

**IPO UNDERPRICING AND PERFORMANCE BY
PRIVATE EQUITY-BACKED ENTITIES IN NORDIC
COUNTRIES 2005-2020**

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ABSTRACT

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Abstract <p>The purpose of the study is to explore the underpricing of Initial Public Offerings (IPO) made by private equity-backed entities and their post-IPO performance in the Nordic region from 2005-2020. This study focuses on understanding the pre-listing ownership effect on underpricing and the post-IPO performance, answering the following questions: (1) How does underpricing occur in PE-backed IPOs compared to non-sponsored IPOs? (2) How do PE-backed IPOs perform post-IPO compared to non-sponsored IPOs? and (3) How do VC-backed IPOs perform post-IPO compared to BO-backed IPOs? The results of the study show that neither private equity backing nor offer size significantly explains underpricing or 3-year performance.</p> <p>IPOs have been a popular topic among researchers for decades, with IPO underpricing and long-term underperformance being well-documented anomalies. Despite the extensive prior literature on these anomalies, there is a notable lack of research on how pre-IPO ownership affects IPO performance. This study is motivated by the lack of research on sponsored and non-sponsored IPOs in the Nordic region. Additionally, only a few previous studies have categorized IPOs based on buyouts, venture capital, and non-sponsored ownership, adding novelty to this research field. This study seeks to provide more evidence into these specific IPO categories within this context.</p> <p>This study uses a quantitative method, with data mainly collected from the Refinitiv database. Underpricing is analyzed using raw initial returns and market-adjusted initial returns. Post-IPO performance is measured using the wealth relative method. OMX Nordic 40 index is used as the benchmark index.</p> <p>The study shows that sponsored IPOs experience larger underpricing than non-sponsored IPOs, even though the difference is not statistically significant, contradicting previous literature. Post-IPO performance is superior for sponsored IPOs when initial returns are included, aligning with prior literature. Venture-backed IPOs outperform buyout-backed IPOs in terms of underpricing and post-IPO performance when initial returns are included, consistent with some previous research.</p>	
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TIIVISTELMÄ

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Tiivistelmä <p>Tutkimuksen tavoitteena on tutkia pääomasijoittajien tekemien listautumisantien alihinnoittelu ja suorituskykyä Pohjoismaissa 2005–2020. Tutkimuksessa keskitytään selittämään listausta edeltävän omistussuhteen vaikutusta alihinnoitteluun ja listautumisannin jälkeiseen suorituskykyyn. Tutkimuksessa vastataan seuraaviin kysymyksiin: (1) Miten alihinnoittelu ilmenee sponsoroiduissa listautumisissa verrattuna ei-sponsoroituihin anteihin? (2) Kuinka sponsoroidut listautumiset suoriutuvat listautumisen jälkeen verrattuna ei-sponsoroituihin anteihin? ja (3) Kuinka venture capital -annit suoriutuvat listautumisen jälkeen verrattuna buyout-anteihin? Tutkimuksen tulokset osoittavat, että pääomasijoittajien tuki tai annin koko ei selitä merkittävästi listautumisen alihinnoitteluä eikä 3 vuoden suoriutumista.</p> <p>Listautumisannit ovat olleet suosittu aihe tutkijoiden keskuudessa viime vuosikymmeninä, ja listautumisantien alihinnoittelu ja pitkän ajan alisuoriutuminen ovat laajasti dokumentoituja ilmiöitä. Tutkimusnäyttöä Pohjoismaiden sponsoroiduista (buyout- ja venture capital) ja ei-sponsoroiduista listautumisista on hyvin vähän, minkä vuoksi tämän tutkimuksen tarkoituksena on lisätä ymmärrystä tästä aihepiiristä.</p> <p>Tutkimus on tehty kvantitatiivisella tutkimusmenetelmällä ja tutkimuksessa käytetty data on pääosin kerätty Refinitiv-datapalvelusta. Tutkimuksessa alihinnoittelu on laskettu käyttämällä raakatuottoa sekä markkinakorjattua tuottoa. Listautumisen jälkeinen suorituskyky on laskettu suhteellisen varallisuuden menetelmällä (Wealth relative, WR). OMX Nordic 40 indeksiä on käytetty tutkimuksessa vertailuindeksinä.</p> <p>Tutkimuksen tulokset osoittavat, että pääomasijoittajien tekemät listautumisannit ovat enemmän alihinnoiteltuja kuin ei-pääomasijoittajien tekemät, vaikka ero ei ole tilastollisesti merkitsevä. Kun tutkitaan listautumisannin jälkeistä suorituskykyä lyhyellä ja pitkällä aikavälillä, tulokset osoittavat, että pääomasijoittajien tekemisen antien suorituskyky on parempi, kun ensimmäisen päivän alkutuotto sisällytetään tuottoihin.</p>	
Asiasanat Listautumisanti, alihinnoittelu, pääomasijoittaminen, venture capital, buyout, Pohjoismaiden osakemarkkinat, anomaliat	
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1 INTRODUCTION

Initial Public Offering (IPO) symbolizes a significant milestone in the company's lifeline. Public markets offer access to equity financing and allow diversification of the shareholders' investment portfolios, making them a popular exit strategy for venture capital investors (Ljungqvist 2007, 378). One of the often-repeated clichés is that companies must grow to survive. Growing a business requires a lot of cash. IPO presents a company with the opportunity to raise equity capital, which can be utilized to finance and grow its business (Geddes 2003, 1). If a company does not meet specific criteria, the stock exchange may not be the best option for securing financing. In such cases, venture capital or private equity investors step in to provide the necessary capital (Demaria 2013, 9).

The underpricing anomaly has interested researchers for decades and several well-known researchers have documented the existence of this phenomenon (Ibbotson and Jaffe 1975; Keloharju 1993; Ritter 1984). New issues are usually underpriced, indicating that the stock price is expected to peak on the first trading day. This underpricing phenomenon is often referred to as companies leaving "money on the table". In the U.S. market, the average underpricing discount has been around 19 % since the 1960s. This means that companies leave billions of dollars "on the table" in the U.S. stock market alone (Ljungqvist 2007, 376-378). In addition to the underpricing anomaly, the long-term underperformance of IPOs has been a popular topic among researchers. Many studies have reported the existence of IPO long-term underperformance globally (Aggarwal and Rivoli 1990; Hahl, Vähämaa, and Äijö 2014; Keloharju 1993).

During the past decade, there has been an increasing number of IPOs, although the trend has been variable. Between 1980 and 2001, the United States witnessed more than one firm going public each business day (Ritter and Welch 2002, 2). Nasdaq (2022) reports that 2021 was a historic year for European markets, welcoming the highest number of new IPOs to the public market. The statistics highlight the Nordic IPO market: Sweden currently leads Europe with the highest number of public companies. Nordic countries stand out because of their ability to attract medium and small enterprises to go to the public market. The Helsinki Stock Exchange experienced its most successful year in 2021 since 1999, seeing 31 new IPOs. The U.S. market also experienced a remarkable year in 2021, with over 700 IPOs on the Nasdaq U.S. market, including the largest IPO by proceeds and the most significant direct listing in Nasdaq's history (Nasdaq 2022). The quantity of IPOs has varied significantly over the last decades: after the financial crisis, Finland's stock market saw only one IPO during the period 2008-2011 (Kauppalehti 2015).

Nowadays, private equity transactions are a key component in the world of modern finance. The private equity sector's fundraising has seen substantial growth after the 1980s. Both venture capital and buyout funds have raised approximately \$1.8 trillion since this period (Cendrowski, Martin, Petro, and Wadecki 2012, 3). Venture capital funds provide capital to companies that might face difficulties getting financing in other ways. Common to these companies is

that they are young, and small-sized representing high-risk investments and operating in rapidly changing markets (Gompers and Lerner 2001, 145). An initial public offering provides an exit opportunity for venture capital investors. Conducting an IPO is a common practice to make an exit from a portfolio company. In the U.S. market, issuing an IPO is a popular exit way for venture capital investors: in 1991-1994 a total of 1059 venture-backed IPOs were issued, averaging 175 annually (Black and Gilson 1998, 243-244, 247).

Buyout deals play a significant role in the market of private equity. Between 2003 and 2006, total commitments to private equity funds increased by 260%, totaling over \$400 billion, with buyout deals constituting the majority of this amount (Cornelius, Langelaar, and Rossum 2007, 2, 4). In contrast to venture capital funds which focus on more young and high-risk investments, buyout funds focus on more mature companies that have more established businesses (Ljungqvist, Richardson, and Wolfenzon 2020, 3). Companies with superior performance and high growth are not ideal targets for buyout funds. Instead, buyout funds focus on small to medium-sized companies that require restructuring (Cornelius, Langelaar, and Rossum 2007, 4).

Since the Financial Crisis, the private equity markets have enjoyed favorable market conditions. Fundraising and deal flow have grown steadily since. The trend continued even in the COVID-19-affected markets. Markets still enjoyed a tailwind from the liquidity provided by the central banks. However, the trend experienced a noticeable change at the beginning of 2023. Banks were unwilling to lend money, valuations, and earnings fell, and PE deals declined (McKinsey and Company 2023). According to Reuters (2023), the trading volume of private equity firms in 2023 is at its lowest point in four years. The threat of a recession, increasing interest rates, and weak corporate earnings are contributing to pressure and uncertainty in global markets. Higher rates make private equity investments more expensive, and PE companies have struggled to secure inexpensive debt. Higher capital costs have reduced the number of deals and avoided investing in companies that have uncertain cashflows (Reuters 2023).

Despite the volatile market conditions in recent years, Pitchbook (2023) reported that the Nordic private equity market showed greater resilience to geopolitical uncertainty and higher interest rates compared to the rest of Europe in 2022. Overall, the decline in Nordic exits was less severe compared to the rest of Europe in 2022. While European exits decreased by 45.1%, the Nordics experienced only a 24% drop. Despite this decrease, 2022 was the second-best year for exits in the Nordic region's history, demonstrating the region's resilience against broader European trends. The number of PE deals in 2022 remained consistent with levels of 2021, with Sweden attracting the majority of PE deals in the Nordic region. Overall, Sweden is a major player in the European private equity market, ranking among the top five countries for venture capital deals in Europe in 2022. In the same year, Finland ranks 13th in venture capital deals in Europe. In total, the Nordic countries account for 12% of the total private equity activity in Europe in 2022 (Pitchbook 2023, 3-5, 12).

The Finnish private equity market achieved a record amount of capital raised for growth funds in 2021. Finnish growth funds set a record by raising a total of 1.2 billion euros in total. Notably, the Finnish private equity sector has

broken fundraising records for three years in a row. This significant growth has been influenced by the impact of zero interest rates in recent years (Mäntylä 2022).

Despite the growing significance of private equity in financial markets and the growth in IPOs over recent decades, the topic of pre-IPO ownership effect on IPO underpricing and performance has still not been comprehensively researched. While the phenomena of underpricing and long-term performance have been popular research topics, the effect of ownership on these aspects has received only a little attention. This study primarily focuses on comparing sponsored IPOs (including both venture- and buyout-backed IPOs) to non-sponsored IPOs, providing new evidence and filling a gap in this area of research.

1.1 Aim of the Study

Firstly, the aim of this study is to investigate whether sponsored IPOs experience underpricing and if so, how underpricing occurs in comparison to non-sponsored IPOs. While academic literature indicates that new IPOs are usually underpriced on average, this study concentrates specifically on understanding the effect of pre-listing ownership on the underpricing phenomenon. In this study, the effect of pre-listing ownership is compared between non-sponsored (NS) and private equity (PE), including buyout (BO) and venture capital (VC) initial public offerings.

Secondly, the purpose is to analyze post-IPO performance in timeframes of 1 month (30 days), 3 months (90 days), 6 months (180 days), 1 year (360 days), 2 years (720 days), and 3 years (1080 days). The purpose is to compare the short and long-term performance of non-sponsored and sponsored IPOs and determine if there are differences in performance between these groups. In addition, this study focuses on finding disparities between BO- and VC-backed IPO performance. The timeline of the study is 2005-2020 and the target area is Nordic countries including Finland, Sweden, Norwegian, and Denmark. The study answers the following questions:

Research question 1. How does underpricing occur in PE-backed IPOs compared to non-sponsored IPOs?

Research question 2. How do PE-backed IPOs perform post-IPO compared to non-sponsored IPOs?

Research question 3. How do VC-backed IPOs perform post-IPO compared to BO-backed IPOs?

1.2 Motivation

Many researchers have been fascinated by the topic of IPO underpricing for decades and there's a lot of earlier literature on this subject. Even though IPO underpricing and performance have been a popular research topic, there is a notable gap in understanding private equity-backed IPOs. Earlier studies of private equity-backed IPOs typically compare IPO underpricing and performance between venture-backed and non-venture-backed or buyout-backed and non-buyout-backed IPOs. However, there is a lack of research comparing private equity-backed IPOs, including both venture and buyout-backed, to non-sponsored IPOs. Levis (2011) highlighted that it's surprising that there's a gap in evidence regarding sponsored IPOs (including both venture capital and private equity-backed IPOs) compared to non-sponsored IPOs (Levis 2011, 254). This study brings evidence to this gap by including both venture and buyout-backed IPOs under the category of private equity-backed IPOs, willing to provide more evidence and a better understanding of their performance compared to non-sponsored IPOs.

In addition, most academic studies on the private equity-backed IPOs' performance focus on the U.S. market. Although the Swedish stock market has been attractive to companies in the 2000s and Sweden has been an important player in the venture capital market – ranking in the top 5 for VC deals in Europe (Pitchbook 2023, 12), research on private equity-backed IPOs in the Nordic region is limited. Notably, in 2017, Stockholm's stock exchange saw the largest number of companies go public in Europe (Segerstrom 2018). Due to the lack of evidence in Nordic countries, this study focuses on initial public offerings by private equity-backed investors in the Nordic region. By selecting the timeline of 2005-2020, the study is willing to provide a comprehensive and up-to-date understanding of the subject.

1.3 Structure of the Study

The study is organized into five main sections, which give a comprehensive view of the topic. The sections of this study are as follows. Section 1 introduces the topic, providing background information on the stock and private equity markets, as well as IPO trends. It also outlines the study's aim, motivation, and structure. Section 2 is a theoretical framework, including information about the IPO process explaining what an IPO is, and discussing various valuation methods. It also offers insights into private equity markets. Additionally, it presents theories that explain IPO underpricing and long-term performance. Section 3 covers the data and methodology implemented in this study. It includes the measurement of IPO underpricing and post-IPO performance, as well as the regression analysis methods used. Section 4 presents the study's findings and compares them with previous literature, providing a thorough analysis of the results. Section 5 consists of conclusions, which summarize the overall results of

the study, highlighting key insights and implications. In the study, artificial intelligence-based ChatGPT is used to improve the text's writing style.

2 THEORETICAL FRAMEWORK

2.1 Initial Public Offering

The company's decision to enter the public market marks a huge milestone in its history. In the Initial Public Offering (IPO), a company offers its shares to the public market for the first time (Geddes 2003, 1). According to Zingales' (1995) study, an IPO is often one of the largest equity issues in a company's history. On average, one-third of the funds' finances have been issued through an IPO (Zingales 1995, 425). Companies may require additional capital beyond what the IPO initially provides. In such cases, the company may return to the market with a secondary issue or share issues for additional financing (Geddes 2003, 1).

There are many reasons for companies to enter the public market. A public market provides companies a platform to raise equity capital (Geddes 2003, 6). According to Ritter and Welch (2002), the primary motive for most companies to go to the public market is to raise equity capital and give their shareholders a chance to liquidate their wealth (Ritter and Welch 2002, 5). The public market not only provides equity financing but also offers financing on more favorable terms, due to the increased liquidity noted by Ibbotson and Ritter (1995, 993). Additionally, according to Pörssisäätiö (2022), going public can lead to reduced borrowing costs as the company gains stronger negotiation power with lenders (Pörssisäätiö 2022, 6). Based on the Ljungqvist (2007) study, issuing a firm serves as an opportunity for its founders to diversify their investment portfolios and actualize capital gains for the hard work they have done, which is important, especially for venture capital investors (Ljungqvist 2007, 378). Pagano, Panetta, and Zingales (1998) noted that entering the public market can serve as a motivation for the company to be acquired by an external buyer (Pagano, Panetta, and Zingales 1998, 8).

Initial Public Offering thrusts the company into the spotlight, potentially offering indirect and direct benefits to the company. One such advantage is the potential to attract higher-caliber directors (Ljungqvist 2007, 378). According to Bancel and Mittoo's (2009) study, which involved interviews with 78 CFOs from 12 different countries, the motivations for making an IPO vary considerably depending on the different characteristics of the country and the companies involved. The CFOs highlighted the most significant benefits of IPOs were increased visibility, enhanced prestige, and financing for growth. The benefits also vary depending on the company's size and the ownership base. Large companies value outside monitoring the most, smaller companies focus on equity raising, and family-owned firms prioritize strengthening their bargaining power with the creditors without losing control. The study revealed that English companies valued most the increased liquidity for shares and the opportunity to make an exit, while for Italians the reduced capital costs are the most important motivation to issue public market. Overall, mainly all CFOs agreed that the benefits of the IPO exceed the potential downsides (Bancel and Mittoo 2009, 1).

The listing also brings other advantages to the company. According to Pörssisäätiö (2022), going through the IPO process significantly improves corporate governance and company processes, especially for small and medium-sized companies. The IPO process also increases the company's visibility, which brings benefits like easier acquisition of employees. A publicly listed company has a real-time market value, which can be utilized as currency in mergers and acquisitions, as well as for employee incentives and rewards (Pörssisäätiö 2022, 6-7). The IPO can also reduce agency problems between shareholders and managers, due to the additional mechanisms that the stock market provides to discipline the management (Pagano, Panetta, and Zingales 1998, 8).

However, going public also sets new requirements and incurs costs for the company. As highlighted by Ljungqvist (2007) there's an increased need for transparency and information production increases for a listed company (Ljungqvist 2007, 378). Pörssisäätiö (2022) outlined that a listed company is accountable for regularly publishing its financial results and informing the market about significant issues affecting the company (Pörssisäätiö 2022, 45). According to Ritter (1987) going public causes different kinds of costs. In the study, the costs are separated into two categories: indirect and direct costs. Indirect costs consist of underpricing and direct costs mainly of investment banking fees. The total costs of IPO are on average 21.22 % of the realized market value of the issued securities for firm commitment offers and 31.87 % for best efforts offers (Ritter 1987, 1). Ibbotson and Ritter (1995) noted that direct costs include expert fees, such as those for auditors and legal services, in addition to investment banking fees. Indirect costs contain also the time and effort managers spend on the IPO process (Ibbotson and Ritter 1995, 993).

2.2 IPO Process

As stated in Geddes' (2003) study, the process of IPO is a substantial investment from the company, both in terms of time and money (Geddes 2003, 1). According to Zingales' (1995) study, the choice to enter the public market was seen as a natural part of the company's growth process till the early 1980's. This assumption no longer exists, and there was a trend in the U.S. market in the 1980s where many large and mature companies went private (Zingales 1995, 425). Pagano, Panetta, and Zingales (1998) noted in their study that nowadays, a considerable number of large companies choose private ownership. This trend can be seen, for example, in Italy and Germany, where public companies are more the exception than the norm (Pagano, Panetta, and Zingales 1998, 1).

Entering the public market is a complex choice and requires careful consideration of both positive and negative aspects before making the decision. In the IPO process, there are three interested parties: the company, the vendor, and the investor. These parties share complementary objectives: firstly, the company's aim is to maximize its proceeds and achieve a successful IPO. Secondly, the vendor's aim is also to maximize its proceeds and be seen as part of a successful IPO. The vendor is usually an investment bank. Thirdly, investor's

aim is to maximize share price return both short-term and long-term and widen and diversify their investment portfolio (Geddes 2003, 1-5). Based on the Espinasse (2014) book, to execute an IPO other parties must be also included in the process, such as legal advisors, auditors, property values, banks, and consultants (Espinasse 2014, 63-70).

According to Espinasse (2014) on average, the IPO process takes six to nine months from the start to execute the IPO. The timetable of the IPO depends on how experienced and familiar the company is with the public markets. The IPO process requires preparation time including due diligence, documentation, and a marketing phase. The due diligence process involves parties who assess the adequacy of the business, considering both financial and legal aspects. During the documentation phase, the primary focus is on working with the prospectus. The marketing phase includes promoting the company's shares to both institutional and retail investors (Espinasse 2014, 77-89). The IPO process takes a lot of time and effort and requires a lot of different kinds of expertise (Pörssisäätiö 2022, 20).

2.3 The Valuation of the Company

The determination of the valuation for an IPO is a complex phenomenon in the world of finance (Lowry and Schwert 2004, 3). A critical aspect of the listing process involves determining the company's value, as the offer price paid by the investor is based on it. The company value is based on forecasts of future financial success and the corresponding risks. The basic principle of valuation is that the better the prospects for a company's future financial success, the higher its perceived value (Kallunki and Niemelä 2012, 11). Lowry and Schwert (2004) asserted that the more uncertain the company's value is, the higher the underpricing is. The study stated that underwriters do not fully include all available information in the pricing process, indicating that the process is not fully efficient, which can lead to pricing imbalance (Lowry and Schwert 2004, 4, 25).

In the theory of finance, the company's valuation is established by its forecasted cashflows discounting them to present value, a method called discounted cash flow (DFC). In theory, the approach is quite simple, but in practice, it is complicated and subjective. The DFC approach requires careful analysis of cashflows, selection of a suitable discount rate, and careful calculation of terminal value. In the DFC method, discounted cash flows are calculated from the present to infinity (Larrabee and Voss 2012, 105-106).

In addition to the DFC method, there are diverse options available for performing valuation calculations. Common methods used in the IPO process include peer company analysis, where the financial metrics of the issuing company are compared to other companies in the same industry. Financial metrics, such as enterprise value (EV) in relation to EBITDA or revenue, are usually used in this analysis. Furthermore, a review of completed mergers and acquisitions enables comparison of valuations between different companies. In

this comparison, financial metrics are analyzed between companies that have completed financial transactions in the same field. The most used valuation method in the IPO valuation process is the peer company analysis of the methods described above (Pörssisäätiö 2016, 26-27). Kim and Ritter (1999) argued that the analysis of financial metrics is a preferable option for IPO companies rather than DFC methods. This perspective stems from the difficulty of forecasting cash flows, especially for young companies that often go through an IPO (Kim and Ritter 1999, 410).

According to Pörssisäätiö (2016), the valuation in the IPO process consists of three key phases: the preparation phase, the premarketing phase, and the subscription phase. In the preparation phase, a preliminary pricing range of the offer is determined based on the initial valuation analysis. During the premarketing phase, the valuation is specified based on the feedback provided by potential investors. In the third and last phase, the offer price is settled in a price range or fixed price. In the IPO process, the company's valuation becomes more specific as the process goes further. Throughout the process, new information is disclosed, and providing listing parties more detailed information about the company's prospects and its ongoing developments. Additionally, new information about the market and comparable listings is obtained, creating a more refined understanding of the company's overall value (Pörssisäätiö 2016, 26-27).

Valuing companies, especially those in their early stages or without revenue, which is a common scenario for many startups, poses significant challenges. Polovets (2014) states, that even after comprehensive analysis, the final valuation of a startup is more of an art than a precise science. Although there are numerous guidelines for valuing a company, the true value of an investment often becomes apparent over time (Polovets 2014). Demaria (2013) highlighted that in private equity deals, the valuation of a company is the one of challenging tasks in the process. The complexity of the valuation process increases, particularly for younger and unstable companies. The foundation of the valuation is typically established with "multiple methods" where the analysis includes examining EBIT, or EBITDA, and cashflows (Demaria 2013, 226).

2.4 Private Equity

As Demaria (2013) pointed out, when a company requires financing, there are two primary options available: bank loans or issuing shares on the stock exchange. The stock exchange option is available mainly for medium to large-sized companies that meet specific criteria. Bank loans also come with strict requirements. When neither the stock exchange nor banks can provide financing for the company, alternative options step in. This can include venture capital firms and private equity investors (Demaria 2013, 9).

As highlighted by Scharfman (2018), private equity is an investment strategy, which seeks to invest in companies that are privately owned (Scharfman

2018, 1). As an asset class, private equity is illiquid, non-transparent, and often hard to analyze. Private equity is usually characterized by high risk and high return potential and is funded by outside investors. Private equity offers an opportunity to provide early-stage financing for private companies, and investors can benefit from their potential future success (Demaria 2013, 9-11). Private equity investors typically offer not only capital but also management and advisory expertise to the company (Kaplan and Schoar 2005, 3-4). According to Gorman and Sahlman (1989), venture capitalists offer three essential services beyond providing capital: gathering the investor group, helping to shape the business strategy, and assisting in forming the management team. The work schedule of venture capital investors is strongly focused on portfolio management, and the majority spend 60 % of their working time in this area (Gorman and Sahlman, 1989, 235-237).

Private equity transactions include various strategies, for example, venture capital (VC) and buyout (BO) transactions. During the past decade, the private equity industry, particularly the venture capital and buyout sector has seen significant growth (Kaplan and Schoar 2005, 2). Venture capital and acquisition strategies have their own special features. Venture capitalists concentrate their investments in startup companies in the early stages, where they become minority shareholders of the company. Buyout investors focus on more mature companies, that have well-established businesses. In buyout transactions, the ownership can be a majority or minority investment. Buyout transactions are typically financed by a mix of equity and debt (FVCA 2022, 4, 36). One feature of buyouts is leveraged buyouts (LBOs). In a leveraged buyout transaction, the purchase of the company is financed mostly with debt and only a relatively small amount of equity is used. Typically, the debt ratio is 60 % up to 90 %, hence the name leveraged buyouts. In a leveraged buyout transaction, the PE firm typically becomes a majority shareholder, which differs from a VC transaction where the PE firm typically buys minority stakes of the company (Kaplan and Strömberg 2009, 121, 124) As the European Venture Capital Association (2007) highlights, venture capital, and buyout strategies may vary in their approach to investment stages, but the fundamental principle remains consistent: providing capital, creating value, and developing the business (EVCA 2007, 6).

2.4.1 The Value Creation of Private Equity

The value creation plans are customized based on the unique requirements and situations of each portfolio company. These plans have become more practical, varying based on deal type, strategy, ownership structure, and geographical considerations. The key driver of investment returns is the successful implementation of the value creation plan (Biesinger, Bircan, and Ljungqvist 2020, 1).

According to Acharya, Hahn, and Kehoe (2013), the value creation of portfolio companies in private equity firms happens through proactive ownership and improved governance. Their study includes interviews with general partners, and intention to recognize value-creation practices in private

equity funds. The active ownership activities identified in the study were creating a value-creation plan, early management changes, implementation of top management incentives, and other strategic measures. These practices were made in the early phase of the investment. In the later phase, the practices will be redefined if needed. The top management's actions are closely monitored and any deviations from the established plan are dealt with immediately (Acharya, Hahn, and Kehoe 2013, 1, 31-32).

As Biesinger, Bircan, and Ljungqvist (2020) noted, the key areas for value creation differ based on the investment strategy. Buyouts usually focus on improving the capital structure, implementing changes in top and middle management, and promoting growth through acquisitions or mergers. Early stage such as venture capital or growth stage usually focuses on capital expenditures. The study observed that certain value-creation practices are easier to implement, such as changes in management, cost reduction, and asset transactions. Activities like increasing market share, growth through acquisitions, and international expansion are harder to implement (Biesinger, Bircan, and Ljungqvist 2020, 3).

2.4.2 The Process of Private Equity

Private equity investing operates over a limited partnership structure, wherein the private equity firm performs as a general partner (GP) and the limited partners (LP) offer the capital. Limited partners are usually institutional investors or wealthy investors who provide the needed capital (Kaplan and Strömberg 2009, 123).

According to Cendrowski, Martin, Petro, and Wadecki (2012), the standard lifeline of a PE fund ranges from 8 to 12 years. A typical PE fund experiences four phases in its lifecycle: organization and fundraising, investment, management, and harvesting. During the first phase of organization and fundraising the fund formulates its strategy and determines its investment focus. Determining the investment focus is important, particularly for VC funds that seek investments in specific areas. When defining the investment focus, industry, stage, and geography are considered. In the first stage, fundraising is also made. The fundraising phase might be challenging, especially during economic challenges. The investment phase begins when fundraising and organization have been finalized. In the investment phase GPs actively seek potential deals and initiate commitment flows to the fund. Following the investment phase, the focus shifts to actively managing the portfolio companies. PE fund uses its expertise to improve the company's performance. Sometimes the GP might replace the company's management team with other professionals. In the final harvesting phase, typically years 4-10, the primary goal of the PE fund is to quickly realize the income generated from the investments. While some investments generate substantial gains, others may not perform as strongly (Cendrowski, Martin, Petro, and Wadecki 2012, 7-9).

There are many opportunities for private equity investors to make an exit from the investment. According to the European Venture Capital Association

(2007), the most popular exit strategy is trade sale, also known as M&A (Mergers and acquisitions), where the company's shares are sold to industrial investors. Another option is to sell the company back to the entrepreneur or the management team. Alternatively, the company can be sold to another financial purchaser. Conducting an initial public offering is another possible exit strategy (EVCA 2007, 33-34). Even if an IPO is a popular exit option for venture capital investors, Megginson and Weiss (1991) argued that venture capital investors typically refrain from selling their holdings during an IPO, with most venture capitalists retaining all of their stakes in the process (Megginson and Weiss 1991, 879, 901). Based on Zingales' (1995) study, making an IPO is the best way to maximize a company's value and the most efficient way for shareholders to exit from the company (Zingales 1995, 426).

2.5 IPO Underpricing and Short-Term Performance

The stock market anomalies have been a popular topic among the researchers for decades. IPO underpricing is one of the most well-known IPO-related anomalies and previous studies have shown that underpricing occurs worldwide (Table 1). When a company issues an IPO and sells its shares, the shares tend to be underpriced, meaning that the stock produces abnormal returns on the first trading day. According to Ljungqvist (2007), underpricing is usually measured as the percentage difference between the offer price and the closing price on the first day of trading. During the 1990s, the average underpricing discount in the United States was more than 20% (Ljungqvist 2007, 376-381).

Table 1. Previous Literature on IPO Underpricing

Study	Country	Period	Underpricing %
Aggarwal and Rivoli (1990)	U.S.	1977-1987	10.67
Alvarez and Gonzalez (2005)	Spain	1987-1997	13.00
Ibbotson (1975).	U.S.	1960-1969	11.4
Keloharju (1993)	Finland	1984-1989	8.7
Lee, Taylor, and Walter (1996)	Australia	1976-1989	11.86
Levis (1990)	UK	1985-1988	8.6
Mumtaz, Smith and, Ahmed (2016)	Pakistan	2000-2010	32.00
Westerholm (2006)	Nordic countries	1991-2002	17.00

IPO underpricing has been identified as a global phenomenon. Loughran, Ritter, and Rydqvist's study (1994/2024) presents a table documenting IPO underpricing across 55 countries, all of which show evidence of underpricing (Loughran, Ritter, and Rydqvist 1994/2024, Table 1). Keloharju (1993) investigated Finland's IPO market in 1984-1989 and confirmed the presence of underpricing on the Helsinki Stock Exchange. During this period, the average initial excess return was 8.7 % (Keloharju 1993, 272). Lee, Taylor, and Walter (1996) studied Australia's IPO market from 1976-1989 and confirmed that new issues were underpriced by 11.86 % (Lee, Taylor and Walter 1996, 1195). Westerholm's study (2006) examined IPOs in the Nordic countries, including Sweden, Norway, Denmark, and Finland, during the period of 1991-2002. Westerholm (2006) confirmed relatively high initial returns: issues were on average 17 % underpriced in the Nordics during this period (Westerholm 2006, 39).

Anomalies signal market inefficiencies and represent phenomena that are inconsistent with asset-pricing theories. These inefficiencies offer investors profit opportunities. After these anomalies are recognized and studied in the academic literature, they tend to weaken or disappear (Schwert 2003, 3). Based on

Ljungqvist's (2007) study, many theories have been presented to explain the underpricing phenomenon. Theories can be categorized into four groups: asymmetric information, control considerations, institutional reasons, and behavioral approaches. Theories based on asymmetric information are the most well-known (Ljungqvist 2007, 376-381). The following chapters discuss the most recognized theories behind IPO underpricing.

2.5.1 Winner's Curse

Theories based on asymmetrical information are the most well-known for explaining the IPO underpricing phenomenon. One of the most well-known research based on asymmetrical information is Rock's (1986) study, which provides empirical evidence that IPOs are often underpriced. This underpricing can be linked to the Winner's Curse theory. The theory assumes that there is an information gap between investors: some investors are informed, and some are uninformed of the true value of the company's shares. Investors who are informed, participate only in IPOs that are attractively priced. Uninformed investors participate in all IPOs without understanding the company's real value and might overestimate the stock's worth. Attractively priced IPOs tend to generate high demand, leading to oversubscription. Consequently, investors receive only a portion of the shares they originally subscribed for. Uninformed investors who participate in overpriced share offerings are likely to receive a larger portion of the shares they subscribed for. Informed investors receive a higher initial return than uninformed investors. If IPOs were not underpriced on average, uninformed investors might refrain from participating in public offerings. Hence, the shares of the initial public offering would remain unsubscribed, and the initial public offering would not succeed. To ensure the completion of IPOs, investment banks underprice IPOs, allowing uninformed investors to achieve average returns (Rock 1986).

The Winner's Curse theory has been investigated across various countries. Keloharju (1993) investigated Finland's stock market and tested Rock's (1986) hypothesis in the Finnish IPOs. Keloharju's (1993) study consisted of 80 IPOs from 1984-1989 and documented the existence of the Winner's Curse in the Finnish stock market (Keloharju 1993, 251). Levis (1990) investigated London's stock exchange between 1985-1988. In accordance with Keloharju's (1993) study, Levis confirmed the Winner's Curse's existence in the London stock market (Levis 1990, 81, 88).

Much research has confirmed the Winner's curse existence, but Rock's (1986) theory has also faced criticism. The Winner's Curse theory, as presented by Rock, assumes that IPOs are naturally underpriced. Keasey and Short (1992) argued that Rock's theory suffers from a free-rider problem. Their argument suggests that if the winner's curse is a general market problem, individual firms may ask why they should accept the costs of solving a general problem. In practice, this means that the issuing company may refrain from underpricing its IPO, assuming that uninformed investors would still participate. Thus, the listed company would have the opportunity to benefit at the expense of other listed

companies and uninformed investors, creating a free-riding scenario. If all companies prioritize their own best interests and do not systematically underprice their IPOs, uninformed investors should exit the market. Rock's (1986) theory does not explain how the free-rider problem is solved in the market (Keasey and Short 1992, 74-75).

2.5.2 Hot and Cold Markets

The theory of hot and cold markets, originally presented by Ibbotson and Jaffe in 1975, refers to certain periods when IPO returns in the first month exceed the average market return. Ibbotson and Jaffe (1975) noticed in their study a correlation between the earnings of IPOs and the quantity of IPOs. The profits of IPOs and the number of IPOs run in cycles commonly referred to as "hot and cold markets". During hot markets, both the quantity of IPOs and the returns on IPOs tend to increase. In contrast, cold markets see fewer IPOs with smaller returns. In hot markets, issues are often oversubscribed, while in cold markets, the demand is typically lower (Ibbotson and Jaffe 1975, 1027.) Based on Ritter's (1984) study, there was a 15-month period starting in 1980 when the mean return for IPOs was 48.4 %, indicating a "hot issue market". This was remarkably higher compared to the mean return of 16.3 % for IPOs over a six-year period from 1977 to 1982. Ritter calculates the underpricing as the difference between the offering price and the closing price on the first trading day, but without adjusting it with the same period market return (Ritter 1984, 215). According to Ibbotson and Jaffe (1975), an investor should participate in IPOs during the hot market, as IPO returns tend to be significantly higher during these periods. From the perspective of the issuing firm, researchers recommend considering issuing during the cold market. This is because it results in higher offering prices because the underpricing is smaller during a cold market (Ibbotson and Jaffe 1975, 1041).

As Ibbotson and Ritter (1995) pointed out, it is hard to find a rational explanation for the existence of hot issue markets. Ibbotson and Ritter proposed a "positive feedback" strategy as a possible reason for the emergence of hot markets. In a positive feedback strategy, the investors assume that the initial returns of the IPO show positive autocorrelation. This strategy suggests that investors will bid up the price of the issue if the prices of other recent issues have risen. If there are enough investors to follow this strategy, the issuing prices will increase (Ibbotson and Ritter 1995, 1003). Another possible explanation is presented by Ritter (1984). Ritter suggested that "changing risk composition" might explain the dramatic changes in initial returns. A high-risk offering has usually a higher initial return, and a "hot issue market" is created when many high-risk companies issue in the public market at the same period (Ritter 1984, 216).

Lowry (2003) presented several hypotheses to explain the variation in IPO volumes: the capital demands hypothesis, the information asymmetry hypothesis, and the investor sentiment hypothesis. The capital demands hypothesis suggests that demand changes in companies' capital explain the variation in IPO volume. When market conditions are better and there is optimism about economic growth, companies need more capital to fund their

expansion, leading to an increase in IPOs. The information asymmetry hypothesis suggests that fluctuations in IPO volumes are caused by asymmetrical information on the true value of the firm between its managers and the market. Managers are willing to issue the firm when the market is overvalued, but when the company announces its equity offering, the market lowers its estimate of the firm's value. This operates under the assumption that the market functions in a semi-strong efficient manner. Through devaluation, it is ensured that, on average, the pricing of companies is correct. The investor sentiment hypothesis states that issuing costs of equity is influenced by the level of investor's optimism thereby causing fluctuations in IPO volumes over time. When the investor sentiment is high, the equity costs are low, leading investors to pay higher prices for shares during IPOs. Conversely, when investor sentiment is low, IPOs may be undervalued, creating a less attractive market for companies to go public. This dynamic results in lower IPO volumes during such times (Lowry 2003, 6-7). Lucas and McDonald (1990) argued that in a market with low investor sentiment undervalued firms may delay going public until market valuation is corrected. In contrast, they added that overvalued firms tend to go public quickly; delaying the IPO process might result in a decline in valuation (Lucas and McDonald 1990, 3).

2.5.3 Efficient Market Hypothesis

The financial intermediary role is essential in the financial markets. The fundamental role of the financial market is to allocate capital as efficiently as possible between surplus and deficit sectors. This efficiency ensures that capital from surplus sectors reaches deficit sectors with minimal delay and cost. An efficient financial market ensures that the capital is allocated where it is most efficiently used. A well-functioning financial system is beneficial for the entire economy (Knüpfer and Puttonen 2018, 53).

The fundamental assumption in financial markets is that markets are efficient. In efficient markets, the identification of arbitrage opportunities is challenging, even impossible (Knüpfer and Puttonen 2018, 168). Academic literature on efficient markets led to Fama's (1970) study. In the study, Fama noted that in an efficient market, security prices fully reflect all information available. Based on theory, investors have access to all information, and buying and selling stocks sets the prices correctly. Hence, IPO underpricing should not occur since every investor shares the same amount of information. The underpricing of new issues indicates market inefficiency and contradicts Fama's (1970) theory of efficient markets.

In the study, he defined three levels of market efficiency based on how information is incorporated into market prices: weak form, semi-strong form, and strong form (Fama 1970, 383). In weak-form markets, the prices reflect all the historical information. This means that excess returns cannot be made with technical analysis. In semi-strong markets, all historical and publicly available information is already reflected in market prices, making fundamental analysis ineffective for the investor. Strong form markets mean that all historical, public, and insider information is already included in the market prices. In strong

markets, investors cannot benefit from insider information because it is already incorporated into market prices (Knüpfer and Puttonen 2018, 171).

2.5.4 Signaling Theory

In the signaling theory, underpricing is a sign of a company's quality. The theory assumes that the issuing firm has better knowledge about the firm's "real" high value than the investor. Underpricing is used as a signal of the true value of the firm to the investors (Ljungqvist 2007, 400). Signaling theory can be seen as opposite to Rock's (1986) winner curse theory.

Welch (1989) presented a signaling model, where high-value issuers underprice their initial public offering in order to secure higher valuation in future seasoned offerings (SO/SEO). The signaling model is based on the asymmetry information between the IPO company and the investor. Issuers are divided into high- and low-quality companies: by underpricing the IPO, high-quality companies can communicate their high value to investors. This strategic underpricing leads to issuing the seasoned offering in better terms than without the underpricing. The low-quality companies try to imitate high-quality companies by underpricing their IPOs. However, between the IPO and SO the market may receive new information about the low-quality company, which may reveal its true quality. Although low-quality companies may try to hide their low quality, this strategy is expensive and challenging (Welch 1989, 445).

Welch (1989, 423) highlighted that during 1977-1982 one out of three IPOs issued a seasoned offering within a couple of years after their IPO. This finding highlights the broad influence of signaling theory on many IPOs. Ibbotson and Ritter (1995, 999) noted that underpricing is a way to leave investors a "good taste" after issuing the IPO, aiming to create a favorable environment for future stock pricing. Ritter and Welch (2002) agreed on signaling theory and argued that firms communicate their high quality by underpricing their IPOs. They stated that it remains unclear why underpricing is a more efficient way to signal investors than alternative methods such as advertising or contributing funds to charity (Ritter and Welch 2002, 11).

Jegadeesh, Weinstein, and Welch (1993) studied the correlation between IPO profits and SEO activity in the U.S. market during 1980-1986. Their findings revealed that firms that experienced larger IPO profits are more expected to initiate secondary offering after three years of the IPO and the following SEOs tend to be larger. Additionally, their findings indicated a positive correlation between market returns of two 20-day periods right after the IPO and the probabilities of issuing an SEO, as well as the size of the secondary offerings. Firms that generate larger profits during these periods are more likely to issue a seasoned offering quicker than firms with lower returns. Researchers highlighted that the IPO's first day returns alone do not determine the appearance of seasoned offerings; rather, subsequent trading days also play a significant role (Jegadeesh, Weinstein, and Welch 1993, 157, 174).

In contrast to Jegadeesh, Weinstein, and Welch's (1993) study, Michaely and Shaw (1994) opposed the signaling theory and discovered no empirical evidence to support the model. Their findings indicated that companies that used a more

aggressive underpricing strategy in their IPOs returned to the market less frequently and with smaller amounts than companies that used fewer underpricing methods. The study also discovered that firms that underpriced less their IPOs showed higher profits and paid higher dividends compared to companies that had a more aggressive underpricing strategy (Michaely and Shaw 1994, 279).

Allen and Faulhaber (1989, 304) argued that high-end IPO firms propose a trade-off between IPO underpricing in exchange for a more positive outlook for future dividends. Low-quality firms are not willing to do that because they may not experience high future cashflows and therefore unable to pay high dividends. Hence, investors read future dividends more positively when firms are underpricing their IPOs.

2.5.5 Underpricing and Short-Term Performance of Private Equity backed IPOs

Meggison and Weiss (1991) provided evidence that VC-backed IPOs experience significantly lower underpricing than non-VC-backed IPOs due to the VC-certification hypothesis. They documented that the VC-backed IPO's average initial return was 7.1 %, while the initial return of non-VC-backed IPOs was 11.9 %. The study highlighted that the involvement of venture capitalists in IPO maximizes the returns of the IPO and lowers its costs. They argued that reduced costs are due to the reduction of asymmetry information between the firm and the investors and the reduction in the need for financial specialists, like auditors and underwriters (Meggison and Weiss 1991, 893, 901). Cao and Lerner (2009) documented that reversed leveraged buyouts (RLBOs) IPOs' initial return was on average 15.4 % when non-buyout backed IPOs' initial return was 32.8 % on the first trading day (Cao and Lerner 2009, table 2). Similar results were presented by Sieradzki and Zasepa (2016, 261), who documented that buyout-and venture-backed IPOs are less underpriced than other IPOs. Welch (1989) suggested that IPO underpricing can be avoided using venture capitalists' expertise and capital funding.

In contrast, Lee and Wahal (2004, 375) presented results that diverge from earlier studies. They argued that VC-backed IPOs offer larger initial returns than non-VC-backed IPOs. They studied the U.S. market during 1980-2000 and highlighted that the underpricing difference was significantly larger during the "dot com" bubble in 1999-2000. Similar findings were presented by Francis and Hasan (2001). Their study highlighted that the first day's returns of VC-backed IPOs are higher compared to non-VC-backed IPOs. Based on the study, they argued that underwriters underprice the issue on purpose, to minimize the costs of prize stabilization post-IPO (Francis and Hasan 2001, 2). Buchner, Mohamed, and Wagner (2019) documented similar results, revealing that VC-backed IPOs are considerably more underpriced than buyout-backed IPOs. They argued that higher underpricing of VC-backed IPOs can be attributed to information asymmetry as VC-backed IPOs are harder to value compared to buyout-backed

IPOs that have more stable businesses and predictable cash flows (Buchner, Mohamed, and Wagner 2019, 39-40).

The studies of the performance of private equity-backed IPOs are mainly focused on the US market, with fewer studies conducted in Europe. Bergström, Nilsson, and Wahlberg (2006) researched buyout-backed IPO underpricing in the London and Paris stock exchange during 1994-2004. They documented that buyout-backed IPOs experience less underpricing than non-buyout-backed IPOs. During the timeframe, the buyout-backed IPO underpricing was on average 9.33 % and non-buyout-backed 12.87 % (Bergström, Nilsson, and Wahlberg 2006, 16, 30). Similarly, Levis (2011) studied London's stock exchange from 1992-2005 and documented that BO-backed IPOs experienced significantly less underpricing than non-sponsored IPOs or VC-backed IPOs and documented that hot market conditions during 1999-2000 did not affect the PE-backed IPO returns (Levis 2011, 274).

Gompers (1996) presents a theory to explain the underpricing of private equity-backed IPOs, known as the grandstanding hypothesis. According to this theory, young VC firms issue firms earlier to the public market to ensure capital raising for new funds and then create a reputation among investors through successful IPO (Gompers 1996, 133). When a company issues an IPO quickly, the level of uncertainty and risk increases, leading to higher underpricing, as noted by Sieradzki and Zasepa (2016, 265). Lee and Wahal's (2004) study support Gompers' (1996) grandstanding hypothesis, meaning that higher underpricing correlates with larger future cash flows into the VC funds in the future (Lee and Wahal 2004, 375-376, 405).

2.6 Long-Term IPO performance

In previous literature, numerous studies have examined the phenomenon of IPO underperformance over the long-term, in addition to the well-documented anomaly of IPO underpricing (Table 2). Aggarwal and Rivoli (1990) followed by Ritter (1991) were the first ones to document this phenomenon. Aggarwal and Rivoli (1990) documented the negative aftermarket performance of IPOs during 1977-1987. Investors who bought stocks from IPOs experienced a loss of -13.7 % after 250 days compared to the benchmark index (Aggarwal and Rivoli 1990, 46). Ritter (1991) documented similar findings. He researched the U.S. market in the 1975-1984 period and documented a clear underperformance of firms issued within a three-year period compared to counterparts of similar size and industry. The study showed that cumulative benchmark-adjusted returns aftermarket performance turned negative four months after issuing an IPO (Ritter 1991, 3, 10).

Table 2. Previous Literature on IPO Long-Term Performance

Study	Country	Period	Review period	Long-term performance %
Aggarwal and Rivoli (1990)	U.S.	1977-1987	250 days	-13.7
Alvarez and Gonzalez (2005)	Spain	1987-1997	3 years	-28.24
Hahl, Vähämaa, and Äijö (2014)	Finland	1994-2006	3 years	-30.0
Keloharju (1993)	Finland	1984-1989	3 years	-21.1
Lee, Taylor, and Walter (1996)	Australia	1976-1989	3 years	-51.58
Ritter (1991)	U.S.	1975-1984	3 years	-29.13
Ritter and Welch (2002)	U.S.	1980-2001	3 years	-23.4

Ritter (1991) also studied long-term performance across various industries. The results indicated that certain industries significantly underperform compared to others. Specifically, financial institutions showed the strongest performance while the oil and gas industry underperformed significantly three years after the listing. On average, IPOs experienced underperformance when compared to the performance of matching firms. However, there were exceptions, especially for financial institutions and pharmaceuticals (Ritter 1991, 18).

Keloharju (1993) studied the Finnish IPO markets' long-term performance during 1984-1989. He confirmed that Finnish IPOs underperformed by -21.1 % compared to market return over a 3-year period (Keloharju 1993, 270). Similarly, Hahl, Vähämaa, and Äijö (2014, 29) found comparable evidence in the Finnish IPO market during 1994-2006, documenting that holding a stock for 3-years after the IPO resulted in a market-adjusted return of -30.0 %.

2.6.1 The Window of Opportunity

Market conditions significantly affect companies' will to enter the public market. In the market, there are certain periods within the market cycle when the public market offers more favourable conditions for raising capital. This creates a "window of opportunity" to raise capital on better terms compared to other periods (Bayless and Chaplinsky 1996, 253). During this period, there is excessive optimism in the market, and companies take advantage of this investor sentiment by going public during a "window of opportunity". Therefore, the initial public offering is a company's response to beneficial market conditions (Ritter and Welch 2002, 7,9). Ritter (1991) noted that companies scheduled issue time on opportunistic periods to minimize the cost of capital (Ritter 1991, 24) The window of opportunity is in connection with hot markets: these market conditions attract

companies to issue to the public market (Rajan and Servaes 1997, 528). However, this phenomenon is associated with long-run underperformance.

Ritter (1991) suggested that during these hot periods, companies may experience long-term underperformance, indicating that companies take advantage of the “window of opportunity”. Companies are willing to enter the market when the market sentiment is high allowing them to secure favourable prices for their shares. However, this can lead to inflated valuations, resulting in long-term underperformance as valuations change over time (Ritter 1991, 3-4). Rajan and Servaes (1997) also documented that the window of opportunity is associated with long-term underperformance. They argued that these windows of opportunity are created by exaggerated expectations, which lead to poor long-run performance (Rajan and Servaes 1997, 528).

Rajan and Servaes (1997) investigated the relationship between hot markets, taking advantage of opportunities, and analyst following during the period of 1975-1987. They documented that greater underpricing is positively correlated with increased analyst following. In cases where analysts express increased optimism about the growth potential of recent IPOs, there is an increased trend in companies going public. The study highlighted that when analysts were more optimistic about the company’s growth opportunities in the long run, the companies tended to underperform in the long run. The researchers found that companies showed better long-term performance when analysts identified lower growth potential (Rajan and Servaes 1997, 507, 528).

2.6.2 The Offer Size and Book-to-Market Value

Ritter (1991) found a correlation between the size of a firm's IPO and its aftermarket performance. The study shows that small-sized issues performed poorly in the long run. Issue size is measured as the gross proceeds of the offering. The research reveals that the smallest offers with the highest underpricing also experience the worst aftermarket performance over a three-year period (Ritter 1991, 13,15). Similar findings were documented by Keloharju (1993) and Goergen, Khurshed, and Mudambi (2007). Keloharju confirmed that small-sized issues showed abnormal underperformance compared to large issues in the long run in the Finnish IPO market (Keloharju 1993, 273). Goergen, Khurshed, and Mudambi studied IPO performance in the UK market and found that small issues performed worse than large issues (Goergen, Khurshed, and Mudambi, 2007, 401).

Hahl, Vähämaa, and Äijö (2014) investigated the Finnish stock market and documented that low book-to-market value and small IPO size are associated with long run underperformance. Researchers found differences between value and growth stocks in post-IPO returns. Growth stocks with low book value significantly underperformed in the long-term than value stocks with high book value. IPOs of value stocks show no significant underperformance compared to the market index in the long-term. Study indicates that Finnish IPO’s long-term underperformance is primarily linked to growth stocks. This pattern, which is not considered abnormal, is due to different factors, including size, book-to-market, and momentum. (Hahl, Vähämaa and Äijö 2014, 27). Brav, Geczy, and

Gompers (2000) documented similar findings. Their study highlighted that underperformance is mainly concentrated in companies characterized by both small offering sizes and low book-to-market value (Brav, Geczy, and Gompers 2000, 209).

2.6.3 Post-IPO Performance of Private Equity-Backed IPOs

Brav and Gompers (1997) investigated VC-backed and non-VC-backed IPOs' long-term performance in US markets during 1972-1992. Brav and Gompers's (1997) findings indicated that when equal-weighted returns were used, VC-backed IPOs outperformed compared to non-VC-backed IPOs. Although, the underperformance of non-VC-backed funds was reduced substantially when the value-weighted method was used. Brav and Gompers (1997) argued that venture capitalists can contribute to improved long-term performance. They stated that venture capitalists provide financial support, but can also lead to improved management structures, which can affect the performance of VC-backed IPOs (Brav and Gompers 1997, 1792-1793). Similar findings were documented by Jain and Kini (1995) in the timeframe of 1976-1988. Jain and Kini (1995) argued that VC-backed IPOs post-IPO performance is superior compared to non-VC-backed IPOs. They also documented that VC-backed issuers have notably higher market-to-book- and price/earnings ratios than non-VC-backed issuers. The study highlights the VC's important role when issuing firms to the public market and guiding their first years as a public company. It suggests that managers of issuing firms should consider VC backing, especially in high-risk, rapidly growing market divisions as the VC support speeds up the development process and enables faster access to the public market. Additionally, the study argues that VC-backed entities achieve higher valuations due to enhanced corporate governance and better monitoring provided by VCs (Jain and Kini 1995, 605).

Cao and Lerner (2009) studied the performance of reversed leveraged buyouts (RLBOs) IPOs during the 1980-2002 in three and five-year timeframes. They found that RLBOs performed superior compared to other IPOs providing positive returns, especially four and five-year post-IPO. They documented that RLBOs have higher book-to-market ratios and have larger proceeds than non-RLBO firms (Cao and Lerner 2009, 1, 20).

Some evidence from Europe is provided by Bergström, Nilsson, and Wahlberg (2006) and Levis (2011). Bergström, Nilsson, and Wahlberg (2006) studied buyout-backed IPOs' long-term performance in the London and Paris stock exchange and documented that BO-backed IPOs outperform non-BO-backed IPOs during all time frames, including 6 months, 3 years, and 5 years. Study shows that IPOs that were issued during hot periods, experienced the largest underperformance, aligning with the windows of opportunity hypothesis (Bergström, Nilsson, and Wahlberg 2006, 42). Consistent with Bergström, Nilsson, and Wahlberg (2006), Levis (2011) documented that in the London market, after three years of the IPO, BO-packed IPOs perform superior compared to venture-backed or non-sponsored IPOs and the benchmark index. The study highlighted that BO-packed IPO's superior performance is strongly correlated

with leverage ratios and sponsors' shareholdings after the IPO (Levis 2011, 253, 274).

2.7 Hypothesis

As highlighted in earlier literature, IPOs underpricing, and long-term underperforming is a well-documented phenomenon existing worldwide. However, when analysing performance from the perspective of pre-listing ownership, there is a lack of literature on private equity-backed IPOs, including both venture-backed and buyout-backed IPOs, compared to non-sponsored IPOs. The existing literature on venture-backed versus non-venture-backed IPOs, as well as buyout-backed versus non-buyout-backed IPOs, presents diverse and sometimes conflicting results on underpricing and post-IPO performance. The first hypothesis concentrates on PE-backed IPO underpricing:

Hypothesis 1: PE-backed IPOs experience lower underpricing than non-PE-backed IPOs.

As mentioned earlier, there is a lack of evidence in the literature on PE-backed IPOs that separate buyout, venture capital-backed, and non-sponsored IPOs into their own groups. However, the study of Levis (2011) and Sieradzki and Zasepa (2016) separate these into their own categories and the studies show that VC- and PE-backed IPOs experience lower underpricing than non-sponsored IPOs. Based on this study, Hypothesis 1 is formed.

Hypothesis 2: PE-backed IPOs perform better in a long run than non-sponsored IPOs.

The second hypothesis is based on the PE-backed IPO's performance in the long run. In the study, the post-IPO performance is measured up to 3 years after the IPO. The study by Levis (2011) shows that PE-backed IPOs outperform both VC-backed and non-sponsored IPOs over a three-year period. Additionally, when combined, PE- and VC-backed IPOs together outperform non-sponsored IPOs. Katz (2009) documented that sponsored-backed companies generally exhibit higher earnings compared to those without sponsored ownership, suggesting that sponsored IPOs perform better post-IPO. Based on these studies, Hypothesis 2 is formulated.

3 DATA AND METHODOLOGY

The primary focus of this study is to investigate whether IPOs by private equity-backed entities are underpriced and how they perform post-IPO in comparison to non-private equity-backed IPOs. In addition, the study seeks to examine the comparative underpricing performance of buyout- and venture-backed IPOs. Additionally, the study explores the performance of private equity-backed IPOs over different timeframes, including 1 month (30 days), 3 months (90 days), 6 months (180 days), 1 year (360 days), 2 years (720 days), and 3 years (1080 days). If the day falls on a weekend or holiday, the next available price is used. If price data is unavailable in Refinitiv or begins significantly after the reported issue date, the listing is removed from the data. The purpose of the study is to compare underpricing and performance among non-sponsored (NS), and private equity (PE), including buyout (BO) and venture capital (VC) IPOs.

The data for this study is based on companies that issued a primary IPO in the Nordic countries including Finland, Sweden, Norway, and Denmark from 2005-2020. Iceland is excluded from the data due to low IPO activity. The timeline is restricted to 2005-2020 because the Refinitiv platform provides daily data for only up to 20 years. The data includes only newly listed companies, excluding secondary offerings, subscription offers, and staffing IPOs. Additionally, some observations with values significantly differing from the rest have been removed due to their potential to cause statistical distortion. The data is categorized based on the ownership structure between private equity including buyout capital and venture capital-backed, and non-sponsored-backed IPOs. Refinitiv provides the original data categorized as venture-backed, private equity-backed, and non-sponsored. Random tests are conducted to ensure that private equity-backed IPOs are truly buyout-backed, preventing any confusion with the terminology used in other literature. During this period, there was a total 374 number of companies that issued an IPO in the Nordic stock markets. The sample includes 64 private equity-backed IPOs and 310 non-sponsored IPOs. Among the private equity-backed IPOs, 38 are buyout-backed IPOs and 26 are venture capital-backed.

In this study, the OMX Nordic 40 index is used as a benchmark index. This index primarily reflects the general performance of the Nordic stock exchanges and gives a comprehensive picture of their market dynamics and trends. The issuing companies and offering prices of the IPOs are collected from the Refinitiv database. Missing information, issue dates, or prices are collected from companies' prospectuses and annual reports. Companies' closing prices and ownership information are gathered from the Refinitiv database.

Figure 1 presents the annual number of IPOs by country in 2005-2020. As shown in the figure, the number of IPOs has varied over the years. In 2008, there were overall only a few IPOs, and in 2009, there were no IPOs in the Nordic region due to the financial crisis. Sweden's IPO market has been the most active in the 2000s, representing 50% of the total number of IPOs in the Nordic

countries. In contrast, Finland’s market has seen the fewest IPOs, demonstrating only 11.50% of the total sample.

Figure 1. Annual Number of IPOs by Country

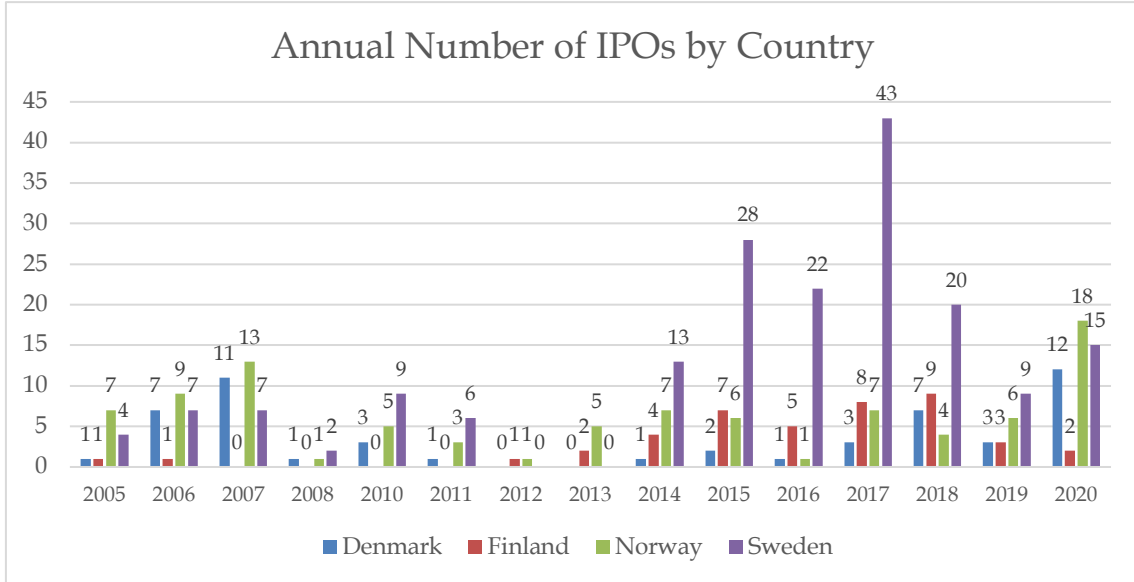
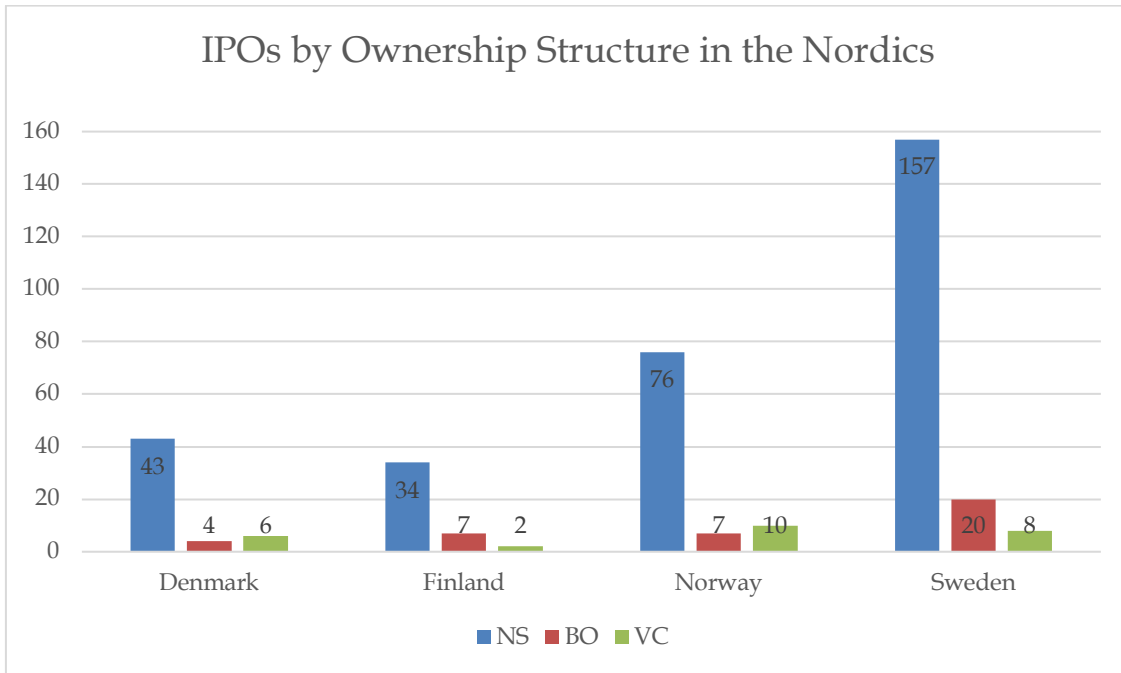


Figure 2 presents the IPOs in the Nordic countries categorized by ownership structure. As noted earlier, Sweden stands out as the most active IPO market in the region. Most of the issued companies are non-sponsored, but Sweden’s market also attracts the highest number of private equity-backed entities in Nordics. Notably, buyout-backed IPOs are concentrated in Sweden. In contrast, Norway leads in attracting the most venture-backed IPOs with a significant difference in the number of venture-backed IPOs between Norway and Finland, even though both have similar levels of buyout-backed IPOs. Denmark and Finland have relatively less active IPO markets, compared to Norway and Sweden.

Figure 2. IPOs by Ownership Structure in the Nordics 2005-2020



3.1 IPO Underpricing Measurement

The purpose of this study is to find out if IPOs made by private equity-backed entities experience underpricing. In the study, underpricing is measured by calculating the difference between the first day's closing price and the stock's offer price and comparing it to the offer price. This formula is presented by Ritter (1984). This calculation yields the stock i raw initial return.

$$RIR_i = \frac{(P_{i,1} - P_{i,0})}{P_{i,0}}$$

Raw initial return (RIR), where $P_{i,1}$ represents the stock's closing price on the first trading day and the $P_{i,0}$ is the offer price. The result is comparable, but this formula does not incorporate the market return during the same period. The market adjusted initial return is calculated as follows:

$$MAIR = \left[\frac{(P_{i,1} - P_{i,0})}{P_{i,0}} - \frac{(M_{i,1} - M_{i,0})}{M_{i,0}} \right]$$

Market adjusted initial return (MAIR), where $M_{i,1}$ is the market benchmark index's first day closing price, and the $M_{i,0}$ is its first day opening price. This formula has been used in Ritter's (1991) and Brown and Warner's (1980) study.

This formula indicates how much a stock's price changed on the first day compared to the offer price while taking into account how the benchmark index moved during the same period. MAIR's positive result indicates underpricing. OMX Nordic 40 index is used as a benchmark index as mentioned earlier.

3.1.1 Underpricing Differences Between Sponsored and Non-Sponsored Entities

An independent samples t-test is used to investigate if there are statistical differences between the underpricing of sponsored and non-sponsored backed entities, assuming unequal variances. The student's t-test is a frequently used statistical test for comparing the means of two different groups. The null hypothesis of the t-test of two independent samples is that there is no difference in the underpricing of sponsor-backed and non-sponsored-backed IPOs. The risk level of this test is 5%. The difference is not statistically significant if the p-value is >0.05. If the p-value is <0.05, the null hypothesis is rejected

$H_0 =$ *There is no difference in underpricing between sponsored and non-sponsored IPOs*

$H_1 =$ *There is a difference in underpricing between sponsored and non-sponsored IPOs*

3.2 Post-IPO Performance Measurement

In addition, the target of the study is to investigate if there are differences in post-IPO performance between sponsored and non-sponsored entities. Post-IPO performance is measured over various timeframes: short-term (1 month, 3 months, 6 months) and long-term (1 year, 2 years, 3 years). This division between short and long-term follows the same pattern as used in Hahl, Vähämaa, and Äijö's (2014) study. Additionally, this study extends the framework by incorporating 3-month and 2-year periods to offer a more comprehensive perspective on performance. Closing prices for companies in different timeframes are collected from the Refinitiv database. In instances where the closing day falls on a weekend or holiday across different time frames, the next possible price information is used in the study. Post-IPO performance is calculated using the Wealth Relative (WR) method. The method has been used in other studies, such as Hahl, Vähämaa, and Äijö's (2014) study and Ritter's (1991) study. The calculation of the Wealth Relative value is as follows:

$$WR = \frac{(1 + r_{i,t})}{(1 + r_{m,t})}$$

In the formula, the $r_{i,t}$ is the return for the stock i in timeframe t and $r_{m,t}$ is the return of the market m in timeframe t . The study calculates two WR values: one

including the initial return and the other excluding it, following the methodology used in Hahl, Vähämaa, and Äijö's (2014) study. This method takes into account initial returns that may affect the stock's performance in the longer term. A WR value greater than 1 means that the stock is outperforming the market, while a WR value under 1 means that the stock is underperforming the market (Ritter 1991).

3.3 Multiple Linear Regression Analysis

3.3.1 IPO Underpricing

In the study, two multiple linear regression analyses are conducted to explain the performance of an IPO on the first trading day and over the long-term. The intention is to investigate whether the chosen independent variables have a statistically significant effect on the dependent variable. The first regression analysis is used to explain IPO underpricing. IPO underpricing, measured by the market-adjusted initial return (MAIR) operates as the dependent variable and the independent variables are private equity backing and offer size. The multiple linear regression formula is as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \epsilon$$

where y represents the dependent variable, which is IPO underpricing, β_0 is the intercept, while β_1 and β_2 are the independent variables' coefficients. x_1 is the private equity backing (PE_backed) and x_2 is the offer size (Offer_size), and ϵ represents the error term. The offer size is calculated by multiplying the offer price by the total number of shares offered and adjusting the amount to the same currency (EUR). Using underpricing (MAIR), as dependent variable, and offer size along with private equity backing as independent variables, the formula changes to the following pattern:

$$\text{Underpricing} = \beta_0 + \beta_1(\text{Offer}_{size}) + \beta_2(\text{PE}_{backed}) + \epsilon$$

The offer size is selected because previous literature demonstrates a negative correlation between offer size and underpricing. Larger offer sizes typically indicate larger companies, which are subject to less uncertainty regarding their IPOs (Beatty and Ritter 1986; Ibbotson, Sindelar, and Ritter 1994). Private equity-backing is chosen due to the reasons presented earlier, as the existing literature does not comprehensively address the effect of ownership on underpricing.

3.3.2 Post-IPO Performance

In the second regression analysis, multiple linear regression is also used to explain the post-IPO performance, measured by the 3-year Wealth Relative (WR) value, which includes the initial return. Including the initial return gives a comprehensive measure of the IPO's performance from the issue date to the end of the three-year period. In this analysis, the dependent variable is the 3-year WR value, while the independent variables remain the same as in the first analysis: private equity backing and offer size. The multiple linear regression formula is as follows:

$$\text{Post IPO performance} = \beta_0 + \beta_1(\text{Offer}_{\text{size}}) + \beta_2(\text{PE}_{\text{backed}}) + \epsilon$$

The offer size is chosen as an independent variable because prior literature indicates that it is positively correlated with long-term performance. Smaller IPOs tend to generate lower profits over the long-term (Brav, Geczy, and Gompers 2000; Keloharju 1993; Ritter 1991; Vithessonthi 2008).

4 RESULTS OF THE STUDY

This section presents the results of this study. First, IPO underpricing results are presented, in addition to the first regression analysis and student's t-test. After that post-IPO is analyzed in the short- and long-term. In the long-term section, the results of the second regression analysis are presented. In the end, the results are analyzed and compared to previous studies.

4.1 IPO Underpricing Results

The goal of the study is to investigate whether underpricing occurs in sponsored IPOs and how the underpricing appears compared to non-sponsored IPOs. In addition, the purpose is to compare the underpricing between buyout-backed IPOs and venture-backed IPOs. The sampling consists of 374 IPOs made in the Nordic region in 2005-2020. The sampling included 310 non-sponsored, 38 buyout-backed, and 26 venture-backed IPOs. The underpricing is measured using raw initial return (RIR) and market adjusted initial return (MAIR) as presented in Chapter 3.1. OMX Nordic 40 index is used as a benchmark index.

Table 3 presents the IPOs made in 2005-2020 categorized by ownership structure. The majority of Nordic IPOs are non-sponsored backed, representing 82.89 % of the total sample. Buyout-backed IPOs represent about 10% of the total sample, while venture-backed IPOs approximately 7%. Sponsored-backed IPOs are concentrated in the period following the financial and euro crises. This trend might be explained by private equity investors aiming to exit their portfolio companies when the market sentiment is high. As a result, there were no sponsored-backed IPOs during the financial crisis in 2008 or 2009.

Table 3. IPOs by Ownership Structure

IPOs by Ownership Structure						
Year	NS	PE all	BO	VC	Total	
2005	9	4	1	3	13	
2006	16	8	4	4	24	
2007	24	7	0	7	31	
2008	4	0	0	0	4	
2010	11	6	4	2	17	
2011	9	1	0	1	10	
2012	2	0	0	0	2	
2013	6	1	0	1	7	
2014	17	8	6	2	25	
2015	29	14	12	2	43	
2016	26	3	3	0	29	
2017	56	5	3	2	61	
2018	37	3	2	1	40	
2019	19	2	2	0	21	
2020	45	2	1	1	47	
Total	310	64	38	26	374	
<i>as % of total IPOs</i>	<i>82.89 %</i>	<i>17.11 %</i>	<i>10.16 %</i>	<i>6.95 %</i>	<i>100.00 %</i>	

Table 4 shows the IPOs categorized by industry. Technology and healthcare industries are the most popular industries for non-sponsored IPOs and are also major sectors for private equity-backed IPOs. This trend reflects the attractiveness of the healthcare and technology sectors due to their high growth and high-risk potential, which is typical for VC-investors. Overall, technology and healthcare IPOs stand out as they represent over 40 % of total IPOs, highlighting the relevance and appeal of these industries in the IPO market. Consumer cyclicals and industrials also show a strong presence in both non-sponsored and sponsored IPOs.

Table 4. IPOs by Industry

IPOs by Industry 2005-2020					
	NS	PE	BO	VC	Total
Academic & Educational Services	2	0	0	0	2
Basic Materials	6	1	0	1	7
Consumer Cyclical	30	14	13	1	44
Consumer Non-Cyclical	16	6	4	2	22
Energy	17	5	3	2	22
Financials	22	2	1	1	24
Government Activity	1	0	0	0	1
Healthcare	55	15	4	11	70
Industrials	48	10	9	1	58
Real Estate	17	1	0	1	18
Technology	80	9	4	5	89
Utilities	9	0	0	0	9
Others	7	1	0	1	8
Total	310	64	38	26	374

In the sample of IPOs from 2005 to 2020, both sponsored and non-sponsored IPOs experienced underpricing as shown in Table 5. The mean market adjusted initial return for sponsored entities is 37.28%, which is significantly higher than the underpricing for non-sponsored entities, which is 8.75%. For the whole sample, the mean underpricing is 13.63%. This means that if you had participated in every IPO from 2005 to 2020 and sold them at the end of the first trading day, you would have received a 13.63-percentage point higher return on your investment compared to investing in the OMX Nordic 40 index. This indicates that the markets are inefficient, thereby contradicting the efficient market hypothesis.

Although the underpricing is high for sponsored IPOs, the median market adjusted initial return is 0.93% for these entities. This means that half of the companies backed by private equity entities experience lower returns than the median value. The median for the whole sample is -2.20%, indicating that over half of the IPOs offer negative returns on their first trading day. The standard deviation around the mean is quite large: 109.30% for non-sponsored and 167.60% for sponsored entities. This indicates a significant variation in the observations around the average. The standard deviation shows that the returns of the non-sponsored IPOs vary significantly, but the returns for sponsored IPOs vary even more. The minimum and maximum values indicate significant variations in the return of IPO companies. The best performance for a certain stock is a 931.23% return, while the lowest return is -99.44%, both measured as market-adjusted initial returns. Overall, private equity-backed IPOs offer greater return opportunities for investors, but these returns are associated with larger risk, due to high standard deviation.

Table 5. Raw Initial Returns and Market Adjusted Returns for Sponsored and Non-Sponsored Entities

Statistics	Raw Initial Returns			Market Adjusted Initial Returns		
	PE	NS	ALL	PE	NS	ALL
Mean	37.45 %	8.68 %	13.60 %	37.28 %	8.75 %	13.63 %
Median	0.00 %	-2.82 %	-1.81 %	0.93 %	-3.33 %	-2.20 %
Maximum	741.62 %	931.20 %	931.20 %	741.30 %	931.23 %	931.23 %
Minimum	-99.19 %	-94.10 %	-99.19 %	-99.44 %	-95.99 %	-99.44 %
Std. Dev.	167.64 %	109.33 %	121.80 %	167.60 %	109.30 %	121.76 %
N	64	310	374	64	310	374

Table 6 presents the findings of comparison between raw initial return and market adjusted initial return of buyout-backed and venture-backed entities. Results show that buyout-backed IPOs experience significantly less underpricing than venture-backed IPOs. On average, venture-backed IPOs are 73.76% underpriced, compared to 12.33% for buyout-backed IPOs, in terms of market adjusted initial return. The standard deviation of venture-backed IPOs is twice that of buyout-backed IPOs, which indicates that there is much more variance around the mean. Venture capital investors concentrate on early-stage startups, which are riskier investments, while buyout capital investors focus on more mature companies, associated with lower risk. Since risk and reward are correlated, this may explain why venture-backed IPOs are more underpriced.

Table 6. Raw Initial Returns and Market Adjusted Returns for Venture-Backed and Buyout-Backed Entities

Statistics	Raw Initial Returns			Market Adjusted Initial Returns		
	BO	VC	PE ALL	BO	VC	PE ALL
Mean	12.51 %	73.88 %	37.45 %	12.33 %	73.76 %	37.28 %
Median	0.10 %	0.00 %	0.00 %	1.73 %	0.13 %	0.93 %
Maximum	618.23 %	741.62 %	741.62 %	617.48 %	741.30 %	741.30 %
Minimum	-99.19 %	-88.72 %	-99.19 %	-99.44 %	-88.78 %	-99.44 %
Std. Dev.	104.13 %	226.04 %	167.64 %	104.09 %	225.98 %	167.60 %
N	38	26	64	38	26	64

Table 7 presents the regression statistics of the first multiple linear regression analysis. The R Square is 0.81%, and the adjusted R Square is 0.28%. This indicates that the model explains 0.81% of the variation in the dependent variable. A higher percentage of explanation indicates a better model, but in this case, the model does not explain the results well. The adjusted R square takes into account the number of variables in the model and provides a more accurate measure of how well the model explains the results.

Table 7. Regression Statistics Results for the First Multiple Linear Regression Analysis

Regression Statistics	
Multiple R	0.090207154
R Square	0.008137331
Adjusted R Square	0.002790362
Standard Error	1.217489781
Observations	374

Table 8 shows the results of the ANOVA test. The p-values for both offer size and private equity-backing are greater than 0.05, indicating that these variables have no significant effect on the dependent variable (MAIR). The coefficient for offer size is 0.00, meaning it has no effect on the dependent variable, while the coefficient for private equity-backing is 0.2629, showing this amount of effect on the dependent variable. However, the significance F value of 0.219 suggests that the independent variables together do not explain the dependent variable.

Since the p-value for the private equity-backed variable is greater than 5% and the R-squared value is quite low, we cannot conclude that PE-backed IPOs are statistically significantly more underpriced compared to non-sponsored IPOs. Hence, the results do not support Hypothesis 1 (*Hypothesis 1: PE-backed IPOs experience lower underpricing than non-PE-backed IPOs*). Overall, there is not enough statistical evidence to conclude that the private equity-backing or offer size has a significant effect on first-day underpricing based on the study's data.

Table 8. ANOVA Results for the First Multiple Linear Regression Analysis

ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	2	4.5116455	2.2558228	1.5218587	0.2196654	
Residual	371	549.9263871	1.4822814			
Total	373	554.4380327				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.0793448	0.0727402	1.0907975	0.2760699	-0.0636899	0.2223796
Offer size (eur)	0.0000000	0.0000000	0.3593407	0.7195446	0.0000000	0.0000000
Private equity-backed	0.2629120	0.1784675	1.4731652	0.1415544	-0.0880226	0.6138467

4.1.1 Underpricing Differences Between Sponsored and Non-Sponsored Entities

The intention of this study is to investigate if there are statistical differences in underpricing between sponsored and non-sponsored entities. Market adjusted initial returns are used to test the statistical difference. The significance level used for this test is 5%. If the p-value is greater than 0.05, the difference is not statistically significant. However, if the p-value is less than 0.05, the null hypothesis is rejected, indicating a statistically significant difference.

$H_0 =$ *There is no difference in underpricing between sponsored and non-sponsored IPOs*

$H_1 =$ *There is a difference in underpricing between sponsored and non-sponsored IPOs*

As shown in Table 9, the p-value is greater than 0.05. Therefore, the underpricing difference between non-sponsored and sponsored entities is not statistically significant. Consequently, there is no evidence to reject the null hypothesis, and it remains valid. Although there is an apparent difference in underpricing between non-sponsored and sponsored entities, the difference is not statistically significant.

Table 9. Results of the Student's t-Test

t-Test: Two-Sample Assuming Unequal Variances		
	NS	PE
Mean	0.08745653	0.372833647
Observations	310	64
t Stat	-1.29647912	
P(T<=t) one-tail	0.099419483	
P(T<=t) two-tail	0.198838966	

4.2 Short-Term Performance Results

One of the purposes of this study is to investigate the post-IPO performance of non-sponsored and sponsored IPOs. WR method is used to measure the short-term performance results, which is described in Chapter 3.2. Short-term performance is measured over three timeframes: 1 month, 3 months, and 6 months. WR value greater than 1 indicates that the stock is performing better than the market index while WR value less than 1 indicates that the stock is performing worse than the market index (Ritter 1991). Two WR values are calculated: one including the initial return and one excluding it. This approach allows us to view the result without the influence of initial returns, which might distort the performance in certain timeframes.

Table 10. shows the WR values including the initial return. As seen in the table, when WR value includes the initial return, private equity-backed IPOs perform better on average in the short-term than non-sponsored IPOs. The average WR value for both non-sponsored and sponsored IPOs is greater than 1, meaning that all IPOs outperform the market index within these timeframes. Investing in all IPOs over three given periods has been more profitable for investors than investing in the OMX Nordic 40 index. Median values indicate that PE-backed IPOs perform better and more consistently than non-sponsored IPOs. The standard deviation is larger across all timeframes for PE-backed IPOs suggesting that higher profit comes with higher risk. Maximum values are higher for non-sponsored IPOs, with certain stocks yielding profits 10.36 times greater than the market index. The WR minimum value is 0.01, indicating that the stock has achieved only 1% of the market index return.

Table 10. Short-Term WR Values Including Initial Return for NS and PE-Backed IPOs

Short-Term WR Values Including Initial Return						
	1 month		3 months		6 months	
Statistics	NS	PE	NS	PE	NS	PE
Mean	1.10	1.26	1.12	1.28	1.11	1.27
Median	0.95	0.99	0.95	1.00	0.93	1.02
Maximum	9.94	6.90	10.36	7.32	9.35	7.59
Minimum	0.06	0.01	0.06	0.01	0.05	0.01
Std. Dev.	108.49 %	129.68 %	109.98 %	127.22 %	104.53 %	127.18 %
N	310	64	310	64	310	64

Table 11 presents the results of short-term WR values excluding the initial return. The results show that when excluding the initial return from the short-term profits, the non-sponsored IPOs perform better. On average, the non-sponsored IPOs perform better than the market index in all time frames. Sponsored-backed IPOs outperform the market in 3- and 6-month timeframes while

underperforming in 1-month timeframe when excluding the initial returns. The median values are at a similar level for both sponsored and non-sponsored IPOs. This indicates that median short-term profits for IPOs are approximately at the same level as the market index profit. The standard deviation decreased significantly compared to the WR values which included the initial return. The situation with standard deviation changes between non-sponsored and sponsored IPOs shows that sponsored IPOs are less volatile when excluding the initial return compared to non-sponsored IPOs. Overall, the standard deviation decreased notably, resulting in the maximum and minimum values being closer to each other.

Table 11. Short-Term WR Values Excluding Initial Return for NS and PE-Backed IPOs

Short-Term WR Values Excluding Initial Return						
	1 month		3 months		6 months	
Statistics	NS	PE	NS	PE	NS	PE
Mean	1.03	0.98	1.08	1.01	1.08	1.01
Median	0.98	0.98	1.00	1.02	0.97	1.00
Maximum	2.96	1.29	5.18	1.33	4.21	1.87
Minimum	0.55	0.56	0.32	0.40	0.27	0.29
Std. Dev.	26.24 %	11.49 %	48.98 %	18.58 %	47.51 %	29.31 %
N	310	64	310	64	310	64

Table 12 presents the WR values including the initial return for buyout-and venture capital-backed IPOs in the short-term timeframe. The table shows that venture capital-backed IPOs perform better on average in all timeframes compared to buyout-backed IPOs. Both buyout-backed and venture-backed IPOs have a WR value greater than 1, indicating that these IPOs perform better than the market index in the short-term. The median value is higher for buyout-backed IPOs, suggesting that buyout-backed IPOs generally perform better and more consistently than venture-backed IPOs. Consequently, most of the buyout-backed IPOs outperformed the OMX Nordic 40 index. The standard deviation is significantly higher for venture-backed IPOs, signaling that a higher average return is associated with higher volatility and risk. For buyout-backed IPOs, the standard deviation decreases over time from 1 month to 6 months. Conversely, for venture-backed IPOs, the standard deviation increases as more time passes since listing.

Table 12. Short-Term WR Values Including Initial Return for BO and VC-Backed IPOs

Short-Term WR Values Including Initial Return						
	1 month		3 months		6 months	
Statistics	BO	VC	BO	VC	BO	VC
Mean	1.12	1.46	1.16	1.46	1.17	1.41
Median	1.00	0.97	1.07	0.91	1.08	0.93
Maximum	6.90	6.66	6.23	7.32	5.86	7.59
Minimum	0.01	0.10	0.01	0.09	0.01	0.10
Std. Dev.	100.28 %	161.22 %	90.56 %	165.30 %	86.91 %	168.58 %
N	38	26	38	26	38	26

As shown in Table 13, the short-term WR values of venture-backed and buyout-backed IPOs, excluding the initial return, are presented. On average, venture-backed IPOs have WR values below 1 in all short-term timeframes, suggesting that these IPOs underperform the market when the initial return is excluded. Conversely, buyout-backed IPOs perform better than the market index in timeframes of 3 and 6 months on average. The higher median WR values for buyout-backed IPOs indicate that these IPOs are generally better investment opportunities compared to venture-backed IPOs. The standard deviation of WR values excluding the initial return is significantly lower than WR values including the initial return. For both buyout-backed and venture-backed IPOs, the volatility of profits increases as more time passes since listing. When WR values excluding the initial return are compared to those including the initial return, it is apparent that the values excluding the initial return are smaller and exhibit much lower volatility. This trend indicates that a significant portion of IPO profits are made on the first trading day.

Table 13. Short-Term WR Values Excluding Initial Return for BO and VC-Backed IPOs

Short-Term WR Values Excluding Initial Return						
	1 month		3 months		6 months	
Statistics	BO	VC	BO	VC	BO	VC
Mean	1.00	0.95	1.06	0.95	1.07	0.91
Median	0.99	0.94	1.04	0.93	1.07	0.87
Maximum	1.20	1.29	1.30	1.33	1.66	1.87
Minimum	0.84	0.56	0.57	0.40	0.57	0.29
Std. Dev.	7.38 %	15.16 %	14.25 %	22.13 %	22.63 %	34.91 %
N	38	26	38	26	38	26

4.3 Long-Term Performance Results

In addition to investigating the short-term performance of IPOs, the long-term performance is analyzed. Long-term performance is measured in three different timeframes: 1 year, 2 years, and 3 years. In the long-term performance, also two WR values are calculated: one including the initial return and one excluding it.

Table 14 presents the findings of long-term WR values including the initial return for non-sponsored and sponsored IPOs. Results show that sponsored IPOs perform superior compared to non-sponsored IPOs when the initial return is included. Participating in every sponsored IPO and holding them for one year since listing yields a return that is 49 % greater than investing in the OMX Nordic 40 index. Overall, both groups of IPOs performed better than the market index in all timeframes. The higher median for private equity-backed IPOs shows that a greater amount of these IPOs yields positive returns compared to non-sponsored IPOs. The standard deviation is quite high for both groups, but significantly higher for private equity-backed IPOs. As noted earlier, larger returns are associated with higher volatility, making this understandable. The maximum value of this long-term period is 25.84 times higher than the market index over a three-year timeline. Conversely, the minimum value is 0.00, indicating that the stock has not achieved any return compared to the market index.

Table 14. Long-Term WR Values Including Initial Return for NS-and PE-Backed IPOs

Long-Term WR Values Including Initial Return						
	1 year		2 years		3 years	
Statistics	NS	PE	NS	PE	NS	PE
Mean	1.10	1.49	1.05	1.63	1.08	1.59
Median	0.89	1.05	0.80	1.05	0.67	1.06
Maximum	7.98	14.42	7.15	21.63	17.31	25.84
Minimum	0.05	0.01	0.03	0.01	0.00	0.00
Std. Dev.	102.41 %	216.49 %	99.73 %	305.52 %	154.11 %	323.42 %
N	310	64	310	64	310	64

Both sponsored and non-sponsored IPOs outperform the market index over long-term timeframes of 1, 2, and 3 years, even when initial returns are excluded as shown in Table 15. When excluding the initial return from WR values, the profit situation changes; on average, non-sponsored IPOs perform better compared to sponsored IPOs. This suggests that a significant portion of the long-term profits from sponsored IPOs are made on the first trading day. It is worth noting that non-sponsored IPOs perform better over a 3-year timeframe when initial returns are excluded compared to when they are included. Additionally, the standard deviation differs significantly with non-sponsored IPOs showing

much higher variability compared to sponsored IPOs. IPOs. This indicates a wider dispersion of returns for non-sponsored IPOs.

Table 15. Long-Term WR Values Excluding the Initial Return for NS-and PE-Backed IPOs

Long-Term WR Values Excluding Initial Return						
	1 year		2 years		3 years	
Statistics	NS	PE	NS	PE	NS	PE
Mean	1.10	1.08	1.14	1.10	1.20	1.11
Median	0.99	1.12	0.88	1.03	0.78	0.99
Maximum	6.48	2.43	8.00	3.36	17.56	4.27
Minimum	0.14	0.17	0.04	0.07	0.00	0.03
Std. Dev.	70.54 %	41.76 %	106.06 %	59.71 %	162.94 %	75.17 %
N	310	64	310	64	310	64

Table 16 shows the long-term WR values including initial return for buyout-backed and venture-backed IPOs. As seen from the table, the average return for venture-backed IPOs is much higher than for buyout-backed IPOs. The WR values of venture-backed IPOs significantly outperform the overall market, consistently exceeding 1.8 over all time periods. As apparent from the maximum values, certain venture-backed IPOs achieve returns exceedingly over 25 times the market return over a 3-year period. On average, venture-backed IPOs have shown to be highly profitable investment targets. However, both groups surpass the OMX Nordic 40 index profit across all timeframes. The difference in standard deviation between these groups is significantly high, resulting in a much higher variation between returns for venture-backed IPOs. The median is greater for buyout-backed IPOs, indicating that these IPOs are more stable and a higher proportion of them yield positive returns.

Table 16. Long-Term WR Values Including the Initial Return for BO-and VC-Backed IPOs

Long-Term WR values Including Initial Return						
	1 year		2 years		3 years	
Statistics	BO	VC	BO	VC	BO	VC
Mean	1.22	1.89	1.26	2.18	1.23	2.13
Median	1.12	0.94	1.10	0.88	1.13	0.90
Maximum	5.15	14.42	5.11	21.63	4.33	25.84
Minimum	0.01	0.08	0.01	0.07	0.00	0.03
Std. Dev.	83.54 %	320.20 %	91.80 %	460.83 %	82.20 %	492.64 %
N	38	26	38	26	38	26

The profit situation changes between buyout-backed and venture-backed IPOs when the first day's initial return is excluded from the WR value, as seen in Table 17. The Table shows that buyout-backed IPOs yield greater profits when initial return is excluded than venture-backed IPOs. On average, venture-backed IPOs underperform the market index, while buyout-backed IPOs achieve higher returns than the market index. This indicates that the initial return plays a significant role in the superior profitability of venture-backed IPOs. When the initial return is excluded, the standard deviation is notably lower than when WR includes the initial return. Maximum values are significantly lower for WR values that exclude the initial return, indicating that oversized profit opportunities are more limited without the first day's returns.

Table 17. Long-Term WR Values Excluding Initial Return for BO-and VC-Backed IPOs

Long-Term WR Values Excluding Initial Return						
	1 year		2 years		3 years	
Statistics	BO	VC	BO	VC	BO	VC
Mean	1.16	0.97	1.21	0.94	1.19	0.99
Median	1.13	0.97	1.08	1.01	1.12	0.89
Maximum	2.43	1.93	3.36	2.59	4.27	3.09
Minimum	0.18	0.17	0.31	0.07	0.14	0.03
Std. Dev.	38.37 %	44.08 %	60.72 %	54.56 %	77.69 %	69.69 %
N	38	26	38	26	38	26

Table 18 presents the regression statistics for the second regression analysis. The R Square is 1.01 %, and the adjusted R Square is 0.47 %. These values indicate that the model explains only 1.01 % of the variation in the dependent variable, which is an improvement over the first regression analysis but remains quite low.

Table 18. Regression Statistics for the Second Multiple Linear Regression Analysis

Regression Statistics	
Multiple R	0.100394746
R Square	0.010079105
Adjusted R Square	0.004742604
Standard Error	1.946419981
Observations	374

Table 19 presents the ANOVA results for the second regression analysis. The p-value for the intercept is almost zero, indicating that the intercept is statistically very significant. The p-value for offer size is 0.8868, which is greater than 0.05,

indicating statistical insignificance. The p-value for private equity backing is 0.0629, which is slightly above the significance level of 0.05. This suggests that private equity backing may have some effect on the dependent variable, but the result is not completely certain. The significance F-value is 0.1527, indicating that variables together do not explain the independent variable in a statistically significant way.

The results of the second regression analysis do not support Hypothesis 2 (*Hypothesis 2: PE-backed IPOs perform better in a long run than non-sponsored IPOs*), The p-value for the private equity-backed variable is slightly above the significance level of 5%, and the R-squared value is quite low. Therefore, we cannot conclude that PE-backed IPOs perform statistically significantly better in the long-term compared to non-sponsored IPOs.

Table 19. Anova Results for the Second Multiple Linear Regression Analysis

ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	2	14.3109511	7.1554755	1.8887105	0.1527183	
Residual	371	1405.5523261	3.7885507			
Total	373	1419.8632771				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	1.0818592	0.1162909	9.3030458	0.0000000	0.8531873	1.3105311
Offer size (eur)	0.0000000	0.0000000	-0.1424056	0.8868369	0.0000000	0.0000000
Private equity-backed	0.5322338	0.2853187	1.8654008	0.0629144	-0.0288109	1.0932784

4.4 Analysis of Results and Comparison to Previous Research

4.4.1 IPO Underpricing

The underpricing of initial public offerings is a well-documented phenomenon, with numerous studies confirming its existence (Ibbotson 1975; Ljungqvist 2007; Loughran, Ritter, and Rydqvist 1994/2024; Ritter and Welch 2002). Keloharju (1993) studied the underpricing on the Helsinki Stock Exchange, while Westerholm (2006) examined the phenomenon across the Nordic region. Both studies confirmed the presence of underpricing in the Nordic markets. When examining the ownership background of IPOs, the literature presents mixed results. By classifying IPOs by ownership, Megginson and Weiss' (1991) study indicates that VC-backed IPOs tend to experience lower underpricing compared to non-VC-backed IPOs. Cao and Lerner's (2009) study documented that RLBO-

backed IPOs are less underpriced than non-RLBO-backed IPOs. However, some studies report contrary findings. For example, Francis and Hasan (2001) and Lee and Wahal (2004) documented that VC-backed IPOs have higher first-day initial returns compared to non-VC-backed IPOs.

This study reveals that Nordic IPOs experience an overall underpricing of 13.63%, which is consistent with the findings of Keloharju (1993) and Westerholm (2006). This finding contradicts the efficient market theory, presented by Fama (1970). Results indicate that sponsored IPOs have higher underpricing than non-sponsored IPOs. According to the data, sponsored IPOs exhibit a 37.28% underpricing on the first trading day, while non-sponsored IPOs experience an 8.75% underpricing, after adjusting for market returns. This contradicts the Levis (2011) study, which shows that sponsored IPOs experience lower underpricing. Ritter (1984) documented that riskier firms' IPOs tend to be more underpriced. This finding aligns with the results, as sponsored IPOs are generally riskier than non-sponsored IPOs due to the inherent nature of private equity firms. However, the statistical difference between these groups, tested using a student's t-test, shows a p-value greater than 0.05, indicating that the difference in underpricing is not statistically significant. Therefore, no further conclusions can be drawn from this result.

Furthermore, when comparing venture-backed and buyout-backed IPOs, the study shows that venture-backed IPOs experience significantly higher underpricing. On average, venture-backed IPOs are underpriced by 73.76%, while buyout-backed IPOs are underpriced by 12.33%, in terms of market adjusted initial return. This supports Buchner, Mohamed, and Wagner's (2019) findings that venture-backed IPOs offer larger first-day returns than buyout-backed IPOs. Similar findings were presented by Lee and Wahal (2004) and Francis and Hasan (2001), who documented that venture-backed IPOs experience higher underpricing than non-venture-backed IPOs. Lee and Wahal (2004) highlighted that the valuation of venture-backed IPOs is more challenging than buyouts because the cash flows of venture-backed IPOs are unpredictable and unstable. Consequently, information asymmetry increases, leading to higher underpricing (Lee and Wahal 2004, 40)

The results of the first regression analysis indicate that no further conclusions can be drawn for the existing literature, as the offer size and private equity backing do not have a statistically significant effect on first-day underpricing.

4.4.2 Short-Term Performance

When analyzing the short-term performance of IPOs, the results signal that sponsored IPOs tend to outperform non-sponsored IPOs when the initial return is included. Both types of IPOs generally outperform the market overall, as the WR values are greater than 1 across all three timeframes. Excluding the initial return changes the performance dynamics between sponsored and non-sponsored IPOs, as non-sponsored IPOs then perform superior to sponsored ones. Even excluding the initial return, all IPOs perform greater than the market index except sponsored IPOs in 1 month timeline.

However, there is limited research evidence on the short-term performance of sponsored versus non-sponsored IPOs, making it challenging to compare these findings directly with earlier studies. Despite this, the observations align with previous research that suggests IPOs, on average, tend to perform better in the short term compared to the market index (Friesen and Smith 2009; Hahl, Vähämaa, and Äijö 2014; Mumtaz, Smith, and Ahmed 2016).

4.4.3 Long-Term Performance

Along with the IPO underpricing, the IPO long-term underperformance is another well-documented phenomenon. Numerous studies have confirmed the existence of this underperformance (Aggarwal and Rivoli 1990; Lee, Taylor, and Walter 1996; Ritter 1991). Both Keloharju (1993) and Hahl, Vähämaa, and Äijö (2014) researched the Finnish IPO market and documented that Finnish IPOs underperform in the 3-year timeline. The previous literature presents different results when analysing IPOs long-term performance categorized by ownership. Several studies reveal that VC-backed IPOs perform superior compared to non-VC-backed IPOs in the long term (Brav and Gompers 1997, Jain and Kini 1995). In contrast, Cao and Lerner (2009) and Bergström, Nilsson, and Wahlberg (2006) provided evidence that buyout-backed IPOs outperform non-buyout-backed IPOs in the long term.

This study reveals that all IPOs in the Nordics from 2005 to 2020 have outperformed the market index during the long-term, both with and without including the initial return in the WR value. The average WR value exceeds 1 in both cases indicating that investing in these IPOs and holding them for 1, 2, and 3 years has been more profitable than investing in OMX Nordic 40 index. This finding contradicts the previous studies (Hahl, Vähämaa, and Äijö 2014; Keloharju 1993). When comparing sponsored and non-sponsored long-term performance, results show that sponsored performs superior compared to non-sponsored when initial return is included. This aligns with the Levis (2011) study, which shows that the PE-category (including VC-backed and BO-backed) together perform better in the long run than the non-sponsored category. When comparing the venture-backed IPOs to buyout-backed IPOs, results show that venture-backed IPOs perform superior to buyout-backed IPOs, when including the initial return. This aligns with previous studies (Brav and Gompers 1997; Jain and Kini 1995), which documented that venture-backed IPOs perform superior in the long-term to non-venture-backed IPOs. The situation changes when the initial return is excluded from the WR value. When excluding the initial return, the long-term WR values of venture-backed IPOs are less than 1, indicating that they underperform the market index over 1, 2, and 3-year periods. However, buyout-backed IPOs have WR values greater than 1 across all long-term periods, showing they offer better profit opportunities than both venture-backed IPOs and the benchmark index, even when the initial return is excluded. These findings for buyout-backed IPOs align with the study by Bergström, Nilsson, and Wahlberg (2006), which also excluded the initial return over a 3-year period, demonstrating that buyout-backed IPOs perform better in the long run.

The second regression analysis shows that private equity backing and offer size do not have a statistically significant effect on long-term performance. Therefore, no further conclusions can be drawn from the existing literature.

4.4.4 Summary of results

Table 20 presents the overall results of this study, indicating that IPOs generally offer investors a significant investment opportunity. The table shows that the first day's market-adjusted initial return is positive across all groups. Additionally, the WR values for both short-term (6-month) and long-term (3-year) periods are above 1. This suggests that investing in all IPOs issued between 2005 and 2020 and holding them for these periods, has been more profitable than investing in the OMX Nordic 40 index.

As seen from the table, venture-backed IPOs offer the greatest profit opportunity among these IPO groups. Overall, sponsored IPOs provide significantly higher returns compared to non-sponsored IPOs. As the study's results show, sponsored IPOs exhibit a higher standard deviation, making them riskier investments compared to non-sponsored IPOs.

Table 20. Statistics for all IPO Groups by the Ownership Structure

Statistics	Sponsored IPOs	Venture- backed IPOs	Buyout- backed IPOs	Non- sponso- red IPOs	All IPOs
Underpricing Mean (MAIR) %	37.28 %	73.76 %	12.33 %	8.75 %	13.63 %
6-month WR Value Mean (Including IR)	1.27	1.41	1.17	1.11	1.14
3-year WR Value Mean (Including IR)	1.59	2.13	1.23	1.08	1.17
N	64	26	38	310	374

5 CONCLUSIONS

The purpose of this study is to investigate how underpricing occurs in sponsored IPOs and how these underpricing compares to non-sponsored IPOs. Additionally, the intention is to analyze post-IPO performance over short-term and long-term periods, studying differences between various groups categorized by pre-IPO ownership. This study specifically concentrates on the impact of pre-IPO ownership on IPO underpricing, and post-IPO performance. These ownership groups include sponsored IPOs, i.e. buyout and venture capital-backed IPOs, and non-sponsored IPOs.

IPO underpricing and IPO long-term underperformance have been common research topics among researchers for decades. The IPO underpricing occurs when a stock generates abnormal returns on the first trading day. The amount of underpricing is usually described as the amount of money companies leave “on the table”. The number of IPOs has varied during the 2000s, but the trend has been upward in recent decades. The public market offers companies a platform to raise equity capital, and that capital can be used for acquiring other companies and generally growing their business. The public market offers existing shareholders an opportunity to liquidate their wealth or diversify their investment portfolios. An IPO also offers private equity capital investors a chance to exit their investments.

The Nordic region stands out as an attractive market for companies to enter the public market, drawing significant interest from private equity investors. Despite extensive research on underpricing and long-term underperformance, the impact of pre-listing ownership on these phenomena has received limited attention in previous literature. There is a notable lack of research on sponsored IPOs, including both buyout and venture capital-backed IPOs compared to non-sponsored IPOs, particularly in the Nordic region, as existing studies mostly focus on the U.S. market. This study aims to fill these gaps by providing more evidence on the effects of pre-IPO ownership in the Nordic region.

The data of this study consists of 374 companies, that are issued an initial public offering during 2005-2020. This includes primary IPOs made in the Nordic region, including Finland, Sweden, Norway, and Denmark. The data includes 310 non-sponsored IPOs and 64 sponsored IPOs including 38 buyout-backed and 26 venture capital-backed IPOs. The data shows that the most active industries for private equity investors are healthcare, consumer cyclicals, and industrials. For non-sponsored IPOs, the most active industries are technology, healthcare, and industrials. The underpricing is calculated by the difference between the offer price and the first day’s closing price, following the method used by Ritter (1991). This is measured using the raw initial return (RIR) and the market adjusted initial return (MAIR), which accounts for market index movements over different periods. The post-IPO performance is calculated using

the wealth relative (WR) method, which also Ritter (1991) and Hahl, Vähämaa, and Äijö (2014) have used in their studies.

The results of this study show that sponsored IPOs experience higher underpricing compared to non-sponsored IPOs. Sponsored IPOs exhibit 37.28 % underpricing on the first trading day, while non-sponsored IPOs exhibit an 8.75 % underpricing, as measured using market adjusted initial returns. Private equity IPOs generally involve higher risk and higher risk is associated with greater underpricing, as noted by Ritter (1984), which might explain this difference. Even though this study documents the percentage difference in underpricing, the results of the student's t-test show that the difference is not statistically significant. Overall, all IPOs issued during 2005-2020 experienced underpricing of 13.63 % on average. This finding aligns with previous literature, which consistently shows that IPOs are generally underpriced on average.

When comparing venture-backed IPOs underpricing to buyout-backed IPOs, results show that venture-backed IPOs experience significantly higher underpricing than buyout-backed IPOs. Venture-backed IPOs exhibit an underpricing of 73.76 %, while buyout-backed IPOs experience a 12.33 % underpricing, measured as a market adjusted initial return. This greater underpricing in venture-backed IPOs might be due to their higher risk, as they often involve smaller companies with unstable business models and more unpredictable cash flows.

The explanation for underpricing is explored using multiple linear regression analysis. The first day's underpricing, measured by market-adjusted initial return, operates as the dependent variable, while the independent variables are private equity backing and offer size. The result of this regression analysis shows that the independent variables do not explain the dependent variable alone or together, since the p-value is greater than 5% for both the individual coefficients and the overall F-statistic.

When exploring the post-IPO performance, results indicate that sponsored IPOs perform superior in the short- and long-term compared to non-sponsored IPOs, when including the initial return. Overall, all IPOs conducted between 2005 and 2020 have been better investment opportunities in both the short and long-term compared to investing in the OMX Nordic 40 index. Comparing the post-IPO performance of buyout-backed and venture-backed IPOs, the results suggest that venture-backed IPOs outperform buyout-backed IPOs when initial returns are included.

In addition, a regression analysis was conducted to explain the post-IPO performance over a three-year period. The results show that neither offer size nor private equity backing significantly explains the three-year performance. However, private equity backing is close to the significance level, suggesting that it might have some effect on the three-year performance.

The higher underpricing of private equity-backed IPOs documented in this study could be explained by the greater risk and uncertain cash flows related to these companies, as mentioned earlier. In addition, greater underpricing may

also be influenced by reputational motives: private equity firms may aim to maintain their good reputation by demonstrating that their IPOs are successful and attractive investment opportunities. This strategy might also help private equity investors achieve good and smooth exits in the public market in the future. The result of this study indicates that the presence of private equity firms can affect IPO pricing, and companies may benefit from cooperating with private equity firms to ensure an efficient and successful exit. For investors, the findings indicate that IPOs made by private equity-backed entities may present more attractive investment opportunities than non-sponsored IPOs.

For further research, it would be interesting to investigate how sponsored and non-sponsored IPOs perform across different industries. Specifically, examining whether there are advantages in sectors such as healthcare or consumer cyclicals, which are popular among private equity investors, could provide valuable insights. Additionally, exploring how economic factors such as interest rates or inflation statistically impact IPO activity, and the performance of private equity-backed companies would be valuable.

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