitude. The Wilcoxon rank-sum (Mann-Whitney) test is used, which is a non-parametric alternative to the two-sample t-test (Ford, 2017). With this test, the null-hypothesis can be seen as two populations having the same distribution with the same median. The resulting z-score is 5.081, which is significant at the 0.05 level given that $|z| \geq 1.645$. As seen in Table 3, the rank-sum of regular IPOs is higher than expected and of SPACs lower than expected. In other words, the mean of underpricing in regular IPOs is higher than in SPACs. More detailed results of this test can be found in Table 3 of the Appendix.

The conclusion for both tests is that SPACs experience lower underpricing than regular IPOs after the first trading day in 2019-2020, which is in line with the first hypothesis. This

finding is in accordance with Boyer and Baigent (2008), who concluded that SPACs were less underpriced than regular IPOs in 2003-2006.

To check if there are any outlies in the data, a scatterplot is created. As seen in Table 4, multiple outliers are visible, which makes it more difficult to analyze the data. After looking into the concerned datapoints, it can be concluded that none are due to errors in the data. In order to deal with the outliers, a method called *Winsorization* is used. This method minimizes the influence of outliers in the data (Dixon, 1960). Because the outliers are located in the upper area of underpricing, the observations above the 95$^{th}$ percentile are winsorized. In other words, the values above the 95$^{th}$ percentile will take the value of the 95$^{th}$ percentile. Table 5 in the Appendix shows the scatterplot after winsorization where no outliers are visible.

The cone shaped distribution of the datapoints in the scatterplot may be a sign of heteroskedasticity, meaning that variability is unequal over the sample. When running a regression analysis, heteroskedastic data can ruin the results and bias the coefficients (Glen, n.d.). To check for heteroskedasticity, the Breusch-Pagan/Cook-Weisber test for heteroskedasticity is used. Table 6 in the Appendix shows the result of the test and confirms that heteroskedasticity is present in the data because the p-value is smaller than 0.05. In order to deal with this problem, robust standard errors are used to perform the OLS regression. When using robust standard errors, the coefficients are reliable even when heteroskedasticity is present (Croux, Dhaene and Hoorelbeke, 2004).

Another important check before the OLS regression can be performed, is checking for multicollinearity between independent variables. It is important that these independent variables are actually independent and not correlated with each other. High correlated independent variables can cause problems interpreting the results. Table 7 shows the pairwise correlation table for all the independent variables in the regression. The rule of thumb for multicollinearity is that if the correlation is higher than 0.8, there may be multicollinearity in the variables (Seviratna and Cooray, 2019). As seen in Table 7, no correlation is higher than 0.8, so according to this method there is no multicollinearity in the data. Another method to detect multicollinearity is by Variance Inflation Factors (VIF), which is a score assigned to an independent variable that represents how well the variable is explained by other independent variables (Frost, n.d.). A VIF exceeding five indicates high multicollinearity between the independent variable and other variables (Bhandari, 2020). Table 8 in the Appendix shows the VIF scores per independent variable for the OLS regression used in this thesis. The table

displays zero independent variables with a VIF higher than five. Thus, using the aforementioned rule of thumb, the independent variables do not show multicollinearity.

Table 2 on page 24 contains the results of the OLS regression. Multiple regressions with different combinations of independent and dummy variables are shown. First, the second hypothesis is discussed. This hypothesis is in line with the research question, namely that a higher (lower) underwriter rank causes more (less) underpricing in 2019-2020 U.S. SPACs.

The third column, which does not control for industry, describes a significant positive effect ($p < 0.05$) of underwriter score on underpricing. If the underwriter score for a SPAC IPO rises with one, underpricing rises with 0.145%. As mentioned in the methodology part, the underwriter score varies from 1,001 (low) to 9,001 (high). Because a jump in underwriter score of one is plausible given this range, financial consequences are inevitable. The average market value of 2019-2020 U.S. SPACs is 276 million dollars. Given that a random company with this market value hires an underwriter / multiple underwriters such that the average underwriter score rises by one, the costs of underpricing increase by 400 thousand dollars. The other variables show the following with respect to underpricing: market value reduces underpricing, prominent leadership increases underpricing, the number of underwriters decreases underpricing and underpricing is higher in 2020. Unfortunately, no conclusions can be made on the basis of these variables because they are not significant ($p > 0.05$). The R-squared shows the percentage in variation that is explained by the independent variables, which is 3.5%. As mentioned earlier, little is known about SPACs when they go public and not even at the end of the first trading day more information is available. Because of this limited information, an R-squared of 3.5% is acceptable using the regression in model three when predicting underpricing.

When controlled for Tech and Healthcare industry, as in column 4, the effect of underwriter score becomes marginally significant under a 90% confidence interval. However, the combination of all independent variables results in the highest R-squared, namely 6.8%. In other words, model 4 is the best performing model but underwriter score is not significant. ($p = 0.058 > 0.05$)

A significant negative effect of IPO year (2019-2020) on underpricing is visible in the first two columns. This means that in 2019 (dummy value 1), SPACs were less underpriced than in 2020 (dummy value 0). A possible explanation for this, is that 2020 had many more SPACs than 2019 (241 and 56 respectively), signaling the increasing popularity. However, this effect becomes insignificant when controlled for market value and industry.

In Table 2, a negative relationship between market value and underpricing is visible, meaning that higher market value decreases underpricing. This is in accordance with Lungqvist (2007), Beatty & Ritter (1986) and Michealy and Shaw (1994), who all concluded that IPO size identifies uncertainty and therefore underpricing. Unfortunately, the results in are not statistically significant ($p > 0.05$), contradicting the conclusion of the aforementioned authors. Thus, the third hypothesis stating that 2019-2020 U.S. SPACs with higher market value were less underpriced than SPACs with lower market value is failed to reject.

Column 4 of Table 2 shows the effect of underpricing within two specific industries, namely tech and healthcare. In the sample containing 297 SPACs, 81 focused on the tech industry and 42 on the healthcare industry. Both tech and healthcare are positive and significant, respectively on a 5% and 10% significance level. Also, for both industries underpricing will increase with approximately 0.6%. The highly significant coefficient of tech is in line with Weatherhead (2021) and Chahine (2008), who concluded that SPACs are keen on growing sectors and that tech IPOs are riskier, resulting in higher underpricing. The significant effect of healthcare is consistent with Brau and Holloway (2009), concluding that healthcare IPOs should anticipate underpricing after the first trading day. To conclude, both hypotheses regarding target industry are accepted.

The positive effect of prominent leadership and the negative effect of number of underwriters are not significant ($p > 0.05$), thus both do not contain sufficient information to draw conclusions on underpricing.

*Table 2: OLS regression with winsorized SPAC underpricing (%) as the dependent variable and different independent variables / dummy variables. The results are from the 297 U.S. SPACs that went public in 2019-2020.*

U.S. SPACs 2019-2020

| Variables | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Underpricing (%) | Underpricing (%) | Underpricing (%) | Underpricing (%) |
| Underwriter Score | | 0.114** | 0.145** | 0.138* |
| | | (0.0526) | (0.0704) | (0.0725) |
| Ln(Market Value) | | | -0.172 | -0.104 |
| | | | (0.284) | (0.308) |
| Healthcare | | | | 0.604* |
| | | | | (0.331) |
| Tech | | | | 0.611** |
| | | | | (0.271) |
| Leadership | 0.305 | 0.212 | 0.261 | 0.182 |
| | (0.250) | (0.257) | (0.260) | (0.258) |
| # of Underwriters | -0.0790 | -0.166 | -0.135 | -0.189 |
| | (0.216) | (0.224) | (0.226) | (0.221) |
| Year of IPO | -0.438** | -0.378* | -0.374 | -0.214 |
| | (0.211) | (0.203) | (0.202) | (0.207) |
| Constant | 1.050*** | 0.308 | 3.339 | 1.877 |
| | (0.220) | (0.321) | (5.078) | (5.392) |
| Observations | 297 | 297 | 297 | 297 |
| $R^2$ | 0.022 | 0.033 | 0.035 | 0.068 |
| *Adj.* $R^2$ | 0.0122 | 0.0201 | 0.0188 | 0.0454 |

Robust standard errors in parentheses
*** p<0.01, **p<0.05, *p<0.1

# 6. Conclusion

This research aimed to identify the role of underwriters with respect to underpricing in U.S. SPAC IPOs that went public in 2019-2020. A score was assigned to every SPAC based on the individual score underwriters received in Ritter's IPO Underwriter Reputation Rankings. The effect of underwriter rank on underpricing is relevant, because most SPACs contain limited information. Most of the time, only the so-called sponsors are known and occasionally the target industry. This research tried to identify a new piece of information regarding SPACs, which may influence the share price after the first trading dat. The following research question was formulated:

*'Will high (low) ranked underwriters cause more (less) underpicing at the end of the first trading day for U.S. Special Purpose Acquisition Companies going public in 2019-2020?'*

Most of the relevant literature on underpricing and underwriter rank, concluded that higher ranked underwriters cause less underpricing at the end of the first trading day for regular IPOs. However, a couple of papers concluded the opposite, namely that higher ranked underwriters caused more underpricing. All in all, it is plausible that underwriter rank has an effect on underpricing. However, the samples used in the studies aforementioned did not focus on SPACs, only on regular IPOs.

The results of the OLS regression show that underwriter rank has a positive effect on underpricing in 2019-2020 U.S. SPACs. In other words, when hiring an underwriter / multiple underwriters with a higher rank, greater underpricing is expected. A possible explanation for this phenomenon is that an underwriter signals value regarding a SPAC, and thus reveals another piece of relevant information. Also, when controlling for two popular industries for SPACs (healthcare and tech), the OLS regression shows that the effect is even more positive. This is in line with research on regular IPOs concluding that tech and healthcare industry IPOs are more underpriced.

Prominent leadership, the dummy variable indicating that the SPAC sponsors are famous (business) (wo)men, is positive. This means that a SPAC initiated by prominent leaders is expected to show greater underpricing after the first trading day. However, the coefficient is not significant, thus no conclusion can be drawn based on this. Also, both number of underwriters dummy variable and market value variable show negative but unsignificant

coefficients.  underpricing is the negative effect of both number of underwriters and market value.

To better understand the implications of these results, future studies could include data of SPAC IPOs over a larger timespan. In this research, the choice is made to study the first two years of the new SPAC wave, starting in 2019. Also, this study uses the underwriter rank by Ritter, which is not the only method to assign a score to underwriters. For example, Manaster (1990) measures underwriter reputation by relative placements in stock offering tombstone announcements, whereas Megginson and Weis (1991) use the relative market share of underwriters. Finally, this paper used short term underpricing as the dependent variable in the OLS regression. However, a different effect may be possible when long term underpricing is used.

All in all, it can be concluded that higher ranked underwriters cause more underpricing in Special Purpose Acquisition Companies going public in 2019-2020. This is in line with the expectations at the beginning of this research. The results of this thesis contribute to the existing literature on SPACs, and especially on SPAC IPOs. Because this phenomenon is extremely hot nowadays, research on this topic is important in order to understand all its aspects.

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# 8. Appendix

*Table 1: Kernel Density Plot of SPAC and IPO underpricing 2019-2020 (U.S.).*

In order to visualize the distribution of the data, a Kernel Density Plot is created. The results show the distribution of SPAC and IPO underpricing. As seen below, the density of SPAC underpricing is much smaller than IPO underpricing. In other words, the spread of IPO underpricing varies a lot, whereas SPAC underpricing mostly lies close to 0%.

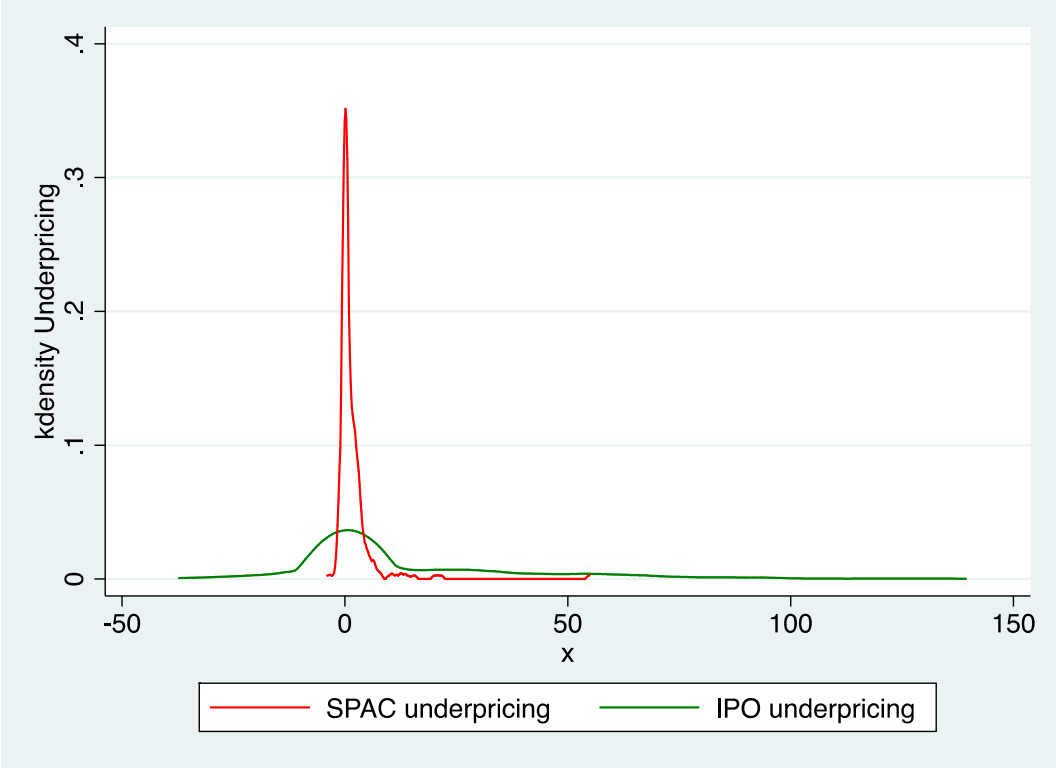


*Table 2: Two-sample t-test with unequal variances for SPAC and IPO underpricing 2019-2020.*

To test whether SPACs are on average less underpriced than IPOs in 2019-2020, a two-sample t-test with unequal variances is performed. The IPO underpricing mean (17.26%) is higher than the SPAC underpricing mean (1.529%). The result is significant ($p < 0.05$).

| | Obs | Mean IPOs (%) | Mean SPACs (%) | Dif | St. Err | T_value | P_value |
|---|---|---|---|---|---|---|---|
| Underpricing | 723 | 17.26 | 1.529 | 15.731 | 2.14 | 7.35 | 0 |

*Table 3: Two-sample Wilcoxon rank-sum (Mann-Whitney) test for SPAC and IPO underpricing in 2019-2020.*

In 2019-2020, the number of regular IPOs exceeded the number of SPAC IPOs. To account for this difference in answering hypothesis 1, the Wilcoxon rank-sum (Mann-Whitney) test is used. Under the null-hypothesis, both populations have the same distribution with the same median. The null-hypothesis is rejected, and the results are significant (|z| > 1.645). Because the IPO underpricing rank-sum (id=0) is higher than expected and the SPAC underpricing (id=1) rank-sum lower than expected, SPACs are less underpriced on average than regular IPOs.

| Id | Obs | Rank sum | Expected |
|---|---|---|---|
| 0 | 426 | 168000 | 154425 |
| 1 | 297 | 93971.5 | 108025 |
| Combined | 723 | 262450 | 262450 |

Unadjusted variance = 7669775
Adjustment for ties = -20113.46
H0: Underpricing equal means
H1: Underpricing unequal means
**Z = 5.081**

*Table 4: Multiple outliers*

Because outliers have a negative influence on the data and therefore the results, a scatterplot is created to visualize any outliers. As seen in the plot below, a couple of datapoints are located far outside the other values. In other words: outliers.

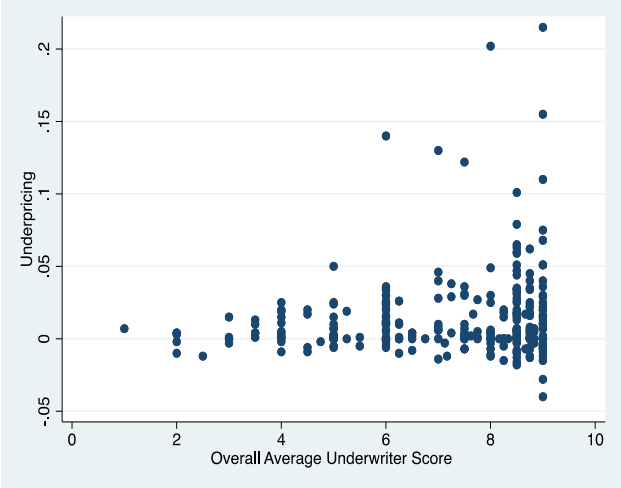

*Table 5: Winsorized datapoints*

In order to deal with outliers, a method called *Winsorization* is used. This method minimizes the influence of outliers, because it gives the choice to assign values of a certain percentile to the outliers. In this case, the outliers are located in the upper area of underpricing. As a consequence, the observations above the 95$^{th}$ percentile are winsorized, meaning they will take the values of the 95$^{th}$ percentile. The result can be seen below, which clearly contains zero outliers.

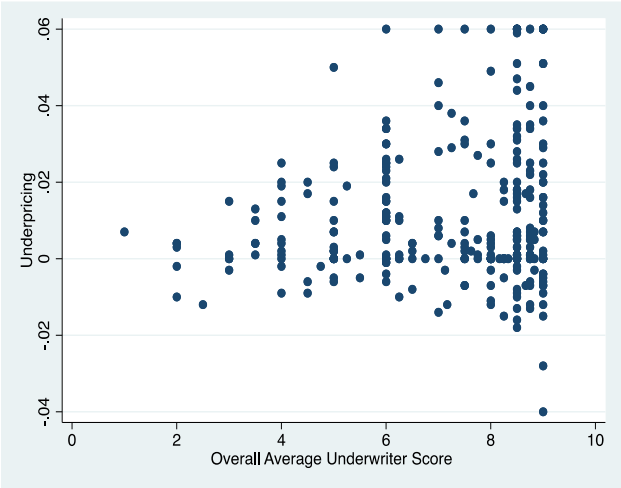


*Table 6: Breusch-Pagan / Cook-Weisberg test*

It is necessary to test for heteroskedasticity, because heteroskedastic data can ruin the results and bias the coefficients. In order to test this, the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity is used, the results of which are shown below. Because the outcome is significant ($p < 0.05$), heteroskedasticity is present in the data. To deal with this problem, robust standard errors are used in the OLS regression. These standard errors are reliable even when heteroskedasticity is present in the data.

| Breusch-Pagan / Cook-Weisberg test for heteroskedasticity |
|---|
| Ho: Constant variance<br>Variables: fitted values of Underpricing_w<br><br>chi2(1) = 27.40<br>Prob > chi2 = 0.0000 |

*Table 7: Pairwise correlations*

In order to check for multicollinearity between independent variables, a pairwise correlations table is created. Multicollinearity means that independent variables are correlated with each other, which causes problems when interpreting the results. The rule of thumb indicates that if correlation is > 0.8, there may be multicollinearity in the variables.

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| (1) Underwriter Score | 1.000 | | | | | | |
| (2) Ln(Market Value) | 0.607*** | 1.000 | | | | | |
| (3) Healthcare | -0.026 | -0.225*** | 1.000 | | | | |
| (4) Tech | 0.076 | 0.160 | 0.013*** | 1.000 | | | |
| (5) Leadership | 0.275*** | 0.362*** | -0.034 | 0.229*** | 1.000 | | |
| (6) # Underwriters | 0.207*** | 0.254*** | 0.029 | 0.036 | 0.030 | 1.000 | |
| (7) Year of IPO | -0.193*** | -0.172*** | -0.069 | -0.214*** | -0.432*** | 0.060 | 1.000 |

*Table 8: Variance Inflation Factors*

Another method to detect multicollinearity in the data, is by Variance Inflation Factors (VIF). The VIF is a score assigned to independent variables, representing the amount it is explained by other independent variables. A VIF exceeding five indicates high multicollinearity.

| | VIF | 1/VIF |
|---|---|---|
| Ln Market Value | 1.911 | 0.523 |
| Underwriter Score | 1.648 | 0.607 |
| Prominent Leadership | 1.396 | 0.716 |
| IPO year | 1.286 | 0.778 |
| # of Underwriters | 1.1 | 0.909 |
| Healthcare | 1.097 | 0.912 |
| Tech | 1.087 | 0.92 |
| Mean VIF | 1.361 | . |