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Master Thesis

Business administration, financial management

The effect of R&D on IPO pricing

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Abstract

This thesis investigates the impact of Research and Development (R&D) intensity on the pricing of Initial Public Offerings (IPOs) across various industries, challenging the traditional view that higher R&D intensity directly correlates with increased IPO pricing. The study employs a quantitative approach, analysing financial data from companies going public between 2016 and 2022, excluding years affected by COVID-19. The findings reveal a more complex relationship than previously assumed. Contrary to expectations, the research indicates either a negligible or even inverse relationship between R&D intensity and IPO pricing. This study also explores the role of patents, finding a potential positive impact, but without a statistically significant correlation with IPO pricing. Additionally, the research shows no significant interaction effects of the high-tech industry context on the valuation of R&D intensity and patents, suggesting that the high-tech industry does not differentially value R&D intensity compared to other sectors. These insights contribute to a nuanced understanding of the role of R&D in IPOs and challenge prevailing assumptions in the field. For finance practitioners and IPO strategists, the findings offer essential insights for optimizing IPO preparation and strategy.

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1. Introduction

In recent years, technology has advanced, leading towards increased globalisation and innovation. This in turn also influences the business landscape, creating more competitive and fast changing markets. To stay ahead of the competition, organisations must keep increasing their value by providing products or services that have a strong demand (Roosenboom, 2007). The increased technological advancements however make it difficult for companies to consistently provide the best viable options. It is therefore more important than ever to focus on innovation and market trends. This is often done by investing in research and development (R&D), this however does come at a cost, often requiring additional funding(Jeon & Kim, 2011; Lome et al., 2016). One of the ways companies can attract the necessary funding to make their investments is by going public. When a company goes public, their shares will be offered on the share market for the first time, transitioning from a privately held company to a publicly traded company. The process is called; initial public offering (IPO). The IPO is guided by underwriters who value the companies and set the initial public offering price at which the company will start off their journey on the stock market.

1.1 Background

The underwriter will during the IPO process perform the book-building process. During this process, the underwriter will calculate the fair value of the company going public. This is however not an easy calculation to make since just looking at the balance sheets and income statements is not going to provide the full picture. The R&D activities from the company are an important part of this. R&D investments are seen as a reflection of the company's commitment to innovation and the potential for growth. Factors which are according to Jeon & Kim, (2011) and Lome et al., (2016) crucial in determining the value of a company. It is however difficult to accurately predict the future rewards that will come from current R&D investments. R&D investments do however often result in the development of products or services that can give the company an edge over their competitors and increase their growth potential. Growth potential can in turn increase the valuation of the company (Chua, 2014; Roosenboom, 2007). Chua, (2014) highlights that investors view companies with R&D investments positively. When appropriately priced this positive perception can create market excitement. Vismara, (2014) supports this perspective by emphasizing that underwriters typically observe market demand for companies with a foundation in R&D, resulting in higher valuations. Whether all of this translates to the initial public offering price however has not been studied before, with all research into the effect of R&D on IPO valuations related to the post-IPO performance.

1.2 Problem discussion

Although limited, prior research into the effect of R&D on IPOs has focused on the performance aspect of the IPO after going public. First day returns and other subsequent points of measuring for the performance of the IPOs are a popular research topic (Fedyk & Khimich, 2018; Hull et al., 2013; Jeon & Kim, 2011; Kim et al., 2008; Vismara, 2014). The initial public offering price at which the IPO goes to market however is an understudied topic of research. This study aims to distinguish itself from prior studies by researching the initial public offering price and the effect R&D has on this process. In doing so, providing towards a more complete understanding of IPO valuation at every point in the IPO process, with a particular focus on research and development, and innovation. This study distinguishes between R&D spending and prior successful R&D activities in patents. This gives some insight into the perceived risk associated with recent investments due to the uncertainty of future profits, in comparison to the no-risk patent ownership (Ke, 2015). While it is a well studied fact that IPOs are often underpriced, this however has mostly been limited towards the post-IPO stage and therefore from the point of view of the investors. This study will focus on the point of view from the underwriters and companies going public themselves. Furthermore, the focus on high tech companies versus non-high-tech companies provides more insight into the way R&D investments and innovation, both aspects of long-term strategy, are viewed today, calculated withing the initial public offering price. Finally, given the Covid pandemic years of 2020 and 2021 that are included in the timeframe of this study, it is necessary to check the compatibility of these years compared to the rest. The pandemic has been an extraordinary situation that is not always comparable to a normal situation. To answer whether the IPOs that have been completed in the pandemic years should be included in this study, the Covid and non-Covid periods are compared, answering whether the Covid period can be considered a normal situation in line with non-Covid years.

1.3 Research question

This study aims to answer the question; "**What is the effect of R&D on IPO pricing across different industries**?" The study seeks to compare how R&D spending influences IPO pricing, within the high-tech and non-high-tech industry. This question aims to explore the impact of R&D investments on determining the IPO offer price with a focus on industry backgrounds, especially in the high-tech sector compared to non-high-tech companies.

1.4 Contributions

The IPO offering price is an understudied research topic, the effect that R&D has on the IPO offering price even more so. This study aims to contribute towards a more complete understanding of the IPO process by looking at the initial public offering price and especially the effect R&D has on the pricing.

The study also contributes towards understanding how underwriters view the risk and value of recent R&D investments, and already rewarded patents. Companies planning to go public are better informed regarding the value their R&D investments and innovative ability will have on the price set by the underwriters. For investors, this study will bring more clarity regarding the way the initial public offering price is set, allowing for a more accurate analysis of the IPO and whether it has a good value. For instance, long term-oriented investors might value innovation and R&D investments much higher than underwriters do when valuing the IPO and therefore gain, based on their criteria, a favourable deal. Furthermore, the way that industry mediates the effect of R&D on IPO pricing can be a valuable insight. For high-tech companies that inherently have higher chance of needing to spend more in R&D, it will give an indication on what level their investments lead to higher pricing. The findings from this study can be used to better understand the IPO process. Underpricing, even though primarily focused on IPO performance, can benefit from the insights of this study by providing a better understanding of the starting point of the newly publicly traded company. In doing so, allowing comparison between what is important for investors and underwriters.

1.5 Data

This study is supported by a dataset comprising companies that underwent IPOs between 2016 and 2022. This period holds significance due to the IPO activity and the unique economic situation caused by the COVID 19 pandemic. To test whether to include the years, a sensitivity analysis will be performed. The dataset used in this study includes industries allowing the analyses of how R&D impacts IPO offer prices in both tech and non-high-tech sectors. The study has sourced this data from databases to ensure the credibility and accuracy of the findings. The analytical approach utilizes this dataset along with methods to isolate the influence of R&D on IPO pricing.

1.6 Thesis outline

Chapter 1: Literature Review.

In this chapter, the study lays the groundwork by reviewing existing literature. The study examines IPO pricing mechanisms explore the role of R&D in companies and highlight the differences between tech and non-high-tech industries. This review helps establish a foundation for the research while also identifying gaps that this study aims to address.

Chapter 2: Research Methodology.

This chapter provides an explanation of the research methodology, describing the process of data collection, and detailing the techniques employed and provide justification for selecting these methods. This section serves as the foundation of the study ensuring correct results.

Chapter 4: Data Analysis

The study will present the analysis of the data. During this chapter, the data will be analysed on outliers and how to handle them. The descriptive statistics of the dataset will be explained as well as the correlation matrix.

Chapter 5: Findings

Dedicated to highlighting the results of the investigation this chapter displays the results of the regression models.

Chapter 6: Discussion

In this chapter the findings of study are compared to the framework outlined in the literature review and interpret the results based on prior litterature. The aim is to assess how well the empirical results align with established theories while highlighting both areas of agreement and disagreement.

Chapter 7: Conclusion

The concluding chapter brings together findings and contributions from the research. The study critically analyses any limitations within the study. Propose directions, for future research. This includes suggesting how new studies can build upon this work.

Chapter 8: References

The last chapter of the study will display the reference list used for this study.

2. Literature review

2.1 Introducing the IPO process

Companies that want to expand often look for new ways of raising money. One of these ways is an IPO, which allows companies to offer shares of their company to the public. The process begins with the selection of an underwriter, investment bankers who assist in determining the pricing and marketing strategy for the IPO (Ibbotson et al., 1988). The next step involves conducting due diligence and estimating the fair value of the company through a book building process. This estimation serves as a reference point for underwriters to gauge investor demand. Based on this information, the last step entails setting the final offer price for the IPO (Roosenboom, 2012).

Selecting an underwriter is an important aspect of the IPO process since their choice can impact the offer price significantly. When companies opt for an IPO, establishing an offer price becomes crucial. Typically this responsibility is entrusted to an investment bank acting as an underwriter. The role of an underwriter holds importance as they possess expertise in certifying a precise offer price, while enhancing their reputation and trustworthiness (Roosenboom, 2007). On the hand according to a study conducted by Chen et al., (2018), they did not find this effect to be significant. The research performed by Bradley et al., (2004) discovered that the offer price is determined through discussions and agreements between the IPO and the underwriter. Since there can be a difference in interests between the underwriter and the IPO company both parties will advocate for their preferences when finalizing the offer price. Consequently underwriters employ a method of reducing their value estimate to establish the initial offer price. These reductions are based on the reputation of the underwriters; higher reputation results in a discount (Abdulai, n.d.; Hu et al., 2021). However it is possible that underwriters intentionally reduce value to create greater demand for IPOs, which can lead to mispricing (Füllbrunn et al., 2020; Roosenboom, 2012). Another factor that can contribute to IPO mispricing is market conditions as stated by Chua, (2014). According to this research it has been found that top tier underwriters, who have a big market share and bring a large number of IPOs to the market tend to rely on historical data for more accurate long term performance estimation of companies. On the hand low tier underwriters, who bring fewer IPOs to the market determine the offer price based on monthly market conditions.

Moving on to the step in the process called book building, the chosen underwriter will calculate the price range at which shares can be valued. This step also involves gathering feedback from investors regarding both price and number of shares. During book building the underwriter determines the value of shares for the IPO company. The valuation process includes evaluating aspects of a company's fundamentals such, as financial performance, growth prospects, industry dynamics and

comparable company valuations (Roosenboom, 2007). Underwriters utilize methods to determine the fair value of a company, such as discounted cash flow (DCF) models, NAV, Adjusted Assets Valuation (AAV) and dividend discount models. According to Bateni & Asghari, (2014) the earnings of the company going public have an impact on the fair value. Lizińska & Czapiewski, (2014) support this notion by confirming that profitability influences valuation. Additionally, cashflow is an aspect considered in valuation. Cogliati et al., (2010) found that expected growth significantly affects the offering price, however it is often based on optimistic expectations. It should be noted that no single valuation method stands out as superior in determining IPO prices as all techniques have biases, accuracy levels and explanatory abilities (Roosenboom, 2012).

According to Abdulai, (n.d.) and Roosenboom, (2007) the commonly used method for valuation is the DCF followed by asset-based approaches such as NAV and adjusted assets valuation (AAV). Underwriters however do not rely on only one method, they utilize multiple methods and assign weights to determine the offer price as stated by Abdulai, (n.d.).

The IPO offer price refers to the price at which shares are sold to investors during an IPO. While fair value serves as a reference point, the offer price does not always align with the estimated value. It may be set below or above the value resulting in IPO underpricing or overpricing, respectively. According to Roosenboom, (2012), underwriters may apply discounts to the estimated fair value and consider their market reputation as mentioned by Abdulai, (n.d.); Chua, (2014); Hu et al., (2021). The offer price is strategically determined, with the aim of creating excitement and attracting investors by presenting it as an attractive investment opportunity according to (Roosenboom, 2012). According to some researchers (Abdulai, (n.d.); Füllbrunn et al., (2020); Manu & Saini, (2020); Sonu, (2022) it is argued that most IPOs are priced below their value.

Apart from company characteristics, market conditions and country specific factors also play a role in determining the IPO offer price. Engelen & van Essen, (2010) discovered that the legal system of a country holds significance in this regard. Additionally, investor demand indirectly affects IPO pricing according to Derrien et al., (2005) Positive market conditions lead to increased investor demand for IPOs as highlighted by Jotwani & Singh, (2012). Subsequently higher IPO prices are created due to this investor demand. Rajan & Servaes, (2002) found that IPOs are often undertaken in market situations where investors have a positive outlook. This however is not realistic as the record number for IPOs has been in the pandemic period. Another influencing factor on the IPO offer price is the size and age of the company as revealed by Leung & Sharma, (2021). The size of the offering also has an impact on the offer price. Chen et al., (2018) noted a correlation between offering size and IPO pricing. This can be attributed to the amount of ownership stake being given up. When there is an oversupply of

shares it leads to decreased demand. According to a study conducted by Chuluun, (2015) it has been found that the pricing of IPOs can be influenced by the connections and relationships of the underwriter. When experienced partners are involved, there is a likelihood of price adjustments. Additionally underwriters may collaborate with each other to set the offer price lower than expected.

It is crucial to distinguish between IPO valuation and IPO offer price as it provides insights into how IPOs are priced and the factors that underwriters consider when determining the offer price. The offer price holds implications for both companies going public and investors as it affects their success and subsequent trading performance in the stock market Roosenboom, (2007) By comprehending these two concepts can further explore the role of R&D intensity in the IPO pricing process and its potential impact, on the offer price.

2.2 The role of information asymmetry in the IPO process

The role of information asymmetry in the IPO process is significant. IPO mispricing, a concern in this process can be attributed to information imbalances between investors, underwriters, and IPO firms (G. Chen et al., 2004). Gao & Hou, (2019) describe information asymmetry as the distribution of information among these stakeholders.

A study conducted by Chiang et al., (2019) reveals that underwriter trading activity has an impact on abnormal returns. This suggests that underwriters' actions and their access to non-public information about the IPO can provide insights into its performance. Thus, highlighting the importance of information. The study by Sherman & Titman, (2002) suggest that underwriters sometimes intentionally underprice shares to attract investors. This serves as compensation for investors thorough evaluations while also making the IPO more appealing for investor participation. The study by Rocholl, (2004) supports the notion that informed investors with knowledge often secure better deals due to their ability to guarantee the success of an IPO, for underwriters particularly when demand is low. This preference for informed investors implies that those with less information, often regular retail investors are more likely to pay higher prices for shares. This phenomenon is referred to as the 'winners curse'. According to a study conducted by Ong, Mohd-Rashid, & Taufil-Mohd, (2020), IPO companies with ownership tend to experience less mispricing during their initial public offerings. The offer prices of these companies are closer to their values. Ong et al., (2020) attribute this phenomenon to the transparency associated with investors as their involvement signals higher quality (Hu et al., 2021).

Another factor contributing to IPO mispricing is quality accounting practices. This reinforces the notion that information asymmetry plays a role in IPO pricing (Sonu, 2022). Abdulai, (n.d.) further

explains that young IPO companies lack experience in forecasting future cash flows, which creates additional information asymmetry and renders traditional valuation methods like discounted cash flow less effective. In addition to the company itself, the CEO also bears responsibility for determining the IPO offer price. According to a study conducted by Zhao et al., (2022) it was discovered that when CEOs have academic experience the discount on IPO offer prices tends to be lower. The study suggests that this could be attributed to reduced information asymmetry. When CEOs possess academic backgrounds, they may have a better understanding of the importance of transparent communication and sharing information effectively.

Information asymmetry, which refers to the distribution of information among investors underwriters and IPO firms plays a crucial role in determining IPO mispricing. Underwriters, who often have access to information can influence trading activities and abnormal returns. While underpricing IPOs can attract well informed investors it often leads less informed individuals to pay more for shares—often referred to as the "winners curse." However institutional ownership within IPO firms can help alleviate this mispricing by signalling quality and enhancing transparency. Additionally subpar accounting practices and lack of forecasting expertise further contribute to information asymmetry and impact valuation methods. Enough CEO credentials such, as academic experience can also contribute towards reducing information asymmetry and result in more accurate IPO offer prices.

2.3 The book building process and R&D intensive companies

Determining the offer price for IPOs is a task that involves complex methods of valuation. Two primary approaches, DCF and NAV play a crucial role in determining the true worth of a company. In this section will explore how R&D investments influence these valuation techniques and subsequently impact IPO offer pricing. The insights are drawn from (Abdulai, n.d.; Roosenboom, 2007).

The DCF method evaluates a company’s value by discounting its projected future cash flows to the present using an appropriate rate. R&D investments have an influence on these cash flow projections. Companies engaged in R&D activities are more likely to introduce new products or services gaining a competitive advantage and potentially expanding their market reach. These advancements can result in anticipated cash flows thereby enhancing the DCF valuation and increasing the IPO offer price (Deloof et al., 2009). However, it is important to note that R&D investments also introduce uncertainties as project outcomes may vary due to factors. Investors may perceive levels of R&D expenditure, as riskier potentially leading to an elevated discount rate and consequently lowering the DCF valuation (Roosenboom, 2007). The NAV is an estimation of a company value based on its intangible assets. R&D investments, which include intangible assets like patents can have an impact

on the NAV. Companies with a R&D portfolio tend to have higher NAV estimates potentially resulting in higher IPO offer prices. Additionally R&D efforts can lead to the creation of technologies further enhancing the company's intangible asset value (Ke, 2015).
When measuring R&D activities they can be categorized into three areas; R&D intensity, acquired patents and R&D expenses. Companies with R&D intensity often utilize IPOs to raise external equity for future investments. On the hand companies that possess a considerable number of patents may reduce their R&D spending after going public as they are perceived as more mature and less risky entities that can raise debt capital (Useche, 2014). Valuation is also influenced by the industry context. In low tech industries debt is often considered a sign of quality. However in high tech sectors it could indicate increased risk and uncertainty; consequently leading to revisions, in IPO prices (Kim et al., 2008). The high-tech industry tends to have stock prices, more favourable financial ratios and greater growth and profitability compared to the low-tech sector (Jeon & Kim, 2011). However the study conducted by C. Chen et al., (2018) did not find evidence supporting this effect.

To summarize investments in R&D play a role in determining the fair value of IPOs, impacting both DCF and NAV methods. These investments provide opportunities, for innovation. Also introduce uncertainties that influence how IPOs are perceived and valued. It is important to consider the industry context whether it is tech or non-high tech when assessing how R&D affects IPO pricing.

2.4 Influence of R&D on IPO pricing

Research shows a nuanced relationship between R&D spending and IPO pricing. Jeon, (2011) found a decrease in R&D spending post-IPO, suggesting a potential influence on IPO pricing. However, this trend should be interpreted with broader market dynamics in mind, not just an indicator of strategic financial manipulation.

In the study done by Hull, Walker, & Kwak, (2013), the authors describe a decrease in R&D intensity around IPO listings as a potential tactic to inflate IPO valuation methods and therefore the offer price. This underinvestment in R&D, they argue, could be a deliberate effort to present an enhanced financial imago. Contrastingly Kao & Chen, (2020) observed that high-tech companies often postpone R&D spending until after their IPO, while non-high-tech companies might reduce R&D expenses to steer the IPO offer price. Yet, It is essential to consider other reasons. Fedyk & Khimich, (2018) point out that R&D investment decisions are influenced by a company's phase of growth, profitability, and industry focus. This suggests that the observed patterns in R&D spending around IPOs could be a strategic choice influenced by a multitude of factors, not solely a manipulation tactic.

R&D is the key driver of innovation and responsible for the existence of many products and services. In a study done by Falk, (2012), focusing on the impact of R&D along conditional firm growth

distribution. He concluded that R&D has a significantly positive effect on firm performance in the two years after. a factor influencing the impact of R&D on firm performance is growth rate. Falk, (2012) state that the growth rate corelates with the impact of R&D where high growth firms benefit more from R&D than their lower growth counterparts. This has been confirmed in a study by Gui-long, Yi, Kai-hua, & Jiang, (2017) stating that there is robust evidence of a positive relationship between R&D intensity on better performing firms. The study of Chun Chen, Guo, Chen, & Wei, (2019) state that R&D investments over a given period will lower the business performance in the same period. The authors furthermore describe the existence of a positive and lagged effect of R&D investments. According to YChen & Ibhagui, (2019), the intensity of R&D is important. The authors claim the existence of a threshold where in case exceeded, negatively impacts firm performance. There is however a positive influence on firm performance below this threshold. The existence of this threshold is confirmed by Yeh, Chu, Sher, & Chiu, (2010) who state that there is an inverted U correlation between R&D intensity and firm performance. Chen et al., (2019) note that this threshold changes based on the economy. During the late 2000s financial crisis, authors Lome, Gunnar Heggeseth, Moen, & Accenture, (2016) claim that high R&D intensive firms perform better. This confirms the believe that the threshold is susceptible to the economy. The study by Vithessonthi & Racela, (2016) claims that R&D intensity is negatively associated with firm performance and positively with firm value when looked at high R&D firms. Their lower counterparts do not experience the same effects. This is further evidence of the existence of the R&D intensity threshold.

Size also factors into firm performance. According to Falk, (2012), the larger the firm size, the greater is the use of resources for R&D which will in turn end up as more sophisticated technologies. The study by Chen et al., (2018) found that firm size is negatively correlated with IPO pricing. Another factor increasing the impact of R&D on firm performance is a firms multinationality. in the study done by Bae, Park, & Wang, (2008), the authors state that a firms multinationality is related to greater firm performance when the firm possesses R&D investments. Although less convincingly, this has been confirmed by Vithessonthi & Racela, (2016) who state that there is some evidence for the moderating effect of internationalization on the relationship between R&D intensity and firm performance. R&D can be responsible for future successes. It can also be a double-edged sword, responsible for accumulating enormous amounts of money with no real innovation to show for. There is a timeliness aspect to R&D spending, Liu, Qiu, & Chen, (2023) state that companies with high R&D investments that cannot be early movers and maintain their momentum can potentially make a loss. This timeliness factor also influences the likeliness for companies to go public early, accompanied by underpricing.

The industry where the company is in can matter for the IPO performance of the company. The authors Ang & Boyer, (2009) found that new industry's IPO performance is lower than established industries. This is due to the uncertainty of future earnings that goes with the new industry. In the long term however, new industry IPOs will merge less often, declare bankruptcy less and are delisted less often. Besides category of industries, a specific industry itself can have their own challenges. Competitiveness is one of the factors that can be very industry specific (Akhigbe et al., 2006). Within the same industry, companies are often competing with their competitors. According to AVCI, (2021), IPOs are responsible for the stock price decline of their competitors. Overall, however, there is no intra-industry effect on their competitors.

R&D spending influences IPO pricing. Companies often adjust their R&D investments around IPO time, impacting their offer prices. While R&D can boost long-term performance, there is an optimal intensity level, too much or too little can be detrimental. Firm size and international reach can amplify R&D benefits. Although new industries face more IPO uncertainty, they are resilient overall. IPOs can briefly affect competitor stock prices, but broader industry impacts are minimal.

2.5 Hypothesis

To answer the research question, this study proposes the following hypotheses.

Hypothesis 1 (H1a); There is a positive relation between R&D intensity, measured by total assets, and the total deal value of the IPO. Firms with higher R&D intensity relative to their total assets are expected to attract a higher valuation, indicating their potential for growth and innovation.

Hypothesis 1(H1b); There is a positive relation between R&D intensity, measured by revenue, and the total deal value of the IPO. Companies that invest a higher proportion of their revenue in R&D activities are anticipated to command higher IPO prices, signalling their dedication to innovation and future financial growth.

Hypothesis 2 (H2); there is a positive relation between patents and the total deal value of the IPO. Patents represent valuable intellectual property that can enhance a company's valuation by indicating innovation capacity and technological advancement.

Hypothesis 3 (H3); For high-tech companies, the positive relation between R&D intensity (considering R&D intensity total assets, R&D intensity revenue, and the number of patents) and the total deal value of the IPO is stronger than for non-high-tech companies. This suggests that in the high-tech sector, R&D investment is a critical factor for company valuation due to rapid technological evolution and the sector's emphasis on innovation.

3. Methodology

3.1 Research design

This study will use regression models to analyse correlation between the intensity of R&D and the IPO offer price considering the moderating effect of industry type (high-tech vs. on-high-tech). The quantitative approach enables an analysis of data facilitating the examination of relationships between variables and providing statistical insights into the research question.

Next, two regression models will be constructed. Model one will include data from the COVID 19 years while Model 2 will exclude those years. These models will help in understanding how various financial and operational factors impact the deal value of companies. The study will consider indicators such as Research & Development expenses, Total Assets, and Debt/Equity ratios, among others. This distinction is necessary to determine whether including or excluding the COVID 19 years provides an understanding of normal situations compared to the impact of the pandemic.

Afterwards, statistics will be used to gain insights into the dataset. This approach allows the identification of trends and characteristics within the data. Importantly before delving into the regression analysis, it is essential to conduct an examination of correlations to identify any multicollinearity among the variables. This is crucial because it can significantly impact the understanding of the results obtained from the regression analysis. The primary focus of the analysis will employ regression models, carefully designed to test the hypotheses. For Hypotheses 1 and 2, a multiple regression analysis will be done to investigate how R&D Intensity and the Number of Patents affect the IPO offer price while accounting for control factors. In Hypothesis 3, the effect of industry will be measured in the model by incorporating an interaction term that combines R&D Intensity and Industry Type. This will help to determine whether diverse types of industries (tech versus high tech) influence the relationship between R&D and the IPO offer price. By using this approach, the study aims to answer the intricate dynamics between R&D investments, industry categorization and their collective impact on IPO pricing. This research aims to provide insights into the mechanisms at play in initial public offerings, across diverse market landscapes.

To test hypothesis 1a, the following formula will be used for the regression model.

Total Deal Value = $\beta 0 + \beta 1 \cdot$ (R&D Intensity Total Assets) + $\beta 2 \cdot$Total Assets Log + $\beta 3 \cdot$Share Offering IPO + $\beta 4 \cdot$Inflation Rate + $\beta 5 \cdot$Underwriter Reputation + $\beta 6 \cdot$Debt/Total Assets + $\beta 7 \cdot$ROA + $\beta 8 \cdot$Hightechdummy + $\beta 9 \cdot$Age LOG + e

To test hypothesis 1b, the following formula will be used for the regression model.

Total Deal Value = β0 + β1· (R&D Intensity Revenue) + β2·Total Assets Log + β3·Share Offering IPO + β4·Inflation Rate + β5·Underwriter Reputation + β6·Debt/Total Assets + β7·ROA + β8·Hightechdummy + β9·Age LOG + *e*

To test hypothesis two, the following formula will be used for the regression model.

Total Deal Value = β0 + β1·Patents + β2·Total Assets Log + β3·Share Offering IPO + β4·Inflation Rate + β5·Underwriter Reputation + β6·Debt/Total Assets + β7·ROA + β8·Hightechdummy + β9·Age LOG + *e*

To test hypothesis three, the following formula will be used for the regression model.

Total Deal Value = β0 + β1· (R&D Intensity Measures) + β2·Total Assets Log + β3·Share Offering IPO + β4·Inflation Rate + β5·Underwriter Reputation + β6·Debt/Total Assets + β7·ROA + β8·Hightechdummy + β9·Age LOG + Interaction Terms + *e*

3.2 Variables

The model this study employs centres around the Total Deal Value, a metric representing the total worth of a company at the point of its initial public offering (IPO). This value is derived from the IPO's offer price multiplied by the total number of shares the company has issued, logarithmically scaled to normalize the data. The methodology for calculating the Total Deal Value is rooted in the work of Aggarwal et al., (2009); Hull et al., (2013) and Sonu, (2022), and the data is sourced from Orbis.

To gauge a firm's dedication to innovation, R&D intensity is considered in two forms: relative to total assets (*R&D intensity TA*) and to total revenue (*R&D intensity Rev*). These measures of R&D intensity are validated by the studies of Bae et al., (2008); Gao & Hou, (2019); Kao & Chen, (2020); Liu et al., (2023) and Vismara, (2014), reflecting the investment a company makes in research and development in relation to its operational scale and financial capacity. The number of patents a company holds at the time of its IPO serves as a marker of its innovative output and future growth potential, with the data for this measure obtained from Google Patents and Edgar and underscored by the research of Useche, (2014) and Vismara, (2014).

The firm's Age at the time of the IPO provides insights into the company's maturity, with the number of years from incorporation to IPO log-transformed for analysis. This variable, together with Total Assets, which represents the company's asset base in the year prior to the IPO, shapes the financial profile of the firm as recognized by Chua, (2014); Kim et al., (2008); Roosenboom, (2007), (2012) and Zhao et al., (2022). The proportion of shares offered during the IPO (% of shares offered in IPO) is also

considered, as it impacts the market's reception of the IPO, following the findings of Chen et al., (2018); Chuluun, (2015).

Additional controls for Market Conditions are incorporated, with the Inflation Rate at the time of the IPO serving as a proxy for the economic climate, a variable of interest in the work of Navyatha & Gaddam Naresh Reddy, (2022). The Underwriter Reputation, based on the average rating of underwriters, is also included to capture the influence of credibility on investor confidence, with data sourced from company statements and J. Ritter's database, supported by Ang & Boyer, (2009) and Roosenboom, (2012). A High-tech dummy variable is introduced to distinguish firms operating within the technology sector, reflecting the unique dynamics of R&D reliance in this industry as categorized in Nace Rev2 and discussed by Bradley et al., (2004) and Engelen & van Essen, (2010). The financial health of the firm is evaluated through the Debt/Total Assets ratio, and ROA is included to assess profitability, with these measures supported by the research of Akhigbe et al., (2006) and Ang & Boyer, (2009).

Table 1

Variable name	**Description**	**Measurement**	**Data source**	**Sources**
Total deal value Log	The total value of the company based on the offer price	Total offer price * total number of shares in the company in LOG	Orbis	(Aggarwal et al., 2009; Hull et al., 2013; Sonu, 2022)
R&D intensity TA	The total of R&D compared to the total assets.	R&D / total assets T-1	Orbis (3 years)	(Kao & Chen, 2020)
R&D intensity Rev	The total of R&D compared to the total revenue.	R&D / total revenue T-1	Orbis (3 years)	(Bae et al., 2008; Falk, 2012; Gao & Hou, 2019; Liu et al., 2023; Vismara, 2014)
Patents	The number of patents at the time of the IPO	The number of patents at the time of the IPO in LOG	Google patents / Edgar	(Useche, 2014; Vismara, 2014)
Age	The age of the company at the time of the IPO	Number of years between incorporation and IPO in LOG	Orbis	(Chua, 2014; Cogliati et al., 2010.; Fedyk & Khimich, 2018; Kim et al., 2008; Liu et al., 2023;

				Roosenboom, 2007, 2012; Sonu, 2022; Useche, 2014; Zhao et al., 2022)
Total assets	The total assets of a company T-1	Total assets in LOG T-1	Orbis	(G. Chen et al., 2004; Chua, 2014; Gao & Hou, 2019; Liu et al., 2023; Lowry & Schwert, 2004; Roosenboom, 2007, 2012; Sonu, 2022; Useche, 2014; Zhao et al., 2022)
% of shares offered in IPO	The percentage of shares offered in the IPO compared to the total	IPO offered shares / total shares	Orbis	(C. Chen et al., 2018; Chuluun, 2015; Jotwani & Singh, 2012)
Inflation rate	The market variable are the market conditions at the time of the IPO	The inflation rate for the month of the IPO	US inflation rates	(Navyatha & Gaddam Naresh Reddy, 2022)
Underwriter reputation	The reputation of the underwriter	The average rating of the underwriters	Company statement for underwriter and database J. Ritter for the score	(Ang & Boyer, 2009; Gao & Hou, 2019; Kim et al., 2008; Liu et al., 2023; Lowry & Schwert, 2004; Roosenboom, 2012)
High-tech	Dummy variable whether a company is high-tech or not	High-tech = yes	Nace Rev2	(Bradley et al., 2004; Chua, 2014; Chuluun, 2015; Engelen & van Essen, 2010; Gao & Hou, 2019; Kao & Chen, 2020a; Kim et al., 2008; Lowry & Schwert, 2004; Roosenboom, 2012)

Debt/Total assets	The total debt of the company compared to the total assets	Total debt / Total assets T-1	Orbis	(Akhigbe et al., 2006; Bae et al., 2008; G. Chen et al., 2004; Chiang et al., 2019; Kao & Chen, 2020a; Kim et al., 2008; Vismara, 2014)
ROA	The return on assets to view the company's profitability	Revenue / total assets	Orbis	(Ang & Boyer, 2009; Bae et al., 2008; G. Chen et al., 2004; Kao & Chen, 2020a; Liu et al., 2023; Lizińska & Czapiewski, 2014; Sonu, 2022; Useche, 2014; Vismara, 2014)

4. Data analysis

4.1 Outlier identification

The analysis of initial public offerings in this research includes outliers within the dataset to capture the full range of market participants. Outliers, often corresponding to larger entities, play a pivotal role in shaping IPO market trends. Their inclusion ensures a comprehensive portrayal of the market, acknowledging the influence of companies of all sizes. Incorporating outliers allows for a representation of the IPO landscape that is inclusive of both the extraordinary and the normative market cases. This approach broadens the scope of the study, maintaining the applicability of the findings to a wide array of companies. While this may introduce a slight deviation from the precision that might be achieved with a more homogenized sample, it is a necessary trade-off to preserve the integrity and relevance of the research across the entire market spectrum. To mitigate the impact of extreme values, winsorization at the 1st and 99th percentiles was employed, trimming the most pronounced outliers to enhance the overall stability of the dataset. Additionally, the logarithmic transformation of specific variables further refines the analysis, reducing the skewness of the distribution and aligning the data with the assumptions underlying the regression analysis. These statistical techniques are carefully selected to balance the need for robust, generalizable findings with the accuracy of the model's predictions.

The methodological decision to retain and adjust for outliers, rather than exclude them, supports a nuanced view of the IPO market. It reflects the diverse nature of companies engaging in public offerings and underscores the study's commitment to a realistic and inclusive examination of the market phenomena.

4.2 Descriptive statistics

The dependent variable, *Total deal value Log*, demonstrates a log-transformed mean of 19.88 across 301 observations, reflecting the variance in deal sizes within the data. When expressed in non-logarithmic terms, the median deal value significantly exceeds the highest annual total deal value of 467 million reported by Aggarwal et al., (2009), with a current median of 1,102 million. This increase is in line with the progressive growth pattern documented in the study and may be attributed to market and inflationary developments over the intervening years. In the intellectual property domain, the '*Patents Log*' variable exhibits a log-transformed mean of 1.70, which corresponds to an average of 37 patents per firm when back-transformed, higher than the 14.06 and 14.71 patents reported by Useche, (2014) and (Vismara, 2014), respectively. This discrepancy indicates a marked elevation in patenting activity, suggesting an intensified focus on innovation within the firms represented in the current dataset. The mean for '*R&D intensity Rev*' stands at 174.99%, dwarfing the

mean of 128% reported by Kao & Chen, (2020), which signals a notable escalation in research and development expenditure as a proportion of revenue. Similarly, *'R&D intensity TA'* reports a mean of 18.37%, eclipsing the 11.89% mean found in the study by Vismara, (2014), thereby denoting a higher allocation of asset resources to R&D activities. Consistency with prior research is observed in the *'Total assets Log,*' with a mean of 19.42. This figure aligns with the asset magnitudes reported in the literature, suggesting a comparable scale of firm assets. The mean for 'Share offering IPO' at 28.96% is situated within the established ranges of 23.39% and 31% from Sonu, (2022) and Chen et al., (2018), indicating a continuity in equity financing trends. The proportion of high-tech firms, as determined by the 'Hightechdummy' variable, is 26.16%, marginally lower than the 36% identified by Chuluun, (2015). The *'Age Log*' mean of 1.55 points to a dataset comprising younger firms compared to those in previous studies. Furthermore, the *'Debt/total assets'* ratio, with a mean of 19.56%, suggests a more conservative debt stance compared to the 35,601 mean leverage ratio reported by Kao & Chen, (2020).

Table 2

Descriptive Statistics			
Variable	N	Mean	Std. Deviation
Total deal value	301	19,88	1,37
R&D intensity Rev	185	174,99%	406,74%
R&D intensity TA	258	18,37%	28,65%
Patents Log	301	1,70	1,79
Total assets Log	258	1,94	1,82
Share offering IPO	301	28,96%	20,86%
Inflation rate	301	2,59%	1,07%
ROA	258	45,02%	54,71%
Hightechdummy	302	0,26	0,44
Age LOG	301	1,55	0,87
Underwriter reputation	301	7,41	1,84
Debt Total assets	258	19,56%	32,69%

4.3 Correlation analysis and multicollinearity assessment

In the regression analysis of the IPO dataset, Variance Inflation Factor (VIF) scores, which are comfortably between 1 and 2 even for the highest values, suggest minimal multicollinearity, affirming that the significant correlations observed are indicative of distinct impacts on the IPO offering price as set by underwriters. The negative correlations of *'Total deal value Log*' with '*R&D intensity TA*' and *'R&D intensity Rev*' indicate that R&D investment intensity might not be consistently translated into higher offering prices by underwriters, pointing towards a nuanced interpretation of R&D's valuation impact. Conversely, the positive correlation with *'Patents Log'* implies that underwriters recognize patents as value-enhancing assets in IPO pricing. Notably, the positive relationship between *'Total assets Log'* and *'Underwriter reputation*' (0.536) is reflective of high-quality companies engaging reputable underwriters, which is often a signal to investors of a company's robust market standing and is thus reflected in the offering price. The negative correlation between *'Share offering IPO*' and *'Total deal value Log'* (-0.331) could suggest that underwriters may adjust prices conservatively when a larger proportion of shares is offered. These insights, corroborated by low VIF scores, validate the regression model's effectiveness in isolating the individual and combined influences of these variables on the underwriters' pricing decisions, confirming that it is the intrinsic quality of the firms that is the primary determinant of valuation in the IPO process.

Table 3

Correlations

		Total deal value	R&D intensity TA	R&D intensity Rev	Patents	Total assets	Age	Share offering IPO	Inflation rate	Underwriter reputation	ROA	Debt / total assets
Total deal value	Pearson Correlation											
R&D intensity TA	Pearson Correlation	-,294**										
R&D intensity Rev	Pearson Correlation	-,344**	,644**									
Patents	Pearson Correlation	,194**	,246**	,210**								
Total assets	Pearson Correlation	,706**	-,530**	-,393**	0,023							
Age	Pearson Correlation	0,109	0,114	0,122	,380**	-0,037						
Share offering IPO	Pearson Correlation	-,331**	-0,091	-0,005	-,261**	-0,024	-,333**					
Inflation rate	Pearson Correlation	-,220**	-0,084	-0,006	-,186**	-0,037	-,216**	,288**				
Underwriter reputation	Pearson Correlation	,667**	-0,116	-,165*	,222**	,536**	,155**	-,314**	-,366**			
ROA	Pearson Correlation	,286**	-,305**	-,439**	-0,049	,261**	0,097	-,164**	-,169**	,163**		
Debt / total assets	Pearson Correlation	0,080	-0,026	-0,095	-0,117	-0,033	0,005	-0,045	-0,042	-0,053	,233**	
Hightechdummy	Pearson Correlation	0,029	0,037	0,021	,246**	-0,042	0,063	-,166**	-0,011	-0,025	0,032	0,067

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

5. Results

5.1 Hypothesis results

Table 4

Regression results

Model Dependent variable = Total deal value IPO	1 R&D TA	2 R&D Rev	3 Patents	4 Int-HT-R&D TA	5 Int-HT-R&D Rev	6 Int-HT-Patents
R&D intensity TA	0,003 (1,221)			0,004 (1,522)		
R&D intensity Rev		-0,000 * (-1,970)			-0,000 (-1,909)	
Patents			0,560 (1,831)			0,047 (1,215)
Interacting High-tech R&D1				-0,004 (-1,016)		
Interacting High-tech R&D2					0,000 (0,459)	
Interacting High-tech patents						0,024 (0,400)
Total assets	0,425 ** (10,563)	0,444 ** (11,622)	0,399 ** (11,667)	0,424 ** (10,523)	0,445 ** (11,604)	0,398 ** (11,605)
Share offering IPO	-0,014 ** (-4,408)	-0,025 ** (-8,274)	-0,014 ** (-4,370)	-0,013 ** (-4,272)	-0,025 ** (-8,238)	-0,014 ** (-4,370)
Inflation rate	0,143 (1,754)	0,257 ** (3,668)	0,124 (1,553)	0,134 (1,628)	0,258** (3,670)	0,123 (1,541)
ROA	0,002 (1,645)	0,000 (-0,406)	0,002 (1,541)	0,002 (1,677)	0,000 (-0,426)	0,002 (1,477)
Hightechdummy	0,187 (1,634)	0,089 (0,902)	0,133 (1,129)	0,273 (1,917)	0,070 (0,649)	0,079 (0,442)
Age	-0,044 (-0,715)	0,046 (0,863)	-0,073 (-1,149)	-0,042 (-0,683)	0,050 (0,922)	-0,074 (-1,155)
Underwriter reputation	0,231 ** (5,292)	0,216 ** (5,061)	0,238 ** (5,575)	0,232 ** (5,292)	0,216 ** (5,060)	0,238 ** (5,578)
Debt / total assets	0,004 * (2,255)	0,001 (0,926)	0,004 * (2,255)	0,004 * (2,255)	0,001 (0,875)	0,004 * (0,400)
Observations Adj. R2	258 0,629	185 0,778	258 0,632	258 0,629	185 0,777	258 0,631

T-statistics are in parentheses. **, and * indicate 1%, and 5%, significance, respectively

Hypothesis 1 (H1a). R&D intensity total assets.

Hypothesis 1 (H1a) explores whether the level of *R&D intensity TA* affects the initial pricing of initial public offerings. This factor represents how much a firm invests in innovation compared to the total assets of the company.

Looking at the regression results for model 1 this study finds that *R&D intensity TA* from the previous period is associated with an unstandardized coefficient (B = 0.003) and a standardized Beta of 0.059.

However this relationship does not reach levels of statistical significance as indicated by a p value of 0.223. Thus within the context of this data the proportion of *R&D investment TA* does not have a statistically significant impact on the total deal value of IPOs. This outcome contradicts the initial hypothesis proposing that higher R&D intensity would lead to increased valuations, for IPOs prompting to reconsider how these variables interact.
The regression model shows an adj R value of 0.629 indicating that it can account for 62.9% of the variation in the log transformed total deal value of IPOs. Although included the *R&D intensity TA* from the previous period in the model its contribution to explaining the variation in IPO pricing is not statistically significant based on the p value.

Based on these findings this study cannot support Hypothesis 1 (H1b) with the data. The analysis suggests that *R&D intensity TA* does not have a significant predictive effect on the total deal value in IPOs for the sample. This could indicate that investors prioritize factors more heavily than R&D intensity when evaluating a firms worth during its IPO or that the impact of R&D intensity, on IPO pricing may occur through indirect pathways that were not directly measured in this analysis.

Hypothesis 1 (H1b). R&D Intensity revenue.
Hypothesis 1 (H1b) examines the relationship between log transformed *R&D intensity Rev* and the log transformed total deal value of IPOs. Where hypothesised that higher R&D intensity leads to higher total deal values, In model two of the regression analysis, the opposite is observed. The regression model found statistical evidence that an increase in *R&D intensity Rev* is associated with a decrease in the expected total deal value. It is important to interpret these findings due to the log transformation used for the dependent variable. The coefficient for *R&D intensity Rev* suggests that each additional unit increase in *R&D intensity Rev* leads to a decline in the total deal value of IPOs in percentage terms. However when considering the confidence interval for this coefficient it becomes apparent that this variable has impact on IPO pricing. Model two has an Adjusted R^2 of 0.778 indicating that 77.8% of the variation, in the log transformed total deal value of IPOs can be explained by this model.

The importance of the coefficients for log transformed total assets and other variables in the model highlights the significance of these factors in predicting IPO pricing compared to *R&D intensity Rev* Although there is a negative correlation between *R&D intensity Rev* and the log transformed *total deal value* and its unique contribution is minimal when considering other factors these findings do not align with what the literature suggests about higher *R&D intensity Rev* positively impacting IPO pricing.

To summarize Hypothesis 1 (H1b) does not receive support in model two. The data indicates a complex relationship between R&D intensity and IPO pricing challenging the assumption that R&D leads to higher valuations where it in fact leads to lower total deal values.

Hypothesis 2 (H2). Patents.

Hypothesis 2 (H2) posits that the log-transformed number of patents (*Patents Log*) has a positive impact on the log-transformed total deal value of IPOs. Given the regression output, a coefficient of 0.056 for *Patents LOG* suggests that a 1% increase in the number of patents is associated with an average increase of 0.056% in the total deal value of IPOs. However, the t-value of 1.831 shows that this observed effect does not reach the conventional threshold for statistical significance ($p = 0.068$). The confidence interval for B, which ranges from -0.004 to 0.117, includes zero, implying uncertainty about the precise impact of patents on IPO pricing within this data. The positive Pearson correlation coefficient ($r = 0.136$, $p < 0.05$) between the log-transformed number of patents and the log-transformed total deal value signals a statistically significant, albeit mild, positive relationship. This shows that, statistically, patents are factored into market valuations, but the correlation is not particularly strong. With an Adjusted R^2 of 0.632, the model demonstrates a good fit, explaining a considerable proportion of the variance in IPO deal values. Yet, the individual contribution of the patent variable to this explanatory power is statistically ambiguous due to the p-value.

In summary, Hypothesis 2 finds limited support. While there is a suggested positive effect of patents on IPO deal values, it is weaker than expected. The data implies that while the market does value patents, the extent of this valuation is not as influential as the number of patents might suggest. This could point to other qualitative factors of patents, such as their relevance and potential for commercialization, playing significant roles in their contribution to a firm's market valuation at IPO.

Hypothesis 3 (H3). Interaction with High Tech Status.

In Model 4 in table 4, the interaction term 'InterHightechRD1' has a coefficient (B) of -0.004, but with a p-value of 0.311, it does not reach statistical significance. This suggests that within the dataset, the impact of *R&D intensity TA* on the log-transformed total deal value of IPOs does not differ between high-tech and non-high-tech companies in a statistically discernible way. This finding shows that the premium or discount applied to R&D investments in total assets at IPO is consistent across industries, not specifically moderated by being in the high-tech sector. For Model 5, 'InterHightechRD2' similarly shows a non-significant interaction effect ($B = 0.000$, $p = 0.647$). This implies that the relationship between *R&D intensity Rev* and the log-transformed total deal value of IPOs does not statistically differ between high-tech and other industries. This could mean that investors are indifferent to the

industry classification when it comes to the revenue percentage allocated to R&D, focusing instead on other factors that might contribute to the potential of R&D to generate future growth and returns. The interaction term 'InterHightechRD3' in Model 6 also does not show a significant effect (B = 0.024, p = 0.689). This shows that the market's valuation of patents, in terms of their number and potential impact on the log-transformed total deal value, is not contingent upon whether the firm is part of the high-tech industry. Patents may be valued for their quality, relevance, and enforceability rather than the industry context, which might explain the lack of a significant interaction effect.

Hypothesis three, which considered the moderating effect of the high-tech industry on the relationship between R&D intensity, patents, and IPO deal value, does not find support in the data across these models. The lack of significant interactions suggests that the high-tech industry classification does not significantly influence how *R&D intensity TA*, *R&D intensity Rev*, and the number of patents are perceived by the market in the context of IPO pricing. This could point to a more nuanced investment landscape where factors such as the effectiveness and potential returns of R&D, as well as the strategic value of patents, are evaluated on their merits, irrespective of industry classification.

Control variables.

In the regression models assessing the dynamics between R&D, patents, and the log-transformed total deal value of IPOs, various control variables are consistently present. The log of total assets from the year prior to the IPO (*Total assets Log*) shows a strong positive correlation across all models. In contrast, the share offering at the IPO (*Share offering IPO*) consistently reveals a negative relation. The reputation of the underwriter (Underwriter reputation) consistently shows a positive relation with IPO deal value in these models. Other variables such as the log of company age (*Age Log*), inflation rate, return on assets from revenue (*ROA Revenue*), and the *Debt/total assets* ratio show varying levels of significance across the different models. Each of these control variables, ranging from firm size to economic indicators and financial metrics, plays a role in the models, contributing to the analytical framework for understanding the total deal value of IPOs.

5.2 Sensitivity analysis

To make sure that the database included a representable period, a sensitivity analysis is conducted to assess the impact of including or excluding COVID 19 data in modelling specifically focusing on various financial metrics during IPOs. This study compared three models; one that included COVID 19 data, one that excluded it and a model solely focused on COVID 19. The study examined R&D

expenses, the percentage of stake offered in IPOs, market variables, underwriter reputation, indicators for high tech companies debt/assets ratios, ROA total assets and model fit.

Key findings emerged from this analysis. R&D expenses showed the correlation with deal value in the model that excluded COVID 19 data. This suggests that their influence was more pronounced outside of the era. The percentage of stake offered in IPOs had an impact on deal value; however this effect diminished when excluding COVID 19 data. This indicates that pandemic conditions may have affected investor perceptions at IPOs differently. The influence of market variables on deal value demonstrated inconsistency. Appeared to depend on the specific economic context—whether during the pandemic, outside of it or solely focused on it. Underwriter reputation consistently maintained an influence, across all scenarios but had a slightly reduced impact during the pandemic.

The perception of corporations consistently remained negative across different time periods while high tech companies were viewed more positively during the pandemic. The ratio of debt to equity had a positive impact during the pandemic indicating a shift in the importance of capital structure in determining deal valuation in these challenging times. The return on assets consistently demonstrated relevance with varying degrees of impact across models. Among all the factors considered total assets showed the correlation with deal value in the model that only included data from the COVID 19 period. On the hand excluding pandemic data resulted in the best overall fit for the model suggesting that excluding such data could lead to more reliable financial modelling, under certain circumstances. These findings together offer a nuanced understanding of how including or excluding COVID 19 data can influence analysis and decision making when it comes to IPO contexts.

6. Discussion

6.1 Discussion

Hypothesis 1 (H1a) – R&D intensity total assets:

The exploration of Hypothesis 1 (H1a) regarding the influence of *R&D intensity TA* on the log-transformed total deal value of IPOs reveals a nuanced landscape that diverges from traditional expectations. Our analysis found a negative statistically significant relationship between *R&D intensity TA* and IPO pricing, as indicated by a significant Pearson correlation coefficient of -0.294. The regression model however does not indicate any statistical effect of R&D intensity on total deal value. This outcome, coupled with the model accounting for 64.2% of the variance in IPO pricing, suggests a more complex interplay than a straightforward positive correlation between R&D intensity and IPO pricing.

This lack of a significant positive relation contrasts with existing literature, which often show a positive link between R&D intensity and firm valuation. Studies like those by Kao & Chen, (2020) and Bae et al., (2008) underline the value of R&D investments in reflecting a firm's commitment to innovation and future growth. However, the findings of this study suggest that in the context of IPOs, this relationship is not as straightforward. One potential explanation for this discrepancy could be the risk perception associated with R&D investments. While R&D activities are intended to drive future growth and innovation, they also introduce uncertainties and risks. Where most research has been focussed on post-IPO performance, and therefore the investors point of view, the reason for this discrepancy could be the difference in how investors and underwriters interpret the risk of R&D investments. This perspective aligns with Roosenboom, (2007) insights into the complexities and inherent risks of R&D investments, although it seems more positively viewed by investors than underwriters. Furthermore, the impact of R&D intensity on IPO pricing might be significantly mediated by industry-specific dynamics and strategic timing of investments. In sectors where innovation is rapid and pivotal, such as in high-tech industries, R&D intensity might be more positively valued, while in more stable, traditional industries, its impact could be less pronounced. This has however not been found during this study, with high-tech having no significant evidence of contributing to higher pricing. This variation underscores the need for a contextual analysis of R&D intensity. Moreover, strategic behaviours around IPOs, such as adjusting R&D spending, as discussed by Hull et al., (2013), could further influence how R&D intensity impacts IPO pricing. This requires a broader consideration of market dynamics, investor sentiment, and strategic financial decisions in the period leading up to an IPO.

In conclusion, the findings from Hypothesis 1 (H1a) challenge the conventional narrative of a direct positive impact of R&D intensity on IPO pricing, highlighting the complexity of this relationship. It underscores the need for further research to unravel the multifaceted role of R&D in IPO pricing, considering industry norms, market conditions, investor perceptions of R&D-related risks, and the strategic timing of R&D investments. Understanding these dynamics is crucial for a more nuanced interpretation of how R&D intensity influences IPO pricing in various contexts.

Hypothesis 1 (H1b) – R&D intensity revenue:

In the discussion of Hypothesis 1 (H1b), which examines the influence of *R&D intensity Rev* on the total deal value of IPOs, the findings present an interesting deviation from the findings in previous IPO valuation literature. The analysis indicates a significantly negative relationship between *R&D intensity Rev* and IPO pricing. This outcome contrasts with the prevailing view in financial literature, which often correlates higher R&D investment with a company’s potential for growth and innovation,

thereby presumably enhancing its market valuation. The process of establishing an IPO's offer price, as detailed by Roosenboom, (2012) and Ibbotson et al., (1988), is intricate, involving numerous factors such as company fundamentals and market conditions. In this context, the findings imply that underwriters perceive *R&D intensity Rev* as a bad thing, potentially due to the risks and uncertainties associated with R&D investments (Roosenboom, 2007).

The role of underwriters in the book building process, as elaborated by Roosenboom, (2007), involves assessing the companies value through methods like DCF and NAV. Although these methods consider future returns from R&D investments, the actual impact of *R&D intensity Rev* on IPO pricing could be subdued due to market dynamics, investor demand, and strategic approaches adopted by underwriters. This could align with the observed inverse relationship between *R&D intensity Rev* and IPO pricing in the study. Additionally, strategic adjustments in R&D spending around IPOs, as noted by Hull et al., (2013) and Kao & Chen, (2020), could also influence how R&D intensity is perceived in the valuation process. Such strategic decisions might impact the underwriter's perception of the firm's prospects, reflecting in the IPO pricing. Moreover, the influence of R&D intensity on IPO pricing might vary across different industries and be subject to prevailing economic conditions and investor sentiment, as indicated by Engelen & van Essen, (2010) and Chua, (2014). The industry specific factor has not been found in this study with high-tech not being a factor.

In summary, the findings from Hypothesis 1 (H1b) challenge the traditional expectation of a positive relation between *R&D intensity Rev* and IPO pricing, with the relation in this study being statistically negative. This highlights the complexity of the relationship, underscoring the importance of a more detailed analysis that considers industry norms, market conditions, and the strategic financial management of firms during the IPO process. It suggests the need for a deeper exploration into how R&D intensity is evaluated by underwriters.

Hypothesis 2 (H2) - The Role of Patents:

In assessing Hypothesis 2 (H2), the role of patents in influencing the total deal value of IPOs, it is essential to integrate the findings with insights from the existing literature. Hypothesis two suggests that the number of patents, indicative of a company's innovative capacity, would have a positive impact on its IPO pricing. The analysis reveals a positive but not statistically significant relationship between the log-transformed number of patents (*Patents LOG*) and the log-transformed total deal value of IPOs. While this indicates a potential positive impact of patents on IPO pricing, the lack of statistical significance implies that the influence of patents may not be as straightforward or robust as

expected. This finding is in contrast with the prevalent understanding in the literature, which often emphasizes the value of patents as critical intangible assets.

The literature review underscores the importance of patents in the valuation process, with patents often seen as key indicators of a company's technological advancement and future growth potential. For instance, the work of Useche, (2014) and Vismara, (2014) highlights the role of patents in signalling a company's innovative output. However, the findings of Hypothesis 2 suggest that while patents are indeed recognized by underwriters, their impact on the IPO pricing may be moderated by other factors such as the perceived quality or commercial viability of the patented technologies. Moreover, the findings resonate with the insights from the broader literature that discuss the nuances of valuing R&D intensive companies. According to Deloof et al., (2009), while R&D activities can enhance a company's DCF valuation by creating anticipated future cash flows, these investments also introduce uncertainties, which could affect the valuation of intangible assets like patents. This might explain why patents, despite being significant indicators of innovation, do not automatically translate into higher IPO pricing. Additionally, the study of Chen et al., (2019) indicates that the impact of R&D investments, including those leading to patents, can have a lagged effect on business performance. This could mean that the market may value patents in the context of a longer-term horizon, potentially influencing their immediate impact on IPO pricing.

In summary, while Hypothesis 2 posits a positive correlation between the number of patents and IPO pricing, the actual relationship is more nuanced, with a positive but no significant relation. This finding calls for a deeper exploration of how patents are valued in the context of IPOs, considering factors such as patent quality, industry context, and investor sentiment. It underscores the complexity of valuing intangible assets and the need for a comprehensive approach that considers both the quantitative aspects of patents and the qualitative dimensions of innovation they represent.

Hypothesis 3 (H3) - High-Tech Industry Context:

In examining Hypothesis 3 (H3), which posits that the high-tech industry context moderates the relationship between R&D intensity, measured as a percentage of total assets, and percentage of total revenue, and number of patents, and the total deal value of IPOs, it is essential to compare the findings with the relevant literature. This hypothesis suggests that in the high-tech sector, where innovation and technological evolution are rapid, R&D investments are expected to be more critically valued, and thus have a stronger correlation with IPO pricing. The analysis for Hypothesis 3, however, reveals that the interaction terms '*InterHightechRD1*', '*InterHightechRD2*', and '*InterHightechRD3*', representing the interplay between high-tech industry classification and various measures of R&D

intensity, do not show significant results. This indicates that the high-tech industry context does not significantly alter the impact of R&D intensity on the total deal value of IPOs. These findings challenge the notion that the high-tech sector inherently places a higher premium on R&D investments compared to other sectors. This outcome contrasts with some of the existing literature which suggest that high-tech industries typically value R&D and innovation more heavily. For instance, the literature indicates that the high-tech sector often enjoys more favourable stock prices and financial ratios due to its focus on growth and profitability (Jeon & Kim, 2011). However, the lack of significant interaction effects in this study suggests that the valuation of R&D intensity in the context of IPOs might be influenced by a broader set of factors beyond just industry classification. The literature also discusses the varying dynamics in different industries regarding R&D valuation. In low-tech sectors, debt might be seen as a sign of quality, whereas in high-tech industries, it could indicate increased risk and uncertainty (Kim et al., 2008). This could imply that the valuation of R&D investments in IPOs is nuanced and dependent on the specific characteristics and underwriter perceptions within each industry. Furthermore, the study conducted by Chen et al., (2018) found no significant evidence supporting the differential impact of R&D on IPO performance between new and established industries, suggesting that the industry's maturity or novelty does not necessarily dictate how R&D investments are valued in IPOs. This aligns with the findings of Hypothesis 3, where the high-tech context does not markedly alter the relationship between R&D intensity and IPO pricing.

In summary, Hypothesis 3 highlights the complexity of valuing R&D investments in the context of IPOs and challenges the assumption that high-tech industry classification inherently enhances the impact of R&D intensity on IPO pricing. These findings suggest that factors such as the overall market environment, investor sentiment, and the unique attributes of each firm might play a more significant role in determining how R&D investments are valued in the IPO process. It underscores the need for a more comprehensive approach to understanding the valuation of R&D in IPOs, considering the multifaceted and industry-specific factors that influence investor perceptions and market valuation.

Contextualizing control Variables with Prior Research:

When evaluating the influence of control variables on the total deal value of IPOs, it becomes evident that each variable interacts within a complex framework, reflective of both company-specific characteristics and broader market dynamics. This interplay aligns with findings from prior research, which underscore the multifaceted nature of IPO pricing. The strong positive correlation of *Total Assets Log* with IPO pricing across all models resonates with existing literature, underscoring the underwriter's preference for larger, more established firms, perceived as stable and potentially more profitable. This aligns with the insights from Chua, (2014); Roosenboom, (2007), (2012), highlighting the importance of firm size in IPO pricing. Conversely, the consistently negative relationship of Share

Offering IPO suggests concerns about equity dilution, echoing the findings of Chen et al., (2018), where an increased offering size is linked to reduced demand and potentially lower valuations. The role of Underwriter Reputation in positively influencing IPO deal value further validates the significance of underwriter credibility in the IPO process, as discussed in the literature by Roosenboom, (2007) and Hu et al., (2021). This indicates that underwriters with a high reputation will set higher offer prices, in turn have lower underpricing. On the other hand, variables such as *Age* and *ROA Revenue* show variable levels of significance, suggesting that factors like firm maturity and profitability, while important, are weighed alongside other considerations. This finding is in line with the research of Leung & Sharma, (2021) and Lizińska & Czapiewski, (2014), indicating that these aspects, though relevant, form part of a broader set of evaluative criteria. Finally, the varying significance of the *Debt/Total Assets Ratio* across models points to a nuanced understanding of financial leverage in the context of IPOs. This variability, as discussed by (Kim et al., 2008), suggests that the perception of debt and financial health may differ between industries and is interpreted in the context of overall firm characteristics and market conditions.

In summary, the analysis of control variables demonstrates the complexity inherent in IPO pricing. It highlights the need for a comprehensive approach in understanding how these factors collectively influence underwriter perspective and the resultant valuation, underscoring the intricate interplay of firm-specific attributes and broader market dynamics in the IPO process.

6.2 Sensitivity analysis reflection

The sensitivity analysis carried out in this study was crucial for evaluating the reliability of the research findings in relation to the COVID 19 pandemic. This analysis provided insights into how external factors, such as global crises can affect the relationship between R&D spending and IPO pricing and whether it is suitable to include in the data for this study.

Impact of COVID 19 on Financial Metrics and IPOs.

The analysis involved comparing three models; one that included COVID 19 data, one that excluded it and a model focused solely on COVID 19. This approach allowed for an examination of how the pandemic influenced various financial metrics during IPOs. The study considered variables, including R&D intensity, patents, the percentage of stake offered in IPOs, market conditions the reputation of underwriters and indicators of multinational and high-tech company status. Additionally debt/total assets ratios and ROA were considered. The key finding from this analysis was that R&D expenses had the correlation with deal value when excluding COVID 19 data. This suggests that the impact of R&D expenses on IPO pricing was more significant outside the period. It implies that unusual economic

conditions, during COVID 19 may have temporarily changed investor behaviour and valuation methods.

Understanding Market Dynamics During Unprecedented Times.

The sensitivity analysis sheds light on how important it is to consider context when conducting financial modelling and valuation.

The different outcomes observed from models that include or exclude COVID 19 data highlight the influence that unusual market conditions can have on fundamental business measures. This understanding is crucial for companies and investors as it emphasizes the importance of considering economic factors when evaluating investment opportunities and business strategies. The analysis also offers a framework for assessing the stability of models under various market conditions thereby improving the reliability and relevance of research findings in real world situations.

Reflection on Model Reliability and Applicability.

The comparative analysis of the three models reaffirms the reliability of the research methodology employed in this thesis. By examining how well the models' predictors hold up across economic periods this analysis ensures that the conclusions drawn are only applicable to normal market conditions.

In conclusion the sensitivity analysis conducted in this study provides insights into how external factors such as global crises can impact financial measurements and investor behaviour, in IPO contexts. It highlights the significance of considering the context when conducting modelling, which enhances the overall strength and credibility of the research findings.

7. Conclusion

7.1 Conclusion

This study aimed to answer questions surrounding the impact of R&D intensity, patents, and the influence of high-tech industry classification on the total deal value of IPOs. The research was based on a robust analytical framework, incorporating various control variables to paint a comprehensive picture of the IPO pricing landscape.

The findings of this study have illuminated several key aspects. First, the relationship between R&D intensity (both in terms of total assets and revenue) and IPO pricing was found to be less straightforward than traditionally perceived. Contrary to the expectation of a positive relation, the results indicated that *R&D intensity Rev* had a significant negative relation. This challenges the conventional wisdom that higher R&D intensity uniformly translates into higher IPO pricing,

suggesting a more nuanced interplay between R&D spending and investor perceptions. In the *R&D intensity TA* however no statistical significance has been found to support evidence of any influence. Second, the study's examination of the role of patents. While indicating a potential positive impact, did not establish a statistically significant relation with IPO pricing. This outcome nuances the widely held view of patents as indicators of a firm's innovative capacity and value, highlighting the complexity of patent valuation in the context of IPOs. Thirdly, the investigation into the moderating role of the high-tech industry context revealed no significant interaction effects, suggesting that underwriters do not value R&D investments any different for high-tech companies as they do for non-high-tech companies. This finding is particularly insightful, as it contradicts the prevailing assumption that R&D investments are inherently more valued in high-tech companies. Moreover, the analysis of control variables such as firm size, equity dilution risk, underwriter reputation, and other financial metrics provided additional depth to the understanding of IPO pricing dynamics. The study confirmed the significant influence of these variables, underscoring the multifaceted nature of IPO pricing.

In conclusion, this study contributes to the existing body of knowledge by offering a more nuanced understanding of how R&D intensity, patents, and industry context influence IPO pricing. It challenges some long-held beliefs and opens new pathways for further research. For practitioners in the field of finance and IPO strategy, the findings offer valuable insights for optimizing IPO preparation and strategy. As the landscape of innovation and public offerings continues to evolve, this research serves as a foundation for ongoing exploration and understanding of the intricate dynamics at play in IPO pricing.

7.2 Implications and limitations

The study’s insights into the relationship between R&D intensity, patents, and the total deal value of IPOs, particularly in the high-tech sector, open new avenues for future research. The findings, especially the impact of R&D intensity and the complex role of patents, challenge conventional beliefs and underscore the need for further research. Academics are encouraged to delve deeper into the dynamics of R&D spending, considering factors like industry context, market conditions, and underwriter perceptions. The findings also call for a more detailed exploration of the qualitative aspects of patents, beyond mere quantity, to understand their true impact on IPO pricing. Moreover, the unexpected results regarding high-tech industry classification suggest a more granular examination of industry-specific valuation mechanisms and investor sentiment. These areas provide promising grounds for future research to expand the understanding of the relationship between innovation investments and IPO pricing and IPOs as a whole.

From a practical standpoint, this study offers valuable insights for companies contemplating IPOs and investors looking to gauge IPO potential. Firms should strategically manage their R&D investments, recognizing that investors may value the efficiency and potential returns of these expenditures over their sheer volume. Effective communication about how R&D initiatives contribute to future growth is crucial. For companies with significant patent portfolios, the focus should be on developing high-quality patents with clear commercial potential. Additionally, the findings highlight the importance of considering industry-specific nuances in IPO strategies, especially for high-tech firms. Understanding that R&D investments might not automatically attract a valuation premium in this sector is vital. Lastly, the impact of control variables like firm size, equity dilution risk, and underwriter reputation on IPO pricing emphasizes the need for a comprehensive and well-tailored approach to IPO planning, one that addresses diverse investor concerns and aligns with current market trends. These insights are instrumental for companies in optimizing their IPO strategies and for investors in making informed decisions.

This study has limitations that need to be considered. These limitations encompass aspects, including data constraints, methodological considerations and specific challenges related to key variables such as R&D intensity, patent quality, financial data timing and the delayed impact of financial metrics.

To focus on typical market conditions this research utilizes data from companies going public between 2016 and 2022 while deliberately excluding the years affected by COVID 19. While this approach aims to provide a view of standard IPO trends it might not capture insights into how extraordinary global events like pandemics could impact IPO dynamics and R&D investment strategies. The study specifically focuses on variables like R&D intensity, patents, and various financial metrics. May not encompass all factors that influence IPO pricing. Crucial elements such as brand value, market sentiment and investor behaviour, which are essential for IPOs, are not included in this analysis. Additionally since the focus is on the US market the findings may have limited applicability to other global markets with different IPO and R&D practices.

The study relies on analysis using multiple regression models to examine the relationship between R&D spending and IPO pricing. While this method is statistically rigorous it may not fully capture the non-linear relationships that are often observed in financial markets. For example it may not account for the threshold effect in R&D spending where the benefits start declining beyond a point. The risk of omitted bias should also be considered, which means that there might be other factors influencing the relationships that are not accounted for. Additionally unique market events like changes or technological breakthroughs can significantly impact IPO pricing and R&D strategies but may not be

adequately captured in these models. Measuring R&D intensity is particularly challenging for companies with zero revenue. In cases using a ratio-based approach may not be effective and can limit the scope of analysis.

It is important to note that this study focuses on the quantity of patents without assessing their quality or commercial viability. This limitation prevents it from understanding how patent quality influences IPO pricing.

Another limitation to any IPO pricing studies in general is the discount that underwriters include in the offering price. The amount of this discount is unknown, which makes it difficult to fully understand and interpret the results that come from studies about IPO pricing.

In summary these limitations show the need for improvement in future studies. It is important to adopt a comprehensive approach that encompasses a wider range of factors considers qualitative aspects and investigates the potential non-linear impacts, on financial markets. Later research could offer a better understanding of IPO dynamics and R&D investment strategies particularly by considering industry specific elements and global market fluctuations.

7.3 Research contributions

This study makes steps in the understanding of the IPO pricing process, especially through its unique focus on the pre-IPO phase, a critical yet often underexplored area. By shedding light on how R&D metrics such as intensity and patent counts influence IPO offer prices, the research provides invaluable insights into the valuation strategies and considerations of companies and underwriters in the run-up to an IPO. This fresh perspective is crucial for comprehending the complex dynamics that shape IPO pricing decisions. Furthermore, the study offers strategic insights of practical relevance, particularly for underwriters and companies navigating the IPO landscape. Additionally, the research enhances the understanding of industry-specific IPO strategies, challenging the conventional belief that high-tech companies automatically receive a higher valuation for their R&D activities. Instead, it reveals a consistent impact of R&D expenses on IPO pricing across various industries, offering valuable insights for high-tech firms to leverage their R&D investments effectively.

Advancing the discourse on R&D metrics in IPO pricing, the study distinguishes between the effects of different R&D aspects, thereby facilitating a more nuanced understanding of how these factors influence IPO pricing. The relation between patent counts and IPO pricing in particular, sheds light on the valuation of intellectual property in the IPO process, enhancing the understanding of its role. Lastly, the comprehensive analysis of control variables such as firm size, equity dilution risk,

underwriter reputation, and financial metrics underscores the nature of factors influencing IPO pricing, broadening the scope of understanding the complex interplay of firm-specific attributes and market dynamics.

Since this study had a focus on the pre-IPO stage as opposed to prior research that focussed mainly on the post-IPO stage, this study has contributed to a better understanding of the IPO process as a whole. By combining the insights from this study to the knowledge already present In post-IPO research, comparisons can be made between investors and underwriters. The main contribution is the knowledge that underwriters have a significantly different view on R&D than investors. As this study has shown, underwriters value R&D negatively as opposed to investors who, according to prior research view R&D as much more positive.

This research contributes significantly to both academic research and practical applications in IPO pricing, offering a deeper, more nuanced perspective on the pre-IPO process. It not only challenges long-standing beliefs but also provides practical guidance for companies and underwriters, emphasizing the importance of a well-rounded approach in preparing for an IPO.

7.4 Future research

The research conducted in this study presents potential avenues for future exploration particularly regarding the impact of R&D spending on IPO pricing. The following areas of study are worth considering.

1. **Examining the Effects of COVID 19 on IPO Trends.**

Given the influence of the COVID 19 pandemic on the data it would be valuable for future research to delve deeper into understanding how specific aspects of the pandemic have affected IPO dynamics. This could involve analysing factors such as the influx of investors during this time and how their presence may have influenced market behaviour and valuation perceptions. A thorough understanding of these dynamics could shed light on how global events like a pandemic reshape traditional financial models and investor behaviour.

2. **Extending Industry Analysis Beyond Tech vs Non-High Tech.**

Another worthwhile area to explore would be expanding industry analysis beyond simply categorizing companies, as high tech or non-high tech. Future studies could investigate how R&D spending impacts IPO pricing across a range of industries considering sector specific nuances and distinguishing factors. This approach would provide a comprehensive understanding of the industry specific dynamics involved in IPO pricing.

3. **Addressing Limitations in R&D Intensity Measurements**.

One key area to focus on in research is finding ways to overcome the limitations associated with measuring R&D intensity especially when companies have zero revenue. When divided by zero it makes the R&D intensity ratio ineffective. To address this issue future studies could concentrate on datasets that include both revenue and R&D expenses for companies. By adopting this approach, it can conduct an accurate and comprehensive analysis of how R&D intensity impacts IPO pricing while also examining a wider range of IPO cases.

4. **Long-Term Resilience of New Industries and Market Dynamics Post-IPO**.

It would be valuable to explore the long-term resilience of emerging industries after they go public through an IPO. Investigating whether these industries demonstrate a trend of resilience due to their innovative nature and how IPOs briefly affect competitor stock prices can significantly enhance the understanding of IPOs and market dynamics. Such research could help uncover whether broader industry impacts are negligible and shed light on the underlying reasons behind trends.

5. **Exploring the Optimal Level of R&D Intensity.**

A fascinating avenue for studies is exploring the notion of an optimal level of R&D intensity. Gaining insights into whether there exists a threshold beyond which R&D investments yield diminishing returns or become detrimental can provide knowledge. This exploration will help understand if there is a point at which companies should balance their investments, in research and development for maximum effectiveness.

6. **Exploring alternative variables and model structures.**

To gain an understanding of the relationship between R&D spending and IPO pricing future studies could consider exploring alternative variables or model structures. The results from this study highlight that different models used for analysing R&D intensity, R&D expenses and patents have varying levels of predictability. Therefore it is worth investigating approaches that may provide further insights especially regarding R&D intensity and patents. By examining model structures or incorporating additional variables, there can potentially gain a clearer understanding of how these aspects impact IPO pricing.

7. **Assessing the quality and impact of patents.**

Additionally it is important to assess the quality and commercial viability of patents in research. While this study considers the number of patents as an indicator of innovation it is crucial to acknowledge that the quality and market potential of these patents can significantly influence their impact on IPO

pricing. Subsequent studies could delve into how types of patents (in terms of quality and applicability) affect a company's market valuation during an IPO.

8. **Enhancing database accuracy for predictions.**

Since this study opted not to exclude outliers aiming to preserve the predictability for individual company's future research could consider utilizing a more refined database. This enhanced approach would provide an accurate representation of most companies that go public. By striking a balance between accuracy and comprehensive data representation this study can obtain findings that are both applicable to a broader context and sensitive to the unique dynamics of each company.

9. **Exploring market indicators.**

In future research it would be valuable to expand beyond solely relying on the inflation rate as an indicator of market conditions as done in this study. By exploring indicators, there can gain a more comprehensive understanding of how external economic factors influence IPO pricing. Variables such as interest rates, stock market performance or economic growth indicators could be considered to provide a rounded view.

10. **Extending the analysis period.**

To delve deeper into company data analysis it would be worthwhile for research to examine information beyond just the year in which a company goes public. An insightful approach would involve studying averages from several years prior. Since R&D often takes time before yielding products or services earlier periods might yield stronger correlations, between certain financial metrics and IPO outcomes.

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