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MASTER THESIS

IŠORĖS IR VIDAUS VEIKSNIŲ POVEIKIS JAV TECHNOLOGIJŲ ĮMONIŲ PO IPO VEIKLAI PRIEŠ IR PO COVID19	**THE IMPACT OF EXTERNAL AND INTERNAL FACTORS ON POST-IPO PERFORMANCE OF THE US TECHNOLOGY COMPANIES BEFORE AND AFTER COVID19**

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INTRODUCTION

The relevance of the topic: Today, the tendency of many technology companies with a tremendous amount of losses over a long period to go public can be seen. For example, in 2020, 70 companies with a capitalisation of over $1 billion went public, but only 10% showed a profit.

Investors understand that technology can change our way of life and always consider technology companies a risky but promising sector. So they invest their money and hope companies will show fantastic results in the future. Unfortunately, however, few tech companies can perform well in the short term, and some underperform in the long run.

Widely accepted, COVID-19 drastically damaged the world economy in general, and investors became more sensitive and careful in decisions about how to spend money and which type of investments to choose in the current situation to stay on the safe side and not lose money neither in a short run nor the long term .

Many factors can affect a company's performance after an IPO (Initial Public Offering). On the one hand, factors directly related to the company itself - the quality of corporate governance, the company's growth and profitability, liquidity, cash usage and many others. On the other hand, there are external factors that the company can't influence itself, such as inflation, general stock market performance, rating of underwriters involved in IPO conducting, and other factors.

In general, there exists a lack of a complete and proper vision of how to treat technology companies and how to assess their cause. Moreover, the problem becomes even more challenging due to significant macroeconomic changes and lots of peculiarities of companies that operate in the technology industry that are not considered and investigated sufficiently. All this brings the necessity of conducting this research.

The level of exploration of the topic. Many companies go public by conducting IPOs. However, growing interest from companies' sides to IPOs has made IPO an attractive research topic. Such disciplines as economics, finance, and strategic planning successfully investigate this topic.

Researchers who are investigate IPO process are mainly interested in following matters:

1. *IPO process description.* Each step of the IPO process is under the consideration of researchers. The major part of the papers is devoted to the process of underwriters choosing and how their reputation can influence different post-IPO outcomes. So, Hu, Y., Dai, T., Li, Y., Mallick, S., Ning, L., & Zhu, B. (2021) and Dimovski, W., Philavanh, S., & Brooks, R. (2011) found out that. A not less critical topic for investigation is pre-IPO roadshows when high-level management of companies, in cooperation with underwriters, prepare and present companies'

results, development strategy, and achievements to investors. As was proved by some research, companies' financials may have an unconditional impact on investors' decisions to invest money. Also, investors are responsive to the emotions and behaviour of managers during road shows (Bian et al., 2021; Feng, G., 2022). Aggarwal, R. K. (2000) proved the effectiveness of after-market stabilisation tools, which maybe implied by underwriters 25 days after the IPO

2. *Advantages, disadvantages, and reasons for going public.* Many researchers questioned whether it is worth going public and what benefits and positive consequences a company may have after becoming publicly traded. Ritter, J. R. (1987) conducted the first comprehensive research that revealed all these questions. He identified three reasons to go public and the benefits from IPO: overcoming financial, window dressing, and diversification of the shareholder portfolio. However, besides positive outcomes, there are disadvantages: administrative expenses and loss of confidentiality. Pagano, M., Panetta, F., & Zingales, L. (1998) extended Ritter's research with their most famous work, "Why Do Companies Go Public?".

3. *Impact of external and internal factors on post-IPO performance.* Many scientific papers are dedicated to assessing the impact of different factors on IPO outcomes, such as underpricing and overpricing in the short and long runs. Among the scope of factors, researchers pay more attention to macroeconomic factors (Satta, G., 2017; Tran, A. and Jeon, B., 2011; Ameer, R., 2012), and factors related to the placement (Kumar, Langberg, & Sivaramakrishnan, 2016; Zhao, R., Xiong, X., & Shen, D., 2018; Swamy, V., Dharani, M., & Takeda, F., 2019; Neupane, S., & Thapa, C., 2013; Wang, W., & Yung, C., 2011; Kirkulak, B., & Davis, C., 2005) and internal factors (Wilbon, A. D., 2003; Kim, Y., & Heshmati, A., 2010; Fisch, C., Meoli, M., Vismara, S., & Block, J. H., 2022).

The novelty of Master Thesis. From a theoretical point of view, this work is a continuation of many studies on the influence of various factors on an IPO. However, it is one of the few works where external and internal factors are considered simultaneously for companies from the technology sector. Furthermore, due to recent changes caused by COVID-19, this research intends to investigate how investors' behaviour and priorities have changed under the pressure of macroeconomic shifts.

Research question. How did different external and internal factors affect the performance of technology IPOs before COVID-19 damaged the world economy and after that from a short and long-run perspective?

The object of this study is the performance of technology companies after IPO and the internal and external factors that affect it.

The aim of the master thesis. The research aims to estimate the key factors that affected the post-IPO performance of technology companies and define influential power before and after COVID-19.

To achieve the aim of the Master Thesis following steps should be passed:

1) To analyse the technology industry theoretically;

2) To analyse the literature regarding IPO;

3) To analyse literature regarding external and internal factors that affect post-IPO performance in general;

4) To develop the research model and also: (i) define the criteria for technology companies and parameters (e.g., time frame, offer type, offer stage and so on) that will subsequently be included in the sample theoretically; (ii) define the list of variables that will be used for model construction; (iii) define the measures for each variable and if the variable requires additional calculation to specify the methodology which will be used;

5) With a developed research methodology, to assess the impact of a combination of external and internal factors on the IPO performance of the chosen technology companies by building regression models.

6) And finally, when all previous steps are done, conclusions are to be made with suggestions for further research and investigations.

This work uses the following research methods: analysis and synthesis, comparative analysis using deduction and induction, classification, analytical method for analysing statistical data, and building regression models.

The Master Thesis structure is defined below:

The first chapter discloses an summary view of the scientific literature covering the main topics related to the research question.

The second chapter describes the methodological aspects of how imperial analysis will be conducted. This part provides a sample description, variables definition, hypothesis setting, model specification and detailed explanation of which statistical method will be utilised for hypothesis testing and how results will be interpreted.

The third chapter discloses the most significant empirical results and their interpretation.

Besides that, at the end of the research, the author provides conclusions and suggestions for further research and investigations.

1. THEORETICAL ASPECTS OF IMPACT OF INTERNAL AND EXTERNAL FACTORS ON POST-IPO PERFORMANCE OF TECHNOLOGY COMPANIES

1.1. Technology industries as an essential part of the United States economy

1.1.1. Definition and classification of the technology sector

Before analysing the post-IPO performance of technology companies, it is helpful to understand what the technology sector means, how other researchers define it, and which peculiarities of this industry could be taken from the definition stage.

The classifications of traditional sectors of the economy are based on the product they produce. However, the "technology sector" notion is difficult to determine as it is challenging to say precisely what product in the technology sector is.

Thomas Hatzichronoglou, in his paperwork, described complete methods used to classify industrial sectors and industries in OECD countries by technology level (Hatzichronoglou, T., 1997). He proposed two approaches to classification: sectoral and product approaches.

The sectoral approach. Four groups of manufacturing industries were identified by Hatzichronoglou, T., 1997 taking into account manufacturability. The calculation took into account the level of technological development for the sector, determined by the ratio between R&D costs and value added, and also took into account the technologies used in the acquisition of capital and intermediate goods, Figure 1.

Figure 1

Classification of the technology sector according to the sectoral approach

High-technology
- aerospace;
- computers,
- office machinery;
- electronics-communications;
- pharmaceuticals

Medium-high-technology
- scientific instruments;
- motor vehicles;
- electrical machinery;
- chemicals;
- other transport equipment;
- non-electrical machinery

Medium-low-technology
• rubber and plastic products;
• shipbuilding; other manufacturing;
• non-ferrous metals;
• non-metallic mineral products;
• fabricated metal products;
• petroleum refining;
• ferrous metals

Low technology
• paper printing;
• textile and clothing;
• food, beverages, and tobacco;
• wood and furniture

Source: Hatzichronoglou, T., 1997.

The product approach. The proposed by Hatzichronoglou, T., 1997 high-tech product list is consistent with industry lists, as the products are classified according to the sector to which they belong. This list includes nine main products: aerospace, computers/office machines, electronics and telecommunications, pharmaceuticals, scientific instruments, electrical machinery, chemicals, nonelectrical machinery and armaments.

Also, researchers Wolf, M., & Terrell, D. (2016) formulated a universal and comprehensive term. In the interpretation of Wolf, M., & Terrell, D. (2016) high-technology industries are those which utilize a lot of workers from such specializations as Science, Technology, Engineering, Mathematics.

1.1.2 Evolution of the technology sector in the United States

In addition to defining the technology sector, it is crucial to examine its development in the US.

Technology is a crucial element for business expansion, growth, and competitiveness, making the technology sector an integral part of the US economy. The US has experienced a substantial technological transformation since 1990, which former Federal Reserve Chairman Alan Greenspan referred to as a "palpable historical change" (Bram, J., & Ploenzke, M., 2015).

Over 30 years, the US technology sector has experienced growth and significant contractions caused by various factors.

Charles Gascon and Evan Karson have analysed the US technology sector since 1990 (Gascon, C., & Karson, E., 2017). The first significant technological breakthrough occurred from 1990 to 2000. The authors note a significant employment growth in the industries of the technology sector during this period (+36%). In addition, the average weekly wages of tech workers increased 102% over ten years.

John Haltivanger, Ian Hathaway, and Javier Miranda also analysed changes in the US tech sector from 1978 to 2011. Still, they supplemented their analysis with a comparative study of general trends in the high-tech and private sectors (Haltiwanger, J., Hathaway, I., & Miranda, J., 2014). The authors are comparing the employment redistribution rate between the technology sector (sum of job creation and destruction rates) and the private sector. And they concluded that the redistribution of jobs in the private sector had a steady downward trend over the entire considered period of time. However, in the technology sector, there was a trend towards an increase in the redistribution rate until about 2000. Moreover, growth in the tech sector was particularly dramatic between 1996 and 2000.

This dramatic advancement in the technology sector has led to a bubble in the stock market since 1995. Between 1995 and 2001, there was a significant increase in Internet companies that went public. As a result, the shares of Internet companies were unjustifiably overvalued. Many economists have tried to justify such high prices by saying that the era of the "new economy" has arrived, but in reality, these new business models have proved ineffective. However, companies were spending money from the sale of shares on advertising and attracting new customers. At the same time, they continued to remain deeply unprofitable. On March 10, 2000, the Nasdaq Composite Index set a new all-time high. On the same day, a devastating collapse and the dot-com bubble burst. The bankruptcy of hundreds of Internet companies followed this.

Not surprisingly, that bubble led to a druidical drop in the numbers of IPOs, especially technology IPOs. In April 2012, former US President Barack Obama signed the Jumpstart Our Business Startups (JOBS) Act to revitalize the US capital market and promote active IPOs by emerging growth companies. This Act covers EGS companies. According to this Act, EGC companies have a right to disclose less financial information while conducting an IPO. At the same time, it is just a right, not a must, so companies may refuse this opportunity and disclose their financial data to the same extent as other non-EGS companies and compete with them on equal terms.

Jensen, M. R. (2015) proved that the opportunities that JOBS Act gave to EGC were a motivating factor to go public in 2013 and 2014. The fact that more companies wished to go public is the most apparent cause of the JOBS Act. But if JOBS Act is considered a factor that limits clarity and reduces visibility on the companies' performance, then there could not be only positive

consciousness. Many researchers studied the issue of information asymmetry caused by implication of JOBS Act rules. Barth, M. E., Landsman, W. R., & Taylor, D. J. (2017) investigated the extend of information uncertainty which caused by application of JOBS Act in public companies. They measured information uncertainty as IPO underpricing and post-IPO equity returns. To test the hypothesis about high underpricing issue, authors selected companies which became public after the date when JOBS Act entered into force. The authors found out that the implication of JOBS Act exemptions explained more than 40% underpricing of shares in the first days after IPO.

Since the bursting of the dot-com bubble, the technology sector has undergone significant transformations. Beginning in 2000, the sector transitioned from predominantly young firms to more established ones, distinguishing it from other sectors of the economy (Haltiwanger, J., Hathaway, I., & Miranda, J., 2014). Consequently, employment in the tech sector began to decline, with a 17.8% decrease from 2001 to 2004. In 2000, over 4% of people were employed in the technology sector, but this figure dropped to 3.4% by 2004 (Gascon, C., & Karson, E., 2017).

Despite the initial decline in employment, the technology sector experienced a resurgence in the late 2000s. From 2004 to 2014, the technology sector regained its share of employment and then some, accounting for 5.6% of total employment in 2014 (Gascon, C., & Karson, E., 2017). This recovery is largely attributed to the growth of mature technology firms, particularly in software and e-commerce, which have become dominant players in the industry. Moreover, the development of new technologies such as mobile computing and cloud computing has led to new opportunities for employment and innovation within the tech sector.

Since 2005, the technology sector has begun to recover slowly. However, the 2009 financial crisis prevented the tech sector from recovering.

Since the end of the Great Recession, the tech sector has seen robust employment growth and moderate wage growth. For example, from 2010 to 2015, the number of jobs in the industry increased by 20.3 per cent, compared with an increase in employment in the private sector of only 11.1 per cent (Gascon, C., & Karson, E., 2017).

Over the past few years, the landscape of the global economy has changed thanks to information technology. Many of the world's economies have embarked on a digital transformation, and large tech companies have become a significant drivers of progress and innovation. This shift in the economy's structure can be seen in the list of the most valuable companies in the world prepared by Goldman Sachs, Figure 1.

Figure 2

List of the most valuable companies in the world
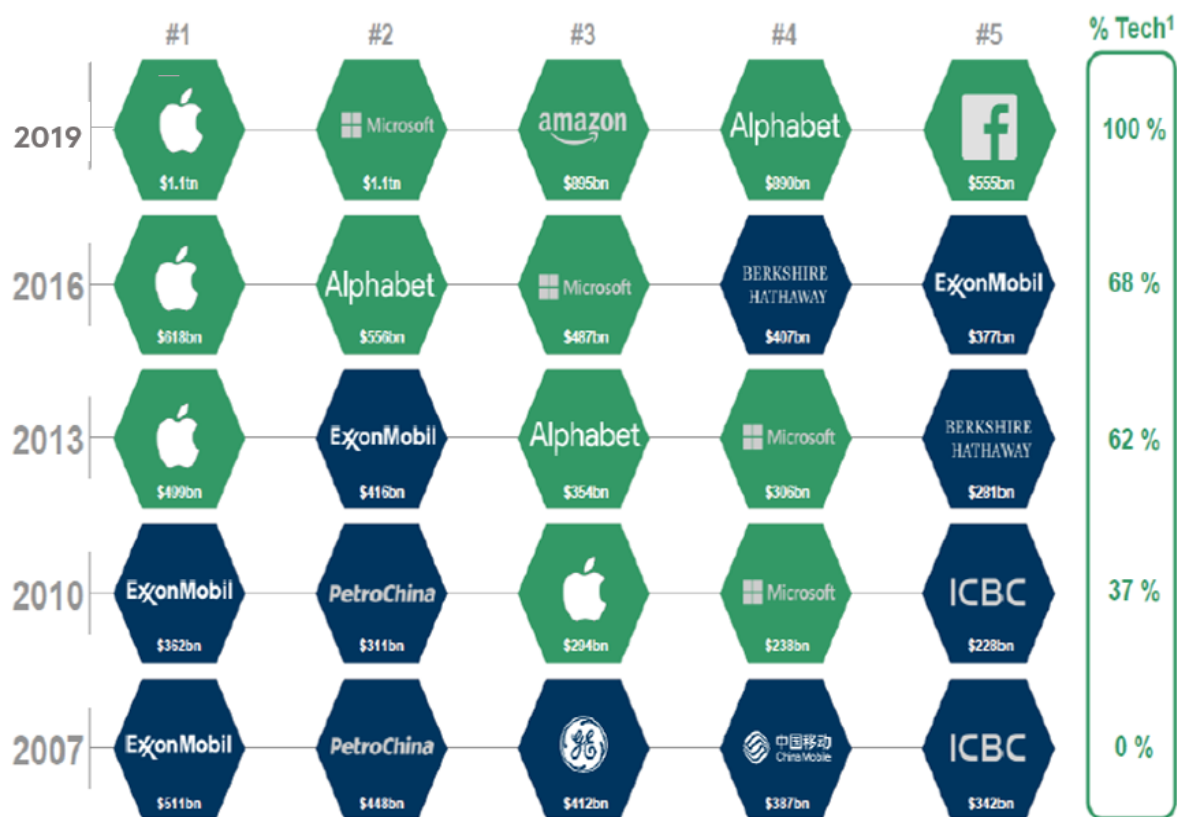
Source: Goldman Sachs. Internet Monthly Industry Update. December 2019.

Analysts in this report note the gradual transition of the IT sphere to a dominant position.

In summary of the literature reviewed, it can be concluded that defining the technology sector is a complex task, with varying definitions proposed by different authors. For the purposes of this research, the technology industry will refer to those that heavily rely on workers with expertise in Science, Technology, Engineering, and Mathematics (STEM), as defined by Wolf, M., and Terrell, D. (2016).

Over the last two decades, the US technology sector has experienced significant volatility but remains the most sought-after sector among all others in the country. Despite facing challenges such as the dot-com bubble burst and subsequent decline in employment, the tech sector has since recovered and become a dominant force in the industry, particularly with the growth of mature firms and advancements in new technologies. The continued growth and evolution of the technology sector are crucial to the development of the US economy and its competitiveness in the global market.

1.2. Theoretical aspects of Initial Public Offering: process description, advantages and disadvantages, reasons for going public

In light of the rapid economic growth of developing countries and the establishment of their stock markets, an increasing number of companies are utilizing Initial Public Offerings (IPOs) as a means of financing. Essentially, an IPO is the process by which a privately held company becomes publicly traded by offering new shares for sale on the stock market.

After a deep research review of the IPO process, there could be highlighted seven main steps in the process:

1. Several authors have examined the importance of **selecting a reputable investment bank as an underwriter for an IPO**, with many of them finding a correlation between underwriters' reputation and IPO underpricing. For instance, Hu et al. (2021) investigated the role of institutional investors in the Chinese growth enterprise market and ranked underwriters' reputations based on their total gross proceeds raised, number of IPOs managed, and revenue from IPO underwriting. The authors used a sample of ChiNext listed firms from 2009 to 2012 to examine the impact of underwriter reputation on IPO underpricing.

Similar findings were reported in other studies that examined IPO markets in different regions. For instance, Dimovski et al. (2011) explored the relationship between underwriter reputation and underpricing in the Australian IPO market. These studies emphasize the importance of selecting a reputable underwriter for an IPO, as it can have a significant impact on the success of the offering and the performance of the company's stock after the IPO.

2. The process of **due diligence** is crucial during an IPO, as underwriters and legal counsel investigate the company to identify and understand any potential risks. Due diligence is an essential factor that is considered in empirical research on underpricing. For instance, Ramsay and Sidhu (1995) conducted a study on the underpricing of Austrian companies' IPOs, with a focus on the associated costs of due diligence. The authors found that the average underpricing was between 11% and 14% in two samples of IPOs, based on the level of disclosure of the due diligence costs.

3. The process of **submitting IPO regulatory filings** involves the IPO team gathering and compiling all the necessary information required for IPO documentation. This includes drafting a letter of intent, preparing a Red Herring document, and completing S-1 paperwork that must be filed with the Securities and Exchange Commission (SEC).

4. The process of going on an **IPO roadshow** involves the company and underwriters promoting the shares to institutional investors to gauge interest and assess demand. The executives' performance during the roadshow can have a significant impact on investors' expectations and investment behaviors. To evaluate executives' emotions, scholars often analyze the language tone

of CEOs in online roadshows. For instance, Feng et al. (2022) discovered that negative emotions expressed by CEOs during roadshows lead to lower underpricing rates of IPOs. This finding is particularly valuable for companies with limited information disclosure.

5. The process of **setting the IPO price** is crucial and involves different mechanisms such as the book-building method, auction, and fixed-price mechanism, as described by Ritter (1998). The price-setting mechanism used can have a significant impact on the level of underpricing, and researchers aim to identify the best approach. Aggrawal (2003) conducted a study on the book-building mechanism and found a negative relationship between this method and post-IPO performance on the first day. In contrast, Gounlpolus (2006) found the opposite result when investigating the link between the fixed-price mechanism and IPO stock price performance.

6. The initial shares are released by underwriters on the day of the IPO when a **company goes public on the stock exchange.**

7. After the IPO release day, underwriters are granted a **25-day quiet period**, during which they can utilize various means such as lock-up periods and the green shoe option to influence the share price. The green shoe option is a provision in the underwriter agreement that allows underwriters to purchase up to 15% of shares at the offer price during the IPO. This enables the underwriters to stabilize share prices by controlling the supply of shares. The primary objective of underwriters is to sell shares as close to the targeted offer price as possible. If they anticipate high demand, they may sell additional shares to increase supply and stabilize the price closer to the offer price. Conversely, if they anticipate low demand, they may sell all issued shares plus the additional 15%, then buy back an extra 15% at the offer price to reduce supply and increase the price. The effectiveness of this method has been confirmed in Aggarwal's research "Stabilization Activities by Underwriters after Initial Public Offerings" (2000).

The lock-up period is one more commonly used after-market stabilisation tool. The lock-up period allows a company to have some time as a publicly traded company with the minimum amount of choppiness resulting from all these shares being dumped into the public market. There could be a fear in the market that if a lock-up period ends for a particular company, that is the day when the stock will probably go down. It is important to note that there is no proof that when a lock-up period ends, a stock will go down (Ofek, E., 2000). More shares will be available to be traded in the public markets, but that does not mean that people who have the option to trade these shares will sell.

Three reasons the lock-up period exists number:

1. To reduce the volatility of the stock in the market.

2. To create confidence in the company

3. For the underwriters to feel protected when taking the company public.

There are many advantages that companies can derive from conducting an IPO. The most significant benefit is raising capital directly during the offering and enabling easier access to capital in the future. However, the reasons for going public can vary significantly, depending on the entrepreneur and the company's goals. This section provides a summary and analysis of current debates regarding the reasons why firms choose to go public.

Academic theory suggests at least five motivations for going public that follow (Ritter, J. R., 1987).

Overcoming financial constraints. The key benefit of a public offering is obtaining a new source of funding. Bank loans are often the primary source of financing for the company's activities. However, credit interest rates are often high, and an alternative, more profitable way to raise capital is the initial sale of shares.

Windows dressing. An additional incentive for an IPO is a highly overvalued market, i.e. investors are optimistic about companies in the industry and value companies unreasonably high. At such times, the number of companies wishing to conduct an IPO increases significantly. The reason for the growth in the number of public companies is that companies want to take advantage of favourable conditions and attract more capital, as well as increase the value of the business.

Diversification of the shareholder portfolio. Another significant incentive for a company to conduct an IPO may be the desire of investors to diversify their portfolios. Investors can sell their shares in an IPO company and buy shares of other companies with the money received.

Pagano argued that companies with higher risk profiles are more likely to pursue an IPO, as it allows for greater portfolio diversification for investors. In such cases, the company owners may seek to sell significant portions of their shares during the placement. Additionally, an IPO can serve as a stepping stone for a company to be sold in the future.

There are also disadvantages to going public. The primary disadvantages are the substantial expenses involved in the IPO process and the expenses of disclosing information.

Administrative expenses. When a company sells shares, they have to pay for things like lawyers and registration fees. There are also ongoing costs like audits, certifications, and fees to keep the shares on the stock exchange. These costs can be more expensive for small companies. Ritter said that in the US, the fixed costs are around $250,000 and the variable costs are 7% of the total cost of selling shares.

Loss of confidentiality. Disclosure requirements lead to losses for the company in terms of competitiveness. Information secrecy (R&D volumes, marketing strategies) can be critical to maintaining a competitive advantage. Also, the need for information disclosure increases the possibility of rising tax costs. The high price of losing confidentiality can reduce the likelihood of a firm going to IPO.

When R&D costs are high, companies tend to establish secure, private relationships with creditors to avoid information leakage. Therefore, if the hypothesis is correct, then for high-tech industries, the probability of an IPO should be lower according to this logic.

Pagano, Panetta, and Zingales attempted to uncover the true motivations behind IPOs in their article "Why Do Companies Go Public? An Empirical Analysis" (Pagano, M., Panetta, F., & Zingales, L., 1998). The authors analyzed the performance indicators of a company both before and after the IPO to gain insight into its incentives for going public. They also examined the company's investment decisions and financial policies after the IPO, as these can reveal motives for going public that were not apparent before.

The work is carried out based on Italian companies' data from 1982-1992. To identify the reasons that influenced the IPO, the authors build a probit model, where the probability of a public offering depends on the following factors:

1) the size of the company (sales volume); 2) capital investments; 3) growth rates; 4) return on assets; 5) the average Market-to-Book ratio in the industry, which determines the state of the entire industry; 6) the cost of capital for the company relative to the average cost of the loan; 7) the index of concentration of banking services, depending on the number of banks from which the company can borrow.

To analyse the company's performance after going public, the authors build a regression for each indicator:

1) ROA; 2) capital investments; 3) financial leverage; 4) investments; 5) raising equity capital; 6) borrowed capital; 7) dividends; 8) tax; 9) growth rates; 10) interest rates; 11) index of concentration of bank services; 12) the number of creditor banks.

The authors showed that the main factors affecting the likelihood of an IPO are the significant growth opportunities for companies in the industry and an enormous need for additional capital for investments. Entrepreneurs also use favourable market conditions to increase the company's value and raise funds. The likelihood of going to an IPO positively depends on the size of the company, its growth rate and profit. There is a difference in the motives for going to IPO for independent companies and subsidiaries of large companies that have access to the cheap capital of the parent company. For independent companies, an IPO is more likely after a period of significant investments and rapid growth since An IPO leads to a decrease in leverage and investment. Thus, for them, an IPO is a way to change a company's capital structure. For subsidiaries, an IPO is an opportunity to get new funds and use "windows of opportunity".

After the IPO, there is a significant decrease in profits which may be due to the manipulation of financial reporting before the IPO (window-dressing) or the problem of unfavourable selection. Contrary to expectations, there is a decline in investment after the IPO,

which goes against the motive of meeting capital requirements for growth. However, leverage decreases, indicating that funds raised from the IPO are mainly used to pay off debt.

The analysis also shows a decline in bank lending rates and concentration of debt. Companies are making more tax payments. The main motive for an IPO is the desire of major owners to sell part of their stake, as evidenced by a higher probability of a change in control three years after the IPO compared to other companies in the industry.

Kim and Weisbach came to a completely different conclusion in their article "Do Firms Go Public to Raise Capital?" (Kim, W., & Weisbach, M., 2005). In work, it was obtained that raising capital is a fundamental reason for conducting an IPO. Therefore, researchers investigate the true motives behind the IPO by comparing companies that go public with the sale of newly issued shares to companies where shareholders sell part of their own previously issued shares.

The study uses data from 16,958 companies from 38 countries that have gone public. Research shows that the structure of an initial public offering can reveal the reasons that prompted a company to exit with an initial public offering. For example, if a company places a new issue of shares during an IPO, it increases its share capital, raises additional funds and changes the financial structure of the company. However, placing shares owned by the original shareholders does not entail expanding the company's capital. Still, it is conditioned by the desire of the owners to diversify their investments and increase the liquidity of their capital.

The authors concluded that the company's IPO with shares of a new issue is associated with a subsequent increase in income, debt payments, cash growth, and further attraction of capital from published placements. Since most companies come out with new issue shares, attracting new capital for such companies is an important moment of IPO. The authors showed that in this case, the capital raised is mainly spent on R&D, capital investments and long-term debt. The company does not raise additional funds by placing primary owners on the IPO. The incentive to go to IPO for such firms helps increase their shares' liquidity.

Haugbegart and Hulle conduct research very similar to Kim and Weisbach's but independent research (Huyghebaert, N., & Van Hulle, C., 2006).

The structure of the placement of shares of Belgian companies going to IPO is considered to identify the true motives for going to IPO. Therefore, the authors used OLS regression analysis and two-step OLS to determine how the costs and benefits of going to an IPO affect the structure of the offer of shares at an IPO. In this study, the company's performance is the explanatory variable, and the percentage of primary and secondary shares at issue is dependent.

Regressions give the following results:

- The share of newly issued shares is higher if companies need additional funding, want to use growth opportunities, reduce the percentage of debt, and use a positive stock market environment. Young and fast-growing companies often come out with new issue shares.

- Regression analysis of IPOs of original shareholders shows that, contrary to expectations, diversification is not an important reason for IPOs and shareholders of large well-known companies to sell a larger share of their shares than shareholders of riskier companies.

As a result, the authors concluded that owners often take a company to an IPO to sell it. At the same time, the probability of a change of control is lower for firms with high leverage and high profitability, and higher for companies that go to IPO with only shares of original shareholders.

According to research, companies that go public with a small number of newly issued shares and a large percentage of original shareholders have reduced incentives to use capital raised for growth, as their motive is to increase liquidity through the placement of shares. This is why famous large companies typically offer only secondary shares for IPOs. The desire to use "windows of opportunity" also plays a significant role in determining the volume of shares placed. Many companies that only go public with a new issue may re-enter the market after increasing liquidity to sell shares at a higher price.

Thereby, IPO is a complicated process with many steps that should be considered and analysed. There are advantages and disadvantages of going public, and the company should objectively evaluate its capabilities before conducting an IPO; otherwise, consider other options to attract investments.

1.3. Impact of external factors on post-IPO performance

Many researchers investigate the impact of different external factors on the profitability of stocks after the IPOs. In addition, the effect of external factors is a common subject of many types of research conducted by analysts of large investment banks such as Bank of America, JPMorgan Chase, and Goldman Sachs. Among the scope of factors, researchers pay more attention to macroeconomic factors, factors related to placement and government regulation's impact.

1.3.1. impact of factors related to the placement on post-IPO performance

Several studies in the literature on IPOs have emphasized the significance of information asymmetries between informed and uninformed investors. Subscribers who are more

knowledgeable about the quality of companies at the time of their IPO are more likely to invest in quality issues (Kumar, Langberg, & Sivaramakrishnan, 2016).

One of the most complex works devoted to our research topic is the article by Bong Chang Y (Chang, Y. B., & Kwon, Y., 2020). The main advantage of this work is that there is a separate technology sector that is compared with other sectors in general (non-IT). In this paper, the authors study the influence of external factors on IPO profitability in the short and long term. As an external factor, the authors use an indicator of the popularity of queries about the company in Google through the Google Trends service.

The authors' sample includes companies that conducted IPOs between 2004 and 2014. The authors concluded that the external factor of interest in a company is more significant for technology companies when analysing short-term profitability after an IPO. However, for long-term profitability, no association was found with interest in the company through search terms.

The authors found that IT companies tend to be underpriced more than non-IT companies. While they acknowledged that underpriced IPOs may eventually return to their fundamental value, they also noted that early-stage attention and lower initial offering prices can be crucial for a company's future success. Therefore, the study suggests that the impact of investor attention is significant and long-lasting for underpriced IPOs.

Another paper, which also examined the impact of search queries on IPO returns, looked at the Baidu Index instead of Google Trends (Zhao, R., Xiong, X., & Shen, D., 2018). The sample includes 28 Chinese companies in China's Growth Enterprises Market 6 index.

Figure 3

Illustration of the indicator of interest in a company through the Baidu Index
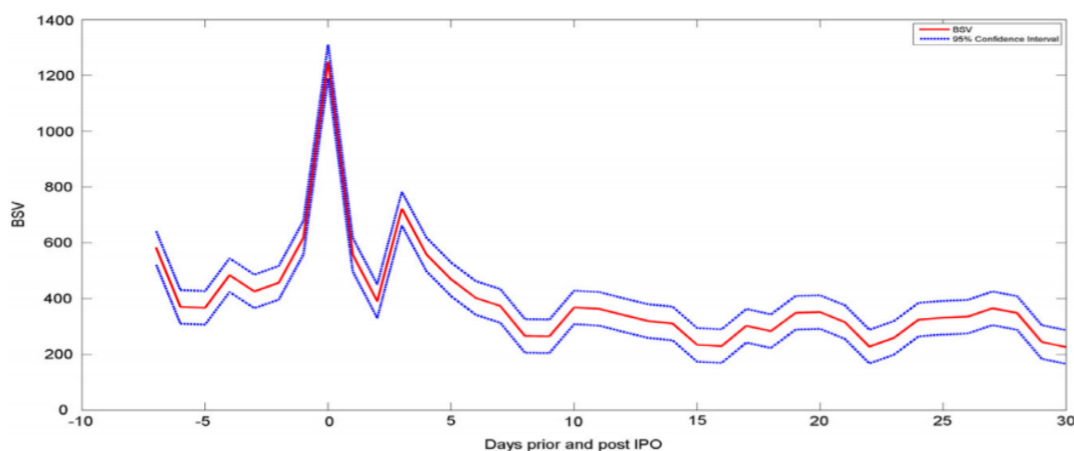
Source: Zhao, R., Xiong, X., & Shen, D., 2018.

In contrast to the previous work, the authors illustrate the indicator of interest in the company in the chart, Figure 2.

The graph above shows that the peak of interest in the company occurs at the time of the IPO, and then interest begins to fade and eventually stabilises. As a variable in their models, the authors calculate the indicator as the difference between the Baidu Index 7 days before the IPO and 30 days after the IPO and investigate its impact on the short-term (1 day after the IPO) and long-term log profitability (90, 180, 360, 720, 900 days). As a result, the authors concluded that the indicator of interest in the company is a significant determinant for short-term profitability and also insignificant for long-term profitability.

In the work of Swamy V., the authors also investigate the relationship between investor interest and company profitability (Swamy, V., Dharani, M., & Takeda, F., 2019). The authors use a sample of 500 Indian companies from the S&P BSE 500 index for 2012-2017 and calculate the indicator of interest in the company through Google Trends data. Like previous authors, the researchers concluded that there is such a relationship, supplementing the CAPM model with an additional factor in the form of a change in the indicator of the company's popularity.

While examining other external factors that can affect the profitability of companies, the authors of many studies highlight the reputation of underwriters who conduct IPOs.

So, in the work of Neupane S., the reputation of underwriters is binary-defined as participation in large or small IPOs by the size of the offering (Neupane, S., & Thapa, C., 2013). Interestingly, the authors also analyse pre-IPO returns. In other words, how underwriters revise the price of shares even before the formal listing on the exchange. It is noted that underwriters with low reputations do not have good ties with large institutional investors, so they often fail to raise the price before the official listing. This is in line with the findings in Wang W's paper, which states that reputable investors are more likely to renegotiate the original price corridor (Wang, W., & Yung, C., 2011). Even though these underwriters try to maintain as much profitability as possible before going public, they still drive up the value of the stock by sending a signal to the market about a qualified IPO and the company's quality.

The paper of Kirkulak B. investigates the impact of banks' reputation on IPOs, which analyses Japanese companies (Kirkulak, B., & Davis, C., 2005). The reputation of banks in two ways: as a coefficient (from 1 to 24) equal to the weighted average appearance of a bank in a particular order among all underwriters for an IPO, and through a rating by the amount of capital raised. In addition to the reputation of banks, the authors introduce an additional factor of demand for securities, concluding that the relationship between the reputation of underwriters and the return one day after the IPO exists when there is a great demand for shares.

1.3.2. Impact of macroeconomic factors on post-IPO performance

One of the most comprehensive analyses of macroeconomic factors as key factors affected post-IPO performance was conducted based on port-related IPOs (Satta, G., Notteboom, T., Parola, F., & Persico, L., 2017). This research, dated 2011 and in the scope of consideration, has included around 100 market players in the port industry worldwide. For the aims of this study, ordinary least squares (OLS) regression analysis was performed to test a set of 7 hypotheses. The authors tested three macroeconomic factors: characteristics of the financial markets, institutional factors, and industry specifics. In addition, the authors decided to try different measures of post-IPO performance, specifically Cumulative Average returns (CAR) and Buy and Hold Average Returns (BHAR). For this research purpose, authors calculated CARs and BHARs for 24 and 36 months after IPO. So, in total, four models were tested separately. The authors also included additional control variables to enhance the model's explanatory power. To a significant extent, these control variables relate to the group of internal factors and, to a minor time, placement characteristics. As a result, three main predictors turned out significant and reliable for all four models, but the highest explanatory power they had for models where CAR was used as a measure of post-IPO performance (for CAR 24 months – $R^2 = 0.339$; for CAR 36 months – $R^2 = 0.414$).

Tran, A and Jeon, B. (2011) conducted a study to explore how macroeconomic factors affect post-IPO performance. The study involved analyzing IPO activities in the US between 1970 and 2005 using econometric techniques. The authors used various measures, such as the Industrial Production Index, S&P500 index, Consumer Price Index, Market Volatility, and Market Liquidity, to predict the impact of macroeconomic factors on IPO activities. They found that there were long-term relationships between IPO activities and selected macroeconomic predictors, with the Stock Market Performance and volatility having the most significant impact on post-IPO performance. Although three models were built, none of them had an R2 value higher than 0.14.

A study conducted by Ameer (2012) aimed to analyze how macroeconomic factors influence the number of IPOs in Malaysia. In particular, the author investigated the impact of interest rate, foreign net private equity flows, industrial production index, bank credit, and S&P500 index on IPOs. The findings revealed that the nominal interest rate, industrial production, and initial IPO yield have a significant effect on the number of IPOs. Moreover, trace tests and maximum eigenvalue tests confirmed a long-term equilibrium relationship between the interest rate, industrial production, private bank credit, and the number of IPOs.

Two major external factors can be defined: factors related to the placement, such as underwriters' reputation and investors' attention, and macroeconomic factors (S&P500 index, inflation, GDP and others).

1.4. Impact of internal factors on post-IPO performance

The analysis of all kinds of internal factors of companies on stock returns has been the subject of many works conducted by scientific researchers, as well as reports from bank analysts.

The most comprehensive study of the impact of internal factors of companies on IPO returns is the Goldman Sachs report: What matter for IPOs from 2019 (Goldman Sachs, 2019). In this study, the bank's analysts examined more than 4000 IPOs over the past 25 years, dividing them into three groups (1995 - 2000, 2001 - 2009, 2010 - 2019). The report analyses the following fundamental factors:

1) The rate of revenue growth (CAGR);

2) Path to profitability (GAAP net income);

3) Valuation (NTM EV / sales in the first quarter);

4) Size (market capitalisation);

5) Age (age of firm at IPO);

6) Industry.

The paper notes that for 1995 - 2000, only 17% of companies could overtake the Russell 3000 index within 36 months after the IPO. This figure is 43% and 33% for 2001 - 2009 and 2010, respectively. Below is a table with factors indicating certain factors' significance.

Realised sales growth from year 1 to year 3 was the only variable analysed in the paper that was a significant indicator of three-year outperformance for all three IPO periods. Also, companies in the group 2010 - 2019 with an average revenue growth rate of 20% are more likely to overtake the Russell 3000 index.

There can be noticed trend towards an increase in the number of unprofitable companies at IPOs (only 26% of all IPOs in 2018 were profitable), mainly due to technology companies. Interestingly, in the entire sample, the profitability factor 1 year after the IPO with a negative sign turned out to be significant. In other words, investors punished companies for profitability and lack of investment in growth. First-year profitability had no discernible impact on the likelihood of IPO outperformance during the first 36 months. But year two profitability was an essential indicator of 36-month outperformance for new offerings during 2001-2009 and offerings completed since 2010. Finally, year three profitability mattered for IPO outperformance during all three cycles.

IPO equity capitalisation relative to the median S&P 500 firm was not a significant determinant of the likelihood of three-year outperformance.

Thus, to summarise all the results obtained in this study, it can be concluded that investors should focus on firms generating rapid sales growth during the first three years rather than

prioritising near-term profitability. However, most outperforming IPOs post positive net income by year three.

Speaking about non-financial factors, Wilbon studied the relationship between a company's competitive position in the market and profitability after IPO in the example of 168 companies that entered the market in 1992 (Wilbon, A. D., 2003). The authors divided the companies into three groups (pioneers, potential leaders, and followers) based on an analysis of company reports and news reports about them. The study showed pioneer companies performed better than other groups in the long run. In general, it can be argued that investors analyse a company's competitive position in the market and try to select companies with the highest barriers to entry in their markets due to unique technologies and a unique selling proposition.

One of the closest investigations to our research topic was conducted by Korean scientists Yunhee Kim and Almas Heshmati (Kim, Y., & Heshmati, A., 2010). After the financial crisis in Korea, IT start-ups have played an essential role in rebuilding the Korean economy by introducing innovative technologies and creating new jobs. And many of them decided to become public.

The authors come to the following conclusions. First, a patent positively affects the performance of firms after an IPO and the growth of firms before an IPO. Second, faster technology acquisitions through a technology alliance positively affect IPOs, regardless of in-house technology. Third, focusing on core technologies instead of diversification can accelerate the maturation of startups. This indicates that an effective start-up strategy is critical to its performance and increases creditworthiness and market confidence.

After analysing the articles and reports that study the influence of internal factors on profitability, it can be said that the key factors are revenue growth and marginality. This makes us wonder if these factors explain a company's valuation multiples.

There is also an unofficial metric called the Rule of 40. The essence of the metric is that the ideal balance of revenue growth and marginality is found when the sum of these indicators is 40 or more than 7. For example, young companies must significantly compensate for their losses to achieve this indicator, and the more mature, on the contrary, must pay for the lack of growth by increasing margins.

The market correction in mid-2019 also caused technology company multiples to decline. Analysts at Goldman Sachs analysed to identify the critical factors of this decline and concluded that the multiplier fell more strongly for companies with a higher revenue growth rate in the last quarter.

Figure 4

Change in EV / Revenue multiplier versus revenue growth rate
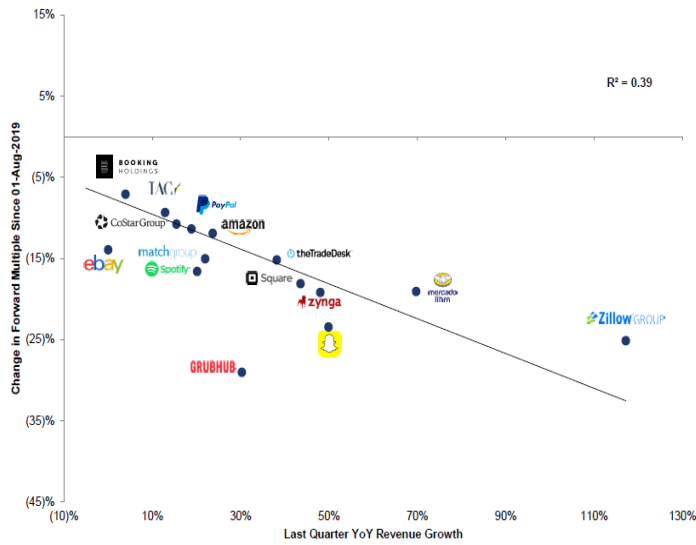
Source: Goldman Sachs. Internet Monthly Industry Update. December 2019.

Analysts have called this phenomenon "Run to Safety" because in the face of uncertainty in the market, investors do not intend to stay with risky stocks, which are characterised by a tremendous growth rate, but no profit.

Another model confirms this fact:

Figure 5

Change in EV / Revenue multiple from EBITDA margin
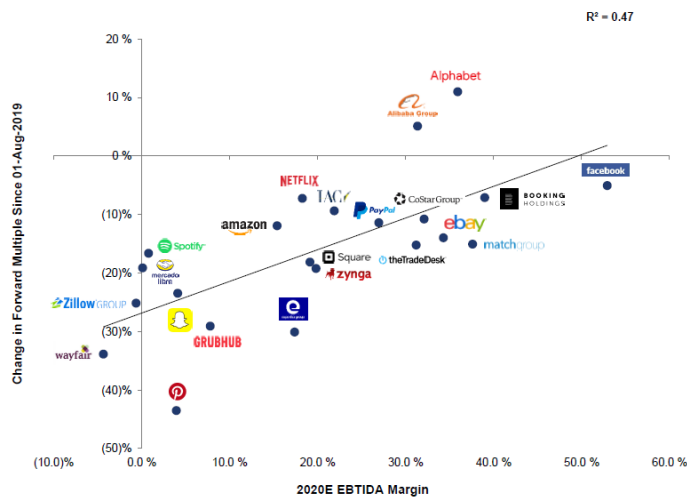
Source: Goldman Sachs. Internet Monthly Industry Update. December 2019.

Investors have rethought their approach to valuing companies and shifted their focus to those with a profit. And the higher the profit, the less the multiplier decreases during the market correction.

Fisch, C., Meoli, M., Vismara, S., & Block, J. H. (2022) conducted research that differs from other research related to internal factors. The authors conducted analyses covering 1510 European IPOs between 2002 and 2015 and found a positive relationship between trademark breadth and firms' IPO valuation and post-IPO performance. Using real options theory, they show that a trademark latitude is an option that appears to be valued by IPO investors and is associated with higher performance.

1.5 Post-IPO performance in the face of economic instability

Within the frames of this study, it is important to consider post-IPO performance in conditions of different economic instabilities. Since the economic instability over the past 30 years has not only been caused by the COVID-19 pandemic, but it is also necessary to consider other significant events that have affected global financial markets.

Impact of financial crises on post-IPO performance has been investigated by many researchers (Nivorozhkin, S., & Louzis, Y., 2011; Deng, X., Li, J., & Zhou, J., 2016)

Nivorozhkin, S., & Louzis, Y. (2011) conducted a research on UK companies that went public between 2007 and 2010. The authors aimed to compare the post-IPO performance of companies that went public before the 2008 financial crisis and its aftermath in the United Kingdom. The authors found a significant decline in post-IPO performance of companies that IPOed in the post-crisis years compared to companies that IPOed in 2008-2010.

The authors used various factors that reflect post-IPO performance, such as companies' average annual return for the post-IPO period, market capitalization, return on assets, return on sales, liquidity. All these factors have seen a decline at a significant level. For example, the average annual return of companies that went public after the crisis was 6.8%, which is significantly lower than the average annual return of companies that went public before the crisis (12.1%).

In addition, the authors note that there may be other factors influencing their performance between companies that went public before the crisis and those that went public after the crisis that were not accounted for in the study. One such factor can be the industry in which the company operates. This is because different industries have been damaged to different degrees and this may explain some of the performance differences between companies that went public before and after the crisis.

A more extensive investigation was conducted by Deng, X., Li, J. and Zhou, J. (2016). Using regression analysis, the authors examined the impact of the financial crisis on the post-IPO

operations of 693 American companies. The authors confirmed the hypothesis that the financial crisis has a strong impact on the operational activity of companies that have carried out an IPO. These companies are experiencing deteriorating profitability and lower levels of effective asset utilization. These results are important for investors when making investment decisions in times of crisis.

Except financial crisis, authors already started to investigate and evaluate impact of COVID-19 on IPO process in general, stock market performance (Lyocsa et al., 2020; Salisu and Akanni, 2020) and post-IPO performance of companies before and after COVID-19 (Nisa, N., & Nawaz, A., 2021, Mazumder, S., & Saha, P. (2021).

After the onset of COVID-19, the authors became interested not only in general changes in IPOs, such as issue size and number of IPOs, but also in issues of underpricing. Using the Ostroma-Rend model, Nisa, N., & Nawaz, A., 2021 analyzed the underpricing problem of US companies in 2020. On a sample of 58 IPOs between February 1, 2020 and August 31, 2020, the authors estimated the rate of IPO underpricing. The study found that underpricing of IPOs increased during the pandemic, which may have been due to increased investor risk and reduced demand for IPOs during periods of uncertainty.

The review of academic literature reveals that despite the many challenges the US economy has experienced over the last two decades, the technology sector remains an important and value-creating sector. While there are many different sources of funding available, conducting an Initial Public Offering (IPO), despite its disadvantages, is considered one of the most preferable ways to raise funding for technology companies in the US.

Investors who are interested in technology companies pay attention to both internal and external factors. Among the internal factors, investors look for a company's good financial position, including healthy balance sheets, sufficient liquidity, and manageable debt levels, as well as its growth and profitability. Two major external factors can be defined: factors related to the company's placement, such as underwriters' reputation and investors' attention, and macroeconomic factors such as the S&P 500 index, inflation, GDP, and others.

2. DATA DESCRIPTION AND THE RESEARCH METHODOLOGY

2.1 Sample source and selection criteria

A sample of USA trading IPOs issued from January 1, 2017, to December 31, 2021 will be used to examine how different factors impact post-IPO performance. The Bloomberg database is used for sample creation purposes. The sample selection process is described in Table 1.

Table 1

Sample selection criteria

Total number of trading companies in the raw sample	183280
Date Range: Custom (from January 1 2017, December 31 2021)	*37786*
Offer Stage: (Trading)	*34963*
Offer type: IPO	*9108*
Country/Region: United States	*1175*
Industry: Technology (excluding Office/Business Equipment)	*177*
Final sample (after removing IPOs where data is not available)	**107**

Source: Author's development.

It is worth to look at the sample and to figure out companies from which categories the sample include as well as to look at descriptive statistics. Further it can help to interpret result more properly.

There are sub-categories to Technology sector in the Bloomberg classification. The distribution of companies by sub-categories as a percentage is given below, both for the general sample and in annual breakdown.

Figure 6

Distribution of companies by subcategories in industries

■ Software
■ Entertainment Content
■ Semiconductors
■ Other

5% 2%
14%
107 companies
79%
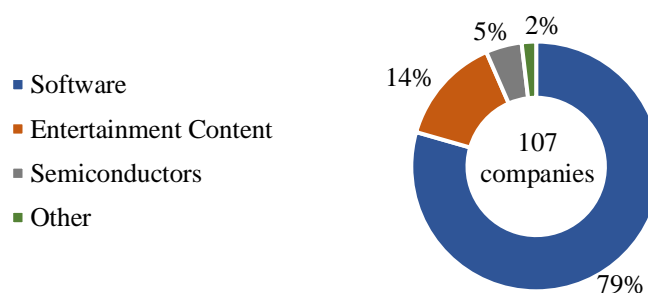
Source: Author's development based on Bloomberg database informationю

Figure 7

Distribution of companies by subcategories in industries
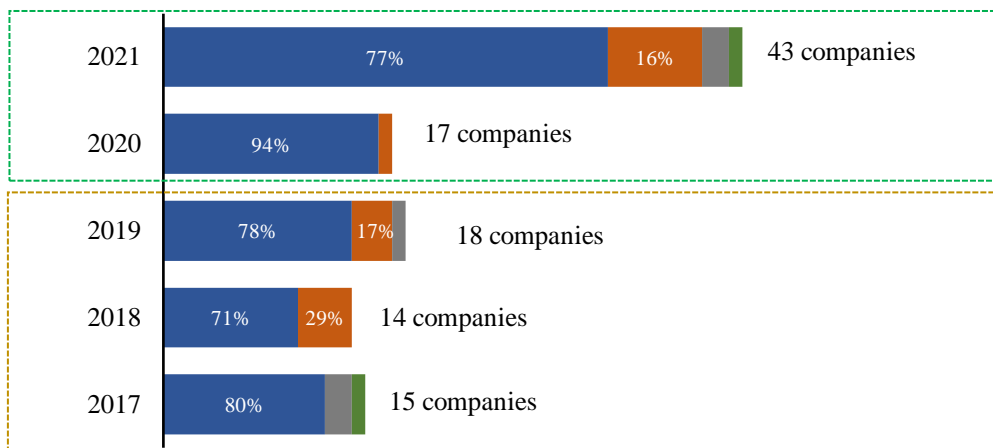
Source: Author's development based on Bloomberg database information.

Using Bloomberg classification, it could be seen that a major part of the whole sample relates to Software (79%). 14% accounts for Entertainment Content companies and only 5% of companies producing Semiconductors. This percentage pattern persists when considering the sample by years.

2.2 Research variables description and descriptive statistics

The literature analysis shows that many researchers have studied the impact of wide range factors on post-IPO performance. However, only a few studies include analyses of technology companies as an isolated industry. Moreover, all these studies have many limitations and consider either internal or external factors.

The main limitation of reviewed studies that examine post-IPO performance is that they don't consider companies from the technology sector in isolation. But it is essential to notice that, from different perspectives, technology companies significantly differ from other industries. For example, most technology companies do not become profitable in the first years of their establishment and on the top of maturity. But such companies, in most cases, generate vast streams of revenues. So, it is hard to say that investors would consider profitability equally as a decision-making driving factor before buying shares.

Table 2 presents external and internal factors that this research will consider and test.

Table 2

Description of independent variables

	Factor		Metric	Source
Dependent variables	**Post-IPO performance**	Post-IPO performance	- The 1st day Initial Return after IPO (Offer_to_1st_close) - The 6-month Initial Return IPO after IPO (Offer_To_Month6)	Bloomberg
Internal factors	**Issuer characteristics**	Issue size	- The gross proceeds from the offering (Offer_Size)	Bloomberg
	Essential financials	Revenue	- Revenue at fiscal year before IPO date (Revenue) - CAGR of Revenue for 2 years before IPO (CAGR_Revenue)	Bloomberg
		Profitability	- EBITDA Margin Ratio at fiscal year before IPO date (EBITDA_Margin) - Average of EBITDA Margin Ratio for 2 years before IPO (Average_EBITDA_Margin)	Bloomberg
		Cash flow	- Cash Flow Net Income at fiscal year before IPO date (CF_Net_Income) - CAGR of Cash Flow Net Income for 2 years before IPO (CAGR_CF_Net_Income)	Bloomberg
		Total liabilities	- Total liabilities at fiscal year before IPO date (Total_Liabilities) - CAGR of Total liabilities of 2 years before IPO (CAGR_Total_Liabilities)	Bloomberg
		Equity	- Equity at fiscal year before IPO date (Equity) - CAGR of Equity for 2 years before IPO (CAGR_Equity)	Bloomberg
		Total assets	- Total assets at fiscal year before IPO date (Total_Assets)	Bloomberg

			- CAGR of Total assets for 2 years before IPO (CAGR_Total_Assets)	
	Capital structure	Liquidity	- Current Ratio at fiscal year before IPO date (Current_Ratio) - Average of Current Ratio for 2 years before IPO (Average_Ratio_Assests)	Bloomberg
		Cash usage	- Sales and marketing costs at fiscal year before IPO date (SM_Expense) - CAGR of sales and marketing costs for 2 years before IPO (CAGR_SM_Expense) - Research and development expenses at fiscal year before IPO date (RD_Expense) - CAGR of research and development expenses for 2 years before IPO (CAGR_RD_Expense) - Selling, general and administrative expense at fiscal year before IPO date (Selling_Admin_Expense) - CAGR of selling, general and administrative expense for 2 years before IPO (CAGR_Selling_Admin_Expense)	Bloomberg
External factors	**Macroeconomic factors**	Stock market performance	- S&P500 index (SP_Index)	Nasdaq
		Inflation	- Consumer price index (CPI YoY Index)	Bloomberg
	Factors related to the placement	Underwriters' reputation	- Total underwriters' rating (UR)	Prospectuses

Source: Author's development based on the data presented in the literature review chapter.

Dependent variables. To calculate post-IPO performance, two metrics are supposed to be used.

Initial Returns (Offer_to_1st_close; Offer_To_Month6) metric was selected to measure short post-IPO performance and will be calculated as follows:

$$IRi = \frac{CP_i - OP_i}{OP_i} ,$$ (1)

where CPi (closing price) is the last price of a company i at which the stock traded during the 1st day or 6th months after IPO, OPi is the offering price, and IRi is the Initial Returns of firm i.

Independent variables. All definitions of variables with the source "Bloomberg" (Table 2) were taken directly taken from the Bloomberg terminal to keep initial meaning and interpretation. In this study, relative indicators will be used in addition to absolute ones. Compounded annual growth for two years before IPO will be calculated for Revenue, Cash flow, Total liabilities, Equity, Total assets, and Cash usage variables. Average for two years will be calculated for EBITDA Margin Ratio and Current Ratio.

The internal factors are divided into three subgroups: issuer characteristics, operational performance, and capital structure.

The 1st subgroup of internal factors, "Issuer characteristics", includes the following factors:

Issue size (Offer_Size). It measures the total amount of proceeds raised during the IPO. It was calculated by multiplying the total number of issued shares by the offering price.

Capitalisation (Total_Capital). In the prospectus, companies must disclose their capitalisation for the fiscal year before the IPO. In addition, the methodology for calculation is universalised so that the capitalisation of different companies can be compared to each other.

The 2nd subgroup of internal factors, "Essential financials", includes the following factors:

Revenue (Revenue; CAGR_Revenue). Amount of sales generated by a company after deducting sales returns, allowances, discounts, and sales-based taxes.

EBITDA Margin Ratio (EBITDA_Margin; Average_EBITDA_Margin). Measure, in percentage, calculates the relation of Earnings Before Interest, Taxes, Depreciation and Amortisation to Revenue. Calculated as:

$$(EBITDA / Revenue) * 100\%$$ (2)

Cash Flow Net Income (CF_Net_Income; CAGR_CF_Net_Income). Net profit after all expenses have been deducted. Includes the effects of all one-time, non-recurring, extraordinary gains, losses, or charges, discontinued operations, changes in accounting standards and minority interests.

Total liabilities (Total_Liabilities; CAGR_Total_Liabilities). Sum of all current and non-current liabilities as reported on the Balance Sheet.

Equity (Equity; CAGR_Equity). Firm's total assets minus its total liabilities as reported on the Balance Sheet.

Total assets (Total_Assets; CAGR_Total_Assets). The total of all short and long-term assets as reported on the Balance Sheet.

The 3rd subgroup of internal factors, "Capital structure", includes the following factors:

Current Ratio (Current_Ratio; Average_Ratio_Assests). The ratio indicates the company's ability to pay back its short-term liabilities with its short-term assets. Calculated as:

$$Current\ Assets\ /\ Current\ Liabilities \tag{3}$$

Sales and marketing costs (SM_Expense; CAGR_SM_Expense) Costs that a business incurs to market and distribute its products that include advertising, sales commissions and salaries, sales office expenses, and shipping charges.

Research and development expense (RD_Expense; CAGR_RD_Expense). A company has incurred research and development expenses adjusted by one-time charges such as restructuring, mergers and acquisitions, gain on sale of subsidiaries, and other nonrecurring activities.

Selling, general and administrative expenses (Selling_Admin_Expense; CAGR_Selling_Admin_Expense). The sum of all direct and indirect selling expenses (such as advertising expenses) and general and administrative expenses (including rental expenses).

External factors include three subgroups: macroeconomic factors, government regulations and factors related to replacements of stocks.

The subgroup of macroeconomic factors includes:

S&P500 index (SP_500). Index S&P 500 was chosen to measure stock market performance at the IPO date. In addition, daily historical data of the S&P 500 index was received from the Nasdaq database.

Consumer price index (CPI). The price of a weighted average market basket of consumer goods and services purchased by households.

Total underwriters' rating (UR). So-called League Tables will be used to assess underwriters' reputations. League Tables represent the ranking of banks. They are published every

year. This rating can be compiled based on the number of deals or placement volume. The current research will use League Tables for banks that participated in the IPO of technology companies. First, each underwriter will be assigned the score according to the corresponding year rating table. Then, the total score for all underwriters involved in the IPO process will be calculated for each company in the sample. If bank underwrites doesn't present in the rating, the 0 points will be assigned. The greater the total amount of scores, the greater underwriters' rating. The lists of Underwriters and their total rating calculations provided in the Annex 2.

In the tables 3 and 4 presented descriptive statistics for each variable.

Table 3

Descriptive statistics for the variable of the period 2020-2021

	Maximum	Minimum	Mean	Median	Std. Deviation
Offer_to_1st_close	201.1	-21.7	35.1	28.6	42.7
Offer_To_Month6	333.9	-80.7	22.4	1.4	79.3
UR	794.0	0.0	370.0	406.5	203.4
SP_500	4662.6	2467.5	3916.6	4001.9	500.0
CPI_YoY_Index	6.8	0.6	3.6	3.4	2.0
Current_Assests	965.1	3.2	216.6	142.7	207.5
Current_Ratio	9.4	0.4	1.9	1.5	1.5
EBITDA_Margin	43.0	-453.5	-26.4	-6.0	73.4
Equity	1166.6	-540.5	183.7	90.3	321.0
Offer_Size	3864.0	5.4	591.8	424.5	621.0
CF_Net_Income	103.1	-348.5	-55.9	-39.9	75.0
RD_Expense	255.9	1.3	56.4	41.5	56.8
Revenue	1451.1	3.4	244.3	180.4	261.3
Selling_Admin_Expense	1157.7	2.5	155.0	102.8	188.5
SM_Expense	627.8	1.3	95.5	61.4	119.5
Total_Assets	5073.4	3.2	574.8	263.9	803.8
Total_Liabilities	3906.8	3.3	391.1	169.0	626.1
Average_Current_Ratio	15.4	0.5	2.2	1.4	2.3
Average_EBITDA_Margin	40.8	-194.4	-27.0	-15.3	53.4
CAGR_CF_Net_Income	6.1	-21.3	-2.2	-2.1	3.1
CAGR_Current_Assests	6.7	-0.5	0.8	0.3	1.3
CAGR_Equity	17.7	-26.2	0.4	0.0	5.4
CAGR_RD_Expense	3.9	-0.4	0.4	0.3	0.7
CAGR_Revenue	6.5	-0.2	0.5	0.3	0.9
CAGR_Selling_Admin_Expense	3.3	-1.0	0.4	0.3	0.6
CAGR_SM_Expense	2.7	-0.6	0.3	0.2	0.5
CAGR_Total_Assets	5.2	-0.4	0.7	0.3	1.0
CAGR_Total_Liabilities	5.9	-0.4	0.7	0.5	1.0

Source: Author's development using SPSS Software.

Table 4

Descriptive statistics for the variable of the period 2017-2019

	Maximum	Minimum	Mean	Median	Std. Deviation
Offer_to_1st_close	106.25	-4.69	32.79	30.76	27.12
Offer_To_Month6	208.64	-45.00	43.43	40.55	52.41
Offer_Size	869.40	9.25	273.25	207.00	234.80
UR	126.00	0.00	42.73	36.50	32.86
SP_500	3,133.21	2,339.58	2,720.49	2,721.91	219.01
CPI_YoY_Index	2.90	1.60	2.15	2.10	0.35
CF_Net_Income	39.00	-187.32	-45.82	-33.20	52.69
Current_Assests	1,513.10	4.19	165.19	106.19	237.19
Current_Ratio	3.69	0.22	1.32	1.14	0.75
EBITDA_Margin	23.13	-146.18	-19.70	-15.71	31.30
Equity	707.80	-390.26	61.79	29.31	156.27
RD_Expense	380.30	0.49	50.53	36.39	59.48
Revenue	1,106.80	12.05	197.60	148.35	184.53
Selling_Admin_Expense	471.30	1.74	123.14	106.54	97.27
SM_Expense	314.00	0.29	89.81	76.05	72.56
Total_Assets	1,811.37	4.49	310.05	170.93	393.37
Total_Capital	752.66	-92.13	119.47	48.61	186.51
Total_Liabilities	2,201.62	4.66	248.26	130.88	387.52
Average_Current_Ratio	4.16	0.12	1.39	1.24	0.78
Average_EBITDA_Margin	30.97	-187.04	-27.29	-22.71	41.57
CAGR_CF_Net_Income	4.34	-14.60	-2.45	-2.03	3.14
CAGR_Current_Assests	2.01	-0.35	0.29	0.13	0.44
CAGR_Equity	4.80	-4.77	-0.49	-0.30	2.11
CAGR_RD_Expense	1.23	-0.13	0.37	0.36	0.29
CAGR_Revenue	2.10	-0.12	0.47	0.38	0.43
CAGR_Selling_Admin_Expense	1.90	-0.03	0.39	0.29	0.37
CAGR_SM_Expense	3.03	-0.07	0.42	0.29	0.50
CAGR_Total_Assets	1.07	-0.34	0.24	0.15	0.30
CAGR_Total_Capital	29.19	-4.69	0.53	-0.12	4.58
CAGR_Total_Liabilities	1.46	-0.28	0.45	0.39	0.37

Source: Author's development using SPSS Software.

All measures of descriptive statistics were analyzed and tested for outliers. No outliers were found in the data that could significantly affect the subsequent results of the analysis.

2.3 Research hypothesis

H1. In the years before Covid19 started to spread (2017-2019), internal factors had more effect on post-IPO performance in the short run (1ˢᵗ day close after IPO).

The company can directly influence internal factors, while most external factors are not dependent on the company's activities. Before Covid19 has started to spread over the world and the global economy was more stable, investors paid much more attention to the internal factors of companies rather than macroeconomics. So, it is assumed that internal factors significantly impact short post-IPO performance for the sample of technology companies that went public during 2017-2019. At the same time, macroeconomic factors have less or no effect.

H2. In the years before Covid19 (2017-2019), internal factors had more effect on post-IPO performance in the long run (6 months after IPO).

The same was for short post-IPO performance. In the long run, when the global economy was less turbulent and more predictable, portfolio managers were focusing on the company's performance, not paying much attention to macroeconomic indexes.

H3. After Covid19 started (2020-2021), external factors had more effect on post-IPO performance in the short run (1ˢᵗ day close after IPO).

In the years when Covid19 damaged the global economy to the severest extent, investors switched their attention from internal factors to macroeconomics. So, it is assumed that macroeconomic factors more impact on the short post-IPO performance of technology companies during 2020-2021. At the same time, internal factors have less or no effect.

H4. After Covid19 started (2020-2021), external factors had more effect on post-IPO performance in the long run (6 months after IPO).

Similarly, to short post-IPO performance, in the long run, the technology companies' post-IPO performance macroeconomic factors had an impact to a significant extent during the pandemic (2020-2021).

2.4 Research methodology

The research steps and methodology are described in detail below.

Step 1	**Raw data collection and preprocessing:** • Collect data from Bloomberg, Nasdaq and Prospectuses.

	- Using raw data, perform all relevant calculations for further utilization in the model.
Step 2	**Reliability and validity check** *1. Descriptive Statistics* *2. Correlation analysis:* - To check if relationships exist. If Significance is equal or less than 0.05, then there are statistically significant relationships between variables, otherwise no relationships. - To check directions of relationships between variables. If sign of Pearson correlation coefficient is "+", then relationship between two variables is positive. If sign of Pearson correlation coefficient is "-", then relationship is negative. - To check how strong relationships are. If Pearson correlation coefficient is less than 0.2, then correlation is week; if between 0.2 and 0.4, then correlation is average, if more than 0.4, then correlation is high.
Step 3	**Transforming data and Model specification** - Independent variables which will show the best correlation results with dependent variables will be included to the model, independent variables with poor correlation will be excluded from equitation.
Step 4	**Resolving potential issues of regression model.** *1. Multicollinearity check.* - Pearson correlation test should be performed in order to identify multicollinearity issue. Correlation coefficients between all independent variables must be smaller than 0.8. If there are variables where correlation coefficient is more than 0.8, then multicollinearity issue exists, and one variable need to be eliminated from the model. If correlation between independent variable is between $0.4 - 0.8$, then Author will decide if it is reasonable to include both variable if only one can be left. - To check result of Variance Inflation Factor (VIF). If Variance Inflation Factor is more than 4 and less than 10 ($4 < VIF < 10$), then it can be assumed that multicollinearity issue exists. If $VIF > 10$, then there is multicollinearity issue for sure. In case of multicollinearity, variable with the biggest VIF value will be omitted. *2. Checking for correspondence of standardized residuals to Normal Distribution.*

- Kolmogorov-Smirnov test should be performed in order to check if standardized residuals fit to normal distribution curve. If Kolmogorov-Smirnov test result $p \geq 0.05$, then points of residual values do not differ from normal distribution curve.

3. *Checking for influential cases.*

- Casewise Diagnostics will be used to check if there are any influential cases in the sample.
- If influential cases defined, then Cook's distance will be used to check if influential cases can impact on the results of the model. If Cook distance value is less than 1, then there is no impact of influential cases on the final results, otherwise the impact exists.
- If Cook's distance value is more than 1, then DFB (difference in beta) statistics should be calculated for each predictor separately and influential cases must be eliminated from the sample.

4. *Heteroscedasticity check.*

- Scatterplot of the residuals against the predicted values of the dependent variable will be examined to check whether Heteroscedasticity issue exists. If scatterplot shows cone-shaped pattern, then Heteroscedasticity issue can be confirmed.

5. *Autocorrelation check.*

- Durbin-Watson's d test will be implemented in order to check if residuals are not independent from each other, in other words autocorrelation issue occurs. If the result of Durbin-Watson's d test is more than 1.5 and less than 2.5, then autocorrelation issue does not exist, in other cases there is autocorrelation issue and one independent variable which is dependent from another should be omitted from the sample.

Step 5	**Develop an Ordinary Least Squares regression and interpret results**

Develop an Ordinary Least Squares regression and interpret results

1. *Coefficient of determination (R^2).*

- R^2 will provide information about which % of the variance of the dependent variable explains by the model. Other studies, where was studied impact of external and internal factors on post-IPO performance demonstrated quite low R2. For example, in the research of Chang, Y. B., & Kwon, Y. (2020), the result of R2 for one-month post-IPO performance was only 0.182.

2. *ANOVA p-value.*

- If the result of Anova p-value test is less than 0.05 ($p < 0.05$), then significance of regression model can be assumed, and other analysis should performed to prove that model is accurate and results of the model can be used for explanation and to answer the main questions of the research.

3. *T (Student) tests for separate predictors.*
- T test will be performed to define which predictors should be eliminated from the model. If result of t test is less than 0.05 ($p<0.05$), such predictors should be left in the model, otherwise removed.

Step 6 **Summarize results and make conclusions**
- Using results of analysis approve or reject Hypothesis.
- Make conclusions and provide suggestions for further studies.

This chapter presents and describes in detail the research methodology. Summarising the above-described methodology:

- Research period: from January 1, 2017, to December 31, 2021.

- There are four hypotheses.

- Total sample consists of 107 companies. To test hypotheses, the sample will be divided into two parts: 2017-2019 years (47 companies) and 2020-2021 (60 companies).

- Ordinary Least Squares regression will be used to test hypotheses.

3. RESULTS OF EMPIRICAL RESEARCH ON THE IMPACT OF INTERNAL AND EXTERNAL FACTORS ON POST-IPO PERFORMANCE OF TECHNOLOGY COMPANIES

This section presents the results of the analysis of the study on how different external and internal factors affected the IPO performance of technology companies before COVID-19 damaged the world economy and after that from a short and long-run perspective following quantitative methodology. Ordinary Least Squares regression was used to test the hypotheses defined in the chapter 2.

This chapter consists of two parts:

- The first part encompasses results of the regression analysis for the sample of companies with IPO dates in 2017-2019 years.

- The second part includes results of regression analysis for the companies which went public in 2020-2021 years.

3.1 Impact of external and internal factors on post-IPO performance of technology companies, which went public during 2017-2019

In order to reveal how various internal and external factors affected post-IPO performance of technology companies before Covid-19 damaged the world economy, regression models will be built where the dependent variables are Initial returns in the 1st closing day and 6-months closing day after IPO date for the sample of companies with IPO dates in 2017-2019. The results received in this part should help to test Hypothesis 1 and 2.

Tests of model where dependent variable is initial return of the 1st closing day.

As per correlation analysis results, there are only 2 independent variables show correlation with the 1st day initial return at a significant level: Underwriter Rating (UR) and Offer Size (Offer_Size), Table 5.

Table 5

Correlation matrix

	Offer_to_1st_close	UR	Offer_Size
Offer_to_1st_close	1.000	0.379	0.335
UR	0.379*	1.000	0.657*
Offer_Size	0.335*	0.657*	1.000

Source: Author's development using SPSS Software.

Correlation matrix shows that there is correlation between Offer_to_1st_close and UR and correlation is significant at the 0.05 level. Correlation between Offer_to_1st_close and Offer_Size has the same level of significance. Besides that, it is worth to note that there is quit high correlation between Offer_Size and UR at the 0.05 level of significance. So, the issue of multicollinearity may exist and there is no basis or need to build one regression model where both independent variables will be included. Another reason to build two regressions separately is that the 1st hypotheses assumes that external factors have more impact on post-IPO performance than internal factors. None of internal factors show correlation with Offer_to_1st_close and there is no reasonability to include them to regression.

The first model that will be tested is following:

$$\text{Offer\_to\_1st\_close (2017-2019)} = a_0 + a_1 \times \text{UR} \qquad (4)$$

The summary of Ordinary Least Squares regression is in the Table 6.

Table 6

Regression analysis results summary

	Test result	Benchmark
Kolmogorov-Smirnov test (p)	0.200	$p \geq 0.05$
Cook's distance	0.177	≤ 1.0
Durbin-Watson's d test	2.178	$1.5 < \& > 2.5$
Coefficient of determination (R^2)	0.144	> 0.2
ANOVA p-value	0.012	< 0.05
F	6.878	

Source: Author's development using SPSS Software.

R^2 is equal to 0.144 means that this model explains 14.4% of the variance in the 1st day Initial Return after IPO of Technology companies which went public in 2017-2019.

Durbin-Watson statistic (2.178) reports that there is no autocorrelation in residuals and model has quite decent quality for further utilization. Thereby, the validity of the model confirmed.

Significance of regression model can be assumed, since Anova p-value is equal to 0.012 which is less than 0.05; F = 6.878.

Kolmogorov-Smirnov test shows that p = 0.200 and it means that standardized residuals fit to normal distribution curve.

Table 7 contains coefficients for variables included to the model.

Table 7

Coefficients

	Unstandardized B	Std. Error	t	Sig.
(Constant)	23.942	6.342	3.775	<0.001
UR	0.309	0.118	2.623	0.012

Source: Author's development using SPSS Software.

The equation for the model of 1st day Initial Return has the following form:

$$\text{Offer\_to\_1st\_close (2017-2019)} = 23.942 + 0.309 \times UR \qquad (5)$$

The economic implication of the equation above defines that 1% increase in Underwriter Rating causes 0.309% increase of the 1st day Initial Return.

An increase in the underwriter's rating can improve the company's reputation and increase investor confidence, which in turn can lead to higher initial returns. However, this increase in initial return may be temporary, as investors may overestimate the true value of the company.

Next will be tested model with Offer_Size as independent variable:

$$\text{Offer\_to\_1st\_close (2017-2019)} = b_0 + b_1 \times \text{Offer\_Size} \qquad (6)$$

The summary of Ordinary Least Squares regression is in the Table 6.

Table 8

Regression analysis results summary

	Test result	Benchmark
Kolmogorov-Smirnov test (p)	0.200	$p \geq 0.05$
Cook's distance	0.119	≤ 1.0
Durbin-Watson's d test	1.949	$1.5 < \& > 2.5$
Coefficient of determination (R^2)	0.112	> 0.2
ANOVA p-value	0.028	< 0.05
F	5.179	

Source: Author's development using SPSS Software.

R^2 is equal to 0.112 means that this model explains 11.2% of the variance in the 1st day Initial Return after IPO of Technology companies which went public in 2017-2019.

Durbin-Watson statistic (1.949) reports that there is no autocorrelation in residuals and model has quite decent quality for further utilization. Thereby, the validity of the model confirmed.

Significance of regression model can be assumed, since Anova p-value is equal to 0.028 which is less than 0.05; F = 5.179.

Kolmogorov-Smirnov test shows that p = 0.200 and it means that standardized residuals fit to normal distribution curve.

Table 9 contains coefficients for variables included to the model.

Table 9

Coefficients

	Unstandardized B	**Std. Error**	**t**	**Sig.**
(Constant)	26.675	6.049	4.410	<0.001
Offer_Size	0.038	0.017	2.276	0.028

Source: Author's development using SPSS Software.

The equation for the model of 1st day Initial Return has the following form:

$$\text{Offer\_to\_1st\_close (2017-2019)} = 26.675 + 0.038 \times \text{Offer\_Size} \qquad (7)$$

The economic implication of the equation above defines that 1% increase in Offer Size causes 0.038% increase of the 1st day Initial Return.

Increasing the size of the offer can increase the initial yield because it can indicate a lot of investor interest in the company, which increases its reputation. In addition, an increase in the size of the offer may give investors more investment opportunities, which may increase competition in the primary market and lead to higher initial returns.

Taken into account both models, the 1st Hypothesis can be rejected. In the years before Covid19 started to spread (2017-2019), external factors had more effect on post-IPO performance in the short run (1st day close after IPO).

Tests of model where dependent variable is Initial Return of 6 months after IPO close.

None of the variables related to internal factors or external factors showed a correlation with 6-month Initial Return at a significant level, Table 10.

Table 10

Correlation matrix

		Offer_To_Month6
Offer_To_Month6	Pearson Correlation	1
	Sig. (2-tailed)	
Offer_Size	Pearson Correlation	0.092
	Sig. (2-tailed)	0.557
UR	Pearson Correlation	0.126

	Sig. (2-tailed)	0.42
SP_500	Pearson Correlation	-0.07
	Sig. (2-tailed)	0.655
CPI_YoY_Index	Pearson Correlation	-0.138
	Sig. (2-tailed)	0.379
CF_Net_Income	Pearson Correlation	0.139
	Sig. (2-tailed)	0.373
Current_Assests	Pearson Correlation	0.103
	Sig. (2-tailed)	0.511
Current_Ratio	Pearson Correlation	-0.031
	Sig. (2-tailed)	0.845
EBITDA_Margin	Pearson Correlation	0.245
	Sig. (2-tailed)	0.113
Equity	Pearson Correlation	-0.081
	Sig. (2-tailed)	0.607
RD_Expense	Pearson Correlation	-0.039
	Sig. (2-tailed)	0.805
Revenue	Pearson Correlation	0.011
	Sig. (2-tailed)	0.944
SM_Expense	Pearson Correlation	-0.03
	Sig. (2-tailed)	0.848
Selling_Admin_Expense	Pearson Correlation	-0.002
	Sig. (2-tailed)	0.992
Total_Assets	Pearson Correlation	0.073
	Sig. (2-tailed)	0.642
Total_Capital	Pearson Correlation	0.008
	Sig. (2-tailed)	0.958
Total_Liabilities	Pearson Correlation	0.109
	Sig. (2-tailed)	0.489
CAGR_CF_Net_Income	Pearson Correlation	0.133
	Sig. (2-tailed)	0.396
CAGR_Current_Assests	Pearson Correlation	0.138
	Sig. (2-tailed)	0.377
Average_Current_Ratio	Pearson Correlation	-0.106
	Sig. (2-tailed)	0.501
Average_EBITDA_Margin	Pearson Correlation	0.279
	Sig. (2-tailed)	0.07
CAGR_Equity	Pearson Correlation	0.265
	Sig. (2-tailed)	0.085
CAGR_RD_Expense	Pearson Correlation	0.088
	Sig. (2-tailed)	0.574
CAGR_Revenue	Pearson Correlation	-0.18
	Sig. (2-tailed)	0.248
CAGR_SM_Expense	Pearson Correlation	-0.158
	Sig. (2-tailed)	0.312
CAGR_Total_Assets	Pearson Correlation	0.174
	Sig. (2-tailed)	0.265
CAGR_Total_Capital	Pearson Correlation	0.109
	Sig. (2-tailed)	0.488
CAGR_Total_Liabilities	Pearson Correlation	-0.153
	Sig. (2-tailed)	0.327
CAGR_Selling_Admin_Expense	Pearson Correlation	-0.115
	Sig. (2-tailed)	0.464

Source: Author's development using SPSS Software.

There is no reasonability to conduct regression analysis.

Hypothesis 2 cannot be neither confirmed, nor rejected.

3.2 Impact of external and internal factors on the post-IPO performance of technology companies which went public in 2020-2021 years

In order to test hypothesis 3 and 4, it is necessary to build two models: the first model includes the 1st day Initial Return after IPO as dependent variable, and the second model includes the 6th month Initial Return after IPO as dependent.

Tests of model where dependent variable is 1st day Initial Return after IPO date.

As per correlation analysis results, there are 6 independent variables which show correlation with the 1st day initial return at a significant level: Index S&P 500 (0.05 sig. level), Consumer price index (0.01 sig. level), EBITDA Margin Ratio (0.01 sig. level), Average EBITDA Margin Ratio for 2 years before IPO date (0.05 sig. level) and Revenue compound annual growth rate for two years before IPO (0.05 sig. level), table 11.

Table 11

Correlation matrix

	Offer_to_ 1st_close	SP_500	CPI_YoY_ Index	EBITDA_ Margin	Average_ EBITDA_ Margin	CAGR_ Revenue
Offer_to_1st_close	1000.00	-0.29	-0.34	-0.35	-0.31	0.33
SP_500	-0.29*	1000.00	0.87	-0.01	-0.17	-0.11
CPI_YoY_Index	-0.34**	0.87	1000.00	0.01	-0.15	-0.12
EBITDA_Margin	-0.35**	-0.01	0.01	1000.00	0.78	-0.81
Average_EBITDA_Margin	-0.31*	-0.17	-0.15	0.78	1000.00	-0.46
CAGR_Revenue	0.33*	-0.11	-0.12	-0.81	-0.46	1000.00

Source: Author's development using SPSS software.

High correlation was revealed between two external factors Index S&P500 and Consumer Price Index. This high correlation can be simply explained since changes in consumer prices greatly affect economy in general and capitalization of companies included in the S&P500 index, particularly. The same correlation was found in the research Boons, M., Duarte, F., De Roon, F., & Szymanowska, M. (2020).

Besides that, correlation analysis showed high correlation between EBITDA Margin Ratio and Average EBITDA Margin Ratio for two years before IPO date. This result was expected since for calculations of Average EBITDA Ratio was used EBITDA Margin Ratio itself.

High correlation between CAGR Revenue for two years before IPO and EBITDA Margin Ration is also logical. EBITDA Margin Ratio shows revenue share in the company's earnings before interest, taxes, depreciation, and amortization, and CAGR Revenue is the average annual growth rate of the company's revenue for the two years before IPO. As it was already mentioned in the paper before, in technology companies, especially start-ups, high revenue growth can mean that the company is investing heavily in developing of its products or services. This can result in a low or negative EBITDA Margin Ratio because of high spending on R&D, marketing, sales, etc.

On the other hand, if a company has a high EBITDA Margin Ratio, then this may indicate that the company is prioritizing profits over growth. In this case, the CAGR Revenue may be low because the company is not investing enough in the development of its products and services. Thus, in technology companies, EBITDA Margin Ratio and CAGR Revenue can be highly negatively correlated, as companies that invest more in growth may have a lower EBITDA Margin Ratio, and companies that prioritize earnings may have a lower revenue growth rate. To the same conclusions regarding relationship between earnings and revenues for technology companies arrived researchers from Boston Consulting Group in the research "The Real Rules of Growth and Profits in Software", 2022. Ahlawat, P., Mayer, A., Schmieg, F., Kennedy, D., Emerson, G., & Roberts, J. (2022) revealed negative correlation between profitability and sales growth of Software companies. Similarly, in the current research the major of the sample contains Software companies (94% in 2020 and 77% in 2021, Figure 2).

Considering obvious multicollinearity issue, to the final model were included EBITDA Margin Ratio and Consumer price index to test if external factors had more effect on short post-IPO performance after COVID-19.

Thus, the final equitation which will be used to test hypothesis is following:

$$\text{Offer\_to\_1st\_close (2020-2021)} = c_0 - c_1 \times \text{EBITDA\_Margin} - c_2 \times \text{CPI\_YoY\_Index} \qquad (8)$$

The summary of Ordinary Least Squares regression is in the 12.

Table 12
Regression analysis results summary

	Test result	**Benchmark**
Kolmogorov-Smirnov test (p)	0.080	$p \geq 0.05$
Cook's distance (max)	0.205	≤ 1.0
Durbin-Watson's d test	1.926	$1.5 < \& > 2.5$
Coefficient of determination (R^2)	0.252	> 0.2
ANOVA p-value	< 0.001	< 0.05
F	9.424	

Source: Author's development using SPSS software.

R^2 is equal to 0.252 means that this model explains more than 25% of the variance in the 1st day Initial Return after IPO of Technology companies which went public in 2020-2021.

Durbin-Watson statistic (1,926) reports that there is no autocorrelation in residuals and model has quite decent quality for further utilization. Thereby, the validity of the model confirmed.

Significance of regression model can be assumed, since Anova p-value <0.001; F = 9.424.

Kolmogorov-Smirnov test shows that p = 0.080 and it means that standardized residuals fit to normal distribution curve.

In the table 13 coefficients for variables included to the model.

Table 13

Coefficients

	Unstandardized B	Std. Error	t	Sig.	VIF
(Constant)	69.134	9.104	7.594	< 0.001	
CPI_YoY_Index	-5.596	2.191	-2.554	0.013	1.000
EBITDA_Margin	-0.202	0.058	-3.496	< 0.001	1.000

Source: Author's development using SPSS software.

The equation for the model of 1st day Initial Return has the following form:

$$\text{Offer\_to\_1st\_close (2020-2021)} = 69.134 - 0.202 \times \text{EBITDA\_Margin} - 5.596 \times \quad (9)$$
$$\times \text{CPI\_YoY\_Index}$$

The economic implication of the equation above defines that 1% increase in EBITDA Margin Ratio causes 0.202% decrease of the 1st day Initial Return. 1% increase in Consumer price index boosts 5.596% decrease of the 1st day Initial Return.

Technology companies are operating in the very competitive environment, where rapid development and change of technology have a significant impact on business. The fact that 1% increase in EBITDA makes technology companies less attractive to investors may be because an increase in EBITDA may indicate a lower investment in research and development, which, in turn, may reduce the company's potential for future growth.

An increase in the CPI indicates an increase in the level of inflation in the economy. This can make investors more cautious about prices when issuing new shares. Especially, in the case

of technology companies, which often have high growth and earnings expectations, investors may lose interest in new stock offerings if they expect price increases to dilute potential gains.

As a result, initial returns may be lower on the first day after an IPO as investors expect lower returns on their investments (Bekaert, G., & Engstrom, E., 2010).

According to received regression results, the 3rd hypothesis can be accepted. After Covid19 started (2020-2021), external factors had more effect on post-IPO performance in the short run (the 1st day close after IPO).

Tests of model where dependent variable is Initial Return of 6 months after IPO close.

Next model should help to accept or reject the 4th hypothesis which states that After Covid19 started (2020-2021), external factors had more effect on post-IPO performance in the long run (6 months after IPO).

As per correlation analysis results, there are only 3 independent variables show correlation with the 6st month Initial Return after IPO at a significant level: Index S&P500 (0.01 sig. level), Consumer Price Index (0.01 sig. level) and Underwriter Rating (0.05 sig. level), table 14.

Table 14

Correlation matrix

	Offer_To_Month6	SP_500	UR	CPI_YoY_Index
Offer_To_Month6	1000.00	-0.51	-0.27	-0.51
SP_500	-0.51**	1000.00	0.53*	0.87
UR	-0.27*	0.53*	1000.00	0.49*
CPI_YoY_Index	-0.51**	0.87	0.49*	1000.00

Source: Author's development using SPSS software.

From the correlation matrix could be seen that there is high correlation between Index S&P500 and Consumer price index that repeats correlation pattern as for the short run.

Besides that, Underwriter Rating shows medium positive correlation with both S&P500 Index and Consumer price index.

There are no internal factors which show correlation with the 6st month Initial Return. In absentia, the hypothesis that After Covid19 started (2020-2021), external factors had more effect on post-IPO performance in the long run (6 months after IPO) could be accepted, but relationship still should be checked and evaluated.

Since external factors have medium correlation between themselves, it was decided to build one factor regression models for each independent factor (SP_500, CPI_YoY_Index and UR).

The first model for testing 6months Initial Return includes Index S&P 500 as independent variable:

$$\text{Offer\_To\_Month6 (2020-2021)} = c_0 + c_1 \times \text{SP\_500} \qquad (10)$$

The summary of Ordinary Least Squares regression for the model with S&P_500 Index as independent variable is in the table 15.

Table 15

Regression analysis results summary

	Test result	Benchmark
Kolmogorov-Smirnov test (p)	0.200	$p \geq 0.05$
Cook's distance	0.802	≤ 1.0
Durbin-Watson's d test	2.001	$1.5 < \& > 2.5$
Coefficient of determination (R^2)	0.256	>0.2
ANOVA p-value	< 0.001	< 0.05
F	19.231	

Source: Author's development using SPSS software.

R^2 is equal to 0.256 means that this model explains more than 25% of the variance in the 6st month Initial Return after IPO of Technology companies which went public in 2020-2021.

Durbin-Watson statistic (2.001) shows that there is no autocorrelation in residuals and model has quite decent quality for further utilization. Thus, the validity of the model confirmed.

Significance of regression model can be assumed, since Anova p-value <0.001; F = 19.231.

Kolmogorov-Smirnov test shows that p = 0.200 and it means that standardized residuals fit to normal distribution curve.

In the table 16 coefficients for variables included to the model.

Table 16

Coefficients

	Unstandardized B	Std. Error	t	Sig.	VIF
(Constant)	268.909	58.696	4.581	< 0.001	
SP_500	-0.065	0.015	-4.385	< 0.001	1.000

Source: Author's development using SPSS software.

Equitation looks as follow:

$$Offer\_To\_Month6 \ (2020\text{-}2021) = 268.909 - 0{,}065 \times SP\_500 \qquad (11)$$

The economic implication of the equation above defines that 1% increase in Index S&P500 causes 0.065% decrease of the 6st month Initial Return after IPO.

Similar patterns have already been encountered in the scientific literature. And the explanation was that an increase in the growth of the S&P500 Index could indicate that the market as a whole is experiencing growth. In such a situation, investors may be less enthusiastic to invest in IPOs of technology companies, as they prefer to invest their money in already established and successful companies. In addition, a rise in the index could mean that more risk-free assets become more attractive to investors as the market shows stability and growth. And this is quite logical in the case of post-IPO companies that entered the IPO during the economic instability caused by COVID-19. Mazumder, S., & Saha, P. (2021).

However, this conclusion may contradict the result that was obtained in the regression, which studied what factors affect the 1st day Initial Return during 2020-2021. There, a negative relationship was found between 1st day Initial Return and EBITDA Margin Ratio, i.e. with a 1% increase in EBITDA Margin Ratio, this causes a 0.202% reduction in 1st day Initial Return.

As previously stated, technology investors can expect fast growth and high returns over the long term, leading to high initial post-IPO expectations and high 1st day returns. However, in order to achieve this growth, companies can reduce the cost of investments in growth and development, which can lead to an increase in the EBITDA Margin Ratio, but reduce the prospects for the company's long-term growth.

At the same time, if the S&P 500 index shows growth, investors may prefer to invest in more stable and mature companies, while technology companies remain riskier and more dependent on new investments in growth and development. This could result in a lower 6months post-IPO initial return for tech companies.

Thus, a company's high growth expectations can lead to high first-day earnings after a public offering, but if a company cuts back on its investment in growth and development, it could negatively impact its long-term growth prospects. Also, tech companies that depend on new investment may become less attractive to investors as the market becomes more resilient. In general, companies must strike a balance between high growth expectations and investment in the future to ensure stability and long-term growth.

Next model for testing 6months Initial Return includes Consumer Price Index as independent variable:

$$\text{Offer\_To\_Month6 (2020-2021)} = d_0 + d_1 \times \text{CPI\_YoY\_Index} \qquad (12)$$

The summary of Ordinary Least Squares regression for the model with CPI_YoY_Index as independent variable is in the table 17.

Table 17

Regression analysis results summary

	Test result	Benchmark
Kolmogorov-Smirnov test (p)	0.200	$p \geq 0.05$
Cook's distance	0.273	≤ 1.0
Durbin-Watson's d test	1.907	$1.5 < \& > 2.5$
Coefficient of determination (R^2)	0.258	> 0.2
ANOVA p-value	< 0.001	< 0.05
F	19.491	

Source: Author's development using SPSS software.

R^2 is equal to 0.273 means that this model explains more than 25% of the variance in the 6st month Initial Return after IPO of Technology companies which went public in 2020-2021.

Durbin-Watson statistic (1.907) shows that there is no autocorrelation in residuals and model has quite decent quality for further utilization. Thus, the validity of the model confirmed.

Significance of regression model can be assumed, since Anova p-value < 0.001; F = 19.491.

Kolmogorov-Smirnov test shows that p = 0.200 and it means that standardized residuals fit to normal distribution curve.

In the table 18 coefficients for variables included to the model.

Table 18

Coefficients

	Unstandardized B	Std. Error	t	Sig.	VIF
(Constant)	153.320	15.142	10.126	< 0.001	
CPI_YoY_Index	-16.246	3.680	-4.415	< 0.001	1.000

Source: Author's development using SPSS software.

Equitation looks as follow:

$$\text{Offer\_To\_Month6 (2020-2021)} = 153.320 - 16.246 \times \text{CPI\_YoY\_Index} \quad (13)$$

The economic implication of the equation above defines that 1% increase in CPI_YoY_Index causes 16.246 % decrease of the 6 months Initial Return.

Similarly, to 1st day Initial Return model, this is because investors react to changes in the rate of inflation. If inflation rises, this can lead to a worsening of the economic situation, as the prices of goods and services increase, which can negatively affect the profitability of companies. Therefore, if the CPI index increases by 1%, this may signal to investors about the possible risks of their investments, which in turn may lead to a decrease in demand for shares of companies.

The testing of the model with Underwriter Rating as independent variable do not show statistically significant results:

$$\text{Offer\_To\_Month6 (2020-2021)} = e_0 + e_1 \times \text{UR} \quad (14)$$

Table 19

Regression analysis results summary

	Test result	Benchmark
Kolmogorov-Smirnov test (p)	0.039	$p \geq 0.05$
Cook's distance	0.422	≤ 1.0
Durbin-Watson's d test	1.969	1.5< & >2.5
Coefficient of determination (R^2)	0.074	>0.2
ANOVA p-value	0.038	< 0.05

Source: Author's development using SPSS software.

R^2 is equal to 0.074 means that this model explains only 7.4% of the variance in the 6st month Initial Return after IPO of Technology companies which went public in 2020-2021.

Kolmogorov-Smirnov test shows that p = 0.039 and it means that standardized residuals do not fit to normal distribution curve.

Table 20

Coefficients

	Unstandardized B	Std. Error	t	Sig.	VIF
(Constant)	45.495	17.113		2.658	
UR	-0.085	0.040	-0.273	-2.119	1.000

Source: Author's development using SPSS software.

After Covid19 started (2020-2021), external factors had more effect on post-IPO performance in the long run (6 months after IPO). The 4th hypothesis is proved.

CONCLUSIONS

In the current research, was used an Ordinary Least Squares regression to to reveal the key factors that affected the post-IPO performance of technology companies and define influential power before and after COVID-19.

The following conclusions and suggestion about the impact of impact of internal and external factors on post-IPO performance of technology companies before and after COVID-19 started were formulated:

- Only two independent variables – Underwriter Rating and Offer Size were significantly correlated with the 1st day Initial Return in 2017-2019 years. An increase in Underwriter Rating and Offer Size could lead to a corresponding increase in the 1st day Initial Return. The validity and significance of the regression models were also confirmed using various statistical tests. The 1st hypothesis was rejected. Analysis showed that external factors had more effect on post-IPO performance in the short run than internal factors.

- Index S&P 500, Consumer Price Index, EBITDA Margin Ratio, Average EBITDA Margin Ratio for two years before IPO, and CAGR Revenue for two years before IPO showed significant correlation with the 1st day Initial Return in 2020-2021. The final model included EBITDA Margin Ratio and Consumer Price Index to test the effect of external factors on short post-IPO performance after COVID-19. The economic implication of the model showed that 1% increase in EBITDA margin ratio causes a 0.202% decrease in the 1st day initial return, while 1% increase in Consumer Price Index leads to a 5.596% decrease. External factors have more impact on post-IPO performance after COVID-19 in a short run, so the 3rd hypothesis proved.

- Index S&P 500, Consumer Price Index, and Underwriter Rating showed a significant correlation with the 6th month Initial Return after IPO. Regression models were built for each independent factor, and the S&P500 and Consumer Price Index were found to have a negative relationship with the 6th month Initial Return.

The limitation of the current study and suggestions for further researchers mainly based on several issues:

- None of the variables related to internal or external factors showed a correlation with 6-month Initial Return at a significant level in 2017-2019. Further researchers could consider other batches of variable to reveal relationship between internal and external factors and post-IPO performance before COVID-19.

- Consideration of 6th month Initial Return as a long term could be considered doubtful, so longer period could be considered (1 year post-IPO performance or even longer).

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SUMMARY IN LITHUANIAN

IŠORĖS IR VIDAUS VEIKSNIŲ POVEIKIS JAV TECHNOLOGIJŲ ĮMONIŲ PO IPO VEIKLAI PRIEŠ IR PO COVID19

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Darbo vadove: Docentas, Arūnas Burinskas, Vilnius, 2023

SANTRAUKA

Darbo apimtis: 84 puslapiai, 20 lentelių, 7 paveikslų, 88 literatūros šaltinių

Šis straipsnis nagrinėja, kaip skirtingi išoriniai ir vidiniai veiksniai įtakojo technologijų įmonių IPO veiklą tiek prieš, tiek po COVID-19 žalingo poveikio pasaulinei ekonomikai. Analizė atliekama iš trumpalaikės ir ilgalaikės perspektyvos, naudojant įprastą mažiausiųjų kvadratų regresiją.

Įprastų mažiausiųjų kvadratų regresijos rezultatai rodo, kad užsakovų reitingas ir pasiūlymo dydis turėjo teigiamą poveikį pirmosios dienos pradiniams grąžinimams 2017-2019 metais. Priešingai, EBITDA maržos santykis ir vartotojų kainų indeksas turėjo neigiamą poveikį pirmosios dienos pradiniams grąžinimams 2020-2021 metais. Be to, S&P500 indeksas ir vartotojų kainų indeksas pasirodė turintys neigiamą ryšį su šeštojo mėnesio pradiniu grąžinimu.

Autorius mano, kad tyrimo empiriniai rezultatai naudingi investuotojams, padedant priimti informuotus investicinius sprendimus, taip pat įmonėms, planuojančioms eiti į viešąją prekybą, padedant joms nustatyti optimaliausią laiką vykdyti IPO siekiant didžiausio sėkmės.

SUMMARY IN ENGLISH

THE IMPACT OF EXTERNAL AND INTERNAL FACTORS ON POST-IPO PERFORMANCE OF THE US TECHNOLOGY COMPANIES BEFORE AND AFTER COVID19

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Master thesis

Global business and economics

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SUMMARY

Size: 84 pages, 20 tables, 7 figures, 88 references

This paper examines how different external and internal factors influenced the IPO performance of technology companies both before and after the detrimental impact of COVID-19 on the global economy. The analysis is conducted from both short-term and long-term perspectives using Ordinary Least Squares regression.

The results of the Ordinary Least Squares regressions provide evidence that Underwriter Rating and Offer Size had a positive impact on the 1st day Initial Return for 2017-2019 years. Conversely, EBITDA Margin Ratio and Consumer Price Index had a negative impact on the initial return on the 1st day Initial Return for 2020-2021 years. Furthermore, the S&P500 and Consumer Price Index exhibited a negative relationship with the 6th month Initial Return.

The author believes that the empirical results of the study will bring benefits to investors in making informed investment decisions, as well as to companies planning to go public by helping them identify the most opportune time to conduct an IPO for maximum success.

ANNEXES

Annex 1. Sample of companies used in the research

Table 1

Sample of companies that went public in 2017-2021

Issuer_Name	Ticker	IPO_Date
Snowflake Inc	SNOW US Equity	24.08.2020
AppLovin Corp	APP US Equity	02.03.2021
Qualtrics International Inc	XM US Equity	28.12.2020
UiPath Inc	PATH US Equity	26.03.2021
Unity Software Inc	U US Equity	24.08.2020
SentinelOne Inc	S US Equity	03.06.2021
HashiCorp Inc	HCP US Equity	04.11.2021
Freshworks Inc	FRSH US Equity	27.08.2021
ZoomInfo Technologies Inc	ZI US Equity	27.02.2020
Informatica Inc	INFA US Equity	01.10.2021
Samsara Inc	IOT US Equity	01.09.2021
Gitlab Inc	GTLB US Equity	17.09.2021
Dropbox Inc	DBX US Equity	23.02.2018
Zoom Video Communications Inc	ZM US Equity	22.03.2019
Confluent Inc	CFLT US Equity	01.06.2021
DigitalOcean Holdings Inc	DOCN US Equity	25.02.2021
AvidXchange Holdings Inc	AVDX US Equity	17.09.2021
C3.ai Inc	AI US Equity	13.11.2020
Datadog Inc	DDOG US Equity	23.08.2019
DocuSign Inc	DOCU US Equity	28.03.2018
Crowdstrike Holdings Inc	CRWD US Equity	14.05.2019
Doximity Inc	DOCS US Equity	28.05.2021
Datto Holding Corp	MSP US Equity	29.09.2020
Dynatrace Inc	DT US Equity	05.07.2019
Pivotal Software Inc	PVTL US Equity	23.03.2018
Clearwater Analytics Holdings	CWAN US Equity	30.08.2021
Cloudflare Inc	NET US Equity	15.08.2019
Duolingo Inc	DUOL US Equity	28.06.2021
Braze Inc	BRZE US Equity	22.10.2021
Jamf Holding Corp	JAMF US Equity	30.06.2020
Olo Inc	OLO US Equity	19.02.2021
ON24 Inc	ONTF US Equity	08.01.2021
Paycor HCM Inc	PYCR US Equity	26.04.2021
Clear Secure Inc	YOU US Equity	07.06.2021
Duck Creek Technologies Inc	DCT US Equity	23.07.2020
Vertex Inc	VERX US Equity	02.07.2020
HUUUGE Inc	HUG PW Equity	18.01.2021
EngageSmart Inc	ESMT US Equity	27.08.2021
E2open Parent Holdings Inc	PCPL/U US Equity	06.03.2020

DoubleVerify Holdings Inc	DV US Equity	17.03.2021
Blend Labs Inc	BLND US Equity	21.06.2021
SolarWinds Corp	SWI US Equity	21.09.2018
Sumo Logic Inc	SUMO US Equity	24.08.2020
Medallia Inc	MDLA US Equity	21.06.2019
MeridianLink Inc	MLNK US Equity	30.04.2021
Sciplay Corp	SCPL US Equity	05.04.2019
ForgeRock Inc	FORG US Equity	23.08.2021
Intapp Inc	INTA US Equity	04.06.2021
Expensify Inc	EXFY US Equity	15.10.2021
Elastic NV	ESTC US Equity	05.09.2018
Tenable Holdings Inc	TENB US Equity	29.06.2018
Viant Technology Inc	DSP US Equity	22.01.2021
Instructure Holdings Inc	INST US Equity	28.06.2021
Outset Medical Inc	OM US Equity	21.08.2020
SailPoint Technologies Holding	SAIL US Equity	20.10.2017
Bentley Systems Inc	BSY US Equity	21.08.2020
Integral Ad Science Holding Co	IAS US Equity	04.06.2021
Cloudera Inc	CLDR US Equity	31.03.2017
MuleSoft Inc	MULE US Equity	17.02.2017
BigCommerce Holdings Inc	BIGC US Equity	13.07.2020
Bill.com Holdings Inc	BILL US Equity	15.11.2019
CS Disco Inc	LAW US Equity	25.06.2021
Schrodinger Inc/United States	SDGR US Equity	10.01.2020
Domo Inc	DOMO US Equity	01.06.2018
Zscaler Inc	ZS US Equity	16.02.2018
MongoDB Inc	MDB US Equity	21.09.2017
Ping Identity Holding Corp	PING US Equity	23.08.2019
Zeta Global Holdings Corp	ZETA US Equity	26.04.2021
Health Catalyst Inc	HCAT US Equity	10.04.2019
Alkami Technology Inc	ALKT US Equity	10.03.2021
Fastly Inc	FSLY US Equity	19.04.2019
Avalara Inc	AVLR US Equity	11.05.2018
Momentive Global Inc	MNTV US Equity	29.08.2018
Smartsheet Inc	SMAR US Equity	26.03.2018
Phreesia Inc	PHR US Equity	21.06.2019
Altair Engineering Inc	ALTR US Equity	29.09.2017
Zuora Inc	ZUO US Equity	16.03.2018
KnowBe4 Inc	KNBE US Equity	19.03.2021
Carbon Black Inc	CBLK US Equity	09.04.2018
Kaltura Inc	KLTR US Equity	01.03.2021
Sprout Social Inc	SPT US Equity	25.10.2019
SEMrush Holdings Inc	SEMR US Equity	01.03.2021
Alteryx Inc	AYX US Equity	24.02.2017
UserTesting Inc	USER US Equity	13.10.2021
Forescout Technologies Inc	FSCT US Equity	02.10.2017
Yext Inc	YEXT US Equity	13.03.2017
Weave Communications Inc	WEAV US Equity	18.10.2021
SkyWater Technology Inc	SKYT US Equity	22.03.2021
Life360 Inc	360 AU Equity	10.04.2019

Appian Corp	APPN US Equity	27.04.2017
Bandwidth Inc	BAND US Equity	13.10.2017
Arteris Inc	AIP US Equity	01.10.2021
Cardlytics Inc	CDLX US Equity	12.01.2018
Aquantia Corp	AQ US Equity	06.10.2017
Motorsport Games Inc	MSGM US Equity	18.12.2020
Limeade Inc	LME AU Equity	20.11.2019
Tintri Inc	TNTRQ US Equity	01.06.2017
SiTime Corp	SITM US Equity	23.10.2019
Augmedix Inc	AUGX US Equity	03.09.2021
Veritone Inc	VERI US Equity	15.03.2017
Intrusion Inc	INTZ US Equity	25.08.2020
One Stop Systems Inc	OSS US Equity	18.12.2017
Glimpse Group Inc	VRAR US Equity	06.04.2021
ACM Research Inc	ACMR US Equity	13.09.2017
VerifyMe Inc	VRME US Equity	10.10.2019
Duos Technologies Group Inc	DUOT US Equity	11.12.2019
Logiq Inc	LGIQ CN Equity	11.05.2021

Source: Bloomberg.

Annex 2. Underwriter rating calculation

Table 2

Rating of Underwriters according to league table for 2021

Underwriter	Rank	Underwriter	Rank
Citigroup Global Markets, Inc	76	Allen & Company LLC	38
Goldman Sachs & Co. LLC	75	Roth Capital Partners	37
Credit Suisse Securities (USA) LLC	74	CODE Advisors	36
BofA Securities, Inc	73	Alliance Global Partners	35
Morgan Stanley & Co. LLC	72	Raymond James & Associates, Inc	34
Cantor Fitzgerald	71	Imperial Capital	33
J.P. Morgan Securities LLC	70	LionTree Advisors LLC	32
Barclays Capital Inc	69	Odeon Capital Group	31
Deutsche Bank Securities Inc	68	Brookline Capital Markets	30
Jefferies LLC	67	Loop Capital Markets LLC	29
UBS Investment Bank	66	Stephens Inc	28
BTIG, LLC	65	Intrepid Partners	27
Cowen and Company, LLC	64	Canaccord Genuity LLC	26
EarlyBirdCapital, Inc	63	CIBC Capital Markets	25
EF Hutton	62	Apollo Global Securities	24
Stifel, Nicolaus & Company, Incorporated	61	Drexel Hamilton LLC	23
Wells Fargo Securities, LLC	60	ThinkEquity	22
Evercore Group L.L.C.	59	Futu Securities	21
Mizuho Securities USA LLC	58	VTB Capital	20
RBC Capital Markets, LLC	57	Scotiabank	19
Guggenheim Securities	56	SoFi	18
B. Riley Securities	55	Kempen & Co.	17
Moelis & Company	54	Berenberg	16
Oppenheimer & Co. Inc	53	Exos Securities LLC	15
Chardan	52	JMP Securities, LLC	14
Maxim Group	51	Robert W. Baird & Co.	13
I-Bankers Securities, Inc	50	JonesTrading	12
BMO Capital Markets Corp.	49	Truist Securities, Inc	11
Nomura Securities International, Inc	48	Tiger Brokers	10
PJT Partners	47	Sova Capital Limited	9
CastleOak Securities, L.P.	46	TD Securities	8
Ladenburg Thalmann	45	ABN AMRO	7
Siebert Williams Shank	44	Seaport Global Securities	6
Needham & Company, LLC	43	Lake Street	5
Craig-Hallum Capital Group	42	SMBC Nikko Securities America, Inc	4
William Blair & Company, L.L.C.	41	R. F. Lafferty & Co.	3
Piper Sandler & Co	40	Network 1 Financial Securities, Inc	2
Northland Capital Markets	39	Ingalls & Snyder	1

Source: https://www.spacresearch.com/underwriter.

Table 3

Calculation of Underwriters rating for companies with IPO date in 2021

COMPANY	UNDERWRITER	RATING
ALKAMI TECHNOLOGY INC	Barclays Capital Inc	69
	Citigroup Global Markets, Inc	76
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	JMP Securities, LLC	14
	KeyBanc Capital Markets Inc	0
	Needham & Company, LLC	43
	William Blair & Company, L.L.C.	41
ALKAMI TECHNOLOGY INC TOTAL		**388**
APPLOVIN CORP	Blaylock Van, LLC	0
	BofA Securities, Inc	73
	Citigroup Global Markets, Inc	76
	Credit Suisse Securities (USA) LLC	74
	Guzman & Company	0
	J.P. Morgan Securities LLC	70
	KKR Capital Markets LLC	0
	LionTree Advisors LLC	32
	LUMA Securities LLC	0
	Morgan Stanley & Co. LLC	72
	Oppenheimer & Co. Inc	53
	R. Seelaus & Co., LLC	0
	Raine Securities LLC	0
	Roberts & Ryan Investments, Inc	0
	Stifel, Nicolaus & Company, Incorporated	61
	Truist Securities, Inc	11
	UBS Securities LLC	0
	William Blair & Company, L.L.C.	41
APPLOVIN CORP TOTAL		**563**
ARTERIS INC	BMO Capital Markets Corp.	49
	Cowen and Company, LLC	64
	Jefferies LLC	67
	Northland Capital Markets	39
	Rosenblatt Securities Inc.	0
ARTERIS INC TOTAL		**219**
AUGMEDIX INC	B. Riley Securities	55
	Lake Street	5
	The Benchmark Company, LLC	0
	William Blair & Company, L.L.C.	41
AUGMEDIX INC TOTAL		**101**
AVIDXCHANGE HOLDINGS INC	Barclays Capital Inc	69
	BofA Securities, Inc	73
	Credit Suisse Securities (USA) LLC	74
	Deutsche Bank Securities Inc	68
	Fifth Third Securities, Inc	0
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	KeyBanc Capital Markets Inc	0
	Nomura Securities International, Inc	48
	Piper Sandler & Co	40
AVIDXCHANGE HOLDINGS INC TOTAL		**517**
BLEND LABS INC	Allen & Company LLC	38
	Canaccord Genuity LLC	26
	Drexel Hamilton LLC	23
	Goldman Sachs & Co. LLC	75
	KeyBanc Capital Markets Inc	0

	Loop Capital Markets LLC	29
	Piper Sandler & Co	40
	Samuel A. Ramirez & Company, Inc	0
	Truist Securities, Inc	11
	UBS Securities LLC	0
	Wells Fargo Securities, LLC	60
	William Blair & Company, L.L.C.	41
BLEND LABS INC TOTAL		**343**
BRAZE INC	Barclays Capital Inc	69
	Canaccord Genuity LLC	26
	Cowen and Company, LLC	64
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	JMP Securities, LLC	14
	Loop Capital Markets LLC	29
	Needham & Company, LLC	43
	Oppenheimer & Co. Inc	53
	Piper Sandler & Co	40
	Raymond James & Associates, Inc	34
	William Blair & Company, L.L.C.	41
BRAZE INC TOTAL		**558**
CLEAR SECURE INC	Allen & Company LLC	38
	Centerview Partners LLC	0
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	LionTree Advisors LLC	32
	Loop Capital Markets LLC	29
	Roberts & Ryan Investments, Inc	0
	Stifel, Nicolaus & Company, Incorporated	61
	Telsey Advisory Group LLC	0
	Wells Fargo Securities, LLC	60
CLEAR SECURE INC TOTAL		**365**
CLEARWATER ANALYTICS HOLDINGS	Amerivet Securities, Inc	0
	BNP Paribas Securities Corp.	0
	Credit Suisse Securities (USA) LLC	74
	D. A. Davidson & Co.	0
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	Loop Capital Markets LLC	29
	Morgan Stanley & Co. LLC	72
	Oppenheimer & Co. Inc	53
	Penserra Securities LLC	0
	Piper Sandler & Co	40
	R. Seelaus & Co., LLC	0
	RBC Capital Markets, LLC	57
	Siebert Williams Shank & Co., LLC	0
	Wells Fargo Securities, LLC	60
	William Blair & Company, L.L.C.	41
CLEARWATER ANALYTICS HOLDINGS TOTAL		**571**
CONFLUENT INC	Barclays Capital Inc	69
	BofA Securities, Inc	73
	Citigroup Global Markets, Inc	76
	Cowen and Company, LLC	64
	Credit Suisse Securities (USA) LLC	74
	D. A. Davidson & Co.	0
	Deutsche Bank Securities Inc	68
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	JMP Securities, LLC	14
	KeyBanc Capital Markets Inc	0

	Morgan Stanley & Co. LLC	72
	Piper Sandler & Co	40
	UBS Securities LLC	0
	Wells Fargo Securities, LLC	60
CONFLUENT INC TOTAL		**755**
CS DISCO INC	BofA Securities, Inc	73
	Canaccord Genuity LLC	26
	Citigroup Global Markets, Inc	76
	Cowen and Company, LLC	64
	J.P. Morgan Securities LLC	70
	Jefferies LLC	67
	Loop Capital Markets LLC	29
	Needham & Company, LLC	43
	Stifel, Nicolaus & Company, Incorporated	61
CS DISCO INC TOTAL		**509**
DIGITALOCEAN HOLDINGS INC	Barclays Capital Inc	69
	BofA Securities, Inc	73
	Canaccord Genuity LLC	26
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	JMP Securities, LLC	14
	KeyBanc Capital Markets Inc	0
	Morgan Stanley & Co. LLC	72
	Stifel, Nicolaus & Company, Incorporated	61
DIGITALOCEAN HOLDINGS INC TOTAL		**460**
DOUBLEVERIFY HOLDINGS INC	Barclays Capital Inc	69
	Canaccord Genuity LLC	26
	Capital One Securities, Inc	0
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	JMP Securities, LLC	14
	KeyBanc Capital Markets Inc	0
	Loop Capital Markets LLC	29
	Needham & Company, LLC	43
	RBC Capital Markets, LLC	57
	Truist Securities, Inc	11
	William Blair & Company, L.L.C.	41
DOUBLEVERIFY HOLDINGS INC TOTAL		**435**
DOXIMITY INC	Canaccord Genuity LLC	26
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	Morgan Stanley & Co. LLC	72
	Needham & Company, LLC	43
	Piper Sandler & Co	40
	Raymond James & Associates, Inc	34
	SVB Leerink LLC	0
	William Blair & Company, L.L.C.	41
DOXIMITY INC TOTAL		**401**
DUOLINGO INC	Allen & Company LLC	38
	Barclays Capital Inc	69
	BofA Securities, Inc	73
	Evercore Group L.L.C.	59
	Goldman Sachs & Co. LLC	75
	JMP Securities, LLC	14
	KeyBanc Capital Markets Inc	0
	Piper Sandler & Co	40
	Raymond James & Associates, Inc	34
	William Blair & Company, L.L.C.	41
DUOLINGO INC TOTAL		**443**
ENGAGESMART INC	BofA Securities, Inc	73

	Citigroup Global Markets, Inc	76
	Deutsche Bank Securities Inc	68
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	KeyBanc Capital Markets Inc	0
	Needham & Company, LLC	43
	Penserra Securities LLC	0
	R. Seelaus & Co., LLC	0
	Raymond James & Associates, Inc	34
	Roberts & Ryan Investments, Inc	0
	Truist Securities, Inc	11
	William Blair & Company, L.L.C.	41
ENGAGESMART INC TOTAL		**491**
EXPENSIFY INC	BofA Securities, Inc	73
	Citigroup Global Markets, Inc	76
	J.P. Morgan Securities LLC	70
	JMP Securities, LLC	14
	Loop Capital Markets LLC	29
	Piper Sandler & Co	40
EXPENSIFY INC TOTAL		**302**
FORGEROCK INC	BTIG, LLC	65
	Cowen and Company, LLC	64
	Deutsche Bank Securities Inc	68
	HSBC Securities (USA) Inc	0
	J.P. Morgan Securities LLC	70
	Mizuho Securities USA LLC	58
	Morgan Stanley & Co. LLC	72
	Piper Sandler & Co	40
	Truist Securities, Inc	11
	William Blair & Company, L.L.C.	41
FORGEROCK INC TOTAL		**489**
FRESHWORKS INC	Amerivet Securities, Inc	0
	Barclays Capital Inc	69
	BofA Securities, Inc	73
	Canaccord Genuity LLC	26
	CastleOak Securities, L.P.	46
	J.P. Morgan Securities LLC	70
	Jefferies LLC	67
	JMP Securities, LLC	14
	Morgan Stanley & Co. LLC	72
	Needham & Company, LLC	43
	Nomura Securities International, Inc	48
	Oppenheimer & Co. Inc	53
	Piper Sandler & Co	40
	R. Seelaus & Co., LLC	0
	Raymond James & Associates, Inc	34
	Robert W. Baird & Co. Incorporated	0
	Samuel A. Ramirez & Company, Inc	0
FRESHWORKS INC TOTAL		**655**
GITLAB INC	BofA Securities, Inc	73
	Cowen and Company, LLC	64
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	KeyBanc Capital Markets Inc	0
	Piper Sandler & Co	40
	RBC Capital Markets, LLC	57
	Truist Securities, Inc	11
	UBS Securities LLC	0
	William Blair & Company, L.L.C.	41
GITLAB INC TOTAL		**431**
HASHICORP INC	Blaylock Van, LLC	0
	BofA Securities, Inc	73

	Citigroup Global Markets, Inc	76
	Cowen and Company, LLC	64
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	JMP Securities, LLC	14
	KeyBanc Capital Markets Inc	0
	Morgan Stanley & Co. LLC	72
	Nomura Securities International, Inc	48
	Oppenheimer & Co. Inc	53
	R. Seelaus & Co., LLC	0
	Stifel, Nicolaus & Company, Incorporated	61
	William Blair & Company, L.L.C.	41
HASHICORP INC TOTAL		**647**
INFORMATICA INC	Academy Securities, Inc	0
	BofA Securities, Inc	73
	Citigroup Global Markets, Inc	76
	Credit Suisse Securities (USA) LLC	74
	Deutsche Bank Securities Inc	68
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	LionTree Advisors LLC	32
	Macquarie Capital (USA) Inc	0
	Nomura Securities International, Inc	48
	RBC Capital Markets, LLC	57
	Siebert Williams Shank & Co., LLC	0
	UBS Securities LLC	0
	Wells Fargo Securities, LLC	60
INFORMATICA INC TOTAL		**633**
INSTRUCTURE HOLDINGS INC	Academy Securities, Inc	0
	BTIG, LLC	65
	C.L. King & Associates, Inc	0
	Citigroup Global Markets, Inc	76
	Drexel Hamilton LLC	23
	J.P. Morgan Securities LLC	70
	Jefferies LLC	67
	Macquarie Capital (USA) Inc	0
	Morgan Stanley & Co. LLC	72
	Raymond James & Associates, Inc	34
	Robert W. Baird & Co. Incorporated	0
	Samuel A. Ramirez & Company, Inc	0
	Truist Securities, Inc	11
	William Blair & Company, L.L.C.	41
INSTRUCTURE HOLDINGS INC TOTAL		**459**
INTAPP INC	BofA Securities, Inc	73
	Credit Suisse Securities (USA) LLC	74
	J.P. Morgan Securities LLC	70
	Oppenheimer & Co. Inc	53
	Piper Sandler & Co	40
	Raymond James & Associates, Inc	34
	Stifel, Nicolaus & Company, Incorporated	61
	Truist Securities, Inc	11
INTAPP INC TOTAL		**416**
INTEGRAL AD SCIENCE HOLDING CO	Academy Securities, Inc	0
	Barclays Capital Inc	69
	Blaylock Van, LLC	0
	BMO Capital Markets Corp.	49
	Evercore Group L.L.C.	59
	Jefferies LLC	67
	Morgan Stanley & Co. LLC	72
	Oppenheimer & Co. Inc	53

	Penserra Securities LLC	0
	R. Seelaus & Co., LLC	0
	Raymond James & Associates, Inc	34
	Siebert Williams Shank & Co., LLC	0
	Stifel, Nicolaus & Company, Incorporated	61
	Wells Fargo Securities, LLC	60
INTEGRAL AD SCIENCE HOLDING CO TOTAL		**524**
KALTURA INC	BofA Securities, Inc	73
	Canaccord Genuity LLC	26
	Deutsche Bank Securities Inc	68
	Goldman Sachs & Co. LLC	75
	JMP Securities, LLC	14
	KeyBanc Capital Markets Inc	0
	Needham & Company, LLC	43
	Oppenheimer & Co. Inc	53
	Wells Fargo Securities, LLC	60
KALTURA INC TOTAL		**412**
KNOWBE4 INC	BofA Securities, Inc	73
	Canaccord Genuity LLC	26
	Citigroup Global Markets, Inc	76
	Cowen and Company, LLC	64
	Goldman Sachs & Co. LLC	75
	KKR Capital Markets LLC	0
	Morgan Stanley & Co. LLC	72
	Needham & Company, LLC	43
	Piper Sandler & Co	40
	Robert W. Baird & Co.	13
	Truist Securities, Inc	11
	UBS Securities LLC	0
KNOWBE4 INC TOTAL		**493**
MERIDIANLINK INC	Barclays Capital Inc	69
	Blaylock Van, LLC	0
	BofA Securities, Inc	73
	BTIG, LLC	65
	Citigroup Global Markets, Inc	76
	Credit Suisse Securities (USA) LLC	74
	Nomura Securities International, Inc	48
	Raymond James & Associates, Inc	34
	Roberts & Ryan Investments, Inc	0
	Samuel A. Ramirez & Company, Inc	0
	Stifel, Nicolaus & Company, Incorporated	61
	Tigress Financial Partners LLC	0
	William Blair & Company, L.L.C.	41
MERIDIANLINK INC TOTAL		**541**
OLO INC	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	Piper Sandler & Co	40
	Raine Securities LLC	0
	RBC Capital Markets, LLC	57
	Stifel, Nicolaus & Company, Incorporated	61
	Truist Securities, Inc	11
	William Blair & Company, L.L.C.	41
OLO INC TOTAL		**355**
ON24 INC	Canaccord Genuity LLC	26
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	KeyBanc Capital Markets Inc	0
	Needham & Company, LLC	43
	Piper Sandler & Co	40

	Robert W. Baird & Co. Incorporated	0
	William Blair & Company, L.L.C.	41
ON24 INC TOTAL		**295**
PAYCOR HCM INC	Cowen and Company, LLC	64
	Credit Suisse Securities (USA) LLC	74
	Deutsche Bank Securities Inc	68
	Fifth Third Securities, Inc	0
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	Jefferies LLC	67
	JMP Securities, LLC	14
	Needham & Company, LLC	43
	Raymond James & Associates, Inc	34
	Robert W. Baird & Co. Incorporated	0
	Roberts & Ryan Investments, Inc	0
	Stifel, Nicolaus & Company, Incorporated	61
	Truist Securities, Inc	11
PAYCOR HCM INC TOTAL		**581**
SAMSARA INC	Academy Securities, Inc	0
	Allen & Company LLC	38
	Cowen and Company, LLC	64
	Evercore Group L.L.C.	59
	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	Loop Capital Markets LLC	29
	Morgan Stanley & Co. LLC	72
	Nomura Securities International, Inc	48
	R. Seelaus & Co., LLC	0
	RBC Capital Markets, LLC	57
	Samuel A. Ramirez & Company, Inc	0
	Siebert Williams Shank & Co., LLC	0
	Wells Fargo Securities, LLC	60
	William Blair & Company, L.L.C.	41
	WR Securities, LLC	0
SAMSARA INC TOTAL		**613**
SEMRUSH HOLDINGS INC	Goldman Sachs & Co. LLC	75
	J.P. Morgan Securities LLC	70
	Jefferies LLC	67
	KeyBanc Capital Markets Inc	0
	Piper Sandler & Co	40
	Stifel, Nicolaus & Company, Incorporated	61
SEMRUSH HOLDINGS INC TOTAL		**313**
SENTINELONE INC	Barclays Capital Inc	69
	BofA Securities, Inc	73
	BTIG, LLC	65
	Cowen and Company, LLC	64
	Deutsche Bank Securities Inc	68
	Drexel Hamilton LLC	23
	Goldman Sachs & Co. LLC	75
	Jefferies LLC	67
	Loop Capital Markets LLC	29
	Morgan Stanley & Co. LLC	72
	Needham & Company, LLC	43
	Piper Sandler & Co	40
	R. Seelaus & Co., LLC	0
	UBS Securities LLC	0
	Wells Fargo Securities, LLC	60
SENTINELONE INC TOTAL		**748**
SKYWATER TECHNOLOGY INC	Cowen and Company, LLC	64
	Jefferies LLC	67

	Piper Sandler & Co	40
SKYWATER TECHNOLOGY INC TOTAL		**171**
UIPATH INC	Barclays Capital Inc	69
	BMO Capital Markets Corp.	49
	BofA Securities, Inc	73
	Canaccord Genuity LLC	26
	Cowen and Company, LLC	64
	Credit Suisse Securities (USA) LLC	74
	D. A. Davidson & Co.	0
	Evercore Group L.L.C.	59
	J.P. Morgan Securities LLC	70
	KeyBanc Capital Markets Inc	0
	Macquarie Capital (USA) Inc	0
	Mizuho Securities USA LLC	58
	Morgan Stanley & Co. LLC	72
	Needham & Company, LLC	43
	Nomura Securities International, Inc	48
	Oppenheimer & Co. Inc	53
	RBC Capital Markets, LLC	57
	SMBC Nikko Securities America, Inc	4
	TD Securities (USA) LLC	0
	Truist Securities, Inc	11
	Wells Fargo Securities, LLC	60
UIPATH INC TOTAL		**890**
USERTESTING INC	Academy Securities, Inc	0
	Canaccord Genuity LLC	26
	J.P. Morgan Securities LLC	70
	Loop Capital Markets LLC	29
	Morgan Stanley & Co. LLC	72
	Needham & Company, LLC	43
	Oppenheimer & Co. Inc	53
	Piper Sandler & Co	40
	Raymond James & Associates, Inc	34
	Robert W. Baird & Co. Incorporated	0
	Truist Securities, Inc	11
	William Blair & Company, L.L.C.	41
USERTESTING INC TOTAL		**419**
VIANT TECHNOLOGY INC	BofA Securities, Inc	73
	Canaccord Genuity LLC	26
	JMP Securities, LLC	14
	Needham & Company, LLC	43
	Raymond James & Associates, Inc	34
	UBS Securities LLC	0
VIANT TECHNOLOGY INC TOTAL		**190**
WEAVE COMMUNICATIONS INC	Academy Securities, Inc	0
	BofA Securities, Inc	73
	Citigroup Global Markets, Inc	76
	Goldman Sachs & Co. LLC	75
	Guggenheim Securities	56
	Loop Capital Markets LLC	29
	Piper Sandler & Co	40
	Raymond James & Associates, Inc	34
	Stifel, Nicolaus & Company, Incorporated	61
	Tigress Financial Partners LLC	0
	William Blair & Company, L.L.C.	41
WEAVE COMMUNICATIONS INC TOTAL		**485**
ZETA GLOBAL HOLDINGS CORP	Barclays Capital Inc	69
	BofA Securities, Inc	73
	Canaccord Genuity LLC	26
	Credit Suisse Securities (USA) LLC	74
	Morgan Stanley & Co. LLC	72

	Needham & Company, LLC	43
	Oppenheimer & Co. Inc	53
	Roth Capital Partners	37
	William Blair & Company, L.L.C.	41
ZETA GLOBAL HOLDINGS CORP TOTAL		**488**

Source: Author's development.

Table 4

Rating of Underwriters according to league table for 2020

Underwriter	Rank	Underwriter	Rank
Citigroup	48	Raymond James	24
Credit Suisse	47	I-Bankers Securities, Inc.	23
Goldman Sachs	46	Robert W. Baird & Co.	22
UBS Investment Bank	45	Northland Capital Markets	21
Deutsche Bank Securities	44	PJT Partners	20
Morgan Stanley	43	Nomura	19
Jefferies	42	JMP Securities	18
J.P. Morgan	41	Moelis & Company	17
Cantor Fitzgerald	40	Ladenburg Thalmann	16
BofA Securities, Inc.	39	Maxim Group	15
Barclays	38	Allen & Co.	14
Cowen and Company	37	William Blair	13
BTIG	36	JonesTrading	12
Wells Fargo Securities	35	National Securites	11
Stifel, Nicolaus & Company	34	Imperial Capital	10
RBC Capital Markets	33	Piper Sandler & Co.	9
EarlyBirdCapital, Inc.	32	ThinkEquity	8
Chardan	31	Keefe, Bruyette & Woods	7
Mizuho Securities	30	Craig-Hallum Capital Group	6
B. Riley Securities	29	Roth Capital Partners	5
Odeon Capital Group	28	SVB Leerink	4
Oppenheimer & Co.	27	LifeSci Capital	3
Evercore ISI	26	Macquarie Capital	2
Apollo Global Securities	25	H.C. Wainwright & Co.	1

Source: https://www.spacresearch.com/underwriter.

Table 5

Calculation of Underwriters rating for companies with IPO date in 2020

COMPANY	UNDERWRITER	TOTAL
BENTLEY SYSTEMS INC	BofA Securities, Inc.	39
	Goldman Sachs & Co. LLC	46
	KeyBanc Capital Markets Inc.	0
	Mizuho Securities USA LLC	30
	RBC Capital Markets, LLC	33
	Robert W. Baird & Co. Incorporated	22

BENTLEY SYSTEMS INC TOTAL		**170**
BIGCOMMERCE HOLDINGS INC	Barclays Capital Inc.	38
	Canaccord Genuity LLC	0
	Jefferies LLC	42
	KeyBanc Capital Markets Inc.	0
	Morgan Stanley & Co. LLC	43
	Needham & Company, LLC	0
	Raymond James & Associates, Inc.	24
	Truist Securities, Inc.	0
BIGCOMMERCE HOLDINGS INC TOTAL		**147**
C3.AI INC	BofA Securities, Inc.	39
	Canaccord Genuity LLC	0
	Deutsche Bank Securities Inc.	44
	J.P. Morgan Securities LLC	41
	JMP Securities LLC	18
	KeyBanc Capital Markets Inc.	0
	Morgan Stanley & Co. LLC	43
	Needham & Company, LLC	0
	Piper Sandler & Co.	9
	Wedbush Securities Inc.	0
C3.AI INC TOTAL		**194**
DATTO HOLDING CORP	Barclays Capital Inc.	38
	BMO Capital Markets Corp.	0
	BofA Securities, Inc.	39
	Citigroup Global Markets, LLC	48
	Credit Suisse Securities (USA) LLC	47
	Evercore Group L.L.C.	26
	Jefferies LLC	42
	Macquarie Capital (USA) Inc.	2
	Mizuho Securities USA LLC	30
	Morgan Stanley & Co. LLC	43
	RBC Capital Markets, LLC	33
	Samuel A. Ramirez & Company, Inc.	0
	Siebert Williams Shank & Co., LLC	0
	William Blair & Company, L.L.C.	13
DATTO HOLDING CORP TOTAL		**361**
DUCK CREEK TECHNOLOGIES INC	Barclays Capital Inc.	38
	BofA Securities, Inc.	39
	D.A. Davidson & Co.	0
	Goldman Sachs & Co. LLC	46
	J.P. Morgan Securities LLC	41
	JMP Securities LLC	18
	Loop Capital Markets LLC	0
	Needham & Company, LLC	0
	Raymond James & Associates Inc.	24
	RBC Capital Markets, LLC	33
	Stifel, Nicolaus & Company, Incorporated	34
	William Blair & Company L.L.C.	13
DUCK CREEK TECHNOLOGIES INC TOTAL		**286**
INTRUSION INC	B. Riley Securities, Inc.	29
INTRUSION INC TOTAL		**29**
JAMF HOLDING CORP	Barclays Capital Inc.	38
	BofA Securities, Inc.	39
	Canaccord Genuity LLC.	0
	CastleOak Securities, L.P.	0
	Goldman Sachs & Co. LLC	46
	HSBC Securities (USA) Inc.	0
	J.P. Morgan Securities LLC	41
	JMP Securities LLC	18
	Loop Capital Markets LLC	0
	Mizuho Securities USA LLC	30

	Piper Sandler & Co.	9
	RBC Capital Markets, LLC	33
	William Blair & Company, L.L.C.	13
JAMF HOLDING CORP TOTAL		**267**
MOTORSPORT GAMES INC	Canaccord Genuity LLC	0
	The Benchmark Company, LLC	0
MOTORSPORT GAMES INC TOTAL		**0**
OUTSET MEDICAL INC	BofA Securities, Inc.	39
	Goldman Sachs & Co. LLC	46
	Morgan Stanley & Co. LLC	43
	Stifel, Nicolaus & Company, Incorporated	34
	SVB Leerink LLC	4
OUTSET MEDICAL INC TOTAL		**166**
QUALTRICS INTERNATIONAL INC	Barclays Capital Inc.	38
	Citigroup Global Markets Inc.	48
	Goldman Sachs & Co. LLC	46
	HSBC Securities (USA) Inc.	0
	J.P. Morgan Securities LLC	41
	Morgan Stanley & Co. LLC	43
	Truist Securities, Inc.	0
QUALTRICS INTERNATIONAL INC TOTAL		**216**
SCHRODINGER INC	BMO Capital Markets Corp.	0
	BofA Securities, Inc.	39
	Jefferies LLC	42
	Morgan Stanley & Co. LLC	43
SCHRODINGER INC TOTAL		**124**
SNOWFLAKE INC	Academy Securities, Inc.	0
	Allen & Company LLC	14
	Barclays Capital Inc.	38
	BTIG, LLC	0
	Canaccord Genuity LLC	0
	Capital One Securities, Inc.	0
	Citigroup Global Markets Inc.	48
	Cowen and Company, LLC	37
	Credit Suisse Securities (USA) LLC	47
	D.A. Davidson & Co.	0
	Deutsche Bank Securities Inc.	44
	Goldman Sachs & Co. LLC	46
	J.P. Morgan Securities LLC	41
	JMP Securities LLC	18
	Loop Capital Markets LLC	0
	Mizuho Securities USA LLC	30
	Morgan Stanley & Co. LLC	43
	Oppenheimer & Co. Inc.	27
	Piper Sandler & Co.	9
	Samuel A. Ramirez & Company, Inc.	0
	Siebert Williams Shank & Co., LLC	0
	Stifel, Nicolaus & Company, Incorporated	34
	Truist Securities, Inc.	0
SNOWFLAKE INC TOTAL		**476**
SUMO LOGIC INC	BTIG, LLC	0
	Cowen and Company, LLC	37
	J.P. Morgan Securities LLC	41
	Jefferies LLC	42
	Morgan Stanley & Co. LLC	43
	Piper Sandler & Co.	9
	RBC Capital Markets, LLC	33
	William Blair & Company, L.L.C.	13
SUMO LOGIC INC TOTAL		**218**
UNITY SOFTWARE INC	Academy Securities, Inc.	0
	Barclays Capital Inc.	38
	BofA Securities, Inc.	39

	Credit Suisse Securities (USA) LLC	47
	Goldman Sachs & Co. LLC	46
	Oppenheimer & Co. Inc.	27
	Piper Sandler & Co.	9
	Siebert Williams Shank & Co., LLC	0
	Stifel, Nicolaus & Company, Incorporated	34
	Wedbush Securities Inc.	0
	William Blair & Company, L.L.C.	13
UNITY SOFTWARE INC TOTAL		**253**
VERTEX INC	BofA Securities, Inc.	39
	CastleOak Securities, L.P.	0
	Citigroup Global Markets Inc.	48
	Goldman Sachs & Co. LLC	46
	Jefferies LLC	0
	JMP Securities LLC	18
	Morgan Stanley & Co. LLC	43
	Stifel, Nicolaus & Company, Incorporated	34
	William Blair & Company, L.L.C.	13
VERTEX INC TOTAL		**241**
ZOOMINFO TECHNOLOGIES INC	Barclays Capital Inc.	38
	BofA Securities, Inc.	39
	Canaccord Genuity LLC	0
	Credit Suisse Securities (USA) LLC	47
	Deutsche Bank Securities Inc.	44
	J.P. Morgan Securities LLC	41
	JMP Securities LLC	18
	Mizuho Securities USA LLC	30
	Morgan Stanley & Co. LLC	43
	Piper Sandler & Co.	9
	Raymond James & Associates, Inc.	24
	RBC Capital Markets, LLC	33
	Stifel, Nicolaus & Company, Incorporated	34
	SunTrust Robinson Humphrey, Inc.	0
	UBS Securities LLC	45
	Wells Fargo Securities, LLC	35
	ZoomInfo Technologies Inc	480
ZOOMINFO TECHNOLOGIES INC TOTAL		**960**

Source: Author's development.

Table 6

Rating of Underwriters according to league table for 2019

Underwriter	Rank	Underwriter	Rank
Cantor Fitzgerald	24	BofA Securities, Inc.	12
Deutsche Bank Securities Inc.	23	Stifel, Nicolaus & Company, Incorporated	11
Credit Suisse Securities (USA) LLC	22	Jefferies LLC	10
Goldman Sachs & Co. LLC	21	Chardan	9
BTIG, LLC	20	Nomura	8
Citigroup Global Markets Inc.	19	Cowen and Company	7
EarlyBirdCapital, Inc.	18	I-Bankers Securities, Inc.	6
UBS Securities LLC	17	Northland Capital Markets	5
Barclays Capital Inc.	16	Craig-Hallum Capital Group LLC	4
Morgan Stanley & Co. LLC	15	Maxim Group LLC	3
J. P. Morgan Securities LLC	14	BMO Capital Markets	2
B. Riley Securities	13	SVB Leerink LLC	1

Source: https://www.spacresearch.com/underwriter.

Table 7

Calculation of Underwriters rating for companies with IPO date in 2019

COMPANY	UNDERWRITER	RATING
BILL.COM HOLDINGS INC	BofA Securities, Inc.	12
	Canaccord Genuity LLC	0
	Goldman Sachs & Co. LLC	21
	Jefferies LLC	10
	KeyBanc Capital Markets Inc.	0
	Needham & Company, LLC	0
	William Blair & Company, L.L.C.	0
BILL.COM HOLDINGS INC TOTAL		**43**
CLOUDFLARE INC	BTIG, LLC	20
	Evercore Group L.L.C.	0
	Goldman Sachs & Co. LLC	21
	J. P. Morgan Securities LLC	14
	Jefferies LLC	10
	JMP Securities LLC	0
	Morgan Stanley & Co. LLC	15
	Needham & Company, LLC	0
	Oppenheimer & Co. Inc.	0
	RBC Capital Markets, LLC	0
	SunTrust Robinson Humphrey, Inc.	0
	Wells Fargo Securities, LLC	0
CLOUDFLARE INC TOTAL		**80**
CROWDSTRIKE HOLDINGS INC	Barclays Capital Inc.	16
	BofA Securities, Inc.	12
	BTIG, LLC	20
	Credit Suisse Securities (USA) LLC	22
	Goldman Sachs & Co. LLC	21
	HSBC Securities (USA) Inc.	0
	J. P. Morgan Securities LLC	14
	Jefferies LLC	10

	JMP Securities LLC	0
	Macquarie Capital (USA) Inc.	0
	Mizuho Securities USA LLC	0
	Needham & Company, LLC	0
	Oppenheimer & Co. Inc.	0
	Piper Jaffray & Co.	0
	RBC Capital Markets, LLC	0
	Stifel, Nicolaus & Company, Incorporated	11
	SunTrust Robinson Humphrey, Inc.	0
CROWDSTRIKE HOLDINGS INC TOTAL		**126**
DATADOG INC	Barclays Capital Inc.	16
	Credit Suisse Securities (USA) LLC	22
	Goldman Sachs & Co. LLC	21
	J. P. Morgan Securities LLC	14
	Jefferies LLC	10
	JMP Securities LLC	0
	Morgan Stanley & Co. LLC	15
	Needham & Company, LLC	0
	Raymond James & Associates, Inc.	0
	RBC Capital Markets, LLC	0
	Stifel, Nicolaus & Company, Incorporated	11
	William Blair & Company, L.L.C.	0
DATADOG INC TOTAL		**109**
DUOS TECHNOLOGIES GROUP INC	Joseph Gunnar & Co. LLC	0
DUOS TECHNOLOGIES GROUP INC TOTAL		**0**
DYNATRACE INC	Barclays Capital Inc.	16
	Canaccord Genuity LLC	0
	Citigroup Global Markets Inc.	19
	Goldman Sachs & Co. LLC	21
	J. P. Morgan Securities LLC	14
	Jefferies LLC	10
	JMP Securities LLC	0
	KeyBanc Capital Markets Inc.	0
	Macquarie Capital (USA) Inc.	0
	RBC Capital Markets, LLC	0
	UBS Securities LLC	17
	William Blair & Company, L.L.C.	0
DYNATRACE INC TOTAL		**97**
FASTLY INC	Citigroup Global Markets Inc.	19
	Craig-Hallum Capital Group LLC	4
	Credit Suisse Securities (USA) LLC	22
	D.A. Davidson & Co.	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Oppenheimer & Co. Inc.	0
	Raymond James & Associates, Inc.	0
	Robert W. Baird & Co. Incorporated	0
	Stifel, Nicolaus & Company, Incorporated	11
	William Blair & Company, L.L.C.	0
FASTLY INC TOTAL		**56**
HEALTH CATALYST INC	Evercore Group L.L.C.	0
	Goldman Sachs & Co. LLC	21
	J. P. Morgan Securities LLC	14
	Piper Jaffray & Co.	0
	SunTrust Robinson Humphrey, Inc.	0
	SVB Leerink LLC	1
	William Blair & Company, L.L.C.	0
HEALTH CATALYST INC TOTAL		**36**
LIFE360 INC	Bell Potter Securities Limited	0
	Credit Suisse Securities (USA) LLC	22

LIFE360 INC TOTAL		**22**
LIMEADE INC	Macquarie Capital (Australia) Limited	0
	Moelis Australia Advisory Pty Ltd	0
LIMEADE INC TOTAL		**0**
MEDALLIA INC	BofA Securities, Inc.	12
	Citigroup Global Markets Inc.	19
	Craig-Hallum Capital Group LLC	4
	Credit Suisse Securities (USA) LLC	22
	Needham & Company, LLC	0
	Oppenheimer & Co. Inc.	0
	Roth Capital Partners, LLC	0
	SunTrust Robinson Humphrey, Inc.	0
	Wells Fargo Securities, LLC	0
	William Blair & Company, L.L.C.	0
	(blank)	0
MEDALLIA INC TOTAL		**57**
PHREESIA INC	Allen & Company LLC	0
	J. P. Morgan Securities LLC	14
	Piper Jaffray & Co.	0
	Wells Fargo Securities, LLC	0
	William Blair & Company, L.L.C.	0
PHREESIA INC TOTAL		**14**
PING IDENTITY HOLDING CORP	Barclays Capital Inc.	16
	BofA Securities, Inc.	12
	Citigroup Global Markets Inc.	19
	Credit Suisse Securities (USA) LLC	22
	Deutsche Bank Securities Inc.	23
	Goldman Sachs & Co. LLC	21
	Mizuho Securities USA LLC	0
	Oppenheimer & Co. Inc.	0
	Raymond James & Associates, Inc.	0
	RBC Capital Markets, LLC	0
	Stifel, Nicolaus & Company, Incorporated	11
	Wells Fargo Securities, LLC	0
	William Blair & Company, L.L.C.	0
PING IDENTITY HOLDING CORP TOTAL		**124**
SCIPLAY CORP	Deutsche Bank Securities Inc.	23
	Goldman Sachs & Co. LLC	21
	J. P. Morgan Securities LLC	14
	Macquarie Capital (USA) Inc.	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Morgan Stanley & Co. LLC	15
	RBC Capital Markets, LLC	0
	Stifel, Nicolaus & Company, Incorporated	11
	Wedbush Securities Inc.	0
SCIPLAY CORP TOTAL		**84**
SITIME CORP	Barclays Capital Inc.	16
	Needham & Company, LLC	0
	Raymond James & Associates, Inc.	0
	Roth Capital Partners, LLC	0
	Stifel, Nicolaus & Company, Incorporated	11
SITIME CORP TOTAL		**27**
SPROUT SOCIAL INC	Canaccord Genuity LLC	0
	Goldman Sachs & Co. LLC	21
	KeyBanc Capital Markets Inc.	0
	Morgan Stanley & Co. LLC	15
	Stifel, Nicolaus & Company, Incorporated	11
	William Blair & Company, L.L.C.	0

SPROUT SOCIAL INC TOTAL		**47**
VERIFYME INC	Joseph Gunnar & Co. LLC	0
	Maxim Group LLC	3
VERIFYME INC TOTAL		**3**
ZOOM VIDEO COMMUNICATIONS INC	Credit Suisse Securities (USA) LLC	22
	Goldman Sachs & Co. LLC	21
	J. P. Morgan Securities LLC	14
	JMP Securities LLC	0
	KeyBanc Capital Markets Inc.	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Morgan Stanley & Co. LLC	15
	Piper Jaffray & Co.	0
	RBC Capital Markets, LLC	0
	Stifel, Nicolaus & Company, Incorporated	11
	Wells Fargo Securities, LLC	0
	William Blair & Company, L.L.C.	0
ZOOM VIDEO COMMUNICATIONS INC TOTAL		**83**

Source: Author's development.

Table 8

Rating of Underwriters according to league table for 2018

Underwriter	Rank	Underwriter	Rank
Credit Suisse Securities (USA) LLC	23	CLSA	10
Chardan	22	Cowen and Company, LLC	9
BofA Securities, Inc.	21	Macquarie Capital (USA) Inc.	8
Citigroup	20	J.P. Morgan Securities LLC	7
Cantor Fitzgerald	19	Dowling & Partners	6
EarlyBirdCapital, Inc.	18	Raymond James	5
Deutsche Bank Securities Inc.	17	CIM Securities	4
Goldman Sachs & Co. LLC	16	Ladenburg Thalmann	3
Oppenheimer & Co.	15	Citigroup Global Markets Inc.	2
B. Riley Securities	14	Wells Fargo	2
Jefferies LLC	13	Wells Fargo Securities, LLC	2
UBS Securities LLC	12	Maxim Group	1
BTIG, LLC	11		

Source: https://www.spacresearch.com/underwriter.

Table 9

Calculation of Underwriters rating for companies with IPO date in 2018

COMPANY	UNDERWRITER	TOTAL
AVALARA INC	Goldman Sachs & Co. LLC	16
	J.P. Morgan Securities LLC	7
	JMP Securities LLC	0
	KeyBanc Capital Markets Inc.	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Stifel, Nicolaus & Company, Incorporated	0
AVALARA INC TOTAL		**23**
CARBON BLACK INC	Cowen and Company, LLC	9
	J.P. Morgan Securities LLC	7
	KeyBanc Capital Markets Inc.	0
	Morgan Stanley & Co. LLC	0
	Raymond James	5
	William Blair & Company, L.L.C.	0
CARBON BLACK INC TOTAL		**21**
CARDLYTICS INC	J.P. Morgan Securities LLC	7
	KeyBanc Capital Markets Inc.	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Raymond James	5
	SunTrust Robinson Humphrey, Inc.	0
	Wells Fargo Securities, LLC	2
CARDLYTICS INC TOTAL		**14**
DOCUSIGN INC	Citigroup Global Markets Inc.	2
	Deutsche Bank Securities Inc.	17
	J.P. Morgan Securities LLC	7
	JMP Securities LLC	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Morgan Stanley & Co. LLC	0
	Piper Jaffray & Co.	0
	William Blair & Company, L.L.C.	0
DOCUSIGN INC TOTAL		**26**
DOMO INC	Allen & Company LLC	0
	Cowen and Company, LLC	9
	Credit Suisse Securities (USA) LLC	23

	JMP Securities LLC	0
	Morgan Stanley & Co. LLC	0
	UBS Securities LLC	12
	William Blair & Company, L.L.C.	0
DOMO INC TOTAL		**44**
DROPBOX INC	Allen & Company LLC	0
	Canaccord Genuity Inc.	0
	Deutsche Bank Securities Inc.	17
	Goldman Sachs & Co. LLC	16
	J.P. Morgan Securities LLC	7
	Jefferies LLC	13
	JMP Securities LLC	0
	KeyBanc Capital Markets Inc.	0
	Macquarie Capital (USA) Inc.	8
	Merrill Lynch, Pierce, Fenner & Smith	0
	Piper Jaffray & Co.	0
	RBC Capital Markets, LLC	0
DROPBOX INC TOTAL		**61**
ELASTIC NV	Barclays Capital Inc.	0
	Canaccord Genuity Inc.	0
	Citigroup Global Markets Inc.	2
	Goldman Sachs & Co. LLC	16
	J.P. Morgan Securities LLC	7
	Jefferies LLC	13
	Merrill Lynch, Pierce, Fenner & Smith	0
	RBC Capital Markets, LLC	0
ELASTIC NV TOTAL		**38**
MOMENTIVE GLOBAL INC	Allen & Company LLC	0
	Code Advisors LLC	0
	Credit Suisse Securities (USA) LLC	23
	Foros Securities LLC	0
	J.P. Morgan Securities LLC	7
	JMP Securities LLC	0
	LionTree Advisors LLC	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	SunTrust Robinson Humphrey, Inc.	0
	UBS Securities LLC	12
	Wells Fargo Securities, LLC	2
MOMENTIVE GLOBAL INC TOTAL		**44**
PIVOTAL SOFTWARE INC	Barclays Capital Inc.	0
	Citigroup Global Markets Inc.	2
	Credit Suisse Securities (USA) LLC	23
	Goldman Sachs & Co. LLC	16
	KeyBanc Capital Markets Inc.	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Mischler Financial Group, Inc.	0
	Morgan Stanley & Co. LLC	0
	RBC Capital Markets, LLC	0
	Samuel A. Ramirez & Company, Inc.	0
	Siebert Cisneros Shank & Co., L.L.C.	0
	The Williams Capital Group, L.P.	0
	UBS Securities LLC	12
	Wells Fargo Securities, LLC	2
	William Blair & Company, L.L.C.	0
PIVOTAL SOFTWARE INC TOTAL		**55**
SMARTSHEET INC	Canaccord Genuity Inc.	0
	J.P. Morgan Securities LLC	7
	Jefferies LLC	13
	Morgan Stanley & Co. LLC	0
	RBC Capital Markets, LLC	0
	SunTrust Robinson Humphrey, Inc.	0
	William Blair & Company, L.L.C.	0

SMARTSHEET INC TOTAL		**20**
SOLARWINDS CORP	Barclays Capital Inc.	0
	BofA Securities, Inc.	21
	Citigroup Global Markets Inc.	2
	Credit Suisse Securities (USA) LLC	23
	Evercore Group L.L.C.	0
	Goldman Sachs & Co. LLC	16
	J.P. Morgan Securities LLC	7
	Jefferies LLC	13
	JMP Securities LLC	0
	KeyBanc Capital Markets Inc.	0
	Macquarie Capital (USA) Inc.	8
	Mischler Financial Group, Inc.	0
	Morgan Stanley & Co. LLC	0
	Nomura Securities International, Inc.	0
	RBC Capital Markets, LLC	0
	Robert W. Baird & Co. Incorporated	0
	Samuel A. Ramirez & Company, Inc.	0
	SunTrust Robinson Humphrey, Inc.	0
SOLARWINDS CORP TOTAL		**90**
TENABLE HOLDINGS INC	Allen & Company LLC	0
	BTIG, LLC	11
	Deutsche Bank Securities Inc.	17
	J.P. Morgan Securities LLC	7
	Morgan Stanley & Co. LLC	0
	Stifel, Nicolaus & Company, Incorporated	0
	William Blair & Company, L.L.C.	0
TENABLE HOLDINGS INC TOTAL		**35**
ZSCALER INC	Barclays Capital Inc.	0
	BTIG, LLC	11
	Credit Suisse Securities (USA) LLC	23
	Deutsche Bank Securities Inc.	17
	Goldman Sachs & Co. LLC	16
	Merrill Lynch, Pierce, Fenner & Smith	0
	Morgan Stanley & Co. LLC	0
	Needham & Company, LLC	0
	Robert W. Baird & Co. Incorporated	0
	Stephens Inc.	0
	UBS Securities LLC	12
ZSCALER INC TOTAL		**79**
ZUORA INC	Allen & Company LLC	0
	Canaccord Genuity Inc.	0
	Goldman Sachs & Co. LLC	16
	Jefferies LLC	13
	Morgan Stanley & Co. LLC	0
	Needham & Company, LLC	0
ZUORA INC TOTAL		**29**

Source: Author's development

Table 10

Rating of Underwriters according to league table for 2017

Underwriter	Rank	Underwriter	Rank
Citigroup	20	B.	10
Deutsche	19	RBC	9
Credit	18	Wells	8
Goldman	17	Cowen	7
EarlyBirdCapital,	16	Maxim	6
J.P.	15	FBR	5
Cantor	14	National	4
Stifel,	13	Macquarie	3
BofA	12	Morgan	2
Chardan	11	Ladenburg	1

Source: https://www.spacresearch.com/underwriter

Table 11

Calculation of Underwriters rating for companies with IPO date in 2017

COMPANY	UNDERWRITER	RATING
ALTAIR ENGINEERING INC	Berenberg Capital Markets LLC	0
	Canaccord Genuity LLC	0
	Deutsche Bank Securities Inc.	19
	J.P. Morgan Securities LLC	15
	Needham & Company, LLC	0
	RBC Capital Markets, LLC	9
	William Blair & Company, L.L.C.	0
ALTAIR ENGINEERING INC TOTAL		**43**
ALTERYX INC	Cowen and Company, LLC	7
	Goldman Sachs & Co. LLC	17
	J.P. Morgan Securities LLC	15
	JMP Securities LLC	0
	KeyBanc Capital Markets Inc.	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Raymond James & Associates, Inc.	0
	William Blair & Company, L.L.C.	0
ALTERYX INC TOTAL		**39**
APPIAN CORP	Barclays Capital Inc.	0
	Canaccord Genuity Inc.	0
	Cowen and Company, LLC	7
	Goldman Sachs & Co. LLC	17
	Morgan Stanley & Co. LLC	2
	Pacific Crest Securities, a division of KeyBanc Capital Markets Inc.	0
APPIAN CORP TOTAL		**26**
AQUANTIA CORP	Barclays Capital Inc.	0
	Deutsche Bank Securities Inc.	19
	Morgan Stanley & Co. LLC	2
	Needham & Company, LLC	0
	Raymond James & Associates, Inc.	0
AQUANTIA CORP TOTAL		**21**
BANDWIDTH INC	Canaccord Genuity Inc.	0
	JMP Securities LLC	0
	KeyBanc Capital Markets Inc.	0
	Morgan Stanley & Co. LLC	2
	Robert W. Baird & Co. Incorporated	0

BANDWIDTH INC TOTAL		**2**
CLOUDERA INC	Incorporated	0
	Allen & Company LLC	0
	Citigroup Global Markets Inc.	20
	Deutsche Bank Securities Inc.	19
	J.P. Morgan Securities LLC	15
	JMP Securities LLC	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Morgan Stanley & Co. LLC	2
	Raymond James & Associates, Inc.	0
	Stifel, Nicolaus & Company Incorporated	13
CLOUDERA INC TOTAL		**69**
FORESCOUT TECHNOLOGIES INC	Citigroup Global Markets Inc.	20
	J.P. Morgan Securities LLC	15
	KeyBanc Capital Markets Inc.	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Morgan Stanley & Co. LLC	2
	UBS Securities LLC	0
FORESCOUT TECHNOLOGIES INC TOTAL		**37**
MONGODB INC	Allen & Company LLC	0
	Barclays Capital Inc.	0
	Canaccord Genuity Inc.	0
	Goldman Sachs & Co. LLC	17
	JMP Securities LLC	0
	Morgan Stanley & Co. LLC	2
	Stifel, Nicolaus & Company, Incorporated	13
MONGODB INC TOTAL		**32**
MULESOFT INC	Allen & Company LLC	0
	Barclays Capital Inc.	0
	Canaccord Genuity Inc.	0
	Goldman, Sachs & Co.	0
	J.P. Morgan Securities LLC	15
	Jefferies LLC	0
	Merrill Lynch, Pierce, Fenner & Smith	0
	Piper Jaffray & Co.	0
	William Blair & Company, L.L.C.	0
MULESOFT INC TOTAL		**15**
SAILPOINT TECHNOLOGIES HOLDING	Canaccord Genuity Inc.	0
	Citigroup Global Markets Inc.	20
	Jefferies LLC	0
	KeyBanc Capital Markets Inc.	0
	Morgan Stanley & Co. LLC	2
	Oppenheimer & Co. Inc.	0
	RBC Capital Markets, LLC	9
SAILPOINT TECHNOLOGIES HOLDING TOTAL		**31**
TINTRI INC	Merrill Lynch, Pierce, Fenner & Smith	0
	Morgan Stanley & Co. LLC	2
	Needham & Company, LLC	0
	Pacific Crest Securities, a division of KeyBanc Capital Markets Inc.	0
	Piper Jaffray & Co.	0
	Raymond James & Associates, Inc.	0
	William Blair & Company, L.L.C.	0
TINTRI INC TOTAL		**2**
YEXT INC	J.P. Morgan Securities LLC	15
	Morgan Stanley & Co. LLC	2
	Pacific Crest Securities, a division of KeyBanc Capital Markets Inc.	0
	RBC Capital Markets, LLC	9
YEXT INC TOTAL		**26**

Source: Author's development