Stockholm School of Economics
Department of Finance
Master Thesis in Finance
Fall 2019

# Does the Market Remember?

**How Underperforming IPOs of Portfolio Companies Impact Future Exit Options of Private Equity Funds**

Armin Hartl, 41482
41482@student.hhs.se

Mateo Steinbach-Künkler, 41484
41484@student.hhs.se

**Abstract**

The unprecedented rise in private equity as an asset class has drawn the attention of scholars, practitioners and the general public alike. Notwithstanding, the determinants of the exit route, a crucial part of the value creation of private equity funds, remains partly unanswered. With this thesis, we intend to shed light on how underperforming IPOs of private equity portfolio companies impact subsequent exit options of the respective private equity fund. We analyse a sample of 4,041 private equity exits from January 1999 to September 2019 for companies headquartered in the USA, of which 626 are IPOs. Using multivariate regressions, we examine the influence of IPOs, that significantly underperform their respective industry index, on the private equity fund's future probability to exit portfolio companies via an IPO. With our tests, we can confirm prior research on exit determinants, i.e. market conditions and company characteristics. However, our analysis suggests that there is no significant impact of underperforming IPOs of portfolio companies on future exits of the respective selling private equity fund.

**Keywords:** Private Equity, Initial Public Offering, Exits, Underperforming IPOs, Reputation

**Supervisor:** Per Strömberg, Professor of Finance and Private Equity

**Acknowledgements**

First and foremost, we would like to express our deepest appreciation to our supervisor Per Strömberg for his continuous support and guidance throughout the project. Furthermore, we would like to thank the industry experts who participated in our interview campaign for their support and invaluable insights.

Stockholm, December 2019

Armin Hartl and Mateo Steinbach-Künkler

# Table of Contents

# Index of Tables

# Index of Figures

# List of Abbreviations

| | |
|---|---|
| IPO | Initial Public Offering |
| IRR | Internal Rate of Return |
| LBO | Leveraged Buyout |
| M&A | Mergers and Acquisitions |
| PE | Private Equity |
| RLBO | Reverse Leveraged Buyout |
| VIF | Variance Inflation Factor |
| VC | Venture Capital |

# 1 Introduction

The unprecedented rise of private equity (PE) as an asset class in the last decades (MacArthur & Rainey, 2019) has drawn the attention from the general public and scholars alike. Despite the increased attention by researchers, a few areas remain that have not yet been comprehensively analysed. One of these areas is the exit process of portfolio companies of private equity funds, which is a crucial aspect of the value creation of the latter (Jenkinson & Sousa, 2015). While there is rather limited research on that topic, exits, especially initial public offerings (IPOs), have a public profile and can evoke scrutiny by the media and the general public. In the last couple of years, the Nordic market has seen a number of IPOs of PE-backed companies, whose share price decreased significantly after the initial listing (Hellstrom, 2019; Newlands, 2014; Nielsen, 2015). In one especially severe case the portfolio company went bankrupt only eight months after listing. The investors, who acquired stakes in the company during the IPO and lost all their capital, sued the selling private equity fund (Nielsen, 2015). As the business model of private equity firms is designed to buy and sell companies regularly (Gilligan & Wright, 2014), and there are only a few key players in the market (Cumming & Walz, 2010; Fenn, Liang, & Prowse, 1996), these incidents raise an interesting question: What impact do "underperforming" IPO-exits of portfolio companies have on subsequent exits of the selling private equity fund? With this thesis, we intend to shed light on this topic and attempt to provide some answers to the question.

The subject of underperforming IPOs of portfolio companies of private equity funds touches upon two dimensions, namely determinants of exit routes of PE funds and the impact of their reputation. With regard to the former, there are mainly three exit options: IPOs, secondary buyouts and trade sales. While some researchers have argued for a pecking order, in which IPOs are the most favourable exit route (Jelic & Wright, 2011), this notion has been challenged (Jensen, Marshall, & Jahera, 2017), as all exit options have their particular advantages and disadvantages[1]. Contrary to the alleged pecking order, it now seems consensus that private equity funds choose the exit route that maximises their returns in the particular case, irrespective of what exit that is (Jenkinson & Sousa, 2015; Y. Wang, 2012). Research has shown that market conditions in public

[1] See chapter 2.1 for an overview

equity and debt markets, as well as company characteristics, such as size, profitability and industry, have the largest impact on the chosen exit route (Jenkinson & Sousa, 2015; Sudarsanam, 2005).

Regarding the second dimension, the reputation of private equity funds, it is important to reiterate that PE funds are distinguishable and recurrent players in the market for corporate control (Masulis & Thomas, 2009). Especially when selling portfolio companies via an IPO (Lee & Wahal, 2004) or secondary buyout (Degeorge, Martin, & Phalippou, 2013), they face the same potential investors on a recurrent basis. Game theorists state that in repeat market setting, firms are forced to provide high-quality products, to protect their reputation and maximise their long-term earnings (Hörner, 2002; Klein & Leffler, 1981). Thus, to the market for corporate control, the reputation of the private equity fund and its relationship to potential investors in an IPO is important (Neus & Walz, 2005).

Combining these two aspects, reputation of PE funds and exit determinants, and building on the above mentioned research, especially Sudarsanam (2005), Wang (2012) and Jenkinson and Sousa (2015), we analyse the effect of underperforming IPOs of PE-backed companies on subsequent exits of the respective PE fund. The research hypothesis we test is as follows: "*Private equity funds are less likely to exit portfolio companies via IPO following an IPO that significantly underperformed its peer group"*. This seems to be intuitive, as investors who have lost money by buying into a PE-backed IPO should be less willing to invest in the next asset of that fund. As Hotchkiss, Strömberg et al. (2014) state, *"If a bank or other lender experiences large credit losses in connection with a PE-backed firm going bankrupt, these lenders will be more reluctant to lend to the future buyout transactions backed by this PE sponsor."* Applying this logic to IPOs, when institutional investors acquire stakes of PE-backed companies and lose money afterwards, as the share price declines, it seems plausible to assume they would be more reluctant to invest in the next IPO from that PE fund. As there would be fewer potential investors willing to meet their price expectations and PE funds choose the exit route with the highest expected returns, this in turn should decrease the fund's capability and thus ex-post their probability to sell portfolio companies via public offerings.

A crucial matter for our key research question is whether investors have different expectations for PE-backed IPOs, also called reverse leveraged buyouts (RLBOs), compared to non-backed IPOs. It is noteworthy that, even though there are numerous studies that demonstrate

outperformance of RLBOs versus non-backed IPOs (Brav & Gompers, 1997; Cao & Lerner, 2009; Chamberlain & Joncheray, 2017; Levis, 2011; Mian & Rosenfeld, 1993; Minardi, Ferrari, & Araújo Tavares, 2013; von Drathen & Faleiro, 2007), several papers did not find significant outperformance (Belden, Keeley, & Knapp, 2001; Datta, Gruskin, & Iskandar-Datta, 2015; Degeorge & Zeckhauser, 1993; Holthausen & Larcker, 1996; Jelic, Saadouni, & Wright, 2005). In light of the non-conclusive research on RLBOs, it appears logical to presume that investment professionals do not have strong expectations about under- or overperformance of RLBOs compared to non-backed IPOs.

As mentioned, we build upon the research of Jenkinson and Sousa (2015), Wang (2012) and Sudarsanam (2005). Therefore, in addition to the above stated hypothesis, we test our dataset for their findings, i.e. that market conditions and company features significantly influence exit routes. We intend to confirm the former conclusion with the hypothesis: "*Market conditions have a significant impact on the exit route"* and the latter with the hypothesis: "*The equity value of a firm has a significant impact on the exit route"*.

We use a data sample by PitchBook of 4,041 transactions for our analysis, covering PE-exits of US-based companies from 01/01/1999 until 30/09/2019. This sample includes only deals from private equity funds that exited at least three companies in the timeframe via a public offering. The 626 IPO-exits of this dataset were complemented by their listing price, their industry as well as their return after six, twelve and eighteen months, as we analyse the relative performance of the IPO versus their industry index for the respective timeframe. We use three different timeframes, to account for the fact that there is not a single timespan after which investors judge whether an IPO was a success or failure. For the purposes of the thesis, we define an IPO as underperforming, when the stock price has returned -20% or less, compared to its respective industry index. For the six months timespan, our dataset includes 157 exits that classify as underperforming. However, when assuming more severe thresholds for underperformance, the set of observations significantly decreases.

The above-mentioned approach was selected, because there is no objectively correct method to choose an evaluation time nor a threshold as to when a stock's development can be classified as underperforming. Additionally, in deriving a measure of the impact on the fund, namely the change in IPO probability, we face a trade-off. The longer the considered time horizon

before and after the listing, the more stable the average calculation becomes. However, this disregards the cyclicality of the IPO market. Vice versa, when the time horizon is decreasing, a meaningful intra-fund IPO probability cannot be calculated, as the average will approach extreme values of either 0% or 100%. This is for example the case, when the considered IPO has only one precedent transaction in the defined time horizon. As a result, this would distort the data and lead to a biased regression outcome. Regarding the observations, more than 4,000 is a rather large sample, yet an even higher number would be required in order to test strong assumptions. For example, considering the impact of more extreme underperformance, i.e. negative 40% compared to the industry index, the dataset includes only fourteen observations fulfilling this criterion. Therefore, the relative importance of a single observation becomes very high. Taking these limitations and the high volatility of the underlying assumptions into account, the validity of our calculations is uncertain. In order to address this issue, we do not solely focus on the impact of the underperforming IPO on a fund's subsequent IPO probability but rather at the performance in general. Using this approach, we can draw conclusions on whether the performance has any influence on the future IPO probability.

By applying *Probit regression* analysis, we aim to confirm the hypotheses that market conditions as well as the equity value influence the fund's choice whether to publicly list an asset or to exit via M&A. Regarding market conditions, we use the number of IPOs in the USA in the year of the transaction as a proxy of how active the market is. The higher the number of all IPOs in the USA, the higher should be the probability of an IPO in the PE space in the USA. Additionally, we include the credit spread of a Baa rated corporate bond to the ten-year treasury bond with constant maturity[2]. The rationale behind the latter measure is that the higher the credit spread, the costlier it is for companies to borrow money for an acquisition. Hence, they should have a lower purchasing power, and thus the IPO probability should increase with the credit spread. During their discussions whether to go via IPO or trade sell, companies take into account the current credit spreads. We consider the credit conditions half a year before the regarded transaction took place, because the process of *"[a]n IPO generally takes around four to six months"* (Jenkinson, 2019). As a next step, we applied multivariate regressions of the *Ordinary Least Squares* estimator and derived the *Best Fitting Model* through *Stepwise Backwards Regression* in

[2] Moody's Seasoned Baa Corporate Bond Yield Relative to Yield on 10-Year Treasury Constant Maturity from 01/01/1998 until 30/09/2019; Source: Federal Reserve Bank of St. Louis

order to find influencing factors on a fund's change in IPO probability. As independent variable, we used the number of IPOs in the US in order to include a measure of general IPO activity in the market. Then we added several additional factors, i.e. the logarithm of the returns as well as dummy variables for certain return related underperformance thresholds, the credit spread and equity value.

With regards to the hypotheses "*Market conditions have a significant impact on the exit route"* and "*The equity value of a firm has a significant impact on the exit route",* we do find results with a significance level of 1% for all regression outcomes. All three variables, number of IPOs in the US, credit spread a half year before the transaction and equity value at the listing, show a positive coefficient. Therefore, we can confirm these hypotheses with the given dataset. For the third hypothesis *"Private equity funds are less likely to exit portfolio companies via IPOs following an IPO that significantly underperformed its peer group",* our results do not show a consistent relationship between returns of prior IPO exits and future IPO probability. Firstly, when analysing the impact of performance on future IPO probability, the return does not appear as an explaining variable. Secondly, when considering solely observations of underperforming IPOs, we do find an impact in only a few cases. Therefore, we reject this hypothesis.

The credit spread at the time of the transaction shows significance in most regressions. This is due to the reason, that the considered spread serves as a proxy for future spreads, namely a higher spread-level today implies a high spread-level in the near future. Since we only regard the average calculations of no more than three years, the level might not change substantially. As reasoned above, the spread today should be a factor in the decision whether the transaction in half a year is a M&A-transaction or an IPO. We find a positive coefficient, which is in line with the findings from the *Probit Model.* In a nutshell, the high spread today increases the likelihood of an IPO in the future, hence it increases the average IPO probability ex-post (i.e. $A_2 > A_1$[3]).

Even though the explanatory power of our dataset is rather limited with regard to the hypothesis of underperforming IPOs, we conclude that there is a compelling reasoning for the antithesis, that underperforming IPOs do not adversely influence future exits of the respective PE. The most important factor for exit routes is, as mentioned, the expected returns the fund will

[3] Refers to Figure 6 and equation (1) of page 25

generate. Various scholars have empirically demonstrated, this is most significantly determined by market conditions and the specific characteristics of the portfolio company.

These empirical findings are in line with the opinion of the professionals we interviewed. Further, these professionals mentioned that they have a clear view on exit paths for each company already when acquiring them. This further supports the thesis that the exit route is very dependent on the specific company. Especially the industry's concentration, the size of the company as well as their business model seem to matter. We additionally conclude from interviews that the relationship between private equity funds and institutional investors is less intense than expected.

*"In general, there is not a very frequent dialogue between private equity funds and institutional investors in the public markets, but they have good and professional relationships. In an IPO process, we do not typically meet with the potential investors, as this is the task of the company's management and the investment banks, unless it is a larger anchor investor acquiring a strategic stake."*

***Partner at Swedish Private Equity Fund A***

Furthermore, institutional investors focus mostly on the company and its management, when considering investing in an IPO, as opposed to the selling PE fund. This undermines the hypothesis that the reputation of the PE is of significance for potential investors in an IPO.

In consideration of our empirical findings, the literature review and the conducted interview campaign, it appears questionable that one underperforming IPO has a significant impact on future exit options of the selling private equity fund. The consensus among the professionals we talked to was that a fund would have to have a series of severely underperforming IPOs, in order to have a significant impact. Taking everything into account, we conclude that one underperforming IPO likely does not affect future exit options of private equity funds.

The remainder of this thesis is structured as follows: Chapter 2 provides the theoretical context, including literature review and contribution. The data sample we use as well as descriptive statistics and variable definitions are described in chapter 3. In chapter 4 we present the methodology, followed by our empirical findings in chapter 5. We discuss our empirical results based on the literature review and our interview campaign in chapter 6. Finally, we conclude the thesis and give an outlook for future research in chapter 7.

# 2 Theoretical Context

This section provides an overview of existing literature related to the topic of underperforming IPOs of PE-backed companies and their impact on future exits of the selling fund. It further provides an outline of our contribution to the academic discussion and introduces our hypotheses we test in the thesis.

## 2.1 Literature Review

Private Equity has been and remains an industry that is controversially discussed and highly scrutinized by the public. This can be observed not least in the current 2020 US democratic party presidential primaries and the accompanying media coverage, which often focuses on bankruptcies such as "Toys R Us", corresponding job losses and the limited liability of private equity funds (Ford, 2019). The public debate on private equity feeds from research, such as the recent study by Davis and Lerner (2019) who concluded that, two years after a sale to a private equity fund, job losses at a portfolio company constitute to 4.4%. These findings directly contradict the often-cited results of their previous study (Davis et al., 2014) identifying almost no effect of net job losses after an acquisition.

While the public debate mostly focuses on these specific topics, financial scholars around the world are researching a broad variety of dimensions regarding private equity. Their studies cover many issues; from the overall economic effect of private equity buyouts (Davis et al., 2019; Davis, Haltiwanger, Jarmin, Lerner, & Miranda, 2011), their economic value added (Kaplan & Strömberg, 2009) to the effect on specific industries (Bernstein, Lerner, Sorensen, & Strömberg, 2016).

As private equity is a broad research topic, we take a broad look at research concerning our particular thesis topic, the impact of underperforming IPOs of a funds' portfolio company on subsequent exits of this fund, which touches upon several dimensions. We review literature concerning the exit options of private equity funds, the performance of PE-backed IPOs and the impact of reputation of private equity firms.

### 2.1.1 Exit Routes

At the private equity firm level, the limited lifespan of funds implies that PE firms have to sell or rather exit acquired companies regularly (Fenn et al., 1996). There are in general three options for the fund to exit an investment: i) trade sale, i.e. the sale to a strategic buyer, most often a firm within the portfolio company's industry; ii) secondary buyout, i.e. a sale to a different private equity fund and iii) IPO, i.e. taking the firm public (Fraser-Sampson, 2011; Wright & Robbie, 1998). For a long time, it has been a common view amongst scholars that there is an exit pecking order. It stated that an IPO was the most attractive exit and only viable for successful companies, a trade sale was a more general exit, also viable for less successful companies and a secondary buyout was the least attractive exit option for companies that can be neither sold via IPO nor via trade sale (Jelic & Wright, 2011). In the past years however, this pecking order has been disputed (Jensen et al., 2017), and the consent among scholars seems to be that the route that maximises returns for the selling PE fund is selected (Jenkinson & Sousa, 2015; Y. Wang, 2012). In the following we will briefly outline the characteristics of each exit route and their key advantages and disadvantages[4], in order to shed light on reasons impacting the exit route decision of private equity funds.

**i) Trade Sale**

The term "trade sale" describes the sale of a PE-backed firm to *"any kind of strategic or industrial investor, including competitors, suppliers, and customer*" (Baumeister & Muelke, 2010). It is a quite common exit route, ranging in frequency from 50% (Giot & Schwienbacher, 2007) to 42% (Jenkinson & Sousa, 2015) for European and US-based firms and different time periods. There are two major advantages to an exit via trade sale for a PE seller. First, the valuation can be higher, as the strategic buyer is capable of realizing revenue and/or cost synergies. Thus, the economic value of the to-be-sold firm to the strategic buyer can be higher than to institutional investors or other PE firms, which can result in a higher bid for the asset (Baumeister & Muelke, 2010). Second, private equity firms are mostly measured in terms of the internal rate of return (IRR) they return to their investors (Fraser-Sampson, 2011). Compared to an IPO, the big advantage of a trade sale, as well as that of a secondary buyout, is that the PE is able to sell 100%

[4] For a more comprehensive overview see Povaly (2007)

of its stake at once. Ceteris paribus, this results in a higher IRR, compared to selling down their stake over time (Pindur, 2009). In addition, trade sales as well as secondary buyouts offer the benefit that there is only one buyer, instead of many for an IPO. Further, these negotiations are private and unregulated as opposed to the strict rules for public offerings (Folus & Boutron, 2015). Both aspects can facilitate the negotiations and improve their flexibility. Another advantage of a trade sale compared to an IPO are the lower fixed costs, as going and being public requires substantial expenses. Therefore, the smaller a firm is, the less attractive becomes an IPO, since their chances to be successful as an independent firm are lower than for their bigger rivals (Pagano & Röell, 1998).

Despite the fact that strategic buyers with synergies are capable of paying a higher price, there is empirical evidence that trade sales result in a lower IRR than IPOs for the selling PE fund (Bienz & Walz, 2010). Furthermore, trade sales are not always straightforward in their execution, especially in highly concentrated industries. This is due to the reason that trade sales result in industry consolidation, which may be prohibited or at least highly scrutinized by authorities, such as antitrust regulators (Wall & Smith, 1997). Brau, Francis and Kohers (2003) analysed this issue and found empirical support for this thesis. In the same study, the authors showed that market conditions, i.e. the "hotness" of the takeover-market versus the IPO market and the specific industry of the target company are as well crucial factors for the exit route. On another note, if the portfolio company is quite large in terms of value, there might be no strategic buyer that is capable of acquiring the target (Jenkinson, 2019). It is also worth mentioning that the management of the to-be-sold company might become redundant after the acquisition and thus has an incentive to lobby for a different exit route (Folus & Boutron, 2015).

**ii) Secondary Buyout**

Transactions in which a portfolio company of a private equity fund is sold to a different private equity fund are called "secondary buyouts" (Cumming & Johan, 2008). While this exit route was rare in the beginnings of private equity, it has increased significantly as share of total transaction value (Anson, 2004; Kaplan & Strömberg, 2009) and accounts to 44% in European transactions from 2000 to 2014 (Jenkinson & Sousa, 2015). This surge has evoked criticism, especially in the academic world, claiming that there is little room for further operational enhancement and that the second private equity fund overpays, which results in lower returns for

them (Bonini, 2015; Masulis & Nahata, 2011; Sousa & Jenkinson, 2012; Y. Wang, 2012). However, there are mixed empirical findings as Achleitner and Figger (2014) did not find any evidence that secondary buyouts generate lower returns. These mixed results are confirmed by Degeorge et al. (2016) who added a differentiated view on this debate. The authors of the study stated that while secondary buyouts, which are conducted when the buyer has pressure to allocate capital are value dilutive, secondary buyouts involving PE firms with complementary skillsets actually outperform other buyouts.

While there is a broad academic debate about the legitimacy and value creation potential of secondary buyouts[5], from the perspective of the selling PE fund there are several advantages of a sale to a different PE firm. It offers a faster execution compared to an IPO and trade sale, as there are neither regulatory nor antitrust aspects to consider, and therefore the process is meaningfully shorter. Further, there is higher transaction certainty, since IPOs depend a lot on market sentiment and trade sales on antitrust authority approval. In addition to these two advantages, a trade sale offers high flexibility, i.e. the selling PE could structure the deal as a partial exit to participate in future value creation or opt for a complete exit (Folus & Boutron, 2015). However, these advantages come at a price, as the buying PE fund has most probably a higher cost of capital or rather IRR hurdle as a strategic buyer, which will result in a lower willingness to pay (Wall & Smith, 1997).

**iii) IPO**

Public offerings used to be one of the most important exit options in the 70s to early 90s, however, it has since decreased significantly in popularity (Strömberg, 2008). The pecking order, especially the notion that IPOs are the most attractive exit option has been widespread amongst scholars (Bascha & Walz, 2001; Cao & Lerner, 2009; Cumming & MacIntosh, 2001; Giot & Schwienbacher, 2007; Lerner, 1994; Sarin, Das, & Jagannathan, 2003). The key reason for their popularity is that, given public markets are hot, IPOs tend to result in higher proceeds than the other exit routes (Folus & Boutron, 2015). Other factors for this could be the publicity that comes with an IPO (Dorn, 2009) and the financing options as a public company (Povaly, 2007).

[5] For an overview of the debate see Jenkinson and Sousa (2012)

However, the notion of "IPO supremacy" has not been unanimous as some scholars found results of lower returns for IPOs than for other exits (C. K. Wang & Sim, 2001) or a preference of financial sponsors for other exits (Murray, 1995). These mixed conclusions seem intuitive, as there are a couple of negative aspects inherent in a public listing. First, it is important to note that PE funds usually have to stay invested in the company for at least a certain lock-up period, e.g. minimum six months, and often even longer, which lowers the IRR ceteris paribus. Cao (2011) found that on average PE funds still hold c.24% three years after the initial offering. Thus, an IPO is only a partial exit for the private equity fund with uncertain proceeds in the future, as the stock price might perform badly. Second, there are higher costs for an IPO, as there are numerous regulatory filings, lawyers and banker fees etc. (Wall & Smith, 1997). Third, the extensive process requires a substantial amount of preparation (Whaley & Semler, 2002). Fourth, the IPO market is very cyclical (Benninga, Helmantel, & Sarig, 2005; Ibbotson & Jaffe, 1975; Ibbotson, Sindelar, & Ritter, 1994; Jain & Kini, 2006; Ritter, 1984), which leads to a smaller window of opportunity (Pástor & Veronesi, 2005; Ritter & Welch, 2002; Yung, Çolak, & Wang, 2008).

When PE firms decide to sell portfolio companies via public listings or reverse leveraged buy-outs, there are many studies that empirically demonstrate a relative outperformance of RLBOs (Brav & Gompers, 1997; Chamberlain & Joncheray, 2017; Minardi et al., 2013; von Drathen & Faleiro, 2007). For example, Mian and Rosenfeld (1993), analysed the performance of 83 PE-backed companies and found positive abnormal returns for a three-year period. More recently, Cao and Learner (2009) found evidence of significant outperformance of PE-backed IPOs compared to both, non-backed IPOs and the general market in a comprehensive analysis of approximately 500 RLBOs from 1980 to 2002. This was further supported by Levis (2011), who found that compared to VC-backed and non-backed IPOs, RLBO firms outperform VC-backed IPOs and non-backed IPOs over a three-year cycle.

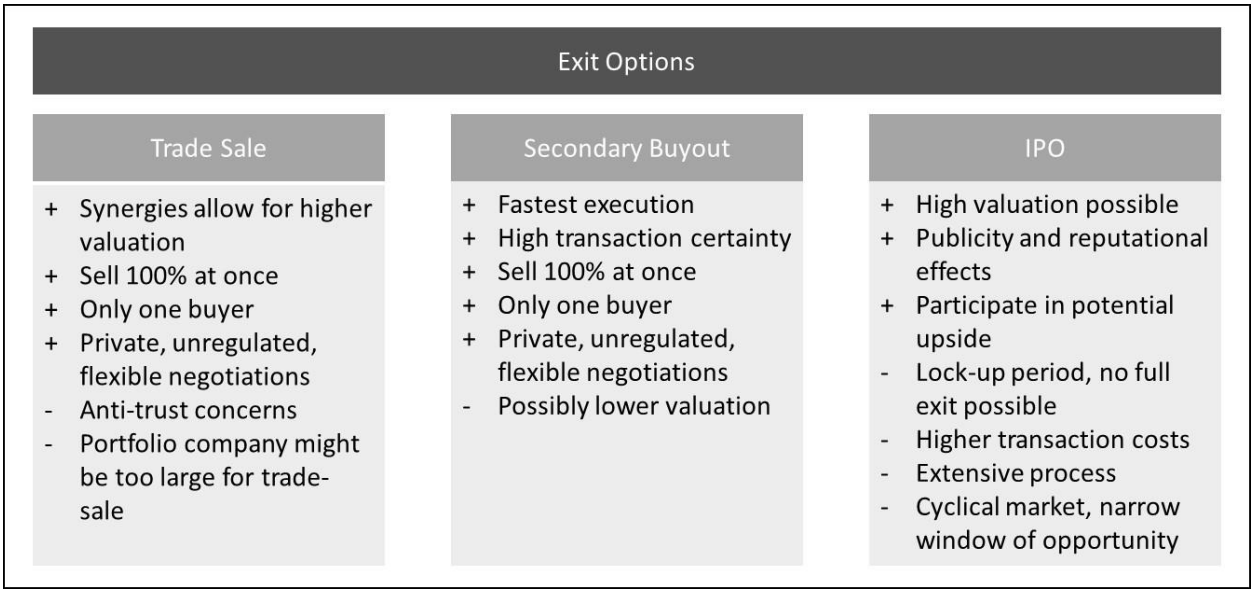
Nevertheless, there are also studies that did not confirm these results (Belden et al., 2001; Degeorge & Zeckhauser, 1993; Holthausen & Larcker, 1996). For example, Jelic et al. (2005) analyses 1,225 leveraged buyouts (LBOs) in the UK for the time period between 1980 and 2009 and did not find any outperformance of RLBOs. Datta et al. (2015) argue that the results are mixed due to the commingling of different sorts of RLBOs. Therefore, he suggests distinguishing between public-to-private, private-to-private and division-to-private RBLOs.

When looking at first day returns, some research suggests that RLBOs experience a lower underpricing, compared to non-backed and VC-backed IPOs (Mogilevsky & Murgulov, 2012; Muscarella & Vetsuypens, 1989). However, also on this matter, previous research is not unanimous. While some scholars indicated that PE-backed IPOs do not differ in underpricing in general (Michala, 2016), others stated that only PE syndicates show less underpricing (Ferretti & Meles, 2011).

**iv) Résumé on Exit Routes**

As discussed, all exit routes have their unique positive and negative aspects. Figure 1 gives an overview of the distinct exit options and their respective characteristics.

**Figure 1: Overview of Exit Routes and Key Considerations**




Source: Own figure

There seems to be no clear supreme option, which is in line with Jenkinson and Sousa (2015), who researched the determinants of exit decisions for private equity funds with a sample of 1,022 European exits from 2000 until 2014, of which secondary buyouts account to 44%, trade sales to 42%, and IPOs to 14%. Instead of confirming the exit pecking order, they concluded that capital market sentiment has the strongest influence on the decision, followed by the features of the exited company. Further, they suggested that the share of trade sales versus secondary buyouts increases for smaller portfolio companies who have grown strongly. Comparing IPOs versus secondary buyouts, the paper suggested that when share prices have soared, IPOs become more

likely, while easy access to cheap debt and a large amount of committed but not allocated capital on PE side increases significantly the share of secondary buyouts. This is in line with Axelson et al. (2013) who found empirical evidence for a significant impact of debt markets on buyout prices. As PE funds tend to borrow as much as they can, their purchasing power increases, and they are able to pay higher prices. The latter analysis is seconded by Wang (2012), who found that market conditions of the IPO market and the debt market are key factors. In further research concerning exits, Cumming and MacIntosh (2003) suggested that information asymmetries also play an important role and that partial exits via IPO increase with a higher degree of it. The study of Sudarsanam (2005) examined a sample of 104 exits for UK-based companies between 1998 and 2004 and observed that the factors size, operating performance, investment duration and industry are significant for the exit route. It further indicates that market conditions are an important factor, as PE firms try to time the market and hold on to assets in downturns.

Given the above discussed research, it is fair to say that PE funds choose the exit route which will maximise the exit proceeds under the specific circumstances of the company, the PE fund and the market at that time or as Jenkinson and Sousa (2015) phrase it: *"private equity funds take advantage of "windows of opportunity", and the exit route that maximises value varies with market conditions"*. Further, given the non-conclusive results of RLBOs, it is sensible to state that the market does not expect an out- or underperformance versus the market. These are important results for our hypothesis, which we lay out in detail in chapter 2.2.

### 2.1.2 Impact of Reputation

The reputation of private equity firms is multifaceted and has an impact on many factors. First and foremost, it has a substantial effect vis-à-vis potential investors of the private equity fund itself. Gompers et al. (1998) showed that, there is a positive relationship between reputation in form of size and age of the fund and its ability to raise new capital. It influences the size of a fund, since it may contain beliefs about future returns that are not depicted in current performance variables. Thus, a large fund should have a good reputation and a small fund either a bad reputation or it has not yet capitalized on its name to increase the fund size. Other factors important to reputation building in the PE sector are the number of investments, the ratio of portfolio firms to investment professionals and the ratio of exits via IPO and trade sales (Balboa & Martí, 2007). Regarding this issue, Fenn et al. (1996) stated that *"A favourable track record is important because it conveys*

*some information about ability and suggests that general partners will take extra care to protect their reputation. […] Partnership managers generally turn first to those who invested in their previous partnerships—assuming, of course, that their previous relationships were satisfactory."* According to the authors, trust and reputation are important factors in transactions, due to the limited number of players and key persons in the private equity market. This is seconded by Cumming and Walz (2010), who provided insights into PE manager's trade-off between showing overvalued current fund returns to investors and a potential reputational loss, implying that reputation is a key aspect in the PE industry.

In addition to the reputation vis-à-vis their own investors, the general reputation in the financial market seems to be important as well. Sudarsanam (2005) stated that due to the business model of PE, in which selling companies constantly is a fundamental part, the reputation of a PE firm is of paramount importance. Especially regarding exits via IPOs (Lee & Wahal, 2004) and secondary buyouts (Degeorge & Zeckhauser, 1993), the involved parties, i.e. private equity funds and institutional investors, interact regularly and repeatedly with each other. Game theory states that in a repeated game scenarios, sellers have an incentive to provide quality products to protect their reputation and maximise their long-term earnings (Klein & Leffler, 1981). If they fail to provide the market with high-quality products, they will be forced out of the market as there are no buyers left, willing to acquire their products (Hörner, 2002). Applied to the market for corporate control, the reputation of PE firms can be seen as a quality assurance to the buyer (Minardi et al., 2013). However, PE funds face a trade-off when selling a portfolio company in an IPO, as they have to build a reputation towards their investors by maximising their returns and in the same time, they have to build trust and establish themselves as a credible counterparty vis-à-vis institutional investors, so that they can sell the next company to the same investors (Neus & Walz, 2005).

Empirical evidence for the importance of reputation is provided by Cain, Macias et al. (2014) in their paper on the cancellation of signed private equity transactions during the financial crisis 2007-2008. Their results showed that PE funds were completing transactions up to a 7% loss of the fund size or $200m to $400m in nominal value, before strategically defaulting on already signed deals. This suggests, that reputation not only plays a vital role for PE funds, but that there is an actual economical value to it and that funds are willing to sacrifice economical value to a certain degree in order to protect their reputation. Demiroglu and James (2010) further

demonstrated that reputation has an economical value, as they found that more reputational firms achieve lower financing costs for LBOs, lower covenants and longer maturities.

To summarise the previous research on reputation of PE funds, it is reasonable to conclude that reputation seems to have a significant impact on several dimensions, including the exit process. However, it remains unclear how large the impact of reputation is on the exit process, especially compared to the factors mentioned in chapter 2.1. In the following section we will lay out in detail our hypothesis, combining the dimensions "determinants of PE exits" and "impact of reputation".

## 2.2 Contribution

While there is already extensive research on private equity in general, the impact of a fund's reputation and on IPO exits of PE funds in particular, the research on the factors influencing exit routes is rather modest. They key findings of Sudarsanam (2005), Wang (2012) and Jenkinson and Sousa (2015), as described in chapter 2.1, are that market conditions and company characteristics are crucial factors for exit routes. Our contribution with this thesis is to build on their findings and extend the body of research on the question "what determines the exit routes for PE-backed companies", by investigating the magnitude of potential adverse effects of prior underperforming IPOs.

The cornerstone of this hypothesis is the relationship between private equity funds and institutional investors that acquire stakes of PE-backed companies in an IPO. Their relationship is multidimensional, since both parties are changing constantly roles as sellers and buyers for take-private transactions and IPOs. They are also competitors with regards to fundraising (Johan, Knill, & Mauck, 2013). It seems reasonable to assume that the relationship between private equity and the public markets, their interplay as well as their reciprocal appreciation of each other is of importance for their transactions. This thesis aims to analyse how crucial this relationship becomes when a PE tries to sell a portfolio company via IPO.

Specifically, we analyse the situation of an underperforming IPO and its subsequent impact on the relationship of public investors and the respective private equity fund. Megginson and Weiss (1991) have shown that the reputation of financial sponsors serves as a "third party certification"

for the companies quality for outside investors in an IPO and has a significant impact on underpricing. On the contrary, it is reasonable to assume that a negative reputation of a private equity fund should have an adverse effect on an IPO of the respective fund. Furthermore, Hotchkiss, Strömberg et al. (2014) state that *"If a bank or other lender experiences large credit losses in connection with a PE-backed firm going bankrupt, these lenders will be more reluctant to lend to the future buyout transactions backed by this PE sponsor."* It seems sensible to presume that the same logic holds true for investors in an IPO and that therefore, investors that lose money in a PE-backed IPO will be more reluctant to invest in the next IPO of a portfolio company of that PE fund.

*"Many investors have long memory! - The people losing money from an investment, for instance in connection with an IPO, are likely to be less interested in investing in new companies from that manager. After a bad experience it will be more difficult, for a long period of time, for a manager to IPO another company on that stock exchange. However, sometimes it is more of a local or regional problem. Investors in different geographies may have different views of the same manager. A number of other topics will also be important and have influence on a managers reputation and not only the most recent IPO"*

***Fund Manager A at a Swedish Institutional Investment Funds***

This quote from a senior investment professional not only very well sums up our research question, it also provides the nuances expected in the thesis. There is various research supporting the hypothesis, that an underperforming IPO could lead to a significant decline in exits via IPO for the respective PE fund. This is due to the reason that public investors, after having incurred great losses in the funds' previous IPO, could more heavily scrutinize the portfolio company intending to go public and apply a "distrust discount" on its valuation. Thus, they could not be willing to meet the PE's price expectations. Depending on the valuation, the PE fund then could be less inclined to exit via IPO and rather consider an exit via trade sale or secondary buyout. In the same time, there seem to be numerous very important factors with regards to the chosen exit route, as discussed in chapter 2.1. The key question to be investigated is therefore, how central is the presumed negative impact of a previously experienced underperforming IPO compared to other factors influencing the exit decision.

In conclusion, we can formulate the key research question we intend to answer with this thesis as follows: *"Do underperforming IPOs of portfolio companies negatively impact private equity funds' ability to exit other portfolio companies via IPO in the future?"*

As described, this question is embedded as a subsection into the broader question *"What factors impact the exit route of PE-backed companies?"*. As market conditions have been identified by various scholars as the most significant factor for IPO exits (Brau et al., 2003; Jenkinson & Sousa, 2015), it is expected that this manifests itself in our dataset as well. Therefore, our first hypothesis is as follows:

**Hypothesis 1: Market conditions have a significant impact on the exit route.**

Furthermore, researchers have shown that the portfolio company's characteristics, such as firm size, plays a crucial role in the exit route as well (Jenkinson & Sousa, 2015; Sudarsanam, 2005). Firm size can be gauged by its equity value and as with the factor "market condition" we expect that this is equally a significant factor for the exit route of PE-backed companies. Thus, our second hypothesis is:

**Hypothesis 2: The equity value of a firm has a significant impact on the exit route.**

Building upon the previously mentioned research, this then leads to the more specific question of what impact an underperforming IPO has on following exits of the respective selling private equity fund. As discussed before, it seems logical that investors that lost money in a prior IPO are subsequently less inclined to invest in the next IPO of the private equity fund, which thus decreases the probability of an IPO in the PE's following exit. In other words, we can formulate our third hypothesis:

**Hypothesis 3: Private equity funds are less likely to exit portfolio companies via IPOs following an IPO that significantly underperformed its peer group.**

After describing our research methodology and dataset in chapter 3 and 4, we will test these three hypotheses in chapter 5 and discuss the results in the ensuing chapter 6.

# 3 Data

Our study concerns private companies which are not required to publish financial information, hence we are dependent on a source that offers a wide range of information on transactions and companies' financials in the private space. The following section describes the procedure of deriving the data sample for conducting a statistical analysis.

## 3.1 Data Collection

In our analysis, we focus on US-based companies, because it is the largest PE market (Bureau van Dijk, 2017), and thus offers the biggest amount of consistent data. We are looking at transactions within a 20-year time horizon, as the long timeframe allows to control for periods when the IPO market is active and when it is idle, such as during the financial crisis of 2008/2009. Moreover, we use a mixture of datasets for our sample, namely PitchBook and Capital IQ. Using PitchBook we retrieved data for transactions of PE-backed companies, including type and date of deal as well as the selling private equity investors. Acquired by Morningstar in 2016, PitchBook is a data provider focusing on private equity, venture capital (VC) and mergers and acquisitions (M&A), hosting a dataset of over one million transactions (PitchBook Data Inc, 2017). Due to its download restrictions it is not very commonly used by scholars (Sharma, 2017), nevertheless we could retrieve a large enough sample for our purpose.

The dataset we construct is filtered by a few criteria. Included are solely portfolio companies with headquarter in the United States of America that were exited from 01/01/1999 until 30/09/2019. To gather only the relevant transactions for our purpose, we filter the search for completed exits as well as exit types of the following criteria: Public Investments, Acquisitions, Other and PE-backed. We study a fund's change in IPO probability after a public listing underperformed. Therefore, we focus only on PE funds that exited at least three of their portfolio companies via a public listing. This filter has two advantages: i) increasing the likelihood of retrieving relevant data points and ii) minimizing the observations, which helps to meet the download restrictions of the data base. According to PitchBook there are 142 private equity funds fulfilling the described criterion. This reduces the number of observations from initially 18,018 to 4,041 for the above-mentioned time horizon. Of these 4,041 companies, 626 were exited via IPO,

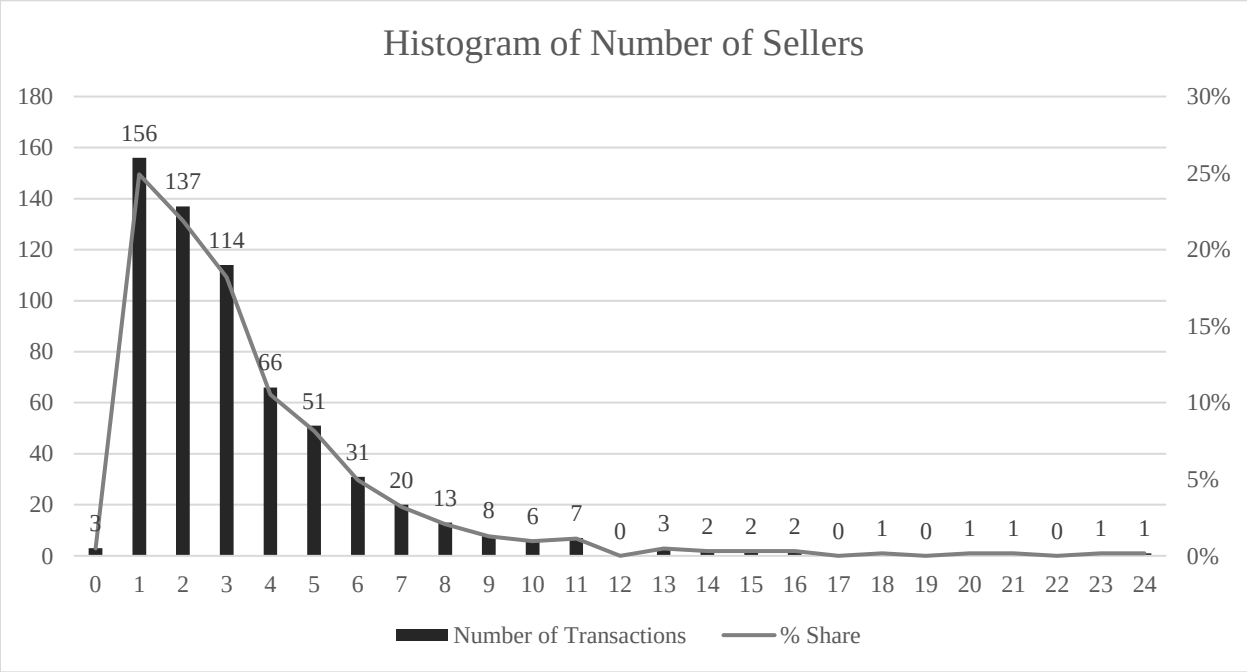
with the remaining 3,415 being M&A transactions. For the remainder of this thesis, we do not distinguish between trade sales and secondary buyouts but use this term interchangeably with M&A transactions. The PitchBook dataset includes most of the time the stock exchange ticker, the listing price of the IPOs as well as the industry the company can be matched to. In few cases, we had to manually add the ticker based on desk research.

Building on this exit dataset, we then matched the companies that went public with the Capital IQ dataset using their Excel Add-in. Capital IQ is an established financial information platform, used commonly by academics (Davis et al., 2014; Hotchkiss et al., 2014; Kaplan & Strömberg, 2009). Mostly based on the stock exchange ticker of the companies provided in the PitchBook data, partly based on manually added Capital IQ "ID numbers", we retrieve both the listing price of the IPO and its first day stock price. In the rare case that there was no listing price available, we use the first day opening price as a proxy for its listing price. This approach comes with a few shortcomings as the dataset of Capital IQ is less comprehensive and complete for earlier years. In very few cases, twelve in total, we had to exclude companies as we could not retrieve the listing price nor the first day opening price. In order to minimise these cases and to improve the quality of our sample we also download data from Bloomberg and compared it to the Capital IQ data. Thereafter, we derive the equity value of the company at the time of the transaction by multiplying the listing price with its shares outstanding. The equity value for private companies involved in M&A transactions is not widely available, hence partially missing in our dataset. Moreover, the missing information can also not be derived since not every transaction discloses an enterprise value nor the necessary items used for the enterprise to equity bridge. The limitations of our analysis are discussed in chapter 5.2. Regarding the industry allocation, we matched the eleven S&P 500 sector indices based on the industry classification from PitchBook. Since the sample also included industry and sub-industry specifications, we identified the S&P 500 sector that is most aligned with the subsector of the companies in our dataset. "Global Industry Classification Standard" (GICS) outlined by MSCI served as a guideline for that (MSCI 2019). A depiction of the exact allocation of industries can be found in Table 6 of Appendix A.

Additionally, we must restructure our dataset. So far, we are looking at the sample on a transaction basis which leads to 626 IPOs. However, one asset can be owned by more than one seller. The implications of an underperforming IPO should be noticeable at every fund which owned the company and participated in the IPO process. Hence, we derive a second version of the

dataset by taking the fund level as observation base. This leads to a transaction appearing as many times as sellers were involved in the IPO process. Figure 2 depicts the distribution of the number of sellers involved per IPO.

**Figure 2: Histogram of Number of Sellers**




Due to the lack of available information, there are three IPOs to which no sellers can be matched. One in four transactions involves a sole PE fund as seller, while half of the companies have between two and four PE firms as shareholders when they went public. The shift in observation level leads to 2,934 transactions in total, whereof 900 are IPOs. During our interviews with experts, we found the appropriate timeframe to judge the performance of an IPO to fluctuate between six and eighteen months after listing.

*"With regard to time horizons, I am judged on a three- to five-year performance. However, I believe professionals in the finance industry judge the success of an IPO after six to eighteen months."*

***Fund Manager B at a Swedish Institutional Investment Funds***

Hence, we retrieved the percentage stock price change after six, twelve and eighteen months of all 900 IPOs and deducted it from the relative change of the matched industry sector

index for the same time. This transformation introduces a relative measure for stock performance compared to industry peers. In order to receive consistent data, we use Capital IQ as resource to download the information for both stock prices and index levels. The initial analysis is based on two integral assumptions regarding the evaluation of the stock performance and the magnitude of the deviation from the index. Firstly, we chose a horizon of six months after listing in order to evaluate the stock performance. Secondly, we classified every IPO with a negative deviation of 20% from its index to be categorized as an underperforming IPO. For descriptive purposes, we focus on the six months setup, however, an analysis of twelve and eighteen months was also conducted. In applying the mentioned filters, we are left with 157 IPOs as depicted in Table 1.

**Table 1: Derivation of Initial Data Sample**

| **Sample Description** | **# Observations** |
|---|---|
| Initial sample of all PE-backed exits form 01/01/1999 to 30/09/2019 | 18,018 |
| (-) Excluding all transactions of PE funds with 2 or fewer IPOs | 13,977 |
| **All exits from PE funds with three or more IPOs** | **4,041** |
| (-) M&A transactions | 3,415 |
| **IPOs** | **626** |
| (+) Added IPOs due to observation on fund level | 274 |
| **Number of IPOs on fund level** | **900** |
| (-) Performing IPOs | 743 |
| **Underperforming IPOs** | **157** |

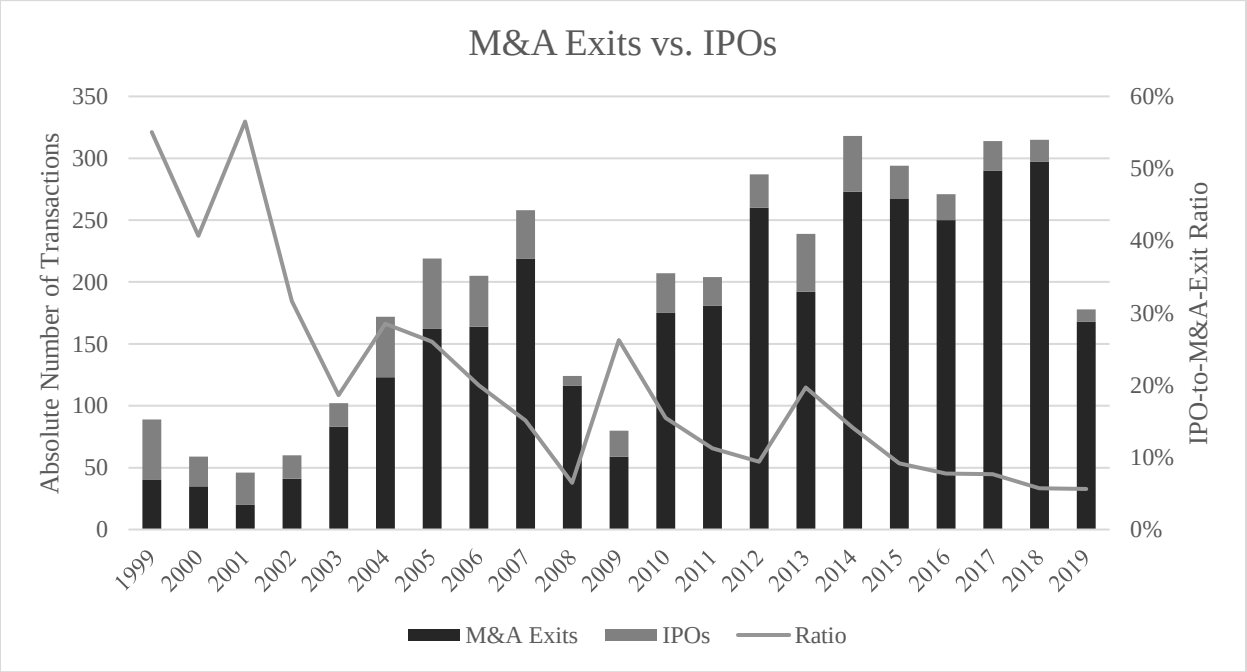
As mentioned before, this number is subject to our assumptions and somehow varies. Notwithstanding, this procedure accurately describes our reasoning in deriving the initial sample. Changes occur by varying both the used time horizon after listing in order to judge the stock's performance and the level of how much of a negative deviation from the companies' industry index is required, so as to be classified as an underperforming IPO.

The additional data was retrieved from other resources. The daily credit spread of *Moody's Seasond Baa Corporate Bond Yield Relative to Yield on 10-Year Treasury Constant Maturity* was downloaded from Federal Reserve Bank of Saint Louis (2019). The number of IPOs per year in the US is based on Jay Ritter's IPO statistics (2019).

## 3.2 Descriptive Statistics

This section is intended to provide a concise and comprehensive overview of the used data. As already touched upon, the initial dataset is based on 4,041 transactions of PE-backed companies. All portfolio companies are headquartered in the United States, yet the fund which backs the companies is not necessarily located there. Based on these transactions, Figure 3 contrasts the quantity of IPO- and M&A-exits in a given year for our dataset. In the used timeframe, a declining trend in PE-backed IPOs can be observed. This pattern is especially apparent since the end of the financial crisis and in line with other research as discussed in chapter 2.1. Hence, the change in the IPO-to-M&A-exit ratio seems to be a structural one.

**Figure 3: Absolute Number of M&A and IPO Exits per Year[6]**

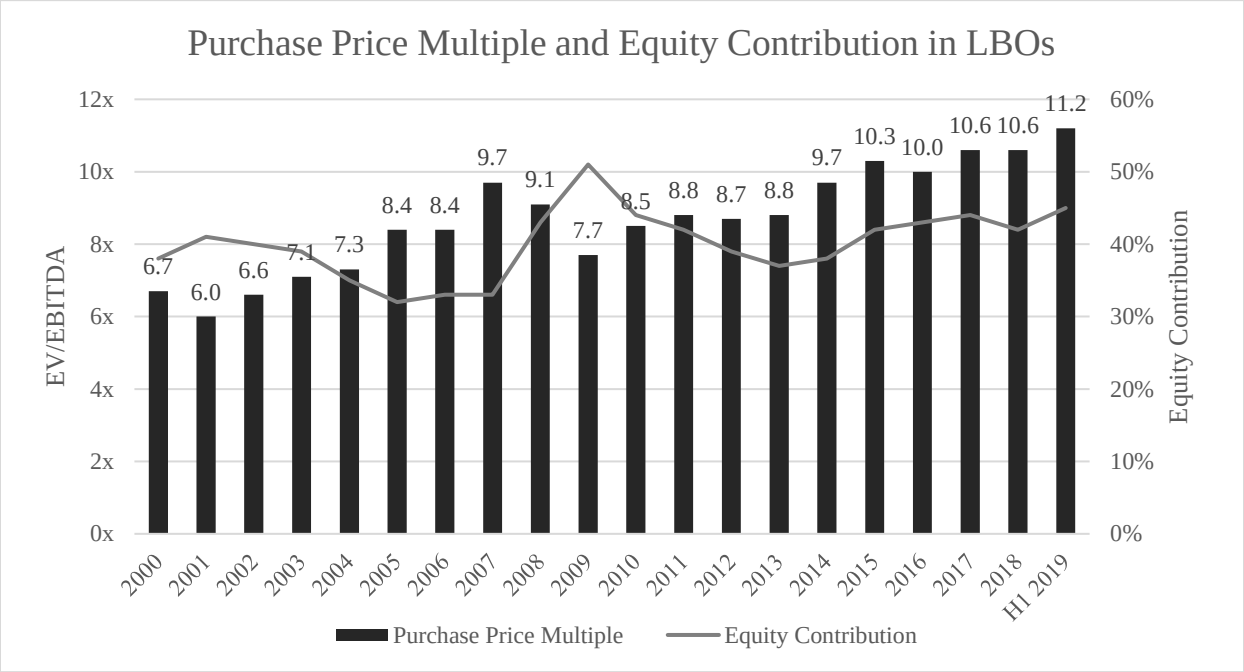



The most significant observation is the decrease of overall exits in 2008 and 2009. The financial crisis in these years had a prodigious impact on the public market. If possible, private equity funds tried to postpone their exits as the willingness to pay high multiples had declined. The deterioration of the aggregated purchase price multiple for levered buyouts is depicted in

[6] 2019 values are year-to-date as of 30/09/2019

Figure 4, which is based on Morgan Stanley's research of the levered buyout market from the beginning of 2000 through the first half of 2019 (Primack, 2019).

**Figure 4: EV/EBITDA Purchase Price Multiple and Equity Contribution in LBOs**

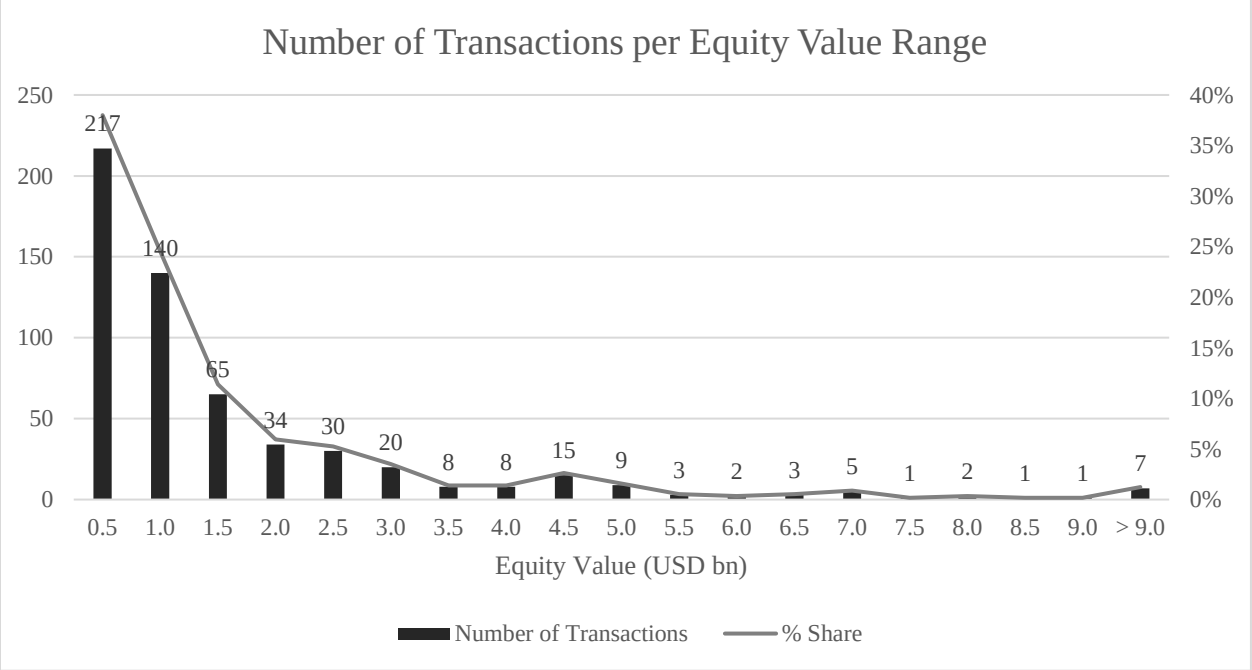



Furthermore, it can be observed that the overall number of transactions increases together with the purchase price multiple and vice versa. This observation was confirmed in our interviews, with private equity professionals stating: "*In 2008 the situation was that if you didn't have to sell, you would just wait. The LPs can give the fund a lifetime extension and are often happy to do that in such a situation, so you wait for the upswing"*. This is due to the reason, that if a fund approaches its lifetime end, all assets must be liquidated in order to pay out their investors (Gilligan & Wright, 2014). As prices had already been low due to market conditions, a forced liquidation would have put them in a more detrimental position for price negotiations, which could have further driven down prices. In order to avoid this vicious circle, funds could reach out to limited partners (LPs), asking for allowance of an extended lifetime. Since LPs are concerned about their returns, an increased holding period is plausible and can explain the substantial decrease in exits for that period in our sample.

In the next step, the data observations are allocated to the eleven S&P 500 industry indices. Most companies operate in the consumer discretionary sector. Contrary, real estate and utilities are the two sectors with the least transactions. The share of transactions per industry is attached as

Figure 8 in Appendix A. Further, Figure 5 shows the distribution of transactions per equity value range. As the histogram shows a skewness with additional “fat tail”, we approach the analysis by using a transformation subject to the natural logarithm. This issue is discussed in detail in section 3.3. A depiction of the credit spread as well as the number of IPOs can be found in Appendix A, Figure 11.

**Figure 5: Histogram of the Number of Transactions per Equity Value**

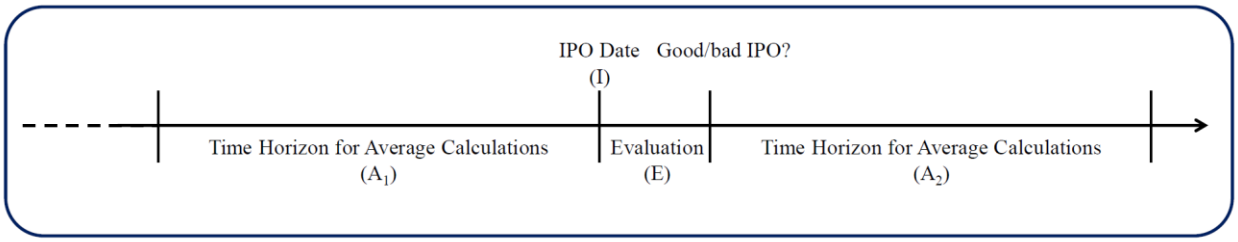



## 3.3 Variable Definition and Data Manipulation

First, we consider the time horizon in which investors evaluate a given stock’s performance. As mentioned, interviews with professionals have led to the conclusion that there is no precise time horizon but more a timespan ranging from six to eighteen months after listing. In this time investors judge a stock’s performance and link it to the reputation of the former owner. Therefore, the timespan we use to derive a funds average IPO probability before the listing and after the evaluation time varies. We do not include the time from listing to the evaluation, because we assume that investors have not finally decided whether to view a listing as a success or failure. Hence, any negative or positive reputation stemming from the IPO will affect investors and private equity professionals after the evaluation time. To be consistent, both time horizons, used to

calculate the funds IPO probability before and after the listing, are the same. Figure 6 is an illustration of the general setup in deriving the change in IPO probability.

**Figure 6: Time Horizon for IPO Performance and Average Calculations**




$$\Delta\ IPO\ probability = A_2 - A_1 \qquad (1)$$

Equation (1) describes the derivation of our change in IPO probability where $A_1$ and $A_2$ resembles the IPO-to-M&A-exit ratio in the respective timeframe. After the IPO date, we waited for an evaluation time E (i.e. six, twelve or eighteen months), after which the decision is made whether the listing can be classified as success or failure. We include a vast combination of different assumptions in our regression in order to not be dependent on soft factors, such as deciding whether to evaluate after six or twelve months. In calculating the average IPO probability of a fund after an IPO from that before the IPO, we derive our dependent variable. The first independent variable we introduce is the change in hotness of the IPO market. We apply the same procedure as for the dependent variable, however, we now consider not a single fund but all 142. This allows for measuring the general shift in IPO probability for the relevant PE peer group[7]. If there are many IPOs, it is often referred to as a hot market. Going forward the measure is called hotness. Since this provides only information for the activity in the PE space, we also include the absolute number of IPOs in the US per year to depict more accurately picture of the overall activity for US-based IPOs. The final indicator of the market situation is *Moody's Seasoned Baa Corporate Bond Yield Relative to Yield on 10-Year Treasury Constant Maturity* derived from the Federal Reserve Bank of St. Louis. The concept behind this variable is that the higher the spread the higher should be the IPO probability because this implies more costly credits for firms which in turn leads to a more expensive M&A-transaction. Hence, the M&A route evolves as less attractive, and the IPO route is more likely to be picked, since funds are focused on maximizing their returns. For the

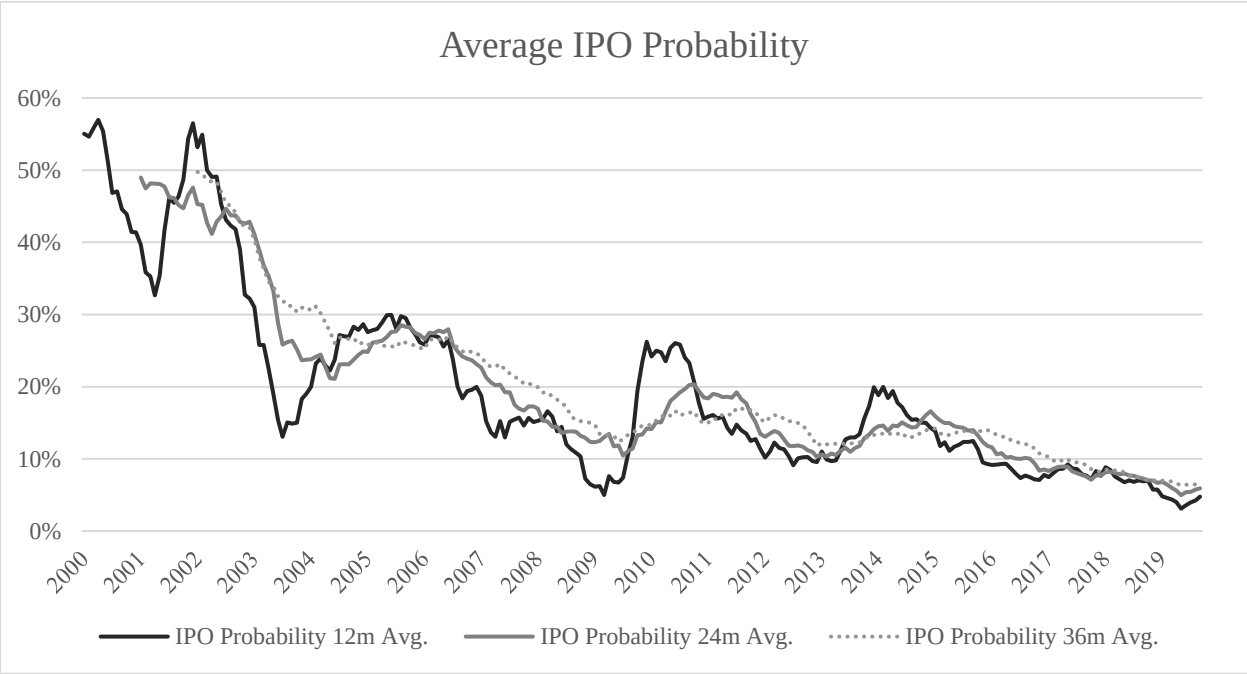
[7] As we only include PE funds with more than three IPOs in the timeframe, this only applies to them

*Probit* model, we consider the credit spreads six months before a transaction because an IPO process takes about four to six months (Jenkinson, 2019). Companies should consider the current credit situation and incorporate this in their evaluation of whether an IPO or M&A is more appropriate. Therefore, the spread half a year before the actual transaction is closer to the value, which is taken into account when deciding on which exit route is more favourable. For the *OLS* model, the spread at the date of the transaction is chosen. This serves as a proxy for the future spread which in turn should impact the fund's IPO probability.

As touched upon above, there is a structural change in the IPO-to-M&A-exit ratio for private equity firms. This is exemplified by Figure 7. Hence, we do not base our *fixed effect model* on the average for the whole time period, because it does not resemble the market's true benchmark. We rather focus on shorter timeframes ex-ante and ex-post of the transaction in order to account for the more current situation. Figure 7 contrasts the implications of different time horizons for calculating averages of the IPO probability.

It is noticeable that not only the level is constantly decreasing, but also that the longer the time horizon is, the more it smooths out the cyclicality. This leads to a limitation of the dataset: The longer the time horizon, the more the cyclicality of the IPO market is disregarded. However, on a fund basis, the shorter the time horizon, the less transactions fall into the observation time. Thus, averages are skewed to extreme outcomes. Considering a fund which exits its second portfolio company via a public listing, which turns out to be underperforming, the initial IPO-share before this exit would be either 0% or 100%. This is damaging the quality of the regression, since the extreme change will flow directly into the regression, causing a set of outliers. Additionally, given the steady decrease of the IPO probability, the change in hotness naturally converts to a negative number when considering an increasing number of months for the average calculation.

**Figure 7: Historic IPO Probability**




Another limitation comes with the following trade-off: The higher the number of required datapoints before the observation, the fewer funds will meet this criterion, decreasing the number of observations. In order to decide on an appropriate threshold of minimum required transactions before an IPO, we performed a sensitivity analysis. Table 2 shows the sensitivity in number of underperforming IPOs, when varying the threshold of minimum required exits before and after the considered listing and the time horizon which is used for the average calculation.

**Table 2: Sensitivity for Number of Underperforming IPOs**

| | | Least prior/following Exits | | | | | |
|---|---|---|---|---|---|---|---|
| | | **0** | **1** | **2** | **3** | **4** | **5** |
| **Months for Average** | **6** | 190 | 59 | 23 | 5 | 1 | 0 |
| | **12** | 183 | 85 | 42 | 26 | 13 | 7 |
| | **18** | 176 | 101 | 63 | 40 | 28 | 19 |
| | **24** | 147 | 103 | 71 | 46 | 32 | 22 |
| | **30** | 151 | 112 | 83 | 60 | 43 | 29 |
| | **36** | 147 | 113 | 84 | 65 | 52 | 40 |

As mentioned, we use a threshold of negative 20% relative to the index for a stock to be classified as underperforming after an evaluation time of half a year. The table depicts the restriction of the database, because ideally one would opt for a higher number of transactions

prior/after IPO to derive a more stable average. Additionally, as PE experts tend to regard market conditions short-term, it would also be preferred to pick an as short as possible timeframe for the average IPO-to-M&A-exit-ratio. Yet, the limiting factor is that a single fund owns a small number of portfolio companies with a holding period of several years. These factors are counteracting, with the short timeframe having a more negative impact on the resulting underperforming IPO observations. This can be seen by comparing the impact of going from zero prior exits to one for every single timeframe. In the dataset, the six months specification experiences the most negative impact – the underperforming IPO observations are reduced by the largest number – which can be explained by the limited number of portfolio companies per fund. The described trade-off would also arise with other datasets, as the nature of the private equity industry is to steadily acquire and sell companies, instead of doing all transactions at once. Hence, a short timeframe before and after an underperforming IPO, in combination with a high number of transactions, that allows for a stable IPO-to-M&A-exit ratio calculation, is very difficult to achieve on a single fund perspective.

The number of underperforming IPOs is decreasing for both the number of least prior/following exits and required months for average calculation. The latter ensues from the increasing shortage of time captured when the number of months is increased. For example, the whole dataset captures transactions from 01/01/1999 until 30/09/2019, but when calculating the average on a 24 months basis all transactions that took place before 01/01/2001 and after 30/03/2017 are omitted. It is not a symmetric decrease of the time horizon, because for the calculation it is important to also consider the evaluation time, which reduces the timeframe, in this case, by further six months. Due to the reasons discussed above, the overall transaction base shrinks.

Similarly, an increasing number of least prior/following exits results in a higher threshold, therefore decreasing the observations that qualify for the condition. Additionally, by increasing the time horizon, one smooths out cyclicality of the IPO market which lowers the controlling power of the average change in IPO hotness. During our interviews, partners at private equity funds highlighted the importance of IPO market conditions, since unfavourable market situations lead to a lower valuation. This in turn drives down the fund's IRR, which is one of the most important measure for the fund's performance (Fraser-Sampson, 2011). Therefore, funds are reluctant to exit an asset via a public listing when the market is unattractive, since it is negative for the fund's performance. Professionals base their valuation of the IPO market conditions on short-term basis.

The sample size is sensitive to the number of least prior/future exits as Table 2 shows. In our opinion, a threshold of three prior/following exits is a reasonable compromise between stable average calculation and the absolute number of observations left. Considering the properties inherent of the average calculation, experts' time horizon for evaluating the market hotness and the restricting size of the underlying sample, a reasonable approach for this analysis is the selection of at least three prior exits in a 24 months' timeline. By picking this set of assumptions, the number of observations decreases to 46. The third independent variable is a binary dummy which will take on the value "one" if all the above-mentioned criteria are met. For example, with the set of assumptions from above, the dummy has 46 observations where it takes on the value "one" with the rest being "zero". However, we are aware of the fact, that the number of observations is sensitive to our assumptions. To increase the validity of our analysis, we consider a variety of different combinations.

Another independent variable is the equity value of the company at the time of the listing. Equity value is used as a proxy for company characteristics. The reasoning behind that is once an asset reaches a certain size it is not able to be bought by another fund, simply because even the largest funds cannot afford to be exposed to the increasingly large equity tickets (Jenkinson, 2019). The equity value is skewed and has an additional fat tail as Figure 5 shows. In order to account for normality, we transform the value using the natural logarithm. Finally, we also consider returns as independent variable. **H3** hypothesises that the more severe the underperformance is, the greater is the negative change in IPO probability of the fund. Although the initial setup classifies all stocks that yield a more negative return than 20% in relation to its industry index as underperforming, we also vary this threshold in our analysis. We transformed the returns with subject to the natural logarithm (ln(1+ return)) and winsorized outliers to the 99% level. In that way, we again account for normality and can address the problem of outliers. Thus, estimates of the *OLS*-coefficients are more precise. A histogram of the transformed variables is included in Appendix A.

# 4 Methodology

As already laid out, we define "underperforming IPO" as a public listing that yields a negative return of 20% or less, compared to its respective industry index after the evaluation time, which is varied throughout the analysis. The implied logic is that investors buying into the company at the listing will judge the success of the company not in absolute, but in relative terms to its peers. This is due to the reason that external factors affecting an industry are not in control of the firm and thus cannot be hold against it. Therefore, a negative stock price development can be in fact a relatively good performance, if the percentage decline has a smaller magnitude compared to the industry peers' over the same period. As a proxy for the peer group we use the eleven S&P 500 sector indices as described in chapter 3. The following section elaborates on the statistical framework used in order to test the hypothesis mentioned above. We split our analysis in two parts. First, we address **H1** and **H2**, i.e. whether market conditions (**H1**) and firm specifics (**H2**) impact the exit decision. The exit is defined as binary variable (IPO=1, M&A=0), therefore the binary response *Probit* model is applied. The following specification is based on Wooldrige (2002):

$$P(IPO_i = 1|x_i) = \phi(x_i'\beta), where\ i = 1,2,\dots,n \qquad (2)$$

Where P denotes the probability that IPO=1 and $\phi$ the cumulative distribution function of the standard normal distribution. The analysis is carried out with the hypothesis variables, namely number of IPOs in the US, credit spread half a year before the transaction and the firm's equity value at listing. For the spread, we consider the conditions six months prior to the transaction as this is usually the time when PE funds decide if they initiate an IPO process (Jenkinson, 2019). All three variables should impact the decision whether to choose the IPO route or not. It is expected that the variables are significant and have a positive coefficient (i.e. $\beta_i > 0$).

Second, we implement multivariate regressions of the *Ordinary Least Squares* (OLS) estimator and use *Stepwise Backwards Regression* in order to identify the best fitting model (Gujarati & Porter, 2009). To test our hypotheses, we apply a two-sided t-test. The return of the IPO impacts a fund's subsequent exit options when the null hypothesis, that the coefficient of the return equals zero, is rejected and instead the alternative hypothesis, that the coefficient is positive, is accepted (i.e. Pr[T>t]<0.05). For our approach, the dependent variable is the change in average of IPO probability, because this allows for an isolation of the intra-fund effects. The controlling

variables are the number of all IPOs in the US in a given year, the equity value, as well as a firm's return after the evaluation time and the credit spread. As a last independent variable, a dummy for the bad IPO indication, based on the underlying assumptions mentioned in section 3.3, is included. In a later step, we condition the *OLS* regression of the change in IPO ratio on the return of the bad IPO with a return threshold of negative 20% and worse. This is used to address the assumption that severe underperforming should impact the fund's future exit option more, while a less underperforming IPO does not hurt the reputation as much. Hence, **H3** suggests a positive β coefficient, which is significantly different from zero. The expression below shows the applied model with all mentioned independent variables denoted as X:

$$\Delta\, IPO = \alpha + \beta Return + X'\gamma + TFE'\delta + u \qquad (3)$$

Next, we use a *Stepwise Backwards Regression* in order to derive the *Best Fitted Model*, which is found by estimating the multivariate regression and eliminating variables that do not meet a certain significance threshold. The selected threshold was 20%. The *Best Fitted Model* serves as basis for the further analysis carried out in section 5.1. The vector TFE describes a time-fixed-effect which is introduced to challenge the model's robustness. Afterwards, we apply diagnostic tests so as to ensure sound results. We perform the *Ramsey Reset Test* to the model's specifications in order to control for non-linear combination of variables that might explain the dependent variable. "*The RESET test is based on the notion that if the functional form of the model is incorrect, then the correct specification might be approximated by the inclusion of powers of the variables in the original model"* (Long & Trivedi, 1992).

Since multivariate regressions are employed, a test for multicollinearity is vital, because two correlated variables that are included in the regression simultaneously can affect the underlying outcome (Farrar & Glauber, 1967). As a test, the *Variance Inflation Factor* (*VIF*) is used, as it indicates multicollinearity of the independent variables (F. Hair Jr, Sarstedt, Hopkins, & G. Kuppelwieser, 2014). Moreover, the *Gauss-Markov Theorem* for *OLS* regressions assumes homoscedastic residuals for the model to generate the best fitted estimator (Wooldridge, 2016). This assumption is integral, as heteroscedasticity leads to biased standard errors, which in turn impact the t-statistics making confidence intervals and tests of hypotheses for the affected coefficients invalid (Newbold, Carlson, & Thorne, 2013). In applying the Breusch-Pagan test we identify potential heteroscedasticity.

# 5 Empirical Findings

The following section describes the results of the empirical tests mentioned in chapter 4. In particular, our test should confirm the outcomes of prior research by Jenkinson and Sousa (2015), namely that market conditions have a significant influence on the exit option (**H1**). Moreover, we also expect company specifics to significantly influence the exit route. This view is based on the in section 3.3 mentioned property, that a large asset is too big to be acquired by a PE fund, because the required equity ticket would equal a too big portion of the fund's volume (Jenkinson, 2019). Hence, the IPO probability should increase in line with the equity value (**H2**). Finally, we look at the change of IPO probability due to the performance of a preceding IPO. First, we test the whole sample, then we focus on a subsample that only includes observations that meet our assumptions of underperformance. While the regression regarding the total sample focuses on a relation between performance and future exit options in general, the subsample addresses the hypothesis that severely underperforming IPOs negatively impact the fund's subsequent exit option (**H3**). In conducting the analysis, we also consider subsamples with higher negative return thresholds, however this significantly reduces the number of observations, rendering unreliable results. Hence, the focus lies on the subsample with threshold of negative 20%. Then, we find for the whole sample as well as the subsample the *Best Fitted Model* via *Stepwise Backwards Regression* using a significance threshold of 20%. Lastly, we also implement a *Time-Fixed Effect* (TFE) model to challenge robustness and control for time specific effects.

## 5.1 Regression Results

This section describes the results from our regression analysis. For all outcomes the models (1) to (6) are based on different datasets derived from our laid-out assumptions. The specification corresponds to the time horizon used in the average calculation and the evaluation time such that it is defined as 'A-E'[8]. For example, 24-6 refers to an average time horizon for IPO probability calculation of 24 months and evaluation time of six months.

[8] Refers to Figure 6 on page 25

Table 3 describes the outcome of the *Probit* model, which seeks to confirm the impact of market conditions and firm specifics on the choice of exit. For all variables we found significance to the 1% level with positive coefficients. There is only one unique set of estimators, since the model does not rely on an input that is affected by our assumptions. Thus, no variance appears.

**Table 3: Probit Regression Output**

*The table describes the results from the Probit model including the absolute number of IPOs in the US at a given year, Moody's seasoned Baa Corporate Bond Yield Relative to Yield on 10-Year Treasury Constant Maturity half a year in advance of the transaction and the equity value at either listing date for IPOs or implied at the transaction date for M&A transactions.*

| VARIABLES | (1)<br>24-6 | (2)<br>24-12 | (3)<br>24-18 | (4)<br>36-6 | (5)<br>36-12 | (6)<br>36-18 |
|---|---|---|---|---|---|---|
| Number of IPOs | 0.003*** | 0.003*** | 0.003*** | 0.003*** | 0.003*** | 0.003*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Credit Spread | 0.167*** | 0.167*** | 0.167*** | 0.167*** | 0.167*** | 0.167*** |
| | (0.051) | (0.051) | (0.051) | (0.051) | (0.051) | (0.051) |
| Equity Value | 0.217*** | 0.217*** | 0.217*** | 0.217*** | 0.217*** | 0.217*** |
| | (0.024) | (0.024) | (0.024) | (0.024) | (0.024) | (0.024) |
| Constant | -2.333*** | -2.333*** | -2.333*** | -2.333*** | -2.333*** | -2.333*** |
| | (0.227) | (0.227) | (0.227) | (0.227) | (0.227) | (0.227) |
| Observations | 1,804 | 1,804 | 1,804 | 1,804 | 1,804 | 1,804 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The model suggests that with every additional IPO in the US, the likelihood that a PE fund will exit an asset via IPO increases by 0.3%. It appears that the overall market activity in the IPO space is considered in the fund's decision which route of exit to choose. Moreover, the credit spread six months before the transaction has a coefficient of 0.167. When the spread increases by one percent point this would increase the probability of an IPO exit by roughly 17%. The equity value's coefficient has a value of 0.217, but it is transformed using the natural logarithm. Thus, an increase in the equity value of 10% implies an increase in IPO probability of approximately 2.1%[9]. The outcome provides sufficient support for the hypothesis that market conditions, here in form of general IPO activity, i.e. number of IPOs and credit condition, i.e. credit spread, as well as firm

[9] $0.217 * \ln(1.1) \approx 0.0207$

characteristics, i.e. equity value, have a significant impact on the decision whether to exit an asset via IPO or M&A. Due to the significance level of the independent variables, it is unnecessary to apply *Stepwise Backwards Regression* to identify the *Best Fitted Model*, because no observation would be eliminated, which in turn leads to the exact model as depicted in Table 3.

For the *OLS* regression we analyse the *Best Fitted Model*. In Appendix C there are detailed outcomes for the full regression models. A detailed overview of the results can be found in Table 9 to Table 15 of Appendix C. The output of the *Best Fitted Model* in Table 4 disregards the return of the IPO as well as the dummy for a bad IPO. This implies that the performance does not have explanatory power on the intra-fund change in IPO probability. Moreover, Figure 13 displays the dependency between change in IPO probability and return for all IPOs regardless of performance. This visualises the missing of an explanatory content.

**Table 4: OLS Best Fitted Model - Regression Output**

*The table below describes the OLS regression results for the Best Fitted Model of the full model. The dependent variable is the change in IPO probability on an intra-fund level. The full model lists as independent variable the overall IPO activity in the US, credit spread, equity value as well as a dummy variable as a bad IPO indicator and the returns of the IPO in relation to its industry index.*

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| VARIABLES | 24-6 | 24-12 | 24-18 | 36-6 | 36-12 | 36-18 |
| Credit Spread | 0.091*** | 0.119*** | 0.113*** | 0.086*** | 0.083*** | 0.083*** |
| | (0.030) | (0.028) | (0.028) | (0.026) | (0.026) | (0.026) |
| Equity Value | | | | -0.025** | -0.023* | -0.023* |
| | | | | (0.012) | (0.012) | (0.012) |
| Constant | -0.297*** | -0.392*** | -0.388*** | -0.143 | -0.165 | -0.165 |
| | (0.073) | (0.070) | (0.070) | (0.105) | (0.103) | (0.103) |
| Observations | 732 | 732 | 732 | 732 | 732 | 732 |
| Adjusted $R^2$ | 0.011 | 0.022 | 0.021 | 0.016 | 0.015 | 0.015 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The model leads to mixed results and unclear dependencies. The equity value is not included in every specification. This shows, that there is no clear connection in explanatory power between firm specifics and the change in IPO probability. Moreover, the dependency is minor

since a coefficient of -0.025 would imply a change in IPO probability by c. -0.2%[10] if the equity value increases by 10%. This relation is from an economical point of view doubtful, since the equity value of prior assets should not impact future exits of different assets. One indication arises from the appearance on the credit spread in model (1) to (6) and the connected significance level. Every coefficient of the spread is significant to the 1% level, ranging from 0.083 to 0.119. Therefore, an increase of the credit spread of one percentage point would lead to an increase in IPO probability of 8.3% to 11.9%. We assume that today's credit spread serves as proxy for the future's credit spread. A high spread today would therefore imply a high-level of the spread in the near future. Since the future spread is a crucial factor for the IPO decision of a fund, as shown with the *Probit* model, this increases the future IPO probability (i.e. $A_2 > A_1$[11]). A graph of the development of the spread can be found in Appendix B.

Since we elaborate on the relation between the exit opportunities after an underperforming IPO, we specifically analyse the observations which fulfil the requirements of a bad IPO outlined in section 3.3. Table 5 depicts the results for the mentioned regression.

[10] $-0.025 * \ln(1.1) \approx -0.0024$

[11] Refers to Figure 6 on page 25

**Table 5: OLS Best Fitted Model with Return Condition - Regression Output**

*The table below describes the OLS regression results for the Best Fitted Model of the full model with the condition of returns of at least negative 20%. The dependent variable is the change in IPO probability on an intra-fund level. The full model lists as independent variable the overall IPO activity in the US, credit spread, equity value as well as a dummy variable as a bad IPO indicator and the returns of the IPO in relation to its industry index.*

| VARIABLES | (1)<br>24-6 | (2)<br>24-12 | (3)<br>24-18 | (4)<br>36-6 | (5)<br>36-12 | (6)<br>36-18 |
|---|---|---|---|---|---|---|
| Number of IPOs | | | | -0.001* | | -0.002** |
| | | | | (0.001) | | (0.001) |
| Return | 0.157** | 0.222 | | 0.102 | | 0.112 |
| | (0.077) | (0.151) | | (0.067) | | (0.071) |
| Constant | -0.026 | -0.023 | -0.096* | 0.130 | -0.152** | 0.203* |
| | (0.059) | (0.090) | (0.049) | (0.103) | (0.072) | (0.116) |
| Observations | 42 | 39 | 39 | 61 | 21 | 51 |
| Adjusted $R^2$ | 0.072 | 0.030 | 0.000 | 0.068 | 0.000 | 0.139 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Again, the results are mixed, but the return appears as explaining variable in four of the six regressions, suggesting a relationship. The coefficients vary from 0.102 to 0.222, which suggests a change in IPO probability of 1% to 2.1%[12] when the return increases by 10%. Yet, the return is only in the 24-6 setup significant to a 5% level, but for the other three models it does not exceed the 10% threshold. Therefore, both the inconsistency of the appearance and the significance level raises doubts about the true underlying relationship. Additionally, the output suggests that the change in IPO probability decreases by 0.1% to 0.2% with every additional IPO in the US. The explanatory power seems to be connected to the applied assumptions since also the number of IPOs is only included in Model (4) and (6) as significant influence while for the remaining models it is not. The inputs only vary in the evaluation time and the time horizon used to derive the average IPO probability of a fund. This supports the perception that the underlying factors are hard to quantify, which decreases the validity of the regression, especially for such a specific subset. We elaborate more on that topic in the next section.

[12] $0.102*\ln(1.1) \approx 0.0097$; $0.222*\ln(1.1) \approx 0.0212$

We also applied a *Time Fixed Effect* model of which the output can be found in Table 15. As the table shows, we did not find any significant impact arising from a time fixture, except for the equity value when the time horizon of the average calculation is 36 months. For the 24 months specifications no significant relation was indicated, supporting our view that the underlying assumptions are crucial.

In order to validate the robustness of the regressions multiple tests have been conducted. For the *Probit* model the ROC curve depicts its accuracy of predicting the binary dependent variable. Figure 12 shows the curve shape, which is above the 50% threshold, underpinning the predictive power of the model. For the *OLS* regressions, the results of the *Ramsey-Reset-Test*, the *Variance Inflation Factor* and the *Breusch-Pagan-Test* are attached in Appendix B in Table 9 to Table 14. We do not experience issues from misspecification (Ramsey-Reset-Test), since the null hypothesis of 'no omitted variables' could not be rejected to a 5% level.

Regarding heteroscedasticity, we applied the *Breusch-Pagan-Test*. At one incident, namely the estimation of the full *OLS* model of the 24-6 setup, the null hypothesis of 'constant variance' was rejected. Therefore, we applied robust estimators for the full and *Best Fitted Model* of the mentioned specification. Otherwise, homoscedasticity was assumed.

In terms of multicollinearity, the highest value measured for the VIF of the *Best Fitted Model* is 2.44 which is well below the threshold of 10 that is assumed to indicate multicollinearity (Alin, 2010). Due to the mentioned reasons, we did not modify the model.

## 5.2 Limitations

With this analysis we want to shed light upon a topic which has been discussed rather modestly by prior literature. However, we experience difficulties in defining variables, since most statistical measures, which have been introduced by us are subjective. It is not possible to give an objectively correct time as to when an IPO is classified as successful of failed by investors. When a private equity fund contemplates about preparing an IPO for an asset and at the same time a prior listing experiences a downturn, it might refrain from going public, disregarding whether the listing happened three or twenty-four months ago. Another fund could potentially opt for a dual-track and decide closer to the actual exit which option might be the best. This problem arises with the

selection of not only the evaluation time but also with the appropriate threshold of return, that classifies a stock's development as underperforming. Further, when deriving the average IPO probability, the selection of a suitable time horizon is also debatable. The trade-off between a short time horizon that captures the current market situation well and an extended period that allows for more stable average calculations cannot be solved unanimously. Nonetheless, the problem with focusing on a short timeframe is that IPO probabilities are skewed to extreme values, because a fund typically does not hold a vast amount of assets, nor does it exit several of them in a short time horizon. Hence, a stable average for a short time horizon is very difficult to achieve. This problem would most probably arise when conducting this study again at a later point in time, unless the PE practice will change significantly.

Another major concern is the overall data size. Although we had a dataset of over 4,000 observations, the required elimination process led to a comparatively small sample size. For certain regressions, i.e. model (2), (3) and (5) of Table 5, there were not even 40 observations included. This problem increases when focusing solely on assets that performed worse. This is especially problematic because the impact of a single datapoint on the regression outcome becomes increasingly high. As elaborated above, the validity of the regression input is questionable due to the subjective assumptions made. Private equity is an established asset class with a long track record, yet the amount of observations that can be retrieved is limited. This is based on two main factors: i) since the companies are private, there is no obligation to publish financial information for the fund's portfolio company and ii) the absolute amount of funds that are large enough to own several assets and exiting them via IPO, as well as established enough that an analysis for a longer time horizon can be deducted, is limited. The latter issue might become less of a limitation in the future, when more time allowed for more PE firms to publicly list their assets. Additionally, data providers such as PitchBook might be able to collect larger amounts of consistent observations. This can help to statistically better analyse the effect of underperforming IPOs on a funds future exit options.

Lastly, we conducted an *OLS* regression model to examine the determinants of PE exits. An important assumption is that we include all explaining variables. As elaborated in section 2.1.1, one important factor for deciding on an exit option is the generated proceeds. Our dataset does not capture a comparable indicator; hence we omit one crucial determinant in the decision process. Another point that influences the decision of whether to exit via M&A or IPO is the opinion about

the future development as well as experience. In case of a very positive view on the public market in which the asset will be exited, funds might be more prone to exit via IPO because that allows them to participate on the market upside. Also, a very negative experience with, for example, a prior IPO might influence the decision process and fund's will be reluctant to exit a similar asset via public listing because of fear that the experience will be similar. We do not have data for such factors, which, in general are hard to quantify. Yet, ideally this should be considered in the analysis since it influences the decision process.

The concerns mentioned above raise doubts about the validity of the analysis and how feasible a statistical evaluation is. Moreover, we conclude from our interview campaign that no clear indications are expected to be found, since the decision process is very nuanced and bespoke. Further, the characteristics of the to be exited assets are in the focus, contrary to past IPO performances. This implies rational decision making by PE funds, that consider only traits of the relevant assets, while emotions of past experiences are disregarded.

# 6 Discussion

The data sample we analysed has overall resulted in mixed findings. For our first hypothesis, ***H1**: Market conditions have a significant impact on the exit route,* we find significant correlations between the probability of an IPO-exit and the hotness of the IPO market, as well as a significant negative correlation with the hotness of the M&A market. The hotter the IPO market and the colder the M&A market, the more likely is an PE to exit a portfolio company via a public offering. As previous research on IPO cycles (Lowry & Schwert, 2002; Yung et al., 2008) shows, there is a high correlation between a high number of companies going public, high initial returns and therefore higher expected valuations. The latter provides the economical explanation, as PE funds choose an IPO when they expect it to maximise their returns. Therefore, our results are in line with the previous research of Jenkinson and Sousa (2015) and Wang (2012).

With regards to ***H2**: The equity value of a firm has a significant impact on the exit route*, we could find conclusive and consistent empirical confirmation as well. The higher the equity value of an asset, the higher is the probability of an IPO as exit. One economical reasoning could be that there is a certain size threshold that needs to be passed, in order to be able to be listed (Pagano & Röell, 1998) and in the same time the number of potential buyers decreases with an increasing equity value (Jenkinson, 2019). In both ways, it is intuitive that the size of the firm should have an impact on the exit route. Thus, also with regard to this issue, our findings are in line with the previous research of Sudarsanam (2005).

However, with regard to our third hypothesis ***H3**: Private equity funds are less likely to exit portfolio companies via IPOs following an IPO that significantly underperformed its peer group*, we do not find conclusive, affirmative evidence. Firstly, when analysing the impact of performance on future IPO probability, the return does not appear as an explaining variable. Secondly, when considering solely observations of underperforming IPOs, we do find an impact in only a few cases. Based on these findings, we reject **H3**. Nevertheless, it is important to note that we have to make strong assumptions on a rather small sample size, which raises some concerns about the explanatory power of our regressions.

As discussed previously, **H3** seems intuitive at first sight and there are compelling arguments in previous literature as well as in some statements we received throughout our

interview campaign that support the hypothesis. However, there is even a more compelling reasoning for why an underperforming IPO would affect not at all or only very lightly future exits. In line with previous research we discussed in prior chapters, the interviewees argued that the single most important factor for an exit route is the expected proceeds.

*"In general, we choose the exit route that will maximise our return. But other factors such as the degree of sell down, deal certainty and the process will also be considered."*

***Partner at Swedish Private Equity Fund B***

As discussed in chapter 2.1, researchers have shown that the expected return is highly dependent on market conditions and company characteristics. Considering the latter factor, company features such as size, industry and profitable should have a substantial impact if one considers the issue on an individual case level. Imagine a PE contemplates about selling a company portfolio which operates in a highly concentrated and cyclical industry. Antitrust might be a major problem for a trade sale (Jenkinson & Sousa, 2015), while the public market is not very fond of cyclical companies (Damodaran, 2009). Therefore, the exit options are quite limited, and it would not be surprising if this hypothetical company would be sold to a different PE firm as a secondary buyout. This notion, that companies have some kind of "natural" exit path due to their characteristics, as well as due to the specifics of the industry they operate in, has been confirmed in our interviews.

*"Before we acquire a company, we already have a view on potential exit options as this is a vital part of our investment hypothesis. Naturally, it is better to have more exit options available."*

***Partner at Swedish Private Equity Fund A***

Further, considering the second factor, market conditions, it is intuitive that depending on the cycle of i.e. the IPO and debt market, the investors in these markets, i.e. institutional investors and private equity firms and strategic buyers have different purchasing power. This in turn leads to higher probabilities of IPOs or M&A, as discussed in chapter 2.1. Therefore, it is questionable if, on top of these two strong factors, a previous underperforming IPO does have any impact. This becomes even more uncertain, as we discovered in our interviews that potential investors in an

IPO are very focused on the target company, while the selling party as such seems to be a rather minor issue.

*"Investors look first and foremost at the asset they are buying into, the selling PE might be a soft factor, but I don't think that it necessarily has that much of an impact unless the GP has a history of poor performing IPOs."*

***Partner at Swedish Private Equity Fund B***

That investors have less concern about the selling party is also underlined by the fact that institutional investors and private equity firms do not have intense, close relationships. Instead, it became clear throughout the interviews that they in fact rarely interact. Even in an IPO process they usually do not talk with each other.

*"In general, there is not a very frequent dialogue between private equity funds and institutional investors in the public markets, but they have good and professional relationships. In an IPO process, we do not typically meet with the potential investors, as this is the task of the company's management and the investment banks, unless it is a larger anchor investor acquiring a strategic stake."*

***Partner at Swedish Private Equity Fund A***

This further undermines one of the key underlying assumption of the thesis, that the relationship between private equity funds and IPO-investors is a significant decision criterion for an exit route. In addition to that, Wright and Robbie (1998) show that the reputation of the selling PE firm is less important, as the target company tend to be large and established and therefore are more in the focus in the investment decision.

In light of the above discussed arguments, it seems doubtful that a previously underperforming IPO has a substantial impact on the chosen exit route. As already touched upon in a quote by a PE-professional, it appears that unless a PE fund has a series of badly underperforming IPOs, there is little to no impact for the fund. Especially with regard to our data sample and methodology, it is vital to note that one underperforming IPO does not seem to hinder you from exiting the next asset as an IPO.

*"If you have a bad IPO, the impact will most likely be quite local. And it is important to note that it will not stop you from IPO'ing the next asset. For that you would probably need to have a real series of severely underperforming listings."*

***Partner at Swedish Private Equity Fund A***

If this statement were to be true, one would have to analyse very severe or repeated underperforming IPOs in order to find potentially statistically significant results. However, this would leave even less observations and undermine the explanatory power further.

Taking everything into account, it seems unlikely that one underperforming IPO has a significant impact on future exits of private equity funds. This is underpinned by our empirical analysis as well as our literature review and interview campaign. Further, it is underpinned by the logic that exit decisions are mostly based on expected returns, which, in turn are determined mostly by market conditions and company specifics. Furthermore, investors in IPOs focus on the particular asset, less on the selling party and the relationship between private equity funds and institutional investors is in general not very intense.

# 7 Conclusion and Future Research

Private equity has grown as an asset class at an unparalleled pace, which has evoked public attention as well as scrutiny around the globe. With regard to the latter, there have been a few high-profile PE-backed IPOs in the Nordic landscape, that underperformed significantly the market. Given that private equity funds are repeat sellers in the market of corporate control, these incidents raise the question whether they will influence the selling private equity fund. One potential result could be that, for a following planned IPO, institutional investors are less inclined to acquire stakes in portfolio companies of the respective PE fund. Contributing to the existent body of research on exit determinants of private equity and the impact of its reputation, this thesis has analysed the impact of underperforming IPOs of private equity portfolio companies on future exit options of the respective selling private equity fund.

Building upon previous studies, we test for market conditions and firm characteristics as important factors of the exit decision of private equity funds. Using a sample of 4,041 PE exits of US-based companies from 1999 to September 2019, our empirical analysis suggests that an underperforming IPO does not have any impact on subsequent exit options of the respective PE fund. This is confirmed by our interview campaign and literature review, from which we conclude that other factors, especially the portfolio company and its characteristics, the management as well as market conditions, are more important. It is also confirmed in our empirical results, as we find significant impact of the IPO and credit market conditions as well as the equity value of a company, on the chosen exit route.

However, there are a few caveats to our findings. We have to rely on assumptions with regard to the magnitude of underperformance, the timespan after which investors judge an IPO as success or failure as well as the observation time horizon for the change in exit behaviour of private equity funds. For all of the above-mentioned assumptions, there is no single correct answer. While we test for several scenarios, the validity of our calculations remains uncertain.

Therefore, concerning future research, it is first noteworthy that these limitations of the dataset will likely prevail for other samples. This is due to the nature of the private equity business model and the resulting fact that the number of exits within a midterm timeframe is limited. Assuming the rise of private equity as an asset class will continue or that it will at least stay at the

current level, there will be more exits, which could increase the robustness of empirical analysis. Therefore, irrespective of the mentioned limitations, it might be worthwhile to repeat our analysis at a later point in time. Moreover, as professionals suggest that a series of bad IPOs might have an impact, this could be explored as well. However, the limitations to an empirical analysis on that subject are likely even greater.

In addition to that, the body of research on determinants of exit options for private equity funds is still modest. Building on the mentioned research in chapter 2, there are numerous interesting aspects that have not yet been considered. This is especially true for factors combining past indicators, such as returns, with future exit options. For example, one could analyse how past returns of exit options influence PE funds future exit decisions.

Furthermore, it could be interesting to look at the impact of underperforming IPOs of portfolio companies on future exit options of venture capital funds. The reasoning behind this is that venture capital funds invest in less mature and established firms. As Wright and Robbie (1998) showed, the reputation of the selling PE firm is less important than that of a selling venture capital firm. Therefore, VC funds could be more prone to reputational effects and the impact of underperforming IPOs could be more significant than for PE funds.

# References


Achleitner, A., & Figge, C. (2014). Private equity lemons? Evidence on value creation in secondary buyouts. *European Financial Management*, *20*(2), 406–433.

Alin, A. (2010). Multicollinearity. *Wiley Interdisciplinary Reviews: Computational Statistics*.

Anson, M. J. P. (2004). Trends in Private Equity. *The Journal of Wealth Management*, *7*(3), 84–91.

Axelson, U., Jenkinson, T., Strömberg, P., & Weisbach, M. S. (2013). Borrow Cheap, Buy High? The Determinants of Leverage and Pricing in Buyouts. *The Journal of Finance*, *68*(6), 2223–2267.

Balboa, M., & Martí, J. (2007). Factors that determine the reputation of private equity managers in developing markets. *Journal of Business Venturing*, *22*(4), 453–480.

Bascha, A., & Walz, U. (2001). Convertible securities and optimal exit decisions in venture capital finance. *Journal of Corporate Finance*, *7*(3), 285–306.

Baumeister, A., & Muelke, M. (2010). Private Equity Exits: German Trade and Secondary Sales in the Financial Crisis. *The Journal of Private Equity*, *13*(3), 47–56.

Belden, S., Keeley, R., & Knapp, R. (2001). Can venture capital-backed IPOs compete with seasoned public companies? *Venture Capital: An International Journal of Entrepreneurial Finance*, *3*(4), 327–336.

Benninga, S., Helmantel, M., & Sarig, O. (2005). The timing of initial public offerings. *Journal of Financial Economics*, *75*(1), 115–132.

Bernstein, S., Lerner, J., Sorensen, M., & Strömberg, P. (2016). Private equity and industry performance. *Management Science*, *63*(4), 1198–1213.

Bienz, C., & Walz, U. (2010). Venture capital exit rights. *Journal of Economics & Management*

*Strategy*, *19*(4), 1071–1116.

Bonini, S. (2015). Secondary buyouts: Operating performance and investment determinants. *Financial Management*, *44*(2), 431–470.

Brau, J. C., Francis, B., & Kohers, N. (2003). The Choice of IPO versus Takeover: Empirical Evidence. *Journal of Business*, *76*(4), 583–612.

Brav, A., & Gompers, P. A. (1997). Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies. *The Journal of Finance*, *52*(5), 1791–1821.

Bureau van Dijk. (2017, November). Value of private equity deals worldwide in 2018, by target country. Retrieved November 27, 2019, from https://www.statista.com/statistics/520845/value-of-global-private-equity-deals-by-target-country/

Cain, M. D., Davidoff Solomon, S., & Macias, A. J. (2014). Broken Promises: The Role of Reputation in Private Equity Contracting and Strategic Default. *The Journal of Corporation Law*, *40*, 565.

Cao, J. X. (2011). IPO timing, buyout sponsors' exit strategies, and firm performance of RLBOs. *Journal of Financial and Quantitative Analysis*, *46*(4), 1001–1024.

Cao, J. X., & Lerner, J. (2009). The performance of reverse leveraged buyouts. *Journal of Financial Economics*, *91*(2), 139–157.

Chamberlain, T. W., & Joncheray, F. X. (2017). The Performance of Reverse Leveraged Buyouts: Another Look. *International Advances in Economic Research*, *23*(3), 357–358.

Cumming, D. J., & Johan, S. A. (2008). Preplanned exit strategies in venture capital. *European Economic Review*, *52*(7), 1209–1241.

Cumming, D. J., & MacIntosh, J. G. (2001). Venture capital investment duration in Canada and the United States. *Journal of Multinational Financial Management*, *11*(4–5), 445–463.

Cumming, D. J., & MacIntosh, J. G. (2003). A cross-country comparison of full and partial venture capital exits. *Journal of Banking & Finance*, *27*(3), 511–548.

Cumming, D. J., & Walz, U. (2010). Private equity returns and disclosure around the world. *Journal of International Business Studies*, *41*(4), 727–754.

Damodaran, A. (2009). Ups and Downs: Valuing Cyclical and Commodity Companies. *Working Paper, Stern School of Business, New York University*.

Datta, S., Gruskin, M., & Iskandar-Datta, M. (2015). On post-IPO stock price performance: A comparative analysis of RLBOs and IPOs. *Journal of Banking and Finance*, *55*, 187–203.

Davis, S. J., Haltiwanger, J., Handley, K., Jarmin, R., Lerner, J., & Miranda, J. (2014). Private equity, jobs, and productivity. *American Economic Review*, *104*(12), 3956–3990.

Davis, S. J., Haltiwanger, J., Handley, K., Lipsius, B., Lerner, J., & Miranda, J. (2019). The Economic Effects of Private Equity Buyouts. Retrieved November 19, 2019, from www.federalreserve.gov/supervisionreg/srletters/sr1303a1.pdf,

Davis, S. J., Haltiwanger, J., Jarmin, R., Lerner, J., & Miranda, J. (2011). Private equity and employment. *Working Paper, National Bureau of Economic Research*.

Degeorge, F., Martin, J., & Phalippou, L. (2013). Is the rise of secondary buyouts good news for investors. *Working Paper, University of Lugano, University of Amsterdam, and University of Oxford*.

Degeorge, F., Martin, J., & Phalippou, L. (2016). On secondary buyouts. *Journal of Financial Economics*, *120*(1), 124–145.

Degeorge, F., & Zeckhauser, R. (1993). The reverse LBO decision and firm performance:

Theory and evidence. *The Journal of Finance*, *48*(4), 1323–1348.

Demiroglu, C., & James, C. M. (2010). The role of private equity group reputation in LBO financing. *Journal of Financial Economics*, *96*(2), 306–330.

Dorn, D. (2009). Does sentiment drive the retail demand for IPOs? *Journal of Financial and Quantitative Analysis*, *44*(1), 85–108.

F. Hair Jr, J., Sarstedt, M., Hopkins, L., & G. Kuppelwieser, V. (2014). Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. *European Business Review*, *26*(2), 106–121.

Farrar, D. E., & Glauber, R. R. (1967). Multicollinearity in regression analysis: the problem revisited. *The Review of Economic and Statistics*, 92–107.

Federal Reserve Bank of Saint Louis, F. (2019). Moody's Seasoned Baa Corporate Bond Yield Relative to Yield on 10-Year Treasury Constant Maturity. Retrieved December 5, 2019, from https://fred.stlouisfed.org/series/BAA10Y

Fenn, G. W., Liang, N., & Prowse, S. (1996). The economics of the private equity market. *Federal Reserve Bulletin*, *82*, 26.

Ferretti, R., & Meles, A. (2011). Underpricing, wealth loss for pre-existing shareholders and the cost of going public: the role of private equity backing in Italian IPOs. *Venture Capital*, *13*(1), 23–47. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/13691066.2010.543321

Folus, D., & Boutron, E. (2015). Exit Strategies in Private Equity. *Private Equity: Opportunities and Risks*, 215.

Ford, J. (2019). Elizabeth Warren is right to worry about private equity looting. Retrieved November 17, 2019, from Financial Times website: https://www.ft.com/content/f2bc6d4e-

afbd-11e9-8030-530adfa879c2

Fraser-Sampson, G. (2011). *Private equity as an asset class* (2nd Ed.). John Wiley & Sons.

Gilligan, J., & Wright, M. (2014). *Private equity demystified: An explanatory guide*. Institute of Chartered Accountants in England and Wales.

Giot, P., & Schwienbacher, A. (2007). IPOs, trade sales and liquidations: Modelling venture capital exits using survival analysis. *Journal of Banking & Finance*, *31*(3), 679–702.

Gompers, P. A., Lerner, J., Blair, M. M., & Hellmann, T. (1998). What Drives Venture Capital Fundraising? *Brookings Papers on Economic Activity. Microeconomics*, *1998*, 149.

Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics* (5th Ed.). McGraw-Hill.

Hellstrom, J. (2019). Munters flags Q4 loss in Data Centers business, shares fall - Reuters. Retrieved December 4, 2019, from Reuters website: https://www.reuters.com/article/munters-stocks/munters-flags-q4-loss-in-data-centers-business-shares-fall-idUSL8N1OE2DF

Holthausen, R. W., & Larcker, D. F. (1996). The financial performance of reverse leveraged buyouts. *Journal of Financial Economics*, *42*(3), 293–332.

Hörner, J. (2002). Reputation and competition. *American Economic Review*, *92*(3), 644–663.

Hotchkiss, E. S., Strömberg, P., & Smith, D. C. (2014). Private equity and the resolution of financial distress. *AFA 2012 Chicago Meetings Paper*.

Ibbotson, R. G., & Jaffe, J. F. (1975). "Hot issue" markets. *The Journal of Finance*, *30*(4), 1027–1042.

Ibbotson, R. G., Sindelar, J. L., & Ritter, J. R. (1994). The market's problems with the pricing of initial public offerings. *Journal of Applied Corporate Finance*, *7*(1), 66–74.

Jain, B. A., & Kini, O. (2006). Industry clustering of initial public offerings. *Managerial and*

*Decision Economics*, *27*(1), 1–20.

Jelic, R., Saadouni, B., & Wright, M. (2005). Performance of private to public MBOs: the role of venture capital. *Journal of Business Finance & Accounting*, *32*(3-4), 643–682.

Jelic, R., & Wright, M. (2011). Exits, performance, and late stage private equity: the case of UK management buy-outs. *European Financial Management*, *17*(3), 560–593.

Jenkinson, T. (2019). Here's what you should know about the IPO process. Retrieved December 3, 2019, from https://www.cnbc.com/2019/03/23/heres-what-you-should-know-about-the-ipo-process.html

Jenkinson, T., & Sousa, M. (2015). What determines the exit decision for leveraged buyouts? *Journal of Banking and Finance*, *59*, 399–408.

Jensen, M. R. H., Marshall, B. B., & Jahera, J. S. (2017). What is the Best Exit Strategy for a Private Firm: IPO or Sale? *International Journal of Business Management and Commerce*, *2*(3).

Johan, S. A., Knill, A., & Mauck, N. (2013). Determinants of sovereign wealth fund investment in private equity vs public equity. *Journal of International Business Studies*, *44*(2), 155–172.

Kaplan, S. N., & Strömberg, P. (2009). Leveraged buyouts and private equity. *Journal of Economic Perspectives*, *23*(1), 121–146.

Klein, B., & Leffler, K. B. (1981). The role of market forces in assuring contractual performance. *Journal of Political Economy*, *89*(4), 615–641.

Lee, P. M., & Wahal, S. (2004). Grandstanding, certification and the underpricing of venture capital backed IPOs. *Journal of Financial Economics*, *73*(2), 375–407.

Lerner, J. (1994). Venture capitalists and the decision to go public. *Journal of Financial*

*Economics*, *35*(3), 293–316.

Levis, M. (2011). The performance of private equity-backed IPOs. *Financial Management*, *40*(1), 253–277.

Long, S. J., & Trivedi, P. K. (1992). *Some Specificatin Tests for the Linear Regression Model*. Retrieved from https://pdfs.semanticscholar.org/bbfe/8850cd31e82c260ae6f54b30fa6c275bb6b6.pdf

Lowry, M., & Schwert, G. W. (2002). IPO market cycles: Bubbles or sequential learning? *The Journal of Finance*, *57*(3), 1171–1200.

MacArthur, H. H., & Rainey, B. (2019). Global Private Equity Report 2019. Retrieved November 27, 2019, from Bain & Company website: https://www.bain.com/contentassets/875a49e26e9c4775942ec5b86084df0a/bain_report_private_equity_report_2019.pdf

Masulis, R., & Nahata, R. (2011). Venture Capital Conflicts of Interest: Evidence from Acquisitions of Venture-Backed Firms. *Journal of Financial and Quantitative Analysis*, *46*(2), 395–430.

Masulis, R., & Thomas, R. (2009). Does Private Equity Create Wealth? The Effects of Private Equity and Derivatives on Corporate Governance. In *University of Chicago Law Review* (Vol. 76).

Megginson, W. L., & Weiss, K. A. (1991). Venture capitalist certification in initial public offerings. *The Journal of Finance*, *46*(3), 879–903.

Mian, S., & Rosenfeld, J. (1993). Takeover activity and the long-run performance of reverse leveraged buyouts. *Financial Management*, 46–57.

Michala, D. (2016). Are private equity backed initial public offerings any different? Timing,

information asymmetry and post-IPO survival. *Journal of Corporate Finance*.

Minardi, A. M. A. F., Ferrari, G. L., & Araújo Tavares, P. C. (2013). Performances of Brazilian IPOs backed by private equity. *Journal of Business Research*, *66*(3), 448–455.

Mogilevsky, V., & Murgulov, Z. (2012). "Underpricing of private equity backed, venture capital backed and non-sponsored IPOs." In *Investment Management and Financial Innovations* (Vol. 9).

Murray, G. C. (1995). Evolution and Change: An Analysis of the First Decade of the UK Venture Capital Industry. *Journal of Business Finance & Accounting*, *22*(8), 1077–1106.

Muscarella, C. J., & Vetsuypens, M. R. (1989). The underpricing of "second" initial public offerings. *Journal of Financial Research*, *12*(3), 183–192.

Neus, W., & Walz, U. (2005). Exit timing of venture capitalists in the course of an initial public offering. *Journal of Financial Intermediation*, *14*(2), 253–277.

Newbold, P., Carlson, W. L., & Thorne, B. (2013). *Statistics for business and economics*. Pearson Boston, MA.

Newlands, C. (2014). Investors launch legal battle against OW Bunker. Retrieved December 5, 2019, from Financial Times website: https://www.ft.com/content/6769a13e-8200-11e4-a9bb-00144feabdc0

Nielsen, A. P. (2015). Danish investors sue bankrupt OW Bunker for $120 mln - Reuters. Retrieved December 4, 2019, from Reuters website: https://www.reuters.com/article/denmark-owbunker/danish-investors-sue-bankrupt-ow-bunker-for-120-mln-idUSL8N0ZC1HA20150626

Pagano, M., & Röell, A. (1998). The choice of stock ownership structure: Agency costs, monitoring, and the decision to go public. *The Quarterly Journal of Economics*, *113*(1),

187–225.

Pástor, L., & Veronesi, P. (2005). Rational IPO waves. *The Journal of Finance*, *60*(4), 1713–1757.

Pindur, D. (2009). *Value creation in successful LBOs*. Springer Science & Business Media.

PitchBook Data Inc. (2017, November). Platform Data. Retrieved November 17, 2019, from https://pitchbook.com/platform-data/deals

Povaly, S. (2007). The exit process: Reducing exposure to a portfolio company. *Private Equity Exits: Divestment Process Management for Leveraged Buyouts*, 181–278.

Primack, D. (2019). Final Numbers. Retrieved November 25, 2019, from Axios Pro Rata website: https://www.axios.com/newsletters/axios-pro-rata-00730727-451b-43ee-9a73-c9adc7afaa3a.html

Ritter, J. R. (1984). The "Hot Issue" Market of 1980. *The Journal of Business*, *57*(2), 215.

Ritter, J. R. (2019). Initial Public Offerings: Updated Statistics. Retrieved from https://site.warrington.ufl.edu/ritter/files/2019/04/IPOs2018Statistics-1.pdf

Ritter, J. R., & Welch, I. (2002). A review of IPO activity, pricing, and allocations. *The Journal of Finance*, *57*(4), 1795–1828.

Sarin, A., Das, S. R., & Jagannathan, M. (2003). The private equity discount: an empirical examination of the exit of venture backed companies. *Journal of Investment Management*, *1*, 1–26.

Sharma, S. (2017). PitchBook. *Journal of Business & Finance Librarianship*, *22*(3–4), 244–247.

Sousa, M., & Jenkinson, T. (2012). Keep taking the private equity medicine? How operating performance differs between secondary deals and companies that go to public markets. *Working Paper*.

Strömberg, P. (2008). The new demography of private equity. *The Global Impact of Private Equity Report, 1*, 3–26.

Sudarsanam, P. (2005). Exit strategy for UK leveraged buyouts: Empirical evidence on determinants. *Working Paper, Cranfield School of Management.*

von Drathen, C., & Faleiro, F. (2007). The Performance of Leveraged Buyout-Backed Initial Public Offerings in the UK. *Working Paper, London Business School*.

Wall, J., & Smith, J. (1997). *Better exits*. European Venture Capital Association.

Wang, C. K., & Sim, V. Y. L. (2001). Exit strategies of venture capital-backed companies in Singapore. *Venture Capital*, *3*(4), 337–358.

Wang, Y. (2012). Secondary buyouts: Why buy and at what price? *Journal of Corporate Finance*, *18*(5), 1306–1325.

Whaley, M., & Semler, F. (2002). *International Business Acquisitions: Major Legal Issues and Due Diligence*. London: Kluwer Law International.

Wooldridge, J. M. (2016). *Introductory econometrics: A modern approach*. Nelson Education.

Wooldrige, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data*.

Wright, M., & Robbie, K. (1998). Venture capital and private equity: A review and synthesis. *Journal of Business Finance & Accounting*, *25*(5 & 6), 521–570.

Yung, C., Çolak, G., & Wang, W. (2008). Cycles in the IPO market. *Journal of Financial Economics*, *89*(1), 192–208.

# Appendix

## Appendix A

**Table 6: PitchBook and S&P 500 Industry Match**

| **PitchBook Industries** | **S&P 500 Equivalent** |
|---|---|
| Agriculture | Materials |
| Apparel and Accessories | Consumer Discretionary |
| Capital Markets/Institutions | Financials |
| Chemicals and Gases | Materials |
| Commercial Banks | Financials |
| Commercial Products | Consumer Discretionary |
| Commercial Services | Industrials |
| Commercial Transportation | Industrials |
| Communications and Networking | Communication Services |
| Computer Hardware | Information Technology |
| Construction (Non-Wood) | Materials |
| Consumer Durables | Consumer Discretionary |
| Consumer Non-Durables | Consumer Staples |
| Containers and Packaging | Materials |
| Energy Equipment | Energy |
| Energy Services | Energy |
| Exploration, Production and Refining | Energy |
| Forestry | Materials |
| Healthcare Devices and Supplies | Health Care |
| Healthcare Services | Health Care |
| Healthcare Technology Systems | Health Care |
| Insurance | Financials |
| IT Services | Information Technology |
| Media | Communication Services |
| Metals, Minerals and Mining | Materials |
| Other Business Products and Services | Real Estate |
| Other Consumer Products and Services | Consumer Discretionary |
| Other Energy | Energy |
| Other Financial Services | Financials |
| Other Healthcare | Health Care |
| Other Materials | Materials |

| | |
|---|---|
| Pharmaceuticals and Biotechnology | Health Care |
| Restaurants, Hotels and Leisure | Consumer Discretionary |
| Retail | Consumer Discretionary |
| Semiconductors | Information Technology |
| Services (Non-Financial) | Consumer Discretionary |
| Software | Information Technology |
| Textiles | Consumer Discretionary |
| Transportation | Industrials |
| Utilities | Utilities |

**Figure 8: Share of Transactions per Industry**

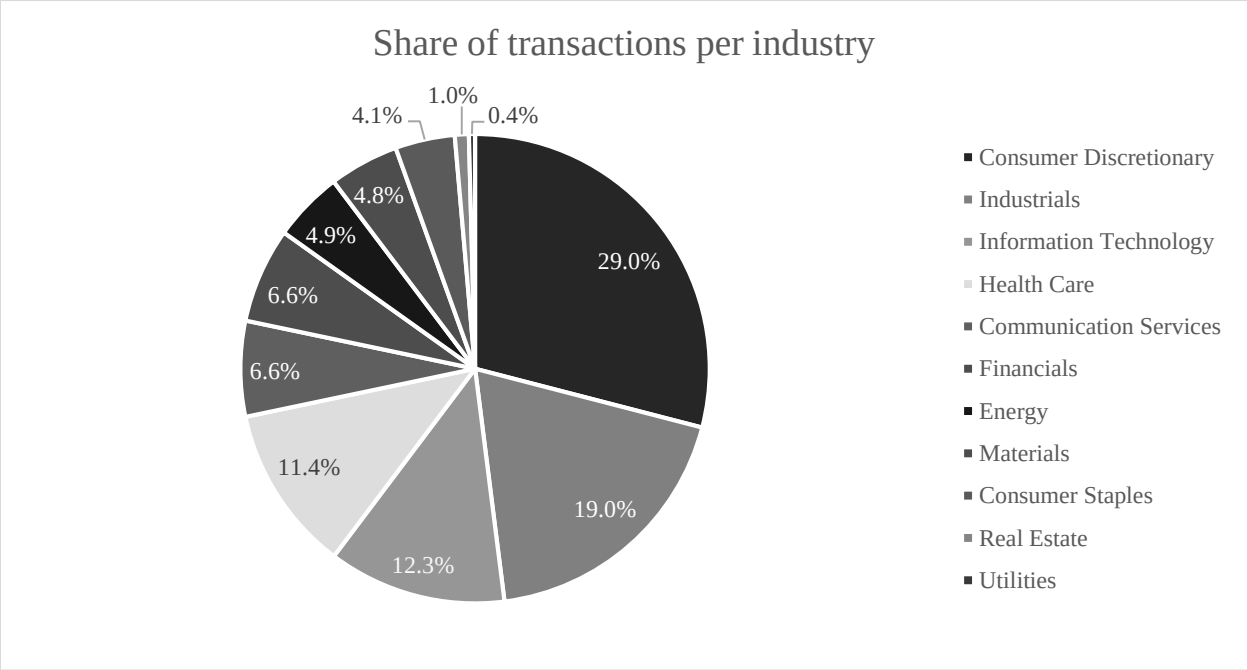


**Table 7: Number of US IPOs, PE Backed IPOs and PE Backed M&As per Year**

| Year | US IPOs | PE Backed IPOs | PE Backed M&As | PE Backed IPOs to all PE Backed Transactions |
|---|---|---|---|---|
| 1999 | 476 | 49 | 40 | 55.1% |
| 2000 | 380 | 24 | 35 | 40.7% |
| 2001 | 79 | 26 | 20 | 56.5% |
| 2002 | 66 | 19 | 41 | 31.7% |
| 2003 | 63 | 19 | 83 | 18.6% |
| 2004 | 173 | 49 | 123 | 28.5% |
| 2005 | 159 | 57 | 162 | 26.0% |
| 2006 | 157 | 41 | 164 | 20.0% |
| 2007 | 159 | 39 | 219 | 15.1% |
| 2008 | 21 | 8 | 116 | 6.5% |
| 2009 | 41 | 21 | 59 | 26.3% |
| 2010 | 91 | 32 | 175 | 15.5% |
| 2011 | 81 | 23 | 181 | 11.3% |
| 2012 | 93 | 27 | 260 | 9.4% |
| 2013 | 157 | 47 | 192 | 19.7% |
| 2014 | 206 | 45 | 273 | 14.2% |
| 2015 | 118 | 27 | 267 | 9.2% |
| 2016 | 75 | 21 | 250 | 7.7% |
| 2017 | 107 | 24 | 290 | 7.6% |
| 2018 | 134 | 18 | 297 | 5.7% |
| 2019* | n.a. | 10 | 168 | 5.6% |
| **Sum** | **2,836** | **626** | **3,415** | **15.5%** |

*until 30/09/2019

**Table 8: Definition of Used Variables in Regressions**

| Variables Used in Regressions | |
|---|---|
| IPO Activity | Absolute number of IPOs in the USA for a given year |
| Credit Spread | Daily Moody's Seasoned Baa Corporate Bond Yield Relative to Yield on 10-Year Treasury Constant |
| Equity Value | Equity value (in USD m) of the listed firm at the time of the exit, transformation: Ln(Equity Value) |
| Return | Return of the listed stock relative to assigned industry index, from IPO date to the selected time horizon, i.e. six, twelve, eighteen months after IPO, transformation: Ln(1+return) |
| Underperforming IPO | Dummy variable, which equals "one" if conditions of underperforming are met, otherwise "0" |

# Appendix B

**Figure 9: Histogram of the Return after Logarithmic Transformation**

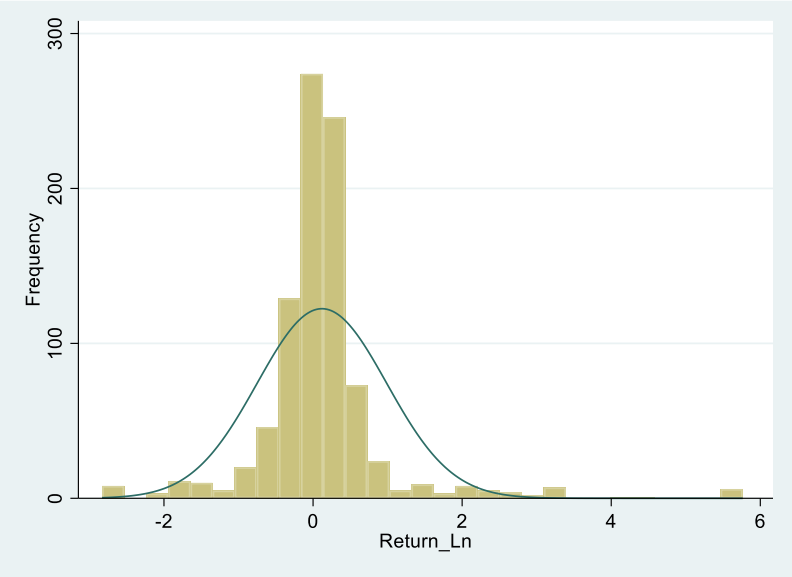



**Figure 10: Histogram of the Equity Value after Logarithmic Transformation**

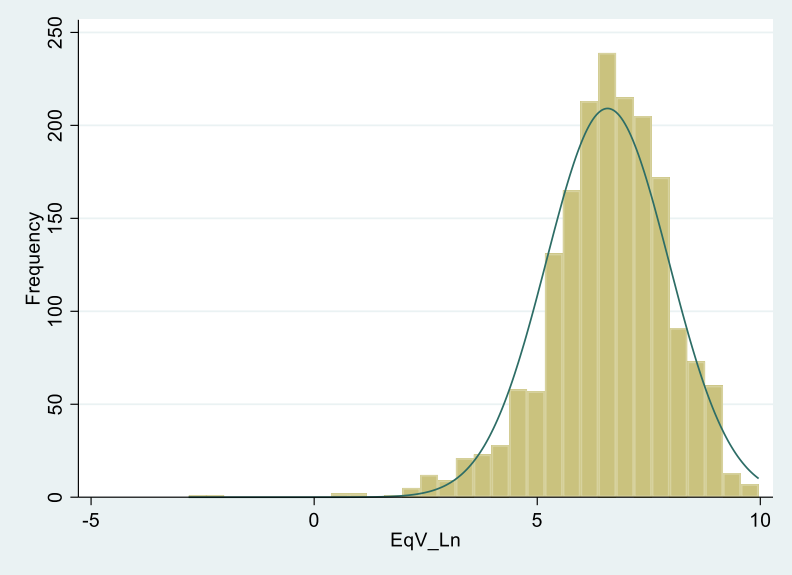
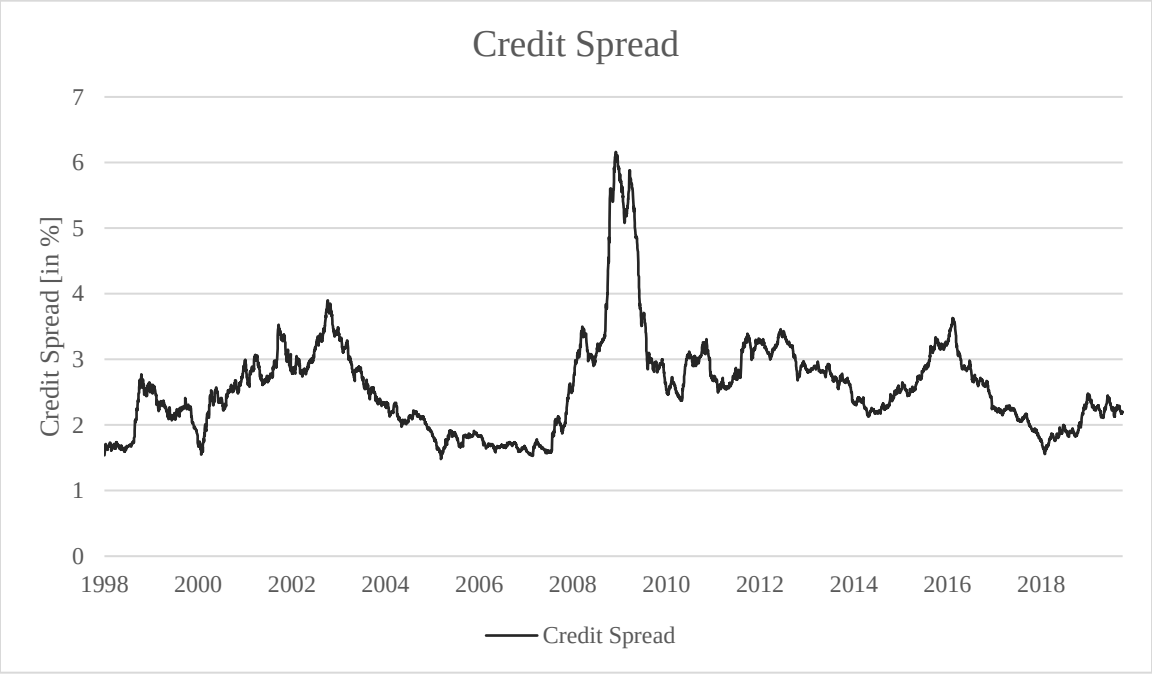


**Figure 11: Credit Spread - Moody's Yield of Baa Corporate Bond to 10-Year Treasury**



# Appendix C

**Figure 12: ROC Curve of the Probit Model**

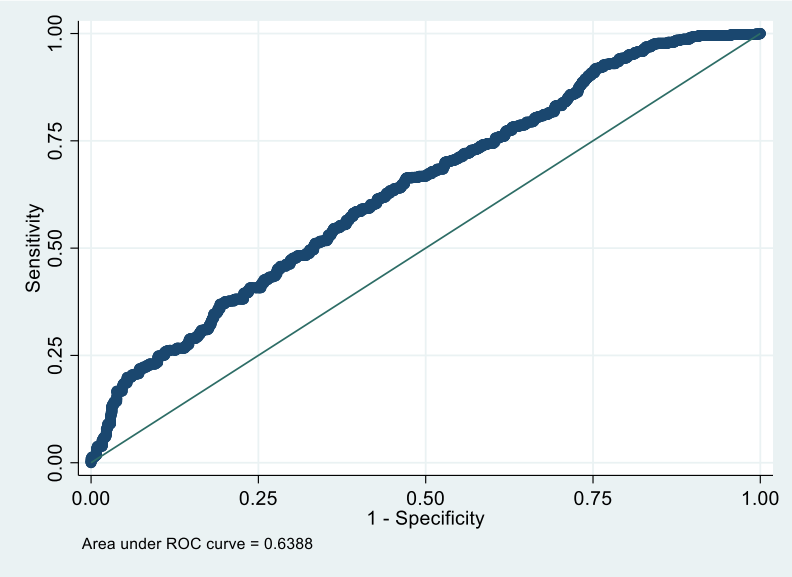



**Table 9: OLS Full Model - Regression Output**

| VARIABLES | (1)<br>24-6 | (2)<br>24-12 | (3)<br>24-18 | (4)<br>36-6 | (5)<br>36-12 | (6)<br>36-18 |
|---|---|---|---|---|---|---|
| IPO Activity | 0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Credit Spread | 0.102*** | 0.117*** | 0.095*** | 0.079*** | 0.072** | 0.072** |
| | (0.032) | (0.031) | (0.032) | (0.029) | (0.029) | (0.029) |
| Equity Value | -0.010 | -0.013 | -0.012 | -0.025** | -0.023* | -0.023* |
| | (0.014) | (0.014) | (0.012) | (0.013) | (0.013) | (0.013) |
| Return | 0.001 | 0.012 | -0.002 | 0.002 | 0.008 | 0.008 |
| | (0.021) | (0.020) | (0.020) | (0.019) | (0.019) | (0.019) |
| Dummy Bad IPO | -0.031 | -0.014 | 0.003 | 0.015 | 0.015 | 0.014 |
| | (0.074) | (0.073) | (0.054) | (0.057) | (0.059) | (0.061) |
| Constant | -0.282** | -0.290** | -0.201 | -0.103 | -0.114 | -0.114 |
| | (0.140) | (0.135) | (0.132) | (0.126) | (0.124) | (0.124) |
| Observations | 732 | 732 | 732 | 732 | 732 | 732 |
| Adjusted $R^2$ | 0.008 | 0.019 | 0.025 | 0.012 | 0.012 | 0.012 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table 10: OLS Full Model – Robustness Tests**

| | (1) 24-6 | (2) 24-12 | (3) 24-18 | (4) 36-6 | (5) 36-12 | (6) 36-18 |
|---|---|---|---|---|---|---|
| **Variance Inflation Factor** | | | | | | |
| IPO Activity | 1.22 | 1.22 | 1.22 | 1.22 | 1.22 | 1.22 |
| Credit Spread | 1.21 | 1.21 | 1.21 | 1.21 | 1.21 | 1.22 |
| Equity Value | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 |
| Return | 1.09 | 1.07 | 1.07 | 1.12 | 1.12 | 1.12 |
| Dummy Bad IPO | 1.05 | 1.04 | 1.04 | 1.08 | 1.08 | 1.09 |
| **Mean VIF** | **1.12** | **1.12** | **1.12** | **1.14** | **1.14** | **1.14** |
| **Ramsey Reset Test** | | | | | | |
| F(.) | 1.23 | 1.03 | 1.00 | 0.73 | 0.77 | 0.73 |
| Prob > F | 0.2970 | 0.3800 | 0.3900 | 0.5349 | 0.5137 | 0.5340 |
| **Breusch Pagan Test** | | | | | | |
| $Chi^2(1)$ | 0.09 | 0.97 | n.a.* | 0.01 | 0.37 | 0.35 |
| Prob > $Chi^2$ | 0.7581 | 0.3249 | n.a. | 0.9293 | 0.5445 | 0.5565 |

*heteroscedastic estimator

**Table 11: OLS Best Fitted Model - Robustness Tests**

| | (1) 24-6 | (2) 24-12 | (3) 24-18 | (4) 36-6 | (5) 36-12 | (6) 36-18 |
|---|---|---|---|---|---|---|
| **Variance Inflation Factor** | | | | | | |
| IPO Activity | | | | | | |
| Credit Spread | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Equity Value | | | | 1.00 | 1.00 | 1.00 |
| **Mean VIF** | **1.00** | **1.00** | **1.00** | **1.00** | **1.00** | **1.00** |
| **Ramsey Reset Test** | | | | | | |
| F(.) | 2.52 | 2.19 | 1.17 | 0.72 | 0.55 | 0.55 |
| Prob > F | 0.0571 | 0.0877 | 0.3218 | 0.5392 | 0.6503 | 0.6503 |
| **Breusch Pagan Test** | | | | | | |
| $Chi^2(1)$ | 2.43 | 1.75 | n.a. | 0.13 | 0.04 | 0.04 |
| Prob > $Chi^2$ | 0.1193 | 0.1853 | n.a. | 0.7184 | 0.8336 | 0.8336 |

**Figure 13: Scatter Plot – Return to Change in IPO Probability**


**Table 12: OLS Full Model with Return Condition - Regression Output**

| VARIABLES | (1)<br>24-6 | (2)<br>24-12 | (3)<br>24-18 | (4)<br>36-6 | (5)<br>36-12 | (6)<br>36-18 |
|---|---|---|---|---|---|---|
| IPO Activity | -0.001 | -0.002 | -0.002 | -0.001 | -0.001 | -0.002* |
| | (0.001) | (0.002) | (0.002) | (0.001) | (0.002) | (0.001) |
| Credit Spread | -0.110 | -0.164 | -0.097 | 0.041 | 0.111 | -0.025 |
| | (0.100) | (0.150) | (0.121) | (0.090) | (0.281) | (0.124) |
| Equity Value | 0.012 | 0.018 | -0.036 | -0.018 | -0.045 | -0.033 |
| | (0.031) | (0.045) | (0.037) | (0.028) | (0.067) | (0.032) |
| Return | 0.180** | 0.300* | 0.203 | 0.099 | -1.165 | 0.118 |
| | (0.084) | (0.174) | (0.150) | (0.071) | (1.743) | (0.073) |
| Constant | 0.336 | 0.519 | 0.745 | 0.136 | -0.321 | 0.542 |
| | (0.428) | (0.579) | (0.511) | (0.361) | (1.154) | (0.486) |
| Observations | 42 | 39 | 39 | 61 | 21 | 51 |
| Adjusted $R^2$ | 0.035 | -0.013 | -0.011 | 0.044 | -0.098 | 0.123 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table 13: OLS Full Model with Return Condition - Robustness Tests**

| | (1) 24-6 | (2) 24-12 | (3) 24-18 | (4) 36-6 | (5) 36-12 | (6) 36-18 |
|---|---|---|---|---|---|---|
| **Variance Inflation Factor** | | | | | | |
| IPO Activity | 1.78 | 1.84 | 1.75 | 1.71 | 2.43 | 2.35 |
| Credit Spread | 2.04 | 2.32 | 1.86 | 1.90 | 2.26 | 2.44 |
| Equity Value | 1.07 | 1.12 | 1.11 | 1.08 | 1.12 | 1.02 |
| Return | 1.16 | 1.28 | 1.08 | 1.10 | 1.29 | 1.06 |
| **Mean VIF** | **1.51** | **1.64** | **1.45** | **1.45** | **1.77** | **1.72** |
| **Ramsey Reset Test** | | | | | | |
| F(.) | 1.03 | 1.29 | 0.66 | 0.53 | 0.03 | 0.72 |
| Prob > F | 0.3933 | 0.2952 | 0.5802 | 0.6663 | 0.9925 | 0.5446 |
| **Breusch Pagan Test** | | | | | | |
| $Chi^2(1)$ | 1.21 | 0.00 | 0.24 | 1.23 | 0.14 | 0.00 |
| Prob > $Chi^2$ | 0.2710 | 0.9736 | 0.6238 | 0.2676 | 0.7125 | 0.9749 |

**Table 14: OLS Best Fitted Model with Return Conditions - Robustness Tests**

| | (1) 24-6 | (2) 24-12 | (3) 24-18 | (4) 36-6 | (5) 36-12 | (6) 36-18 |
|---|---|---|---|---|---|---|
| **Variance Inflation Factor** | | | | | | |
| IPO Activity | | | | 1.01 | | 1.02 |
| Equity Value | | | | | | |
| Return | 1.00 | 1.00 | n.a. | 1.01 | n.a. | 1.02 |
| **Mean VIF** | **1.00** | **1.00** | **n.a.** | **1.01** | **n.a.** | **1.02** |
| **Ramsey Reset Test** | | | | | | |
| F(.) | 1.25 | 2.32 | n.a. | 0.87 | n.a. | 0.65 |
| Prob > F | 0.3053 | 0.0932 | n.a. | 0.4628 | n.a. | 0.5851 |
| **Breusch Pagan Test** | | | | | | |
| $Chi^2(1)$ | 0.68 | 1.31 | n.a. | 0.88 | n.a. | 0.00 |
| Prob > $Chi^2$ | 0.4108 | 0.2525 | n.a. | 0.3477 | n.a. | 0.9595 |

**Table 15: Time Fixed Effects Model - Regression Output**

| VARIABLES | (1)<br>24-6 | (2)<br>24-12 | (3)<br>24-18 | (4)<br>36-6 | (5)<br>36-12 | (6)<br>36-18 |
|---|---|---|---|---|---|---|
| IPO Activity | 0.000 | 0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Equity Value | -0.017 | -0.014 | -0.010 | -0.036*** | -0.026* | -0.026* |
| | (0.015) | (0.015) | (0.015) | (0.014) | (0.014) | (0.014) |
| Credit Spread | 0.078 | 0.111* | 0.088 | 0.047 | 0.057 | 0.057 |
| | (0.069) | (0.066) | (0.067) | (0.062) | (0.061) | (0.061) |
| Dummy Bad IPO | 0.019 | 0.007 | -0.000 | -0.007 | -0.011 | -0.013 |
| | (0.075) | (0.075) | (0.076) | (0.058) | (0.060) | (0.063) |
| Return | -0.002 | 0.014 | 0.001 | -0.009 | 0.004 | 0.004 |
| | (0.021) | (0.020) | (0.020) | (0.019) | (0.019) | (0.019) |
| Years | | | | | | |
| 2000 | -0.193 | -0.191 | -0.216 | -0.077 | -0.063 | -0.063 |
| | (0.161) | (0.156) | (0.157) | (0.145) | (0.143) | (0.143) |
| 2001 | -0.297 | -0.165 | -0.026 | -0.116 | -0.018 | -0.018 |
| | (0.282) | (0.273) | (0.275) | (0.254) | (0.251) | (0.251) |
| 2002 | -0.075 | -0.013 | 0.002 | -0.316 | -0.301 | -0.301 |
| | (0.303) | (0.294) | (0.296) | (0.273) | (0.270) | (0.270) |
| 2003 | 0.090 | 0.135 | 0.317 | -0.015 | 0.014 | 0.014 |
| | (0.299) | (0.290) | (0.292) | (0.270) | (0.266) | (0.266) |
| 2004 | 0.117 | 0.065 | 0.008 | -0.074 | -0.109 | -0.109 |
| | (0.209) | (0.203) | (0.204) | (0.189) | (0.186) | (0.186) |
| 2005 | -0.035 | -0.061 | -0.065 | -0.085 | -0.109 | -0.109 |
| | (0.216) | (0.209) | (0.211) | (0.195) | (0.192) | (0.192) |
| 2006 | -0.172 | -0.175 | -0.101 | -0.181 | -0.157 | -0.157 |
| | (0.221) | (0.214) | (0.215) | (0.199) | (0.196) | (0.196) |
| 2007 | 0.010 | 0.020 | -0.000 | -0.126 | -0.092 | -0.091 |
| | (0.219) | (0.212) | (0.214) | (0.198) | (0.195) | (0.195) |
| 2008 | -0.303 | -0.345 | -0.354 | -0.395 | -0.405 | -0.404 |
| | (0.375) | (0.363) | (0.366) | (0.338) | (0.334) | (0.334) |
| 2009 | 0.278 | 0.188 | 0.157 | 0.135 | 0.055 | 0.056 |
| | (0.303) | (0.293) | (0.295) | (0.273) | (0.270) | (0.270) |
| 2010 | 0.009 | -0.058 | -0.026 | 0.022 | 0.008 | 0.008 |
| | (0.266) | (0.257) | (0.259) | (0.239) | (0.237) | (0.237) |
| 2011 | 0.003 | -0.012 | 0.015 | 0.066 | -0.010 | -0.009 |
| | (0.270) | (0.261) | (0.263) | (0.243) | (0.240) | (0.240) |
| 2012 | 0.099 | 0.032 | -0.012 | -0.027 | -0.064 | -0.063 |
| | (0.268) | (0.259) | (0.261) | (0.241) | (0.238) | (0.239) |
| 2013 | 0.042 | -0.063 | -0.094 | -0.078 | -0.160 | -0.160 |
| | (0.220) | (0.213) | (0.214) | (0.198) | (0.196) | (0.196) |
| 2014 | -0.010 | -0.013 | 0.026 | -0.009 | -0.007 | -0.007 |
| | (0.187) | (0.181) | (0.182) | (0.168) | (0.166) | (0.166) |
| 2015 | -0.108 | -0.114 | -0.022 | -0.099 | -0.118 | -0.119 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.251) | (0.243) | (0.245) | (0.226) | (0.223) | (0.223) |
| 2016 | 0.017 | -0.118 | -0.091 | -0.149 | -0.199 | -0.199 |
| | (0.284) | (0.275) | (0.277) | (0.255) | (0.252) | (0.252) |
| 2017o | 0.105 | 0.011 | -0.060 | 0.055 | -0.036 | -0.036 |
| | (0.255) | (0.247) | (0.249) | (0.229) | (0.227) | (0.227) |
| 2018 | -0.038 | -0.053 | -0.109 | -0.109 | -0.135 | -0.135 |
| | (0.245) | (0.237) | (0.239) | (0.220) | (0.218) | (0.218) |
| 2019 - omitted | - | - | - | - | - | - |
| | | | | | | |
| Constant | -0.206 | -0.258 | -0.208 | 0.111 | 0.034 | 0.034 |
| | (0.370) | (0.358) | (0.361) | (0.333) | (0.329) | (0.329) |
| | | | | | | |
| Observations | 732 | 732 | 732 | 732 | 732 | 732 |
| Adjusted $R^2$ | 0.040 | 0.034 | 0.027 | 0.033 | 0.024 | 0.024 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix D

## Interview Quotes

### Fund Manager A at a Swedish Institutional Investment Funds

*"Many investors have long memory! - The people losing money from an investment, for instance in connection with an IPO, are likely to be less interested in investing in new companies from that manager. After a bad experience it will be more difficult, for a long period of time, for a manager to IPO another company on that stock exchange. However, sometimes it is more of a local or regional problem. Investors in different geographies may have different views of the same manager. A number of other topics will also be important and have influence on a managers reputation and not only the most recent IPO"*

*"Reputation is extremely important, as it attracts the best employees, gives access to larger deal flow as companies want to work with you, attracts more capital and is in itself a reinforcing factor"*

*"A Manager's reputation is clearly coloured by how successful he is in IPO-ing his portfolio companies. Several poorly executed IPOs will eventually give the Manager a bad reputation. Before you participate in a IPO again you will clearly wait to see a couple of successful exits first. On the other hand, if a Manager is known for successful IPOs people will want to come back and invest again."*

*"It could be prudent to leave some money on the table instead of maximizing the IPO value in order for the new owners to have some upside."*

**Fund Manager B at a Swedish Institutional Investment Funds**

*“The reputation of the selling private equity fund is a soft factor. We look more at the holding duration and since when the management is in place. If it is a quick-flip, we will push harder on the valuation."*

*“During an IPO-process the contact with the seller is non-existent. We only talk to management and the investment banks."*

*“With regard to time horizons, I am judged on a three- to five-year performance. However, I believe professionals in the finance industry judge the success of an IPO after six to eighteen months.”*

*”In the last couple of years, there were a few high-profile underperforming IPOs of well-known private equity funds in the Nordics. It will be interesting to see if those will have an impact on the funds."*

*"We focus on the company when considering an investment. You can be unlucky three times in a row as some things are just not in your control. Probably there would be some more pressure on valuation but given the right price we would still be happy to invest."*

*"I don't believe that PEs intentionally sell you lemons, they have to play the long-term game as well."*

*"The exit decision depends on so many things, it is very specific for every company."*

**Partner at Swedish Private Equity Fund A**

*"In general, there is not a very frequent dialogue between private equity funds and institutional investors in the public markets, but they have good and professional relationships. In an IPO process, we do not typically meet with the potential investors, as this is the task of the company's management and the investment banks, unless it is a larger anchor investor acquiring a strategic stake."*

*"Before we acquire a company, we already have a view on potential exit options as this is a vital part of our investment hypothesis. Naturally, it is better to have more exit options available."*

*"In general, we rarely speak to institutional investors, even though we probably should do it more often. In an IPO process specifically, we do not talk to potential investors, as this is the task of the company's management and the investment banks."*

*"Your reputation as a seller does have an impact, especially since you have a short time period for your investment decision and limited information. However, it will be very rarely a deal-breaker. It will more likely affect the valuation."*

*"Ideally you underprice the IPO just so much that it goes up in the beginning, but of course you cannot leave too much money on the table. If the share price tanks you will get blamed by IPO-investors, irrespective of the reasons."*

*"If you have a bad IPO, the impact will most likely be quite local. And it is important to note that it will not stop you from IPO'ing the next asset. For that, you would probably need to have a real series of severely underperforming listings."*

**Partner at Swedish Private Equity Fund B**

*"In general, we choose the exit route that will maximise our return. But other factors such as the degree of sell down, deal certainty and the process will also be considered."*

*"Investors look first and foremost at the asset they are buying into, the selling PE might be a soft factor, but I don't think that it necessarily has that much of an impact unless the GP has a history of poor performing IPOs."*

*"I remember listing a company whose share price went south quite badly shortly after a misleading news article. The investors came to us to get our point of view on the story and we could very well clarify the situation. I don't think our reputation took any damage from that situation."*

*"In 2008 the situation was that if you didn't have to sell, you would just wait. The LPs can give the fund a lifetime extension and are often happy to that in such a situation, so you wait for the upswing."*

**Managing Director at a Global Investment Bank**

*"A family-owned company will sometimes be more positively received by potential investors than a PE-backed firm, as investors tend to question whether there are any considerable upside potentials left, especially after long periods under PE ownership."*

*"In general, I do not think that investors care a lot about who the selling PE firm is, if it is a well-know and reputable investor. However, if several IPOs of the same PE firm fail or underperform consecutively, investors might get cautious on other offerings of this investor."*