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Impact of Public Float on Initial Public Offering Performance: A Comparative Analysis Across European and American Stock Exchanges

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Abstract

This study investigates the effect public float has on one-year abnormal returns, measured by the Carhart Four-Factor Model. The study uses data from the listing venues Euronext, Frankfurt Stock Exchange, London Stock Exchange, Nasdaq, and NYSE to measure the relationship against linear and quadratic regression models and compares findings across changing market conditions and listing venues. The results indicate a negative linear relationship between public float and IPO performance for the general sample, Euronext venue, and US listing venues, with relevant implications for issuers, investors, and policymakers.

Keywords: IPO, Public Float, Abnormal Returns, IPO Proceeds, Equity Issuance

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1. Introduction

The average public float in Initial Public Offerings (IPOs) has steadily declined in the United States this past decade. Literature on the effect public float has on aftermarket performance is scarce despite the fraction of shares offered in an IPO being one of the critical decisions firm management and owners make when structuring an equity raise. Michel, Oded, and Shaked (2014) and Meles and Salerno (2020) find significant evidence for a quadratic relationship between public float and aftermarket performance 2-4 years after IPO. While Michel, Oded, and Shaked (2014) focused on the United States between 1996 and 2006, and Meles and Salerno (2020) focused on European and Asian countries between 2007 and 2011, this study focuses on a comparative analysis across major stock exchanges, namely the Euronext exchange (Amsterdam, Brussels, Paris, and Lisbon), Frankfurt Stock Exchange, London Stock Exchange, Nasdaq, and NYSE. These are the four main listing venues in the most developed financial markets, providing a rich ground for examining the relationship between public float and IPO returns. These listing venues also present different listing rules regarding IPO public float. The Nasdaq and NYSE venues, for example, feature no minimum float requirement (Nasdaq 2023; NYSE 2023), while the Euronext exchanges, Frankfurt Stock Exchange, and London Stock Exchange require minimum floats of at least 5%, 10%, and 25%, respectively (Euronext 2023; Deutsche Börse AG 2022; Financial Conduct Authority 2021).

By analyzing IPO data from these developed markets, this research aims to uncover patterns and implications that could offer valuable insights for issuers, investors, and policymakers in the realm of equity markets. Exploring this relationship is pivotal in understanding the broader mechanisms of market efficiency, investor behavior, and the role of public float in post-IPO performance.

Another way this study aims to contribute to the existing literature is with the timeframe of post-IPO performance. In assessing the IPO structure's impact on investor returns, this study

will consider only one-year returns post-IPO because of the predominant influence the offering structure has during this period. Beyond the one-year mark, factors such as company performance, strategic decisions, market dynamics, and other corporate actions play a more significant role in influencing stock returns. These factors can overshadow the initial effects of the IPO structure, making it challenging to isolate the IPO structure's impact on returns. Therefore, a one-year time frame provides a more focused lens to analyze the direct consequences of the IPO structure on stock market performance before other variables become more influential. While Michel, Oded, and Shaked (2014) measured a U-shaped quadratic relationship between public float and abnormal returns in 6-month, 12-month, 24-month, and 36-month post-IPO periods, this study will be the first study to measure public float's effect on abnormal returns from offer price to one year after IPO.

Michel, Oded, and Shaked (2014) found a non-linear U-shaped relationship between public float and post-IPO stock performance. Low levels of public float correlate with decreasing long-run returns, while high levels increase long-run returns. Michel, Oded, and Shaked (2014) reason that very low or very high public floats are associated with better long-term stock performance due to a trade-off between incentives for insiders and power granted to outsiders. When a very low percentage of shares is sold, insiders retain more control, potentially leading to better alignment of their interests with the company's long-term success. Conversely, a very high public float can imply a wide distribution of ownership, potentially reducing agency problems and attracting investors who favor long-term value creation. This balance between insider control and outsider influence creates a non-linear relationship between public float and long-term performance.

In their answer to Michel, Oded, and Shaked's (2014) call for more evidence on the relationship between equity ownership dispersion and post-IPO performance, Meles and Salerno (2020) discovered an inverted U-shaped relationship between public float and post-IPO operational

performance. The authors interpret the relationship as a balance between factors that facilitate convergence of interest between insiders and outsiders (monitoring effects) and entrenchment factors (agency problems). Specifically, at low levels of public float, increasing the float is suggested to intensify agency problems less than increasing monitoring effects. Conversely, at high levels of public float, the situation reverses, and increasing public float significantly intensifies agency problems more than aids in aligning the interests between insiders and outsiders. This dynamic leads to worse operational performance at both extremes of public float.

This study's approach of using the same methodology as Michel, Oded, and Shaked (2014) to analyze the impact of public float on stock returns is significant. By adopting the same methodology as Michel, Oded, and Shaked (2014), this research ensures comparability with previous findings from the US, providing a direct and robust comparison across different markets at different points in time.

This study also investigates whether the noticeable decline in average public float over the last decade has impacted the relationship uncovered by Michel, Oded, and Shaked (2014). Coben (2023) suggests that investment bankers advise IPO firms that a lower relative offer size can enhance aftermarket performance due to supply and demand effects. By examining this presumed belief, this research seeks to uncover the actual outcomes of such managerial strategies, contributing valuable insights into how the decision on public float size affects post-IPO performance. This aspect is particularly relevant in the current market context and can offer practical guidance for future IPO strategies.

This study finds a statistically significant impact of public float on stock returns, with the direction and strength varying across different listing venues. The regression analysis reveals that in some markets, such as the U.S., a larger public float is associated with lower abnormal returns. However, the relationship is not as clear-cut in other regions.

Notably, this study does not find significant evidence for a quadratic relationship between public float and abnormal performance, as was discovered by Michel, Oded, and Shaked (2014) and Meles and Salerno (2020). The regression analysis reveals a significant linear relationship between public float and abnormal returns, suggesting that public float can meaningfully impact post-IPO performances. The study further indicates that this linear relationship was more robust during the 2007-2014 period and yielded no significant results in later periods. On the contrary, the results showed weak evidence for a U-shaped relationship in the later years that were unaffected by the Global Financial Crisis (GFC), suggesting that market conditions do influence this relationship. This finding is novel and contrasts with Michel, Oded, and Shaked's (2014) conclusion that market temperature (hot or cold) does not significantly affect this relationship. While Michel, Oded, and Shaked (2014) found a consistent effect of public float across different market cycles, this study reveals a more complex, dynamic relationship, with a linear impact during the 2007-2014 market period and a potentially non-linear pattern in more stable times. Though this study does not provide strong evidence for a U-shaped relationship between public float and one-year abnormal returns, it does hope to inspire further research into this changing dynamic during 'hot' and 'cold' market periods.

2. Literature Review and Hypothesis Development

The underperformance of IPOs was first uncovered by Ritter (1991) and has since been further studied and confirmed in following studies, showing that the underperformance of IPOs is both statistically and economically significant, with negative adjusted returns persisting over a more extended period (Loughran and Ritter 1995).

When controlling for firm size, Hensler, Rutherford, and Springer (1997) find an inverse relationship between firm size and the probability of delisting, implying that larger firms are more likely to survive in the aftermarket. Wyatt (2014) and McGuinness (2019) demonstrate that the use of IPO proceeds, especially in growth-oriented activities, positively impacts IPO performance, including underpricing and post-listing market value. Combining these findings and using IPO proceeds as a proxy for firm size, it can be inferred that the amount of proceeds raised will positively impact aftermarket performance. In this study, proceeds raised will later be used as a control variable to isolate the effect of public float on aftermarket performance.

Extensive research has also been done on the first-day and short-run returns of IPOs (i.e., the level of underpricing). Specifically, Bradley and Jordan (2002) find that underpricing in IPOs is negatively related to the public float size. They suggest that larger public floats result in lower first-day returns, indicating that informational effects play a significant role in determining IPO pricing. Habib and Ljungqvist (2001) also observe a negative relationship between underpricing and public float. They also suggest that when an IPO involves a significant sale of secondary shares, which indicates insiders cashing out, the IPO tends to be less underpriced, leading to lower first-day returns. This outcome is linked to the idea that insiders selling a larger fraction of shares have a reduced incentive to underprice the IPO, as their primary goal is to maximize their proceeds from the sale.

However, in later research, Brau, Li, and Shi (2007) present findings that differ from those of Habib and Ljungqvist (2001). While Habib and Ljungqvist (2001) found a negative relationship

between underpricing and the fraction of secondary shares sold, suggesting greater underpricing when fewer secondary shares are sold, Brau, Li, and Shi (2007) concluded that the issuance of secondary shares in the IPO does not significantly affect underpricing or long-run returns. Brau, Li, and Shi (2007) classify an IPO as a primary offering if no secondary shares are filed or offered; otherwise, it is classified as a secondary offering. Later, the proposed research methodology incorporates a control mechanism for the impact of secondary share sales by introducing a dummy variable. The variable will be activated when the number of primary shares sold exceeds the number of secondary shares sold. The underlying rationale for this approach is predicated on the assumption that an IPO mainly serves as a vehicle for insiders to cash out their holdings when the quantity of secondary shares sold exceeds that of primary shares sold.

Michel, Oded, and Shaked (2014) focus on the impact of public float in IPOs on long-run returns, finding a U-shaped relationship between public float and long-run performance. They suggest that low and high public float percentages are associated with better performance than moderate levels. In their analysis, they observe that as the public float increases, the incentives for insiders to deliver strong performance decrease. This occurs because a higher public float implies a smaller ownership stake for the insiders post-IPO, potentially leading to lower post-IPO returns. Conversely, a higher public float enhances the ability of outsiders (new public investors) to govern and monitor the firm effectively, which can result in higher post-IPO returns. This tension between insider incentives and outsider control over governance is proposed to drive the U-shaped relationship observed in long-run IPO returns.

Bradley and Jordan (2002) explore the relationship between underpricing in IPOs and public float. They find that larger public floats result in lower underpricing, indicating that as the amount of stock available to the public increases, the initial price discount typically offered to attract investors decreases. The reduction in informational asymmetry explains this

relationship. When the public float is larger, there is a broader distribution of ownership, leading to better information dissemination and lower uncertainty among investors, thus reducing the need for significant underpricing as an incentive.

While both studies analyze the role of public float in IPOs, Michel, Oded, and Shaked (2014) concentrate on long-term performance, whereas Bradley and Jordan (2002) focus on initial underpricing. This study will bridge these perspectives by investigating whether the initial underpricing influenced by public float size, as identified by Bradley and Jordan (2002), persists into the one-year post-IPO period, aligning with or deviating from the long-run performance trends observed by Michel, Oded, and Shaked (2014). Through a comprehensive analysis, this research will contribute to a more nuanced understanding of the role of public float in shaping IPO performance, both initially and over a one-year horizon.

Based on the findings of Michel, Oded, and Shaked (2014), which demonstrate a consistent U-shaped relationship between public float and long-run returns across various timeframes (6, 12, 24, and 36 months), it is reasonable to formulate a hypothesis predicting a similar relationship as follows:

H1: A U-shaped quadratic relationship exists between the public float in IPOs and the one-year abnormal returns. Specifically, it is anticipated that both low and high public float percentages will be associated with superior one-year abnormal returns compared to moderate levels of public float.

3. Methodology

The sample was compiled using the SDC Platinum database via Refinitiv, specifically targeting live IPOs (excluding SPACs) between 1 January 2007 and 31 December 2021 on the exchanges of Euronext (Amsterdam, Brussels, Lisbon, and Paris), Frankfurt, London, Nasdaq, and New York. Financial and utility firms were excluded according to the Thomson Reuters Business Classification (TRBC) Economic Sector, and Real Estate Investment Trusts (REITs) were

omitted based on the TRBC Industry Group to ensure a focused analysis of sectors with less regulated market dynamics. Security types such as American or Global Depository Shares, Beneficial Interests, Limited Partnership Interests, Stapled Securities, and Units were also removed through the refinement process. The output of this query resulted in 2,784 observations.

Observations with missing or erroneous essential data (e.g., “Shares Offered as Pct of Shares Out After Offer All Markets”, “Percent Change Offer Price to Price 365 Days After Offer”, or Financial data, e.g., “Total Assets Before Offering”, “Proceeds Amount All Markets”, or “Net Income After Taxes Before Offering”) were eliminated. After this process, the sample shrunk to 1,862 observations, with the statistics described in Table 3.1.

As shown in Table 3.1, the average public float is 27.4%, with a median of 23.9% and a standard deviation of 17.2%, indicating variability in the proportion of shares made available to the public. On average, the proceeds from the IPOs are $279.7 million, with a median significantly lower at $108.0 million, which suggests a positive skew in the data. The standard deviation is relatively large at $752.1 million, indicating substantial dispersion in the IPO proceeds. The logarithm of IPO proceeds will be used as a control variable later, given that the proceeds variable has a large standard deviation relative to the mean, suggesting high variability and the presence of outliers or extreme values. Logging the proceeds will help to normalize the distribution, reduce the impact of outliers, and stabilize the variance. Table 3.5 in the appendix shows the mean and standard deviation of each quintile of public float. There is no clear trend across the ranges of public float, and as in Table 3.1, the standard deviation is significantly higher than the mean for every quintile, suggesting a positive skew.

Table 3.1: General sample characteristics

	Mean	Median	Std.	N
Public float (%)	27.4	23.9	17.2	1,862
Proceeds (USD m)	279.7	108.0	752.1	1,862
Net Income (USD m)	-8.9	-2.9	128.8	1,862
Total Assets (USD m)	1,008.1	114.6	4,550.5	1,862
Intangibles (USD m)	330.9	2.4	1,655.0	1,862
Primary shares offered (m)	16.1	6.9	47.9	1,781
Secondary shares offered (m)	24.1	5.1	58.6	577

In terms of financials, the mean net income reported is -$8.9 million, with a median of -$2.9 million, reflecting that, on average, companies experienced a net loss in the year before IPO. The standard deviation is $128.8 million, showing a wide range in net income figures across the sample. Across the public float ranges, there is no clear trend in the mean; however, the standard deviation is significantly higher for low floats in the 0 – 20 range. The mean value of total assets is $1,008.1 million, and the median is $114.6 million, indicating a skewed distribution with some companies having very high total assets. The standard deviation is substantial at $4,550.5 million. There appears to be a U-shaped relationship for total assets across the public float quintiles, suggesting that firms participating in low or high floats are, on average, larger than firms that float between the 20% and 80% range. However, there is also a significant standard deviation across all ranges, suggesting the presence of a long tail for all quintiles. The average value of intangible assets is $330.9 million, with a median of $2.4 million, suggesting that a few companies have very high intangible asset values. The standard deviation is $1,655.0 million.

The degree of intangibles and profitability will be measured in comparison to each company's total assets to control for the skewed distributions. Since many observations have no revenue one year before IPO, net income to total assets is preferred as a measure of profitability instead of net income to revenue.

For primary shares offered, the mean is 16.1 million, the median is 6.9 million, and the standard deviation is 47.9 million, indicating variation in the number of new shares companies offered. The average number of secondary shares offered is 24.1 million, with a median of 5.1 million shares. The standard deviation is 58.6 million shares, indicating a wide range among the sample in the number of secondary shares offered. Table 3.5 in the appendix shows that the average number of secondary shares offered increases as the float range increases from low to high. This should be expected given that when secondary shares are offered in an IPO, the number of shares offered increases while the total number of shares outstanding stays the same; hence, in the public float fraction, the numerator increases while the denominator stays the same.

Table 3.2 describes the sample distribution by public float ranges and year. The sample of IPOs is split into ten groups by public float percentage in 10% ranges to showcase the statistics for low floats (>10%). The table shows that most IPOs have a float in the 20-30% range, a trend that also holds for the years 2007-2015, 2017, and 2020. In the later years, 2018, 2019, and 2021, IPOs with floats in the 10-20% range were most common. Across all years, 31% of the IPOs floated in the 20-30% range, and 76% floated in the 10-40% range. The table also shows that the hottest period for IPOs was between 2013 and 2015, a period in which 31% of the sample was listed. The coldest period was naturally during the GFC in 2008 and 2009, representing just 4% of the total sample.

Table 3.2: IPOs by public float and by year

Public float range (%)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Range total
0 – 10	4	8	3	-	7	5	5	14	3	4	6	9	22	15	41	146
10 – 20	32	6	12	25	23	33	50	55	46	26	31	58	34	32	72	535
20 – 30	59	9	13	31	24	34	64	78	54	26	44	46	25	39	40	586
30 – 40	37	2	7	24	8	11	24	58	35	19	16	14	13	12	23	303
40 – 50	17	4	4	11	4	6	10	16	14	6	7	7	5	3	12	126
50 – 60	8	-	2	3	2	1	7	9	5	3	3	6	3	1	7	60
60 – 70	1	-	-	3	2	-	2	5	4	2	6	2	2	-	3	32
70 – 80	-	1	-	-	1	-	2	2	2	1	2	3	3	2	2	21
80 – 90	5	1	-	1	1	3	1	-	3	1	3	4	1	4	3	31
90 – 100	1	1	-	3	-	1	5	2	-	1	2	3	2	1	-	22
Yearly total	164	32	41	101	72	94	170	239	166	89	120	152	110	109	203	1,862

Table 3.3: IPO 1-year returns

		Abnormal returns		Naïve returns	
	N	Mean (%)	T stat	Mean (%)	T stat
Euronext	97	-10.1	-1.71	-3.4	-0.61
Germany	50	-4.7	-0.68	-2.7	-0.35
United Kingdom	140	7.8	1.24	13.3	2.09
United States	1,575	6.5	3.11	14.8	6.61
All	1,862	5.4	2.92	13.3	6.67

When measuring the performance of IPOs by one-year returns, utilizing the four-factor adjusted abnormal returns (alpha) instead of regular returns provides a more accurate assessment. Regular returns, while straightforward, do not account for various market and risk factors that can significantly influence a stock's performance. In contrast, the four-factor alpha, derived from the Carhart four-factor model, adjusts for market risk (captured by the market premium), company size (small minus big, or SMB), value (high minus low, or HML), and momentum factors. This adjustment is crucial in the context of IPOs, which often exhibit unique risk-return characteristics compared to established stocks. By accounting for these additional risk factors, the four-factor alpha isolates the abnormal performance of the IPO, providing a clearer picture of how the stock fares against its expected return, given its risk profile. This approach is particularly valuable in discerning whether any outperformance (or underperformance) is due to the company's intrinsic qualities and IPO execution or merely a reflection of broader market trends and risk appetites. Thus, for a more robust and insightful analysis of IPO performance, the four-factor adjusted abnormal return offers a superior metric over regular returns.

Key among the data points from the primary dataset was the "Percent Change Offer Price to Price 365 Days After Offer," a metric representing the percentage change in the company's stock price from the offer date to one-year post-offering and pulled from the SDC database alongside the data in Table 3.1. Complementing this, a secondary dataset, consisting of the Carhart four factors, was obtained from "Fama-French 3 Factors Plus Momentum - Daily Frequency" via WRDS (Wharton Research Data Services). This inclusion of established risk factors enabled a more robust stock performance analysis, factoring in broader markets and specific financial attributes influencing stock behavior. Before analysis, the data was rigorously cleansed for accuracy, consistency, and alignment of dates and metrics across sources. To find the Carhart four factors, for each deal in the dataset, the sum of the factor returns was calculated from the IPO date to 365 days after the offer. This was done by taking the sum of the daily

factors between each date. For example, in an IPO with an issue date of 22 January 2007, the daily factors of Excess Return on the Market were summed between 22 January 2007 and 21 January 2008 and recorded in a new data column. This was done for each IPO and each factor. To calculate the four-factor adjusted abnormal returns (alpha) using the Carhart four-factor model, a regression analysis is needed to establish the relationship between the IPO performance measure and market risk factors. The model takes the form of:

$$Return_i = \alpha_i + \beta_{MKT,i} \times Market\ Premium + \beta_{SMB,i} \times SMB + \beta_{HML,i} \times HML + \beta_{MOM,i} \times MOM$$

In this model, $Return_i$ represents the company-specific naïve IPO performance, measured by the "Percent Change Offer Price to Price 365 Days After Offer" metric provided by SDC. The α_i denotes the four-factor adjusted abnormal return (alpha), signifying the portion of the return not explained by the market factors. The beta coefficients indicate the sensitivities of the IPO returns to each of the four factors, encapsulating how different market and financial risks impacted the performance. The results of this regression are shown in Table 3.4.

Table 3.4: Estimation of Carhart four-factor coefficients

	1 year
Intercept	0.0372
	(1.5023)
Excess Return on Market	1.1554***
	(8.2316)
Small-Minus-Big	1.4559***
	(6.1374)
High-Minus-Low	-0.8194***
	(-6.6256)
Momentum	0.1220
	(0.7845)
Adj R sq.	0.1129

*** Indicates significance at the 1% level ($p < 0.01$)
** Indicates significance at the 5% level ($p < 0.05$)
* Indicates significance at the 10% level ($p < 0.1$)

The regression's intercept, alpha, was the focal point, quantifying each IPO's abnormal return after adjusting for the selected risk factors. This alpha provided a refined performance measure, isolating the company's return above or below what the Carhart model predicted based on its risk profile. To calculate the alpha for each company, the predicted return (determined by the Carhart factors and their respective beta coefficients) was subtracted from the actual return. This calculation distinguished the returns attributable to market and financial risks and those attributable to company-specific factors.

It should be noted that the Carhart four-factor model may only partially capture the unique behaviors of IPOs due to potential co-movement across these stocks and unaccounted-for IPO-specific risks. While indicating abnormal returns, its derived alpha might inadvertently reflect IPO-centric factors beyond market, size, value, and momentum, suggesting that the model's application to IPOs could be imperfect.

With the alpha for each IPO company calculated, the column "Four-Factor Adjusted Abnormal Return (Alpha)" was added to the dataset. The variable statistics compared to the naïve returns are outlined in Table 3.3. Adding the four-factor model allows for granular analysis of each IPO, providing insights into whether the company's market performance was in line with, or deviant from, the expected risk-adjusted return. The study offers a nuanced understanding of each company's proper market performance by adjusting the raw IPO returns for market-based and financial risks.

4. Results, Discussion, and Limitations

Table 3.3 outlines the one-year returns for IPOs across various stock exchanges, comparing abnormal and naïve returns. The mean abnormal returns for Euronext and Germany indicate negative performance at -10.1% and -4.7%, respectively, neither of which are statistically significant, as the t-statistics are -1.71 and -0.68. This suggests the IPOs underperformed when considering the four-factor adjustments for market risks. In contrast, the UK shows a positive

abnormal return of 7.8%, with a t-statistic of 1.24, indicating a slightly positive performance above the risk-adjusted benchmark. The United States reports a more robust and statistically significant abnormal return of 6.5% with a t-statistic of 3.11, suggesting a robust outperformance after accounting for risk factors.

In investigating the phenomena of abnormal returns in IPOs, it is crucial also to consider the potential influence of market behaviors that deviate from the classical assumptions of rational decision-making. One explanation for these abnormal returns lies in the heuristics employed by IPO investors. Instead of engaging in a discriminating analysis of each IPO's intrinsic value and potential, investors might over-generalize, applying simple or overly optimistic rules of thumb to a broad spectrum of IPOs. Campbell (2022) writes that IPO investors generally look for a quick profit, achieved by the "IPO pop" (or degree of underpricing), supporting the notion that they participate indiscriminately.

This bias can lead to a lack of sufficient differentiation among individual IPOs. Investors, swayed by the general enthusiasm surrounding IPOs, may overlook the unique characteristics and risks of each offering. Such an approach can result in a homogenized market reaction, where IPOs are collectively overvalued or undervalued, leading to significant discrepancies between the market price and the intrinsic value of these securities. Consequently, this behavior might contribute to the emergence of significant one-year abnormal returns in the aftermath of IPOs.

Naïve returns, which do not adjust for the same risk factors, present a more optimistic view. The UK and the US show substantial positive naïve returns of 13.3% and 14.8%, respectively, with high t-statistics of 2.09 and 6.61, signaling that these raw returns are significantly above zero. However, when comparing these naïve returns to the abnormal returns, it is clear that the risk-adjusted returns are more moderate. This discrepancy highlights the influence of market risks on IPO performance, underscoring the necessity of considering such adjustments for a

more accurate assessment. The overall sample, encompassing all markets, reflects a mean abnormal return of 5.4% and a mean naïve return of 13.3%, both statistically significant with t-statistics of 2.92 and 6.67, respectively. The significant t-statistics across the total sample suggest that, on average, IPOs experienced positive performance over the first year. However, this performance is markedly less when adjusted for the four-factor model. This is unsurprising, given that the timeframe of the sample predominately spans the bull market between 2009 and 2020. The analysis demonstrates the importance of considering market risk factors when evaluating IPO performance, as naïve returns may overstate investor gains by not accounting for the broader market context.

Table 4.1A focuses on the significant data to understand the effect of public float on post-IPO long-run returns, explicitly examining the four-factor adjusted buy-and-hold abnormal returns across various public float ranges and stock exchanges.

The most statistically significant data points are observed in the US and across all markets combined ('All'). In the US, the 10-20% public float range shows a significant positive mean return of 14.3% with a t-statistic of 4.08, indicating a strong performance statistically significantly different from zero. This suggests that IPOs within this public float range tend to outperform the market's expectation based on the four-factor model.

For all markets combined, the 10-20% public float range again stands out with a significant mean return of 13.1% and a t-statistic of 3.86, reinforcing the trend observed in the US data alone. This implies that, across all exchanges, companies with a public float range of 10-20% generally see better performance one year after the IPO than other ranges.

The significant figures in the 'All' category demonstrate that a moderate public float level is optimal for post-IPO performance, offering enough liquidity without diluting control too much, which can positively influence investor confidence and stock performance.

Table 4.1A: Four-factor adjusted one-year returns of IPO stock by 10% public float ranges

	Euronext			Germany			UK			US			All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Public float range (%)	Mean(%)	N	T stat	Mean(%)	N	T stat	Mean(%)	N	T stat	Mean(%)	N	T stat	Mean(%)	N	T stat
0-10	27.12	9	1.26	32.22	2	4.37	-14.49	6	-0.67	9.36	129	1.13	9.79	146	1.31
10-20	-4.69	10	-0.24	-14.61	11	-0.85	-1.64	10	-0.05	14.33	504	4.08	13.08	535	3.86
20-30	-9.66	40	-0.99	-15.36	11	-1.04	25.23	29	1.04	6.69	506	1.75	6.08	586	1.69
30-40	-25.19	24	-2.90	-5.16	14	-0.40	2.46	38	0.28	-4.96	227	-0.91	-5.64	303	-1.30
40-50	-18.00	9	-0.95	3.97	6	0.30	14.78	24	2.16	-3.30	87	-0.42	-0.56	126	-0.10
50-60	25.20	1	-	-4.46	3	-0.40	6.21	17	0.59	-13.89	39	-1.33	-7.07	60	-0.95
60-70	32.05	2	20.27	-55.47	1	-	-3.07	6	-0.12	18.96	23	0.94	13.32	32	0.87
70-80	-54.44	2	-0.66	110.11	1	-	1.14	2	0.07	-9.66	16	-0.66	-7.19	21	-0.51
80-90	-	-	-	39.08	1	-	-30.67	3	-1.47	15.50	27	0.83	11.79	31	0.71
90-100	-	-	-	-	-	-	4.69	5	0.52	-18.08	17	-1.06	-12.91	22	-0.96

Table 4.1B: Four-factor adjusted one-year returns of IPO stock by 20% public float ranges

	Euronext			Germany			UK			US			All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Public float range (%)	Mean(%)	N	T stat	Mean(%)	N	T stat	Mean(%)	N	T stat	Mean(%)	N	T stat	Mean(%)	N	T stat
0 – 20	10.38	19	0.72	-7.41	13	-0.49	-6.46	16	-0.31	13.32	633	4.08	12.37	681	3.98
20 – 40	-15.48	64	-2.24	-9.65	25	-1.01	12.31	67	1.07	3.08	733	0.98	2.08	889	0.75
40 – 60	-13.68	10	-0.78	1.16	9	0.12	11.23	41	1.90	-6.57	126	-1.04	-2.66	186	-0.58
60 – 80	-11.19	4	-0.27	27.32	2	0.33	-2.02	8	-0.11	7.22	39	0.54	5.19	53	0.48
80 – 100	-	0	-	39.08	1	-	-8.57	8	-0.79	2.52	44	0.19	1.54	53	0.14

On the Euronext exchange, although the 60-70% float range shows a high mean return of 32.1%, the t-statistic of 20.27 should be interpreted with caution due to the small sample size (N=2), which could potentially lead to overestimation of the significance level.

The significant results generally suggest a nuanced relationship between public float and post-IPO performance. IPOs with too little or too much public float do not show significant returns. In contrast, those with a balanced level of public float provide better opportunities for investors, as reflected by the positive and significant abnormal returns. These findings highlight the importance of public float as a factor in post-IPO performance but also point to the complexity of its impact, which may vary depending on market conditions and investor sentiment.

Table 4.2 in the appendix provides regression analysis results for IPOs from Euronext countries, Germany, the UK, and the US, detailing linear and quadratic models. The table is split into the two main model types, including coefficients, t-statistics (in parentheses), and significance levels indicated by asterisks.

As described earlier, it is expected that the amount of proceeds raised will have a positive impact on aftermarket performance, based on the combined findings from Hensler, Rutherford, and Springer (1997), Wyatt (2014), and McGuinness (2019). The log of proceeds variables is included in the regressions to control for size instead of traditional size metrics such as total assets or revenue. Total assets and revenue are imperfect measures to control for firm size given that (1) total assets are measured in the last period before IPO and exclude the effect that the IPO proceeds have on the balance sheet, and (2) many firms in the sample have revenue that is zero or near-zero.

In Table 4.2 in the appendix, the variable shows a positive and statistically significant coefficient across all models, indicating that higher proceeds from the IPO are associated with better performance. The significance of this variable is strong, with t-statistics well above the threshold for statistical significance. To investigate whether other measures for firm size are

significant, alternative regressions were run in Table 4.5 in the appendix, adding total assets and revenue. The regressions (1) through (5) show that the log of proceeds stays a significant variable when the log of total assets and revenues are added to the model. The results also show that total assets and revenues are only significant in the model once proceeds are taken out of the model. This should be expected given that proceeds, revenue, and total assets are correlated in a sample of such size.

Table 4.2 in the appendix includes net income to assets and intangibles to total assets ratios as control variables. However, these ratios do not show statistically significant coefficients in either the linear or quadratic models, suggesting that within the context of this regression, they do not have a discernible impact on IPO performance.

The dummy variable for whether primary shares offered exceed secondary shares offered does not show significance in any model, implying that whether the main purpose of the IPO is for insiders to cash out does not significantly influence IPO performance in the sample.

Overall, the adjusted R-squared values are small, indicating that the models explain only a slight fraction of the variability in the dependent variable. The sample size for all models is 1,862, representing the total number of observations used in the analysis. The results emphasize the importance of the public float and proceeds raised in understanding IPO performance, with a notable linear decrease in performance as public float increases, yet without a significant quadratic effect.

To test the robustness of these results, the sample was divided into three subsamples based on period, as presented in Table 4.4 in the appendix. Regressions (1) through (4) encompass the years during and immediately following the GFC, regressions (5) through (8) cover a period leading up to and including the onset of the COVID-19 pandemic, and regressions (9) through (12) are included to capture the post-GFC period and the time before the COVID-19 crisis significantly impacted global markets. Interestingly, the linear relationship between public float

and abnormal performance only yields significant results in the first subsample between 2007 and 2014 in regressions (1) and (2). In contrast, regressions in later periods (7) and (11) detect a quadratic and U-shaped relationship at the 10% significance level.

Though the evidence for a U-shaped relationship is weak, these findings do suggest that the relationship between public float and abnormal returns is dynamic and subject to changing market conditions or periods. During and after the GFC, investors might have reacted more predictably to public float levels. Later on, as markets stabilized, the impact of public float on IPO performance could have developed into a more complex, non-linear relationship. In their sample of IPOs between 1996 and 2006, Michel, Oded, and Shaked (2014) found that the U-shaped relationship between public float and returns remained robust regardless of market conditions. However, their analysis is based on a single cycle of hot-cold-hot market conditions, and the 'cold' market period between 2001 and 2003 represented only a small fraction of their sample. The results of this study suggest that changing market conditions can impact the relationship between public float and abnormal returns and show that a linear relationship is more robust in the years surrounding the GFC.

Table 4.3 in the appendix presents linear regression results for IPOs across various listing venues, specifically Euronext, Germany, the UK, the US, and an aggregate of the non-US markets (Euronext, Germany, and the UK). The coefficients and t-statistics (in parentheses) are reported for each independent variable across different models.

In the Euronext market, the public float shows a negative coefficient in both models at the 10% significance level, suggesting that an increase in public float is associated with decreased IPO performance. The coefficient for the log of proceeds is insignificant, indicating it may not have a discernable impact on performance in this market. Interestingly, the ratio of intangibles to total assets has a positive and significant effect at the 10% level in regression (2), as in the results of Michel, Oded, and Shaked (2014). This suggests that a higher proportion of intangible

assets may be viewed positively by investors or may reflect valuable non-physical assets like patents or trademarks.

For Germany, none of the variables significantly impact IPO performance, which could indicate that these factors do not play a major role in IPO outcomes in this market or that other unlisted variables may be more influential.

In the UK, no significant results are observed for the public float or other variables. This indicates that the model does not capture the factors significantly driving IPO performance in this venue. This result should not be that surprising, though, given that, in the sample period, the London Stock Exchange required companies to list a minimum of 25% of their total shares in an IPO (Financial Conduct Authority 2021). This minimum float requirement potentially convolutes the relationship observed in other listing venues.

The US market presents a different picture, with the public float significantly impacting IPO performance in regressions (7) and (8) at 5% significance levels. This is in line with the findings from Euronext, reinforcing the notion that a larger public float may dilute the value or reflect less confidence by existing stakeholders. Additionally, the log of proceeds has a significant positive effect at the 1% level, providing strong evidence that larger proceeds from the IPO correlate with better performance.

No significant coefficients are observed for the non-US aggregate, suggesting that the listed factors do not have a significant uniform impact on IPO performance across these markets or that the influence of public float and other variables may be more nuanced and specific to each non-US market.

The adjusted R-squared values are relatively low across all regressions, indicating that the independent variables explain only a small portion of the variability in the dependent variable. However, the sample sizes are robust, especially for the US market, providing confidence in the results' significance and reliability. Overall, the significance of the results for public float

and log proceeds in the US and Euronext markets suggests that these factors are important considerations for understanding IPO performance in these venues.

The observed linear relationship between public float and long-run returns might be grounded in several financial theories and market behaviors. For instance, a larger public float could theoretically increase liquidity, which is generally positive, but it may also introduce greater volatility as the ease of trading could lead to quicker profit-taking and pressure on the stock price. Furthermore, a higher public float often entails a dilution of ownership, which could signal a lack of confidence from insiders about the firm's prospects, potentially leading to a negative perception among investors and, consequently, lower long-run returns.

Conversely, the absence of a quadratic, or U-shaped, relationship in the data could suggest that markets do not perceive an optimal public float level that maximizes long-run returns. Instead, returns may consistently decrease or increase with changes in public float, which could indicate that investors either penalize over-dilution or are wary of firms that keep too much ownership concentrated within a small group of insiders, fearing issues like poor governance or higher information asymmetry.

Moreover, the influence of public float on long-run returns could be confounded by other overriding factors such as macroeconomic conditions, sector-specific trends, or individual company performance post-IPO. These elements could be so dominant in determining stock performance that the nuanced effects of a varying public float on long-run returns are overshadowed, leading to the absence of a clear quadratic relationship in the data. Additionally, the data variability within public float ranges and the potential for small sample sizes in specific categories might obscure the detection of a U-shaped pattern. This lack of a quadratic relationship implies that, across the markets studied, there is no uniform middle-ground public float percentage that aligns with the optimal long-run performance of IPO stocks.

The data limitations, particularly the lack of sufficient observations for European exchanges, significantly impact the study's ability to deliver robust results for these markets. This issue is compounded by the use of the SDC database, which contains incomplete data, leading to a reduction in the original sample size from 2,784 to 1,862 observations. Such a reduction can introduce selection bias, potentially skewing the results.

The study's geographical focus further limits its applicability. By concentrating only on major stock exchanges, the findings may not represent trends or patterns in other exchanges, especially those in emerging markets or smaller economies. This limitation restricts the study's generalizability and usefulness for understanding global IPO dynamics.

Regarding the time frame, the study's one-year post-IPO period might not fully capture the long-term impacts and trends of IPOs. This is a critical point since the influence of IPO characteristics, such as public float, tends to diminish over time. Therefore, while a one-year period offers a balance, it might not be sufficient to understand the enduring effects of IPO characteristics on performance.

The study period, from 2007-2021, was marked by a notable decline in the average public float in IPOs, as illustrated by Figure 2.1 in the appendix. This changing market dynamic could significantly influence the applicability and relevance of the study's findings over time, especially if the trend continues or if different patterns emerge in the future. This trend also implies that the number of high-float IPO observations may have declined. A lower number of high-float observations reduces the statistical significance of the effect of high-floats on abnormal returns. If there were more observations of public floats above the 60% mark, the results for abnormal returns in this range may be more significant.

Lastly, the regression analysis, while methodologically sound, may only account for some variables that influence IPO performance. The exclusion of potential influential factors can introduce biases into the results, leading to incomplete or skewed interpretations. This

limitation is crucial for understanding the study's findings, as it highlights the need for a cautious approach when generalizing the results to broader contexts.

This study hopes to inspire future studies that might examine IPO performance across a broader range of global exchanges, including those in emerging markets and smaller economies. This would provide a more comprehensive understanding of global IPO dynamics, offering insights into how different economic and regulatory environments impact IPO outcomes. Such a study could reveal unique patterns or trends not observable in major markets, enhancing the generalizability of IPO performance models. However, future studies would need more reliable and complete databases to source their data.

Combining the analysis of changing market dynamics with comparative studies across different market conditions could also be particularly insightful. This research would examine how IPO performance is influenced by broader economic trends, such as shifts in public float percentages, and how these effects vary during market boom and bust periods. By analyzing data across different economic cycles, such a study could uncover how market sentiment and macroeconomic factors interact with IPO characteristics to affect stock performance. Such a study could provide evidence for why, in Table 4.4 in the appendix, the relationship between public float and abnormal returns is linear in the 2007 – 2014 period, whereas the relationship appears to be quadratic in the 2015 – 2021 and 2010 – 2018 periods. This approach would not only provide a deeper understanding of market mechanisms but also offer valuable insights for companies planning IPOs and investors looking to optimize their strategies in varying market conditions.

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Appendix

Figure 2.1: The Mean and Median Percentage Public Float, 2009-2022 (Ritter 2023)

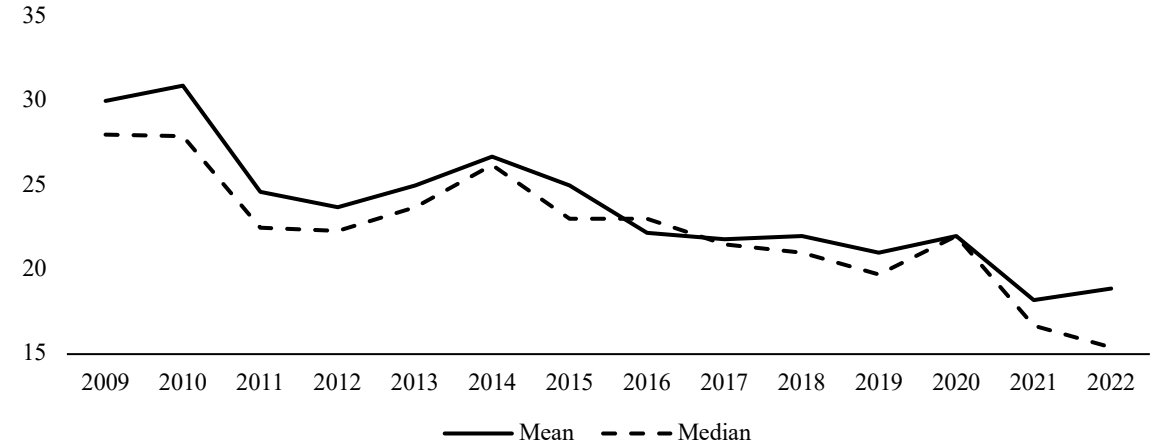

Table 3.5: Sample characteristics across public float ranges (In USD millions)

	Proceeds		Net Income		Total Assets		Intangible Assets		Primary Shares (m)		Secondary Shares (m)	
Public float range (%)	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.
0 – 20	335.2	686.5	-16.1	188.3	1,451.4	4,709.8	473.3	1,873.9	16.8	62.6	13.2	42.7
20 – 40	211.3	626.5	-5.1	78.5	760.8	4,905.9	246.9	1,565.9	12.8	29.8	23.3	51.3
40 – 60	390.2	1,378.7	-7.5	60.3	715.4	2,322.6	301.2	1,588.5	27.9	60.8	47.5	91.7
60 – 80	268.7	428.3	-13.8	51.4	419.6	759.1	129.8	480.1	18.3	32.6	32.8	40.2
80 – 100	336.8	512.6	18.0	89.5	1,078.8	3,994.3	214.9	763.5	21.8	28.5	52.7	106.3
All	279.7	752.1	-8.9	128.8	1,008.1	4,550.5	330.9	1,655.0	16.1	47.9	24.1	58.6

Table 4.2: All IPOs from European countries, Germany, the UK, and the US

	Linear					Quadratic				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	0.1186***	-0.1416**	-0.1275*	-0.1272*	-0.0617	0.1833***	-0.0810	-0.0681	-0.0673	0.0011
	(3.3795)	(-2.0608)	(-1.8381)	(-1.8347)	(-0.6416)	(3.1096)	(-0.9593)	(-0.8028)	(-0.7939)	(0.0101)
Public float	-0.2336**	-0.2601**	-0.2591**	-0.2610**	-0.2690**	-0.6619**	-0.6463*	-0.6382*	-0.6434*	-0.6585**
	(-2.1573)	(-2.4101)	(-2.4020)	(-2.4196)	(-2.4868)	(-1.9961)	(-1.9586)	(-1.9343)	(-1.9500)	(-1.9939)
Public float squared						0.5027	0.4537	0.4452	0.4491	0.4572
						(1.3665)	(1.2385)	(1.2158)	(1.2263)	(1.2481)
Log(Proceeds)		0.1310***	0.1258***	0.1336***	0.1281***		0.1299***	0.1248***	0.1327***	0.1270***
		(4.3952)	(4.1953)	(4.3490)	(4.1027)		(4.3557)	(4.1591)	(4.3160)	(4.0645)
Net Income / Assets			0.0075	0.0078	0.0077			0.0075	0.0077	0.0076
			(1.5130)	(1.5686)	(1.5425)			(1.4943)	(1.5503)	(1.5232)
Intangibles / Total Assets				-0.0871	-0.0974				-0.0879	-0.0985
				(-1.1657)	(-1.2900)				(-1.1767)	(-1.3048)
Primary > Secondary shares offered Dummy					-0.0575					-0.0590
					(-0.9832)					(-1.0104)
Adj R sq.	0.0020	0.0117	0.0124	0.0126	0.0126	0.0024	0.0120	0.0126	0.0128	0.0128
N	1862	1862	1862	1862	1862	1862	1862	1862	1862	1862

*** Indicates significance at the 1% level ($p < 0.01$)
** Indicates significance at the 5% level ($p < 0.05$)
* Indicates significance at the 10% level ($p < 0.1$)

Table 4.3: Linear Regression results by Listing venue

	Euronext		Germany		UK		US		Non-US	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	0.1073	0.1109	-0.1987	-0.4201	0.1336	0.5271*	0.1309***	-0.2111	0.0117	0.1252
	(0.8403)	(0.6923)	(-1.3355)	(-1.1221)	(0.9310)	(1.8065)	(3.3813)	(-1.6271)	(0.1406)	(0.9634)
Public float	-0.7333*	-0.9350*	0.4760	0.3062	-0.1415	-0.1224	-0.2509**	-0.2449**	-0.0457	-0.1038
	(-1.8280)	(-1.9340)	(1.1517)	(0.7279)	(-0.4289)	(-0.3580)	(-2.0185)	(-1.9811)	(-0.2112)	(-0.4512)
Log(Proceeds)		0.0275		0.1761		-0.1420		0.2014***		-0.0070
		(0.4870)		(1.4662)		(-1.4958)		(4.8716)		(-0.1609)
Net Income / Assets		0.0027		-0.2124		0.0933		0.0069		0.0112
		(0.0170)		(-0.4416)		(0.8553)		(1.3388)		(0.1403)
Intangibles / Total Assets		0.4226*		-0.0199		-0.1437		-0.1260		0.0221
		(1.7004)		(-0.0573)		(-0.6877)		(-1.4501)		(0.1534)
Primary > Secondary shares offered Dummy		-0.1113		-0.1406		-0.0475		-0.0507		-0.1367
		(-0.7599)		(-0.8455)		(-0.3413)		(-0.6276)		(-1.6143)
Adj R sq.	0.0238	0.0345	0.0066	0.0394	-0.0059	-0.0109	0.0019	0.0184	-0.0034	-0.0071
N	97	97	50	50	140	140	1575	1575	287	287

*** Indicates significance at the 1% level ($p < 0.01$)
** Indicates significance at the 5% level ($p < 0.05$)
* Indicates significance at the 10% level ($p < 0.1$)

Table 4.4: Linear Regression results by period

	2007 – 2014				2015 – 2021				2010 – 2018			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Intercept	0.1935***	0.2101*	0.2219***	0.2362*	0.0611	-0.3870**	0.1807**	-0.2933	0.1068**	-0.1878	0.2222***	-0.0727
	(3.9202)	(1.8097)	(2.6350)	(1.8067)	(1.2307)	(-2.3991)	(2.1649)	(-1.6024)	(2.3560)	(-1.3588)	(2.7428)	(-0.4552)
Public float	-0.4425***	-0.5038***	-0.6182	-0.6877	-0.0722	-0.0127	-0.9133*	-0.5277	-0.1021	-0.1416	-0.8244*	-0.7472*
	(-2.9515)	(-3.3311)	(-1.3804)	(-1.5314)	(-0.4636)	(-0.0816)	(-1.8372)	(-1.0535)	(-0.7442)	(-1.0289)	(-1.8640)	(-1.6876)
Public float squared			0.1999	0.2088			1.0090*	0.6136			0.8191*	0.6866
			(0.4163)	(0.4349)			(1.7815)	(1.0816)			(1.7178)	(1.4390)
Log(Proceeds)		0.0757*		0.0768*		0.1864***		0.1814***		0.1610***		0.1548***
		(1.8703)		(1.8927)		(3.7935)		(3.6750)		(3.4376)		(3.2934)
Net Income / Assets		0.0038		0.0038		0.0463***		0.0448***		0.0074		0.0074
		(0.7691)		(0.7697)		(2.7017)		(2.6062)		(1.4580)		(1.4604)
Intangibles / Total Assets		-0.2113**		-0.2115**		-0.0262		-0.0288		-0.0952		-0.0974
		(-2.0469)		(-2.0475)		(-0.2403)		(-0.2641)		(-0.9982)		(-1.0219)
Primary > Secondary shares offered Dummy		-0.1305*		-0.1287*		0.0882		0.0770		0.0012		-0.0051
		(-1.8149)		(-1.7865)		(0.9264)		(0.8041)		(0.0155)		(-0.0682)
Adj R sq.	0.0084	0.0156	0.0075	0.0147	-0.0008	0.0246	0.0015	0.0248	-0.0004	0.0097	0.0013	0.0106
N	913	913	913	913	949	949	949	949	1203	1203	1203	1203

*** Indicates significance at the 1% level ($p < 0.01$)
** Indicates significance at the 5% level ($p < 0.05$)
* Indicates significance at the 10% level ($p < 0.1$)

Table 4.5: Linear Regression Results Including the Effects of Total Assets and Revenues

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.1416**	-0.1413**	-0.1356**	-0.1351*	-0.0629	-0.0457	0.0312	0.0320	0.1158
	(-2.0608)	(-2.0552)	(-1.9661)	(-1.9572)	(-0.6510)	(-0.7942)	(0.3501)	(0.7240)	(1.5237)
Public float	-0.2601**	-0.2531**	-0.2414**	-0.2472**	-0.2548**	-0.1906*	-0.1996*	-0.1946*	-0.2053*
	(-2.4101)	(-2.2758)	(-2.2056)	(-2.2196)	(-2.2660)	(-1.7548)	(-1.8247)	(-1.7903)	(-1.8771)
Log(Proceeds)	0.1310***	0.1212**	0.1114***	0.1206**	0.1204**				
	(4.3952)	(2.5292)	(3.1559	(2.5169)	(2.4759)				
Log(Total Assets)		0.0084		-0.0105	-0.0136	0.0724***	0.0740***		
		(0.2603)		(-0.2838)	(-0.3480)	(3.5975)	(3.2496)		
Log(Revenue + 1)			0.0189	0.0218	0.0251			0.0498***	0.0500***
			(1.0321)	(1.0381)	(1.1788)			(3.2209)	(2.9520)
Net Income / Assets					0.0077		0.0059		0.0079
					(1.4892)		(1.1631)		(1.5846)
Intangibles / Total Assets					-0.1137		-0.1258		-0.1105
					(-1.4208)		(-1.5940)		(-1.4139)
Primary > Secondary shares offered Dummy					-0.0500		-0.0597		-0.0654
					(-0.8463)		(-1.0133)		(-1.1127)
Adj R sq.	0.0117	0.0112	0.0117	0.0112	0.0122	0.0083	0.0092	0.0070	0.0083
N	1862	1862	1862	1862	1862	1862	1862	1862	1862

*** Indicates significance at the 1% level ($p < 0.01$)
** Indicates significance at the 5% level ($p < 0.05$)
* Indicates significance at the 10% level ($p < 0.1$)