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What is the Long-Term Impact of Initial Public Offerings of US Firms in 2018 on their Operating Performance?

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The views stated in this thesis are those of the author and not necessarily those of the supervisor, second reader, Erasmus School of Economics or Erasmus University Rotterdam.

Abstract

This paper studies the effects of an Initial Public Offering (IPO) on firm performance. More specifically, we researched the effects of an IPO on the performance ratios, return on assets (ROA), return on equity (ROE), and operating profit margin (OPM). This was done by regressing the change in each of the variables against three control variables: firm size, industry, and a dummy variable indicating whether the company operates online. The change in the performance ratios is measured by the difference between fiscal years before and after the fiscal IPO year. Our results show that on average, for certain industries, firms realize a decrease in certain ratios, depending on the size and their internet presence. Additionally, our results showed that firms in the healthcare industry, on average, experience an increase in ROA. Depending on certain factors, we are able to estimate the expected change in performance ratios.

Keywords: Initial Public Offering, Return on Assets, Return on Equity, Operating Profit Margin, Long-Run Firm Performance

JEL codes: G34

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Chapter 1 - Introduction

For the first time since 2010, the United States initial public offering (IPO) revenues were not the highest in 2022. An IPO is the procedure of releasing shares of a company to the market in order to raise money that enables businesses to develop and flourish. Companies can also use it to pay off debts and earn recognition. In 2022, China had the highest IPO revenues, but for the previous 11 years, the United States was still a global leader in IPO revenues. Because of this, the American market continues to be crucial to the discussion of initial public offerings. "Firms prefer internal to external funds and debt to equity when external funds are needed" is the "pecking order theory" (Myers, 1984, p.1). During an IPO, a corporation can raise external equity, which begs the question of what the effect of the operating performance of a company is following an IPO.

The Chan, Wang, and Wei (2004) study looked into IPOs in China with a focus on underpricing and long-term performance. It is crucial for the economy, financial markets, and different stakeholders to comprehend these factors. The study offered important insights into China's rapid economic development and the subsequent spike in IPO activity. By implementing the rigorous methodology, the researchers looked at IPO data from the Shanghai and Shenzhen Stock Exchanges between 1994 and 1999. To determine underpricing, they examined early IPO returns and then assessed long-term performance using indicators including buy-and-hold anomalous returns and market-adjusted returns. The study's findings showed that Chinese IPOs are frequently underpriced, suggesting that the pricing process may have inefficiencies and that issuers and investors may not have the same information. The long-term performance of these IPOs was frequently subpar, with a sizeable share exhibiting negative anomalous returns. The Chinese IPO market will be significantly impacted by these results, which also underscore persistent difficulties and dangers for investors. The report clarifies the underpricing and long-term performance of IPOs in China, emphasizing the significance of these variables for investors, regulators, and policymakers. It emphasizes how important it is to manage risks for Chinese IPO investors and deal with inefficiencies in the pricing process. Jain and Kini (1994) looked at the post-IPO operating performance of US companies listed on the stock market between 1976 and 1988 in a related study. To gauge the performance difference from the fiscal year prior to the IPO, they employed return on assets (ROA). They determined the industry-adjusted change by comparing IPO firms in comparable industry sectors using Standard Industrial Classification (SIC) codes. The study found that the IPO's timing was very important in the subsequent decline in operating performance. Companies that experienced significant pre-IPO success but were unable to maintain it subsequently saw a drop. These results add to our understanding of long-term IPO success and are consistent with the findings of the present study.

The majority of studies on the topic of IPOs research the short-term performance of IPOs and, more

specifically, the underpricing. Very few studies investigate the effects of IPOs on long-term operating performance. Jain and Kini (1994) performed a study on this topic; however, the paper is almost 40 years old, and since then, few papers have been written on this topic. The United States contributed a total of $24 billion in IPO proceeds in 2022, a significant fall from the previous year, 2021, when the overall proceeds were $323 billion due to China dominating IPO proceeds. This was largely due to the "SPAC Boom," which made it possible for businesses to go public much more quickly and affordably. Notwithstanding the sharp decline in the number of SPACs, this does not explain the $299 billion drop in IPO revenues from 2021 to 2022. Moreover, the number of IPOs held in the United States in 2022 was the fewest since 2016. There are many motives for companies to go public, as mentioned in the first paragraph. Companies also believe that having an IPO has a positive effect on the company's image and publicity. As previously declared above, substantially fewer studies research the long-term operating performance of IPOs.

This study's main goal is to examine how changing American companies' ownership from private to public affects their operational performance in 2018. Given the potential effects of the COVID-19 pandemic in 2020, it was purposeful to select 2018 as the study's reference year. The regression study focuses on the fiscal year prior to the IPO and the post-IPO period in an effort to avoid the impact of the direct and indirect consequences of the pandemic. This choice enables a more thorough analysis of the operating results of the businesses in connection with their change from private to public ownership. Three crucial ratios, return on assets (ROA), return on equity (ROE), and operating profit margin (OPM), will be used in the study to gauge operational success. We will conduct three separate regression analyses using the change in performance ratio as the dependent variable in order to measure the impact of an IPO. The constant in each regression will display the performance impact of an IPO over the long run. The IPO companies will be divided into groups according to their SIC codes, and panel data regression analysis will be used to evaluate potential differences between industrial sectors. The regressions will also take into account the firm's size, industry, and designation as an Internet company by using these variables as control variables. As they are most pertinent to this research, the study will concentrate on the New York Stock Exchange (NYSE) and the National Association of Securities Dealers Automated Quotations (NASDAQ), the two biggest and most significant stock exchanges in the United States. In these markets, IPO listings from 2018 will be evaluated. The applicable companies will be located using the IPO data from the Orbis M&A databank (https://www.bvdinfo.com/en-us/our-products/data/greenfield-investment-and-ma/orbis-ma), and the required financial data will be obtained from the Orbis databank (https://www.bvdinfo.com/nl-nl/onze-producten/gegevens/internationaal/orbis). It is crucial to keep in mind that this study differs greatly from that conducted by Jain and Kini in 1994, who used median-based analysis to look at disparities. However, similar to their study, particular standards will be used to choose the company. The minimum offer price is $5, the minimum amount raised is $1.5 million, and transactions involving

reverse leverage buyouts, close-end mutual fund IPOs, unit issues, and real estate investment funds are not eligible. However, in this study, we will be looking at all companies that had an IPO in 2018.

Prior to performing these analyses, it is difficult to know to what extent the effects of an IPO are on long-term operating performance. However, as mentioned above, I do believe that the companies experienced a decrease in their operating performance as a result of their IPO. Even though the two studies were conducted many years apart and in different geographical locations, Wang et al. (2021) discovered results that were comparable to those of Jain and Kini's (1994) investigation.

The remainder of this paper is structured as follows. Section 2 discusses relevant literature and previous research regarding IPOs and firm performance. Section 3 highlights the steps taken in order to collect our data sample and how the regressions were performed. Section 4 analyses the results of the regressions and discusses them. Section 5 concludes the findings of this paper.

Chapter 2 - Theoretical Framework

2.1 Initial Public Offerings

An IPO is the process through which private corporations offer their shares to the public for the first time, as defined by Fernando (2023). Companies often go public primarily to raise equity capital, as stated by Ritter and Welch (2002). This capital infusion enables them to invest in projects and stimulate growth. Another motive for going public is to create a market where founders and other shareholders can convert their shares into cash. Although non-financial reasons, such as increased publicity, play a minor role in the decision-making process (Ritter and Welch, 2002), they also contribute to consideration.

Private corporations, on the other hand, have various methods to raise equity capital. One such method is crowdfunding, which utilizes small amounts of capital from a vast network of individuals to initiate new businesses (Smith, 2022). Equity-based crowdfunding, which is gaining popularity, involves individuals investing capital in exchange for equity in the company. While it resembles an IPO, there are significant differences. The primary distinction is that after an IPO, a company's shares are traded on public marketplaces like the New York Stock Exchange, whereas crowdfunding projects are not. Trading on a public marketplace provides advantages such as reaching a wider audience and allowing individuals to profit from stock trading.

Once companies go public, founders face challenges, as identified by Beckman and Burton (2008). They found that the level of expertise of top-tier management significantly affects the speed at which companies achieve certain milestones. Additionally, a study conducted by Cirillo, Mussolino, and Saggese (2017) emphasizes the importance of corporate transparency in top-tier decision-making processes to attract investors and gain their trust. Chua (2009) found that as these companies receive a large amount of capital, there are three main categories in which they can invest, fixed asset capital expenditure, R&D, and advertising. The challenges arise in efficiently and effectively choosing how much to invest in said categories.

IPOs have been extensively studied, with research shedding light on various aspects of this process. Lowry, Michaely, and Volkova (2017) discovered that the decline in IPO activity during the early 2000s was primarily attributed to the high costs and conflicts associated with the process. As a result, many privately held companies explored alternative methods of raising equity to avoid these expenses. One crucial element of an IPO is the pricing of the shares. Typically, underwriters, who are usually investment banks, initiate a process called book-building to determine the share price. In many cases, the initial offering price is set below the market's perceived value, resulting in money being "left on the table", this phenomenon is called underpricing. Some factors influence the extent of IPO

underpricing, including the Winner's Curse phenomenon, initially described by Rock (1986). According to Rock (1986), certain investors possess additional information that provides them with an advantage. When a stock is underpriced, these informed investors are more inclined to purchase shares, resulting in excess demand. Consequently, uninformed investors can only acquire a fraction of the available shares. Conversely, when a stock is not underpriced, only uninformed investors show interest and can obtain all the shares they request, as informed investors are not attracted. Therefore, IPOs must, on average, be underpriced to attract a sufficient number of investors. However, this is considered a cost of going public, as it helps attract investors and generate demand for the shares (Fitza & Matusik & Hayward, 2010).

2.2 IPO: Literature Review

This study expands on a body of work by multiple scholars that investigated various IPO-related topics in depth. The topic of IPOs can be handled from a variety of perspectives, resulting in a wide range of research approaches. Examining underpricing and its effects is one of the most popular areas of research in this field. Further research has focused on examining the long-term performance of companies after their IPOs, a subject that will be in-depth covered in the section that follows and will incorporate pertinent data from earlier studies.

Jain and Kini (1994) looked at how companies operated following their initial public offering. Their study was centered on a sample of 682 US businesses that had an IPO between 1976 and 1988. The results of their study showed that, when compared to their pre-IPO levels, these firms' operating performance significantly decreased post-IPO. They emphasized the potentially misleading nature of high pre-IPO operating performance levels for investors. They pointed out that optimistic expectations for earnings growth might be based on these high pre-IPO levels, which are regrettably short-lived. As a result, investor expectations decreased. In Ahmad-Zaluki's (2009) extensive study, a sample of 254 Malaysian IPO companies from the period 1990-2000 was meticulously analyzed, leading to consistent results of prior studies. The research yielded robust evidence indicating a significant decline in performance among IPO companies during their IPO year and extending up to three years following the IPO. Significant research has been undertaken to investigate firm performance and notable studies conducted by Mikkelson et al., (1997), Pagano et al., (1998), and Chan et al., (2004) have made substantial contributions to this field. These studies have explored the subject in different countries, namely the US, Italy, and China, respectively. The collective findings consistently present compelling evidence that firms generally encounter a decline in financial performance shortly after their IPO.

In a study conducted by Pastusiak et al. (2016) using companies listed on the Warsaw Stock Exchange, the impact of an IPO on financial metrics such as ROA, ROE, NPM, and OPM was

examined through a Wilcoxon matched-pairs test. The findings of their research align with the aforementioned studies, revealing a decline in these performance indicators following an IPO. They further investigated the underlying reasons for this phenomenon. Their research led them to the conclusion that businesses engaged in "window dressing" to improve their accounting data to attract more investors. This method entails manipulating financial data to give the impression that the company is financially better than it is, as defined by Chen (2023). The study also explained that after companies go public, they receive substantial sums of capital which they have trouble effectively handling. The proper use of these newly discovered resources consequently becomes difficult, which ultimately contributes to a drop in the firm's overall performance statistics. This theory is also backed by a study conducted by Teoh et al., (1998). Another explanation is given by Loughlan and Ritter's (1995) windows of opportunity theory, which entails that companies issued shares to the public when they were, on average, substantially overvalued. Similarly, Baker and Wurgler (2002) claim that market timing is the main determinant of a corporation's decision to finance through equity or debt. The last explanation is that of information asymmetries. As explained by Jensen and Meckling (1976), as the management's ownership portion decreases as a result of an IPO, agency costs subsequently increase. Which further leads them to act on projects that do not maximize value for the firm.

One interesting research area focuses on the long-term performance of IPOs by comparing their returns to those of indexes within the same country. Aggarwal and Rivoli (1990) discovered that investors who invested in common stock IPOs and held their positions for one year experienced significantly negative returns after accounting for market movements. Jaskiewicz et al. (2005) conducted a similar analysis for German and Spanish companies, examining a period of 3 years. Their research concluded that Spanish and German IPOs exhibited abnormal returns of -32.8% and -36.7%, respectively. Additionally, their study found that firm size had a significant positive influence on abnormal returns. Ritter and Welch (2002) discuss the concept of "hot" and "cold" IPO markets. In hot markets, characterized by increased demand for IPO shares, firms may experience higher initial returns, but these tend to diminish over time. Conversely, in cold markets, firms face more challenging conditions, resulting in lower initial returns. However, the paper suggests that firms that successfully navigate cold markets may demonstrate stronger long-term performance. Michaely and Shaw's (1994) research provides compelling evidence that IPOs underwritten by reputable investment banks not only show significantly less underpricing but also exhibit superior long-term performance. In contrast to the aforementioned studies, Chen, Chen, and Kao (2010) found that companies that underwent IPOs in Taiwan between 1991 and 2002 realized higher returns than the market, even after adjusting for common factors in capital markets.

Chapter 3 - Data & Methodology

3.1 Sample

When deciding which IPO year to take a sample from, we wanted to make sure to avoid external factors that may influence our results. The most influential external occurrence was the COVID-19 pandemic, this resulted in many companies having to shut down, even entire supply chains put on hold. Therefore, we decided to create our sample using companies from 2018, allowing us to compare the data from 2017 and 2019 without the influence of Corona.

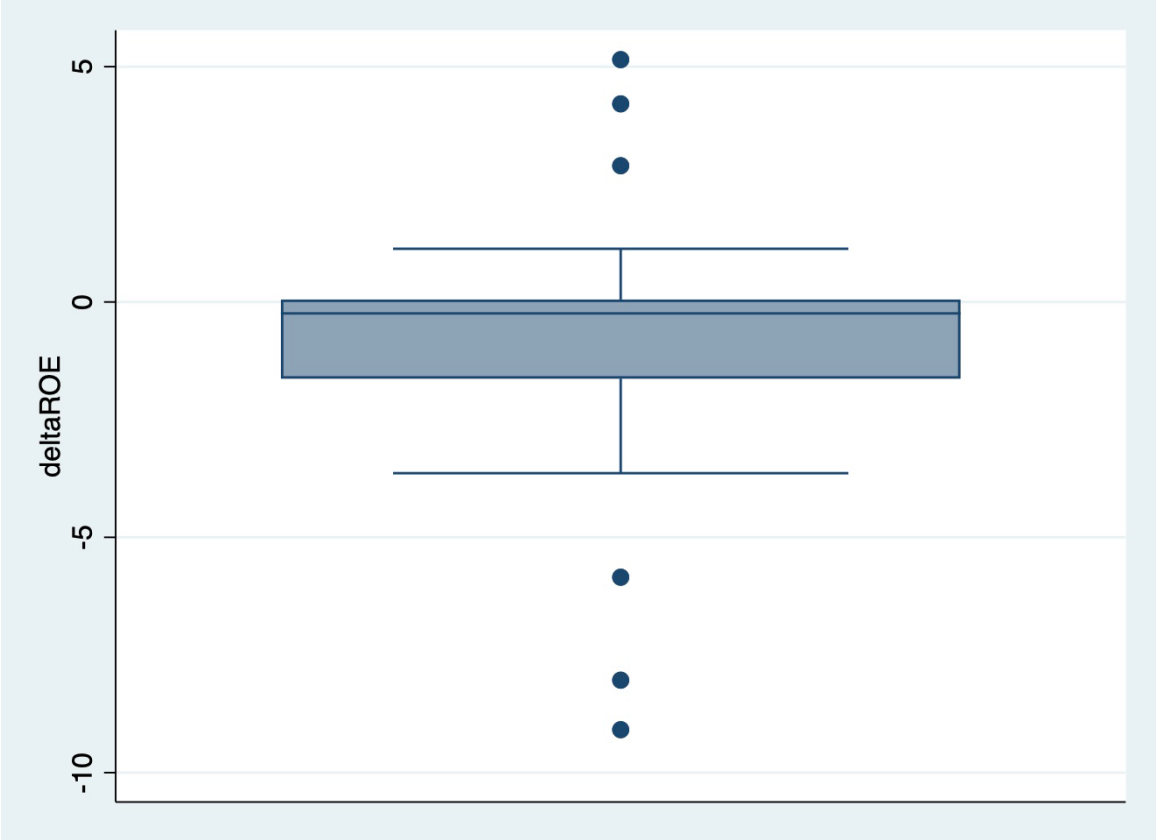
A total of 134 IPOs had taken place in the United States in 2018 according to Jay Ritter (2023). The Orbis M&A databank, a comprehensive tool that includes integrated corporate information and M&A data, was used to gather the data for this study. The database has user-configurable filters, and in our instance, we concentrated on criteria. To begin with, we used the "deal type" filter and chose IPO to include all companies that went public. Second, we focused our search by choosing the US as the "target country code" because we were only interested in businesses that had an IPO in the US. Lastly, we used the "time period" parameter to focus our search on businesses that successfully completed their IPO during the fiscal year of 2018. This refined search gave us 140 companies, 6 more than Ritter said.

We continued the data collection procedure by obtaining the specific companies' financial data. As part of our investigation, we used a particular technique that required extracting the 140 companies from the Orbis M&A database along with their distinct Bureau van Dijk ID number (BvD). Each company's unique identification number provided by BvD can be used to access each company's financial data on a separate Orbis database. We were able to select all the required financial data needed to calculate performance ratios for our regression using the Orbis database. The financial data included Total Assets, Total Shareholder's Equity, Net Income, Operating Income (=EBIT), Net Sales, and US SIC industry codes. Data sets from 2019, 2018, and 2017 were collected for each of the aforementioned datasets. Being an internet-based corporation was the only control variable that could not be automatically found. So, for each organization in our dataset, we will manually find this variable.

After gathering the data, the next step involved data cleaning, which was imperative due to certain circumstances. Specifically, we encountered instances where companies that underwent an IPO in 2018 were then acquired in 2019. Therefore, financial data for the fiscal year of the acquisition was unavailable to us. To ensure the integrity of our dataset, we not only removed companies that were acquired by private entities. Even though the Orbis database has the majority of data needed for our calculations, there were many instances where some data was missing. This, however, was rapidly

solved as we looked them up in Annual Reports and inputted them manually. In some rare instances data was unavailable, the majority of which are for the variable Operating Income. This resulted in us not being able to calculate a company's OPM, unfortunately there was no way around this. Another important part of the data cleaning was to remove outliers in our data. Through Stata, we were able to create box plots per industry, which made it significantly easier to find outliers as the were represented with dots. An example of a box plot is showed in Figure 1 below.

Figure 1: ΔROE Box Plot for Industry *Manufacturing, Energy, and Utilities.*



In the end our sample consisted of panel data for a total of 106 companies.

3.2 Dependent Variables

It is important to describe how the following three performance ratios were used in our regression study before clarifying the reasoning for their selection. Regressions will be run specifically using the performance ratio's change as the dependent variable. We will take the ratio value from the fiscal year before the IPO and subtract it from the value from the fiscal year after the IPO to determine this change. With this structure in place, we can now talk about why the following performance ratios were chosen.

ROA is a crucial performance ratio for businesses since it measures how effectively assets are used by management to generate profits. Strong profitability is denoted by a high ROA, which shows that the company makes significant profits in comparison to its asset base. This implies effective asset usage and illustrates the capability of the business to optimize profits. A low ROA, on the other hand, can point to inefficiencies or underutilization of resources, which calls for attention and improvement. It is represented as a percentage and is computed by dividing a company's Net Income by its Total Assets;

$$ROA = \frac{Net\ Income}{Total\ Assets}$$

The value of ROA extends to discovering the root causes of issues within an organization. A drop in ROA might act as a warning sign, highlighting problems like diminishing revenues, rising costs, or inadequate asset management. Management can identify problem areas, reduce procedures, and boost overall effectiveness by using ROA as a performance statistic. This makes it possible to take prompt remedial action and interventions to reduce any potential risks. Additionally, ROA can direct strategic planning and decision-making within a corporation. It offers insightful information on how different strategies, financial choices, or operational adjustments affect profitability. Management may allocate resources wisely, streamline processes, and create efficient strategies to improve overall financial performance by evaluating ROA trends. One of the main issues regarding ROA is that it can not be used to compare companies across industries (Hargrave, 2022). The reason for this is that companies in one industry may have a different “asset base” than firms in another sector.

ROE is a metric for evaluating a company's financial performance that demonstrates the connection between earnings and investor returns. Any corporation can calculate ROE as a percentage-based financial statistic by ensuring that both net income and equity have positive values. Dividends granted to common shareholders are not included in the computation of net income, which is calculated by deducting dividends paid to preferred shareholders and interest paid to lenders from the company's earnings. ROE is calculated using the following formula;

$$Return\ on\ Equity = \frac{Net\ Income}{Shareholder's\ Equity}$$

The industry or sector, as well as the accepted standards among a stock's peers, determine whether an ROE is favorable or unfavorable. When the net income is much more than the equity, a particularly high ROE may occasionally be an indication of a successful business. This means that the business is performing exceptionally well and making significant profits compared to its equity basis. Extremely high ROE values should, however, be interpreted with caution because they may reflect a small equity

position relative to net income. Given that the company's financial stability mainly depends on a limited stock base, this may indicate a higher level of risk.

Our study's goal is to find out how an IPO affects the long-term dynamics of ROE. Evaluating the financial health of the companies under investigation is not our aim. The relevance of ROE as a financial success statistic, in general, should not be understated, notwithstanding the narrow focus of our research.

OPM is an indicator of a company's core operations' profitability. It indicates the portion of revenue that is left over after all operational costs have been paid, but before taxes and interest costs have been taken into consideration. The OPM calculation is as follows:

$$Operating\ Profit\ Margin = \frac{Operating\ Income\ (= EBIT)}{Net\ Sales}$$

An important indicator that sheds light on the effectiveness and profitability of a company's fundamental activities is OPM. It provides a measure of operational effectiveness and cost control by displaying the proportion of each dollar of revenue that is converted into operating profit. Indicating stronger profitability and effective cost control, a higher OPM means that a company is producing a larger portion of revenue as operating profit. In contrast, a lower OPM indicates that a greater proportion of income is used to pay for operating costs, which leads to reduced profitability.

In financial analysis, OPM is frequently used to analyze the performance of businesses operating in the same sector or industry. It aids in evaluating a company's operations' relative profitability and efficiency and pointing out trends or changes over time for investors, analysts, and stakeholders. Additionally, it offers a framework for comparing performance to that of competitors in the same industry and assessing the success of cost-cutting initiatives or operational enhancements.

3.3 Control Variables

Control variables play a necessary role in a panel regression analysis as it enables the isolation of the change in our dependent variable. By accounting for potential confounding factors, they help ensure that the estimated coefficient of the change in dependent variables is more precise and reliable.

Firm Size is crucial to include as a control variable because it enables us to address the potential impact of firm size on the variables under investigation. The performance and financial results of larger organizations may be impacted by their access to additional resources, their ability to influence

the market, and their ability to take advantage of economies of scale. Research has shown there to be a positive linear relationship between firm size and profitability (Işık et al., 2017). By taking firm size into account while evaluating the effects of the variables of interest, we may efficiently isolate and assess those effects without having to take into account any company-specific size-related aspects. Our study is more reliable and robust thanks to this methodology, which also enables us to come to more precise conclusions and make informed judgments.

Unfortunately, Firm Size is not a variable that can directly be calculated, therefore a proxy must be used. There are three options for a proxy that accurately captures the size of a firm as research by Dang, et al. (2013). These are the natural logarithm of the firm's total assets, sales, or market value of equity. In this research paper, the natural logarithm of the individual firm's total assets will be used as the proxy.

Industry is another variable that we must control for as mentioned in the previous section. Different industries have different standards, some industries require a lot of assets whereas others don't for example. Therefore, we can not compare the performance ratios across industries. The industries will be controlled through dummy variables, which will be explained in detail in the next section.

Internet Companies typically have different financial performance metrics. Due to their asset-light business strategies, internet companies frequently have greater ROAs than non-internet enterprises. They frequently rely on technological infrastructure and digital platforms, which require less financial investment in tangible assets. They can therefore generate greater revenue while using fewer resources. Therefore, another variable that is important to control for is whether or not the company of interest is internet based.

3.4 Calculating Variables

Using the formulas shown in the previous 2 sections of this paper, we managed to calculate the ROA, ROE, and OPM for the years 2017 and 2019. Once these ratios were calculated we were able to calculate our dependent variables, which were the change between 2019 and 2017. This was calculated using the following formulas:

$$\Delta ROA = ROA_{2019} - ROA_{2017} \quad (1)$$

$$\Delta ROE = ROE_{2019} - ROE_{2017} \quad (2)$$

$$\Delta OPM = OPM_{2019} - OPM_{2017} \quad (3)$$

The regression analysis required the manual calculation of two control variables. Using the natural logarithm of the total assets in 2018 as a proxy for business size, the first control variable was created. The development of a dummy variable to represent whether or not a company operated as an internet-based company was the second control variable. A value of 1 was assigned to businesses that predominantly conduct business online, such as Dropbox Inc. On the other hand, organizations that don't operate primarily online were given a value of 0.

The companies were grouped per industry, using the 5 industry classification of Fama & French (1997). Although Stata doesn't have a built-in feature to directly group various SIC codes into their associated industries, the work was made easier with the use of a program created by Judson Caskey (2007) and loaded into Stata. The companies were successfully categorized according to their proper industries by using this program. The options for industry classification that were accessible for this study were 5, 10, 12, 17, 30, 38, 48, and 49. The classification category 5 was used following the study's goals. To analyze and interpret the regression results and gain a more detailed understanding of the relationship between the variables under study, these industry classifications were important. Table 1 shows what the industry classifications are.

Table 1: Fama & French 5 industry classification.

5 Industry Model – Fama & French
Consumer Durables, NonDurables, Wholesale, Retail, and Some Services (A)
Manufacturing, Energy, and Utilities (B)
Business Equipment, Telephone and Television Transmission (C)
Healthcare, Medical Equipment, and Drugs (D)
Other - Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment, Finance (E)

In conclusion, after collecting and cleaning all the data, our ROA variable contained 88 observations. The ROE and OPM variables contained 75 and 40 observations, respectively. The summary statistics and Correlations per industry are shown in the tables below:

Table 2: Summary Statistics of Variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
ΔROA	88	-.014	.202	-.562	.519
ΔROE	75	-.136	.748	-2.072	2.31
ΔOPM	40	.174	1.007	-1.939	3.43
FirmSize	106	19.565	1.574	15.085	26.121
InternetCompany	106	.113	.318	0	1

Note: FirmSize is the natural logarithm of the total assets in 2018. InternetCompany is a dummy variable with values 1 signaling that the firm operates online, and 0 if it does not.

Table 3: Correlation Matrix of Variables.

Variables	(1)	(2)	(3)	(4)	(5)
(1) ΔROA	1.000				
(2) ΔROE	-0.235	1.000			
(3) ΔOPM	0.554	-0.482	1.000		
(4) FirmSize	-0.353	0.367	-0.456	1.000	
(5) InternetCompany	0.034	0.247	-0.145	0.019	1.000

Note: FirmSize is the natural logarithm of the total assets in 2018. InternetCompany is a dummy variable with values 1 signaling that the firm operates online, and 0 if it does not.

As can be seen in the tables above, we have given summary statistics and correlations between variables by industry. The most important item to mention is the statistics regarding deltaROE. In table 2 we see that deltaROE has a small mean with a very large standard deviation. This is the result of outliers, however, there is a substantial amount when it comes to deltaROE. With further investigation, we were able to deduce the cause of this. The extreme changes in ROE were due to the changes in shareholder equity. For example, some companies in the fiscal year before their IPO had negative shareholder equity which happens when liabilities are more than assets. If this company had a positive net income, the ROE would be negative. Now in the fiscal year after the IPO, their shareholder equity becomes positive as a result of the IPO. Now, if the company's income is still positive, the ROE also becomes positive. Now, in this case, deltaROE becomes a large positive number. The same happens the other way around, in which case deltaROE is a large negative number. In other words, the data is quite spread out and not centered around the mean. The same is the case for OPM.

3.5 Methodology

As we transformed the panel data into single data observations, we used a linear regression model with default standard errors. This method was selected by trial and error as it fit the data the best. The equations of the models estimated are shown below.

$$\Delta ROA_i = \beta_0 + \beta_1 B + \beta_2 C + \beta_3 D + \beta_4 E + \beta_5 FirmSize_i + \beta_6 InternetCompany_i + \epsilon_i \quad (4)$$

$$\Delta ROE_i = \beta_0 + \beta_1 B + \beta_2 C + \beta_3 D + \beta_4 E + \beta_5 FirmSize_i + \beta_6 InternetCompany_i + \epsilon_i \quad (5)$$

$$\Delta OPM_i = \beta_0 + \beta_1 B + \beta_2 C + \beta_3 D + \beta_4 E + \beta_5 FirmSize_i + \beta_6 InternetCompany_i + \epsilon_i \quad (6)$$

The particular corporation being regressed is represented by the subscript 'i'. The variables "B", "C", "D", and "E" represent the industries referring to Table 1. These variables are dummy variables that

take on the value of one when the company being regressed operates in said industry, and 0 otherwise. As the companies are given a single industry in which they operate, there is no need for a joint variable. The industry “A” is directly visible in the regressions, only when the other industry variables have a value of 0 do we know we are looking at said industry. The hypothesis of the research question will be tested against significance levels of 1%, 5%, and 10%.

Chapter 4 - Results & Discussion

In this section, the most important results of our regression will be explained in detail to answer our research question. Once the results are explained, the effects of an IPO on long term-firm performance will be clear. Furthermore, Tables 4, 5, and 6 show the regression results for ΔROA, ΔROE, and ΔOPM, respectively. The coefficients are tested against 1%, 5%, and 10% levels of significance which is indicated by the amount of "*".

The model's performance is evaluated using the goodness of fit test, specifically the R-squared metric. R-squared measures how well the model approximates the actual data and ranges from 0 to 1. A value of 0 indicates that the independent variables have no explanatory power, and the model fails to explain any variation in the dependent variable. On the other hand, a value of 1 indicates that the model perfectly predicts the dependent variable, accounting for all the variation. In Table 4, the R-squared value is reported as 0.071, indicating that the model predicts approximately 7.1% of the variation in the data. This low R-squared suggests that the model has limited explanatory power and does not fit the data well. Similarly, Table 6 provides an R-squared value of 0.117, similar to that of Table 4. This indicates that approximately 11.7% of the variation is explained by the model, while a substantial 88.3% remains unexplained. The presence of such a large unexplained variation might be attributed to omitted variable bias (OVB), which will be discussed in detail in the subsequent chapter. However, in Table 5, a notable improvement is observed, with an R-squared of 0.334. Although this value is still relatively low, it represents a significant enhancement compared to Tables 4 and 6. Ahmed (2021) conducted a similar regression and obtained R-squared values of 0.721 and 0.655, suggesting that the model fit the data well in their study. Therefore, it can be concluded that the model used for Table 5 adequately fits the data, although there is still a considerable amount of unexplained variation.

Table 4 presents the regression results with ΔROA as the dependent variable. The table reveals that only one coefficient is statistically significant, specifically at a 5% level. The coefficient pertains to the dummy variable representing the *Manufacturing, Energy, and Utilities* industries, which has a value of -0.125. This finding suggests that, on average, firms within this industry experience a decrease of 12.5% in their ROA when comparing fiscal years before and after their IPO year. The constant in our regression corresponds to the average for the *Consumer Durables, NonDurables, Wholesale, Retail, and Some Services* industry. This is because when the dummy variables for the remaining industries in the regression are set to 0, it becomes the industry being examined. Additionally, upon examining the table, it becomes apparent that the firm's size does not exert any discernible influence on the change in ROA. Similarly, the coefficient associated with the dummy

variable InternetCompany is found to be statistically insignificant. Consequently, based on our results, whether a company operates online or not does not have a significant impact on its ROA.

Table 5 presents the regression results with the change in ROE as the dependent variable. The analysis reveals several noteworthy findings. Firstly, two coefficients are found to be statistically insignificant. The first coefficient represents the constant term, which reflects the industry average for *Consumer Durables, NonDurables, Wholesale, Retail, and Some Services*. The second coefficient pertains to the size of the firm, indicating that, similar to the results observed for the change in ROA, firm size does not have a significant impact on the change in ROE. Moving on to the significant coefficients, we observe that the *Manufacturing, Energy, and Utilities* industry exhibits a coefficient of -0.615, which is significant at the 10% level. This implies that companies in this industry, which underwent an IPO in 2018, experienced an average decrease of 61.5% in ROE when comparing the fiscal years before and after the IPO year. Furthermore, the *Business Equipment, Telephone, and Television Transmission* industry demonstrate a coefficient of -1.38, significant at the 1% level. This coefficient indicates that companies operating in this industry, which had an IPO in 2018, saw an average decrease of 138% in ROE when comparing the fiscal years before and after the IPO year. Similar conclusions can be drawn for the remaining coefficients associated with the remaining industries. Additionally, the coefficient for InternetCompany, which is significant at the 1% level, has a value of 1.121. This suggests that online companies, on average, experienced a substantial increase in ROE of 112.1%, regardless of the industry in which they operate. For instance, an online company in the Business Equipment, Telephone, and Television Transmission industry could expect its ROE to decrease by 25.9% (-138% + 112.1%).

Table 6 presents the regression results with ΔROA as the dependent variable. As can be seen, all coefficients of the regression are insignificant. This means that there is not enough evidence to show that OPM is influenced by our variables, given our data sample. This could simply be due to OPM not changing after the company has an IPO. However, it could also be due to our sample size being relatively small. Further investigation is necessary to draw conclusions. An important note is that Ahmed (2021), who also performed a similar regression, also found insignificant evidence of an effect.

The results showed that companies who have an IPO experience significant changes in their ROA and ROE and insignificant changes in OPM, for a sample of US companies that had an IPO in 2018. These findings are similar to previous studies performed in different contexts, for example, geographical location or time, such as Jain and Kini (1994), Pastusiak et al. (2016), and Chan et al., (2004). This shows that firms that have an IPO are likely to see a decrease in operating performance.

Table 4: Results from Regression with ΔROA as Dependent Variable.

ΔROA	Coef.
Manufacturing, Energy, and Utilities	-.125**
	(.051)
Business Equipment, Telephone and Television Transmission	-.003
	(0.078)
Healthcare, Medical Equipment, and Drugs	-.057
	(0.058)
Other - Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment, Finance	-.018
	(0.042)
FirmSize	.013
	(0.015)
InternetCompany	.07
	(0.061)
Constant	-.236
	(0.295)
R-squared	0.071
Observations	88

Note: *** p<.01, ** p<.05, * p<.1. Standard Errors are in parentheses.

Table 5: Results from Regression with ΔROE as Dependent Variable.

ΔROE	Coef.
Manufacturing, Energy, and Utilities	-0.615*
	(0.342)
Business Equipment, Telephone and Television Transmission	-1.38***
	(0.338)
Healthcare, Medical Equipment, and Drugs	-1.019***
	(0.255)
Other - Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment, Finance	-0.717**
	(0.292)
FirmSize	0.05
	(0.056)
InternetCompany	1.121***
	(0.384)
Constant	-0.346
	(1.113)
R-squared	0.334
Number of obs	75

Note: *** p<.01, ** p<.05, * p<.1. Standard Errors are in parentheses.

Table 6: Results from Regression with ΔOPM as Dependent Variable.

Note: *** p<.01, ** p<.05, * p<.1. Standard Errors are in parentheses.

ΔOPM	Coef.
Manufacturing, Energy, and Utilities	-0.081
	(0.079)
Business Equipment, Telephone and Television Transmission	-0.186
	(0.136)
Healthcare, Medical Equipment, and Drugs	0.646
	(0.528)
Other - Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment, Finance	-0.012
	(0.031)
FirmSize	-0.031
	(0.119)
InternetCompany	0.155
	(0.136)
Constant	0.68
	(2.528)
R-squared	0.117
Number of obs	40

Chapter 5 - Conclusion

We conducted a comprehensive study aiming to investigate the impact of an IPO on firm performance. Our research focused on a sample comprising the majority of companies that underwent an IPO in the US in 2018. However, it should be noted that not all companies were included in our analysis due to some firms reverting to private status, thereby rendering their financial data inaccessible. In our study, we compared three crucial financial ratios, namely ROA, ROE, and OPM, for the fiscal year preceding and succeeding the IPO. By examining these metrics, we aimed to provide valuable insights to companies considering going public, enabling them to better understand the average outcomes associated with performing an IPO within specific industries.

There are multiple ways to study the effects of an IPO on firm performance. The data we collected consisted of three consecutive fiscal years for every firm, with the middle year being the year of IPO (2018). This type of data is also known as panel data and needs a different regression type to be analyzed. In our case, we created a new variable which was the difference between the years 2017 and 2019. This allowed us to perform a linear regression, with the size of the firm, a dummy variable for the industry, and a dummy variable for whether or not the firm operates mostly online as the control variables. We divided the companies according to their industry was necessary as the financial performance ratios differ across industries. The final step taken was to regress each of the changes in performance ratios with our control variables.

Our research found significant evidence that having an IPO, on average, leads to changes in financial performance. We also found that in the case of ROE, internet companies have, on average, an advantage. Our results further show that the size of the firm does not influence the operating performance of firms. Before executing the regressions, we believed that all three performance ratios would see a decrease after an IPO. We believed this because of the substantial amount of previous research as mentioned in Chapter 2 that showed that the performance ratios decrease. We also believed that internet companies have an advantage due to them requiring less financial investment whilst generating a large revenue. Significant evidence of this was found regarding ROE, where internet companies experience, on average, an increase in ROE, not taking into account the decrease per industry. We found significant evidence that companies operating in the *Manufacturing, Energy, and Utilities* industries saw a decrease, on average, of 12.5% in ROA after having an IPO. The rest of the results are shown to be insignificant. DROE as the dependent variable gave us the best and most significant results as all industries, except for *Consumer Durables, NonDurables, Wholesale, Retail, and Some Services,* were significant and negative. OPM is an interesting case, unfortunately, our data sample was relatively small, and therefore, we are unable to draw conclusions. However, as

mentioned, Ahmed (2021) found similar evidence regarding OPM. Therefore, our results may be true in the sense that there is no significant change in OPM after an IPO. To draw this conclusion, further research is necessary.

The findings of our study hold significant implications for various stakeholders. Researchers can draw valuable insights from our research, highlighting the multitude of factors that influence the financial performance ratios of companies. Our study specifically examines the impact of control variables on these ratios within specific industries, providing a deeper understanding of their interplay. Previous research, such as the study conducted by Mannoppo (2016), has established a correlation between company performance ratios and stock prices. This correlation has direct implications for investors, as they can potentially leverage our study's models to predict the future direction of stock prices by inputting specific variables related to companies undergoing an IPO. By employing our models, investors may gain valuable guidance in making informed decisions regarding which companies to consider for investment.

Researchers wishing to continue and expand this research can do so in multiple ways. The regression analyses performed in this research can be improved significantly. As mentioned in Chapter 4, the R-squared in all 3 regressions has a large room for improvement. This is because a lot of the variation in our data is unexplained by our model. A way to improve the R-squared is to add more independent/control variables to the model, as to increase the explaining power. Another way to improve the results is to increase the sample size, instead of looking at one IPO year, collect data on 10 IPO years for example. We believe our sample size was too restricted which could have implications on the external validity. One solution for this is to increase the sample size by analyzing more IPO years. No two companies are the same, only selecting one IPO year to analyze does not imply that every year similar IPOs occur. Therefore, increasing the sample size could improve the external validity of this research. Lastly, researchers can also expand this research by looking at multiple years after the IPO, comparing the fiscal year before the IPO with the fiscal year 3 years after the IPO. This can prove to be insightful to see whether the performance ratios only decrease in the first year after IPO or whether the operating performance of companies continues to decrease or even increase.

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