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Private Equity-backed IPOs – a recipe for success?

A quantitative study of Private Equity-backed and non Private Equity-backed IPOs on the Nordic stock exchanges

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Abstract

Title: Private Equity-backed IPOs – a recipe for success?

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Key words: IPO, Private Equity, Nordic, Underpricing, Long-term performance, BHAR

Purpose: The purpose of this paper is to study and compare the underpricing and long-term performance of Initial Public Offerings of companies backed by Private Equity-firms to Initial Public Offerings of companies not backed by Private Equity-firms on the Nordic stock exchanges between 2007-2018

Methodology: Deductive method

Theoretical perspective: Previous research has indicated that Private Equity-backed IPOs in general are less underpriced than non-PE-backed IPOs, and that they also outperform long-term. In addition, previous research has mostly focused on the US market or other European markets and have not limited the type of IPOs

Empirical foundation: The sample consists of 92 companies that have went public on any of the Nordic stock exchanges between 2007-2018, with an IPO size of at least EUR 100 million. The OMX Nordic All Share has been applied as benchmark index

Conclusions: No significant differences in the underpricing between the PE-backed and non-PE-backed IPOs can be identified, and the chosen variables cannot with statistical significance be confirmed to impact the first day of trading. Furthermore, non-PE-backed IPOs have overperformed to PE-backed IPOs in the sample

Preface

To begin with, I would like to extend my gratitude to my supervisor Anna Grodecka-Messi for providing guidance and advice during the thesis process. I would also like to thank various fellow students for giving me support and ideas.

Olof Ståhl

Definitions and terms

IPO: Initial Public Offering, the first time a company's share are made available for the public on a stock exchange.

Private Equity: "PE". A financial investor that buy and restructure companies not publicly traded.

Underpricing: The return of a stock on the first day of listing.

Return: The change in price of an asset.

Long-term performance: The return over a period of two years compared to relevant benchmark index.

Table of Contents

1 Introduction

In this section the author presents the background of the study, the problem statement, purpose, scope and limitations of the study as well as the outline for the paper.

1.1 Background

IPOs have largely increased in popularity during the past couple of years, mainly among the retail investors whose access to the financial markets has been facilitated. Companies generally seek a public listing for two main reasons, (a) to receive funds in order to execute on growth strategy, expansion or financial constraints, or (b) the owner of the company seeks to sell their position and is not able to retrieve the same value from the private markets.

In relation to the IPO of Nordnet and a completed fundraising in 2020, Nordic Capital (Swedish PE firm) received a lot of criticism from Swedish newspaper Dagens Industri for heavy underperformance of their previous IPOs. According to Dagens Industri, five of their previous IPOs have generated a negative return for the investors in the IPO, during which the stock market in Sweden increased in value (Dagens Industri, 2020-10-01). However, due to the very successful IPO of Nordnet in November, Dagens Industri reported rumours of several other potential PE-backed IPOs in 2021 (Dagens Industri, 2020-11-30), and the question is thus whether IPOs backed by Private Equity firms over- or underperform other IPOs.

Private Equity firms have grown significantly in the Nordic region during the past 20 years, and traditional buyout funds raised more than €22.5 billion in 2018 alone (Argentum, 2018). This has increased the presence of PE firms in the Nordic M&A and IPO market significantly, where some of the largest IPOs the past years have been listed by Private Equity. The largest IPOs in terms of deal value for the past couple of years has been Dong Energy (€ 2,647 million) and Nets (€2,113 million), both backed by Private Equity (Dealogic).

1.2 Problem statement

As previously stated, Private Equity ("PE") firms have to some degree been criticised as PE-backed companies on the public markets have underperformed relevant benchmark index. However, a report published in 2018 on the Nordic Private Equity market (Argentum, 2018) claims that a majority of PE-backed listings have overperformed the general market, mainly driven by a handful of companies but also on a median level.

Underpricing in IPOs is a subject area that has previously been studied to a large degree. A lot of the studies have been carried out to understand the pricing mechanism of IPOs and whether there is any difference in pricing due to information asymmetry between investors – with a large focus on the US and European markets (Rock, 1986; Levis, 2010). Precedent findings have questioned the information efficiency of the IPO market, supporting Shiller's (1990) hypothesis that the IPO market in particular is subject to trends that effect market prices.

Studies on the long-term performance of IPOs in relation to other stocks have also been widely performed, where Ritter (1991) finds that IPOs within three years significantly underperform comparable firms. Main reasons for their underperformance include risk mismeasurement, bad luck and/or fads and over optimism. Similar studies in the subject area have been carried out by Loughran and Ritter (2000), Ljungqvist and Wilhelm (2003) and Lowry, Michaely and Volkova (2017).

Several studies comparing the performance between PE-backed and non-PE-backed IPOs have been carried out previously (Bergström, Nilsson and Wahlberg, 2006; Katz, 2009; Levis, 2011, Lange and Rietmann, 2015). However, most previous studies have focused on the US and specific European markets, as well on the broad IPO market as a whole. As will be presented later, some studies have also been carried out on the Nordic markets, focusing on a lot of the same variables as those completed in the US and European markets. The ambition with this study is thus to focus on other parameters than have previously been studied, such as IPO size and free float, and whether PE-backed IPOs have outperformed other IPOs in the Nordics.

1.3 Purpose and questions at issue

The purpose of this paper is to study the development of PE-backed IPO versus non-PE-backed IPOs. The comparison will be made both from a short-term perspective, defined as the first trading day, and long-term perspective, defined as two-year performance, on the Nordic stock market (Nordic defined as Denmark, Finland, Iceland, Norway and Sweden) between 2007-2018.

This study thus intends to answer the following questions:

- Does the performance on the first trading day differ between PE-backed IPOs and non-PE-backed IPOs?
- Does the performance after two years of trading differ between PE-backed IPOs and non-PE-backed IPOs?

1.4 Scope and limitations

The scope of the study is limited to the Nordic region, in this case defined as Denmark, Finland, Iceland, Norway and Sweden. This is due to the many other studies that have been completed within this topic that mostly focus on the European or US market, and this type of study lacks coverage in the Nordic region. The stock market indices in question are thus limited to the Nordics.

Many other studies in this area as discussed previously solely focus on the broad market in general, which by nature will include certain operating differences among companies in the sample. Previous studies have also found a difference in aftermarket performance between larger and smaller IPOs, as well as that PE-backed IPOs in general are larger. This paper is limited to companies with a minimum IPO size of EUR 100m at listing date. According to a study made by PWC (2020), investors account for size in their cost of capital calculations when valuing stocks, and as such, the size limit aims to neutralise those differences on stock performance in the long-term.

The first day performance has been calculated by comparing the subscription price, rather than opening price, to the closing price at the listing day. Likewise, the long-term performance has been calculated by comparing the first day closing price to the last closing price two years later (adjusted for leap years).

1.5 Outline

The study's theoretical framework of reference, section 2, introduces theories within the area of the subject, as well as previous studies in PE-backed IPOs. Section 3, method, describes the study's methodology to perform the study along with definitions of the calculations performed. Section 4, result and analysis, presents and analyses the examined data from certain perspectives, further discussed in section 5, conclusion.

2 Theoretical framework

Initially, this section presents the definitions of key terms and concepts in this study, followed by a summary of previous key studies and finally the author presents the development of hypothesis.

2.1 IPO definition

In an IPO, the owners sell shares of the company on the open market for the first time, where shareholders can trade shares for cash. Shares are either new (primary) shares or existing (secondary) shares, where the latter is held by venture capitalists, the company's founders, or, in a privatisation, the government. By issuing primary shares, the company is able to raise additional capital if it is in a more distressed position and needs to reduce net debt. The advantages of being a public company are, among others, that investors value the company and its performance on a daily basis, as well that it increases the availability to raise additional funds through, for example, new share issues (Stern & Hutchinson, 2011).

2.2 Private equity definition

SVCA (Swedish Private Equity & Venture Capital Association) defines PE as long-term investments in unlisted companies, i.e. outside of the stock exchange (some PE firms have specialised funds investing in public markets). Investments are typically made through a fund with the purpose to build a better company through value-creating activities, in order to generate a return on the investment. What normally distinguishes PE firms to other investors is the focus on generally more mature companies and a more aggressive financing structure of the investment. PE firms can exit the investment in two ways; either by selling the company to another PE firm or competitor in the sector, or by listing the company on the stock market.

2.3 Previous studies

Underpricing

Grossman (1976) evaluated the underpricing on a market with uninformed and informed investors and concluded that if one group of investors has superior information about the true value of an asset, the information can be read by anyone from the equilibrium price,

generating a paradox. Although, the study is based on a noiseless environment, and if any noise is present in the equilibrium price, the privileged information for one group is secured. Rock (1986) takes an alternative view on the underpricing phenomenon and uses a theoretical model for the underpricing based on information asymmetry between informed investors and uninformed investors. His analysis shows that the offer price includes a finite discount to attract uninformed investors, however noting that it is not clear what advantage accrues to the issuer from uninformed participation. Loughran, Ritter and Rydqvist (1994) agrees with the findings of Rock (1986), stating that across countries and continents, companies going public are underpriced in the short run.

That Private Equity-backed IPOs are in general less underpriced than non-PE-backed IPOs are supported by a study from Bergström, Nilsson and Wahlberg (2006). The authors find that PE-backed IPOs demonstrate less underpricing due to less uncertainty regarding the true value of the issuing firm, since private equity firms contribute to less adverse selection through their certification role and greater information disclosure. They also find that the results differ somewhat between different stock markets due to difference in industry composure and issuing activity between years. This is supported by Levis (2011) study of the UK market, finding a positive relationship between the leverage and stock market returns. Lange and Rietmann (2015) also studied the UK market, and where they received the mean of PE-backed IPOs to be in line with Levis (2011), the authors could not statistically find any evidence of a lower underpricing for PE-backed IPOs.

Megginson and Weiss (1991) also researched on the certification of quality in IPOs from PE-backed companies, concluding that IPOs with a venture capitalist in the ownership structure functions as a certification for quality, thus lowering the underpricing and volatility in its first day of trading.

Long-term performance

Ritter (1991) first elaborated on the long-run performance of IPOs in comparison to the market. He concludes that in the long-run, IPOs tend to be overpriced and that after 3 years of going public, firms significantly underperform compared to a set of comparable firms matched by size and industry. Ritter (1998) continues to study this phenomenon on the US market in a later study, concluding again that over the longer-term IPOs tend to underperform. He states that there is evidence for firms going public on the stock market when the public

market is willing to pay the highest valuations, and thus as a result, when the IPO market is most buoyant, investors frequently receive low long-run returns.

Based on the above, Katz (2009) studies the aftermarket performance of IPOs for PE-backed IPOs. He states that firms with a majority of private equity-ownership experience a better long-term stock performance. Levis (2011) research this issue further and presents evidence that PE-backed IPOs tend to perform better in the aftermarket within 3 years of going public. He also concludes that PE-backed companies are on average larger, in terms of capital raised, market capitalisation, sales and assets.

Those conclusions are also supported by Bergström, Nilsson and Wahlberg (2006), who concludes that PE-backed IPOs on average outperform non-PE-backed IPOs in the longer-term. They also find evidence that larger IPOs tend to perform better than smaller IPOs, with the theory that this may be the result of larger IPOs being less subject to overoptimistic investors adjusting their expectations. Larger IPOs also tend to be associated with a greater percentage of institutional shareholding, contributing positively to less substantial price volatility.

Studies on the Nordic markets

Björkqvist and Kallén (2018) tested IPOs' performance on the Swedish stock markets between 2007-2017 to a benchmark index, both from a short-term perspective and long-term perspective. The authors found that IPOs are in general underpriced by circa 9%, and that those IPOs did not statistically underperform the general market over a three-year period.

Luukka (2020) studied IPOs on the Nordic stock markets, focusing on the different ownership structures of the companies going public, specifically on buyout- and venture capital-firms. The author found that Buyout-backed (PE) IPOs in general are less underpriced compared to non-PE-backed IPOs, contradicting previous studies made on the subject in the US and UK. Luukka (2020) also found that Buyout-backed IPOs in general outperform non-PE-backed IPOs in the long-term (defined as a three-year period) but could not statistically prove the findings.

2.4 Development of hypothesis

Based on previously presented reports on the certification of venture capitalists in IPOs from Megginson and Weiss (1991), the underlying assumption is that the PE-backed IPOs should be less underpriced. Luukka (2020) however, found no evidence of the certification of PE-owners on the Nordic markets. Thus, based on the available studies on the Nordic markets, the first hypothesis is that there will not be any statistical difference in underpricing between the two sample groups.

While previous research indicates that PE-backed companies in general are more efficiently run that non-PE-backed IPOs, the second hypothesis is that the long-term performance will be higher for PE-backed companies.

3 Method

In this section, the scientific method is initially described, followed by a walkthrough of the empirical approach, including data collection, benchmark index, central calculations and the regression model.

3.1 Scientific method

The applied scientific method in this study is the deductive method. Using this method, the researcher deduces a hypothesis based on what is previously known about a particular domain and theoretical concepts linked to that domain. Thereafter, he needs to translate the hypothesis into operational terms, and collect sufficient data in order to test the hypothesis based on theory. The findings from the study will then be applied as a basis to either confirm or reject the previously stated hypothesis, and also enable the researcher to potentially revise the underlying theory and come up with new perspectives for further research (Bryman and Bell, 2015). The below figure illustrates the deductive process.

Figure 1: The deductive process.

Source: Bryman and Bell (2015).

3.2 Empirical approach

3.2.1 Data collection

The data for IPOs has primarily been sourced through Dealogic, a platform providing data on IPOs with detailed information on several variables. The data has then been checked with company specific sources, such as IPO prospectus. The data for trading has primarily been sourced through Nasdaq Nordic and Factset. A compilation of the data is available in appendix 7.1.

3.2.2 Benchmark index

In order to analyse the returns of each stock from IPO, a benchmark index will have to be applied to test against. Over- or underperformance will thus be calculated as the difference between the measured value for each individual stock and the comparable benchmark index. This approach is in-line with previous studies in the area, e.g. Levis (2010) who applied the FTSE All-Share-Index in the UK.

As this study is limited to the Nordic region, the applied benchmark index is the OMX Nordic All Share index. The index is a Pan-Nordic index including all shares on the OMX Stockholm, OMX Copenhagen and OMX Helsinki indices. The index however, only covers those stock exchanges owned by Nasdaq, thus the Norwegian stock exchange is not included in the index. However, as this study aims to apply only one benchmark index for comparability, the chosen Nordic benchmark index is deemed to cover the underlying markets as sufficiently as possible. Other indices of the Nordic stock markets only include a selection of companies, thus not including all shares on the underlying markets.

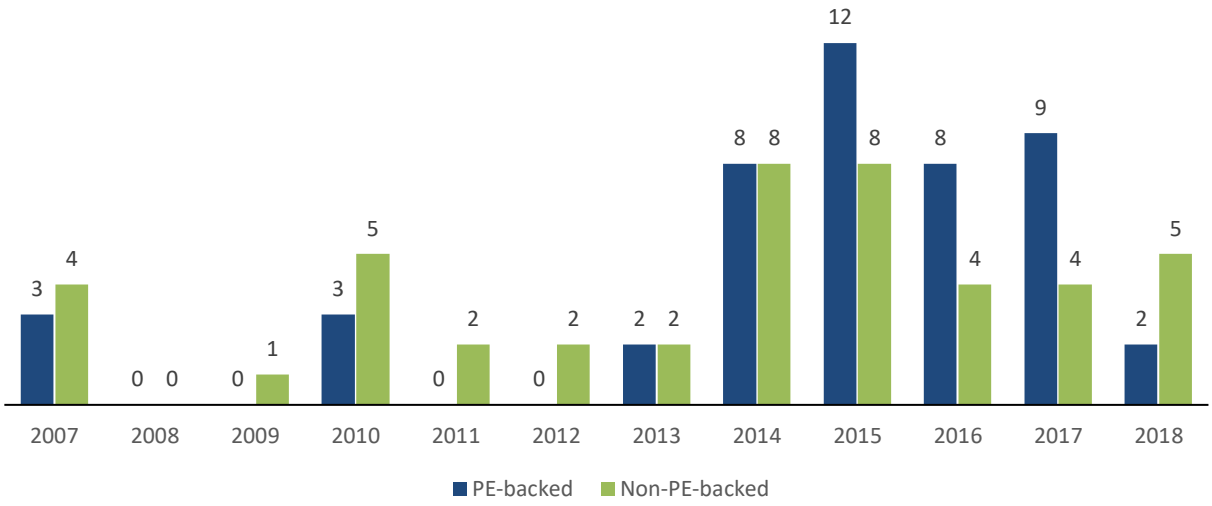
3.2.3 Independent variables

The applied independent variables in this study are listing year, IPO size and free float.

3.2.3.1 Listing year

Companies tend to IPO when the willingness to pay among investors are higher, which will thus be linked to a high IPO market activity when the value of the stock market is higher (Ritter, 1998). Consequently, a dummy variable has been applied for the firms age to examine whether the listing year of a company will affect the first trading day- and long-term performance. The above theory is strengthened by the pattern illustrated below, where the IPO market activity decreased during the financial crisis (2008-2009) as well as during the Euro crisis (2011). According to Thomas Hofvenstam (Argentum, 2018), head of Triton (Swedish PE firm) in the Nordics, investors investing in IPOs become more cautious during times when the market is concerned over where we are in the current cycle, supporting the lower IPO activity in the beginning of the defined time period. Graph 1 illustrates the distribution per year of the IPOs in this paper's sample set.

Graph 1: Number of IPOs per year above EUR 100m in IPO size.



Source: Dealogic.

3.2.3.2 IPO size

The size of the firm going public have according to previous studies had a correlation to underpricing and market underperformance, where most studies focus on the size of the company one year before listing. As stated previously, under the scope and limitations of this paper, the study aims to limit the scope of companies to a sample of companies IPO size of above EUR 100 million. As this study will not differentiate between different sectors, the size of the IPO rather than the size of the company prior to listing has been determined to function as a dummy variable in the regression analysis, as companies will receive different valuations of their revenues and earnings on the public market depending on sector and other company-specific variables. The table below (table 1) illustrates that PE-backed IPOs are on average larger than other IPOs, and also that the largest IPO between 2007-2018 was backed by PE. Similar to the findings of Luukka (2020), PE-backed IPOs are on average larger than non-PE-backed IPOs

Table 1: Statistics for IPO size.

IPO size (EURm)	PE	Other
N	47	46
Mean	455	306
Median	304	216.5
Maximum	2647	1416
Minimum	103	111

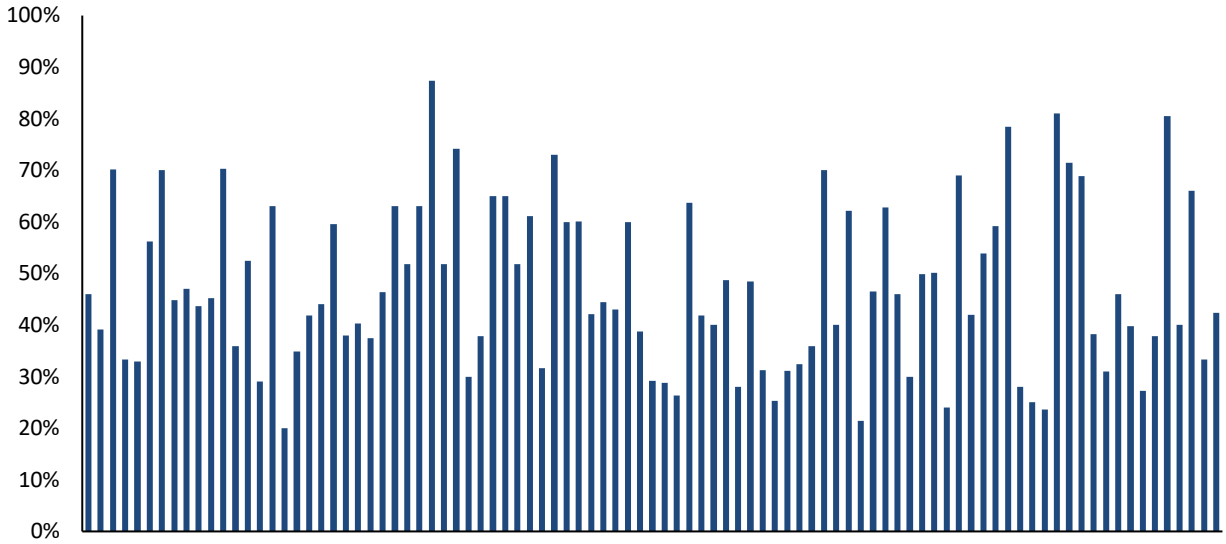
Source: Dealogic, SPSS, company IPO prospectus.

3.2.3.3 Free float

Previous studies, mostly made on the Asian stock markets, suggest that free float ratio significantly affect the market volatility of a stock and its performance. Wang and Xu (2004) illustrate that floating ratio is positively related to the expected stock returns on the Chinese stock market; Chan, Chan and Fong (2004) finds that decreasing floating ratio substantially tightens the liquidity of stocks in the Hong Kong market; and Cui and Wu (2007) study the liquidity effect of floating ratios in the Chinese market.

As previously noted under the criticism of previous studies, studies on European and US markets lack the perspective of applying the free float to the analysis of stock trading. The free float can be another way to look at ownership concentration, i.e. a high concentration of ownership will lead to a low level of floating shares. Bostanci and Kilic (2010) states that a low free float ratio can have two possible effects; (1) the first is related to the corporate governance regime, i.e. it is expected to discourage investors to invest in a firm with a smaller floating ratio under the weak corporate governance structure since ownership concentration increases the probability of expropriation by controlling investors, and (2) the second effect is related to the market structure of a stock, i.e. a low free float ratio means a small number of shares are available in the market which will decrease investor interest in the stock. Graph 2 illustrates the free float of the sample set (ranging between circa 30% to 90%).

Graph 2: Free float of sample data set, in percentage.



Source: Dealogic, company IPO prospectus.

3.2.4 Central calculations

Underpricing

Most previous studies (Loghran, Ritter and Rydqvist,1994; Bergström, Nilsson and Wahlberg, 2006; Björkqvist and Kallén, 2018) follow the same methodology to calculate the underpricing of a stock, which will be applied in this study. Underpricing is defined as the return on the first day of listing, being the percentage difference between the subscription price at IPO (offer price) and the price at closing the same day. However, in order to adjust for movements in the stock market, the first day return needs to be adjusted for the return of a selected benchmark index. Thus, MAIR (market adjusted initial return) has been applied in order to calculate the underpricing of each stock. As previously stated, the chosen benchmark index in this study is the OMX Nordic All Share index. If the MAIR is above 0% the stock is considered to be underpriced, and vice versa if the MAIR is negative.

$$MAIR = IR - MR = \frac{Pi,1 - Pi,0}{Pi,t-1} - \frac{OMXNAS1 - OMSNAS0}{OMXNAS0}$$

where

Pi,0 = closing price at first day of trading for company i

Pi,1 = closing price at specified time for company i

OMXNAS0 = opening price for OMX Nordic All Share

OMXNAS1 = closing price for OMX Nordic All Share

Long-term performance

Similar to Levis (2010) and Björkqvist and Kallén (2018) among others, the long-term performance of an IPO in this study will mimic the method in those previous studies by measuring it by the buy-and-hold abnormal returns (BHAR) method. BHAR measures the total return from a buy and hold strategy, where an investor is assumed to purchase the stock on the day of IPO and held for a specified period of time. In this paper, the time period has been determined to two (2) years. The BHAR method involves a monthly rebalancing, thus in the case of a stock being delisted, the return of the stock is equally balanced between the remaining portfolio companies for the next months' return. After each individual performance within the portfolio has been calculated, the companies are aggregated together with equal weights within the sample set. For the market performance, similar calculations have been computed (mimicking a portfolio where the investor invests in the benchmark index at each IPO date).

$$Ri,t = \frac{P1 - P0}{P0}$$

where

$R_{i,t}$ = return for reach company

P_1 = price for each company at end of period

P_0 = subscription price for each company

After the company performance is calculated, the return of OMX Nordic All Share is subtracted:

$$BHAR = \prod_{t=1}^{T}\left(1 + R_{i,t}\right) - \prod_{t=i}^{T}(1 + R_{m,i})$$

where

Ri,t = return of company i at time t

Rm,i = return of applied benchmark index at time t

3.2.5 One sample student t-test

A one sample student t-test is a statistical test to determine if there is any significant difference between the means of two groups, in this case between the PE-backed IPOs and non-PE-backed IPOs. The t-test is used as a hypothesis testing tool of data that would follow a normal distribution and may have unknown variances, allowing for the testing of an assumption applicable to a population (Investopedia, 2020).

3.2.6 Regression model

A linear regression analysis has been applied, where the return is used as the dependent variable:

$$Return = \alpha + \beta 1 + cx + \epsilon$$

where

α = constant applied for the short-term perspective

β = represents the effect for the first-day trading return of being PE-sponsored

1 = dummy variable applied for PE-sponsored companies, where 1 = PE-sponsored

x = the control variables previously presented, being year of listing, IPO size and free float

For the calculations to examine the long-term perspective, the first-day trading return is replaced by BHAR.

3.2.6 Method discussion

Durbin-Watson

In a regression model through OLS, errors can be identified that are not independent, but autocorrelated. Hurvich (2020) states that such error autocorrelation has many undesirable but correctable consequences, for example that the OLS model estimates sub-optimal, standard confidence intervals for the dependent variable, the error term is forecastable. A test for

autocorrelation can thus be made through a Durbin-Watson test, where in general test values in the range 1.5-2.5 is to be accepted.

Heteroscedasticity

The OLS regression model assumes that the underlying data have homoscedasticity, that is one of the Gauss-Markov conditions and states that the disturbance terms are drawn from probability distributions that have 0 mean and the same variance (Dougherty, 2011). If the regression model has heteroscedasticity instead, the variation of the error terms are not constant. The test for heteroscedasticity assumes the null hypothesis that the regression model has homoscedasticity, and if the null hypothesis is rejected it has heteroscedasticity. Please see appendix 7.2 and 7.3 for output graphs on heteroscedasticity.

4 Results and analysis

Initially the results on the short-term- and long-term performance are illustrated. To conclude the section, the analysis from the results is presented.

4.1 Results

4.1.1 First trading day performance

4.1.1.1 Descriptive statistics

The sample of selected IPOs of 47 PE-backed and 46 other IPOs (seep appendix 7.1), generated an average MAIR of 8.46% for PE-backed and 7.20% for other IPOs. PE-backed IPOs are thus, in average, slightly more underpriced compared to the other sample. Analysis illustrates that the PE-backed sample is moderately skewed, while the c. 3.5 in skewness for the other sample indicates that the data is highly skewed. Kurtosis for the two samples shows that the PE-backed dataset has a moderate right tail, while the large kurtosis of 18.628 for the second sample has a large right tail and is thus not normally distributed. See table 2 for descriptive statistics.

Table 2: Descriptive statistics for the first day trading performance.

Descriptive statistics	PE-backed	Non-PE-backed
Observations (N)	47	45
Median	5.99%	3.26%
Mean	8.46%	7.89%
Variance	0.14	0.036
Standard deviation	11.73%	18.94%
Maximum	46.50%	109.24%
Minimum	-12.36%	-13.90%
Skewness	1.106	3.554
Kurtosis	1.785	18.628

4.1.1.2 One sample student t-test

The two-tailed one sample t-test has a significance of 0.000 for PE-backed IPOs and 0.007 for the other IPOs, rejecting the null hypothesis (that IPOs are not underpriced) on the 5% significance level of underpricing for Nordic IPOs. See table 3 for the one sample t-test.

Table 3: One sample t-test for underpricing.

One sample t-test	PE-backed	Non-PE-backed
Test value = 0		
t	4.946	2.854
df	46	44
Sig. 2-tailed	0.000	0.007
Mean difference	8.46%	7.89%
95% confidence interval of the difference		
Lower	5.02%	2.32%
Upper	11.91%	13.46%

4.1.1.3 Multiple regression analysis

The below multiple regression analysis explains the fit of the regression model to the underlying dataset. The regression value for the model accounts to 0.074, with an r-square of 0.5%. Based on common practice previously presented, a Durbin-Watson value between 1.5-2.5 indicates there is no autocorrelation in the data. Thus, no autocorrelation has been identified for the other IPOs, while there might exist some autocorrelation for the PE-backed IPOs.

Table 4: Multiple regression analysis on underpricing.

Regression	
R	0.074
R-square	0.005
Adj. r-square	-0.04
Standard error of the estimate	15.67%
Durbin-Watson	2.349

Source: SPSS.

The below table illustrates the coefficients for the regression run. The beta coefficients of the variables show more or less zero correlation for the regression, with none of the variables indicating any significant relationship.

Table 5: Coefficients for the regression output.

		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.977	11.163		0.267	0.79					
	PE	0.002	0.034	0.005	0.047	0.963	0.019	0.005	0.005	0.902	1.109
	IPOYEAR	-0.001	0.006	-0.028	-0.262	0.794	-0.026	-0.028	-0.028	0.973	1.028
	IPOSIZE	1.72E-05	0	0.045	0.409	0.684	0.038	0.044	0.044	0.938	1.066
	FREE_FLOAT	0.055	0.108	0.056	0.513	0.61	0.052	0.055	0.055	0.943	1.06

a Dependent Variable: FIRST_PERF

Source: SPSS.

4.1.2 Long-term performance

4.1.2.1 Descriptive statistics

The sample of selected IPOs of 47 PE-backed and 46 other IPOs, generated an average BHAR of 9.39% for PE-backed and 18.84% for other IPOs. Both samples have outperformed the selected benchmark index. However, PE-backed IPOs have underperformed compared to the other IPOs. Both dataset have generally a low skewness. Both the PE-backed IPOs and the non-PE-backed- IPOs has a moderate right tail (see table 6, kurtosis).

Table 6: Descriptive statistics for BHAR.

Descriptive statistics	PE-backed	Non-PE-backed
Observations (N)	43	45
Median	5.71%	16.13%
Mean	9.39%	18.84%
Variance	0.131	0.281
Standard deviation	36.23%	53.02%
Maximum	87.73%	130.20%
Minimum	-69.65%	-105.72%
Skewness	0.236	0.053
Kurtosis	-0.534	-0.337

Source: SPSS.

4.1.2.2 One sample student t-test

The two-tailed one sample t-test has a significance of 0.096 for PE-backed IPOs and 0.023 for the other IPOs, rejecting the null hypothesis for non-PE-backed IPOs on the 5% significance level of underperforming the selected benchmark index for Nordic IPOs.

Table 7: One sample t-test for BHAR.

One sample t-test	PE-backed	Non-PE-backed
Test value = 0		
t	1.700	2.356
df	42	42
Sig. 2-tailed	0.096	0.023
Mean difference	9.39%	18.84%
95% confidence interval of the difference		
Lower	-1.76%	2.70%
Upper	20.54%	34.98%

Source: SPSS

4.1.2.3 Multiple regression analysis

The regression value amounts to 0.127, and the r-square to 1.6%. Based on the below table, some autocorrelation in the data exists, albeit a very small margin.

Table 8: Multiple regression analysis for BHAR.

Regression	
R	0.127
R-square	0.016
Adj. r-square	-0.033
Standard error of the estimate	45.79%
Durbin-Watson	2.53

Source: SPSS.

4.2 Analysis

4.2.1 Underpricing

Independent variables

As previously presented, compared to earlier research conducted within the subject, this study has aimed to look at other variables to the traditional variables used when evaluating underpricing, more specifically the IPO size and free float.

Indicated by the results, no correlation can be seen between the IPO size and year of listing for the underpricing. The correlation for the variables is stronger for the other IPOs compared to the PE-backed IPOs, however the results are not statistically significant (t-statistic).

The free float has, as expected, a negative correlation to the first day trading performance for the PE-backed IPOs. As earlier presented, previous research has shown that the free float has a strong correlation to the market volatility of the stock. Thus, the lower the free float, the higher the market volatility, given that there is less number of shares available for trading for investors. However, the free float has the inverse correlation to the first day trading performance for the other IPOs. The variable is not statistically significant in either case.

Based on the above, no conclusion can be made between the correlation of the independent variables and the dependent variable.

Underpricing

Bergström, Nilsson and Wahlberg (2006) found that PE-backed IPOs is on average less underpriced compared to non-PE-backed IPOs, stating that the variations in the findings are large across different sector, but in general supported, as well as a statistically significant relationship between issue size and underpricing on the London Stock Exchange ("LSE"). The authors conclude that the timing of the IPO and the amount of capital raised in the IPO have larger effects on the underpricing than the presence of a private equity firm in the

shareholder list, suggesting the results to be open for discussion. The general findings of PE-backed IPOs being less underpriced compared to non-PE-backed IPOs are further supported by Levis (2010). However, both studies state the importance of the underlying methods and defined benchmarks to be comparable in order to compare conclusions between different studies.

Based on the findings in this study, there is no evidence of any difference in underpricing between PE-backed IPOs and non-PE-backed IPOs on the Nordic stock markets. However, the standard deviation is larger for non-PE-backed IPOs (18.94%) compared to PE-backed IPOs (11.73%), with the data also being significantly more skewed with a very high kurtosis. From the t-test, one can conclude that both samples of IPOs in general are underpriced on the 5% confidence interval. The R-square for the PE-backed IPOs are slightly higher (3.2%) compared to the second sample (0.6%), however both R-squares are determined to be too low to show any statistical significance for the regression model. Similar to the results of this study, Lange and Rietmann (2015) found that PE-backed IPOs in average experience higher first day trading returns (underpriced to a larger extent), while these findings lacked statistical significance. This is further reinforced by the study of Luukka (2020), who could not statistically distinguish any differences between PE-backed IPOs and non-PE-backed IPOs, while both groups' underpricing was statistically evident.

It is difficult to find any clear connection of the results between this study and the ones made by Lange and Riermann (2015) and Luukka (2020), apart from the data being more recent compared to other research. One reason could be that the presence of Private Equity firms today is much stronger, given the strong development of the whole PE sector the past years (Argentum, 2018), and that the older certification of quality that PE firms provided, no longer exists. One can also note that the large majority of IPOs in the defined size has been from 2014 and onwards. Differences to previously completed studies could also be explained by the time period and choice of underlying benchmark. Although, the sample size in this study is likely too small to generate any statistical evidence of difference in underpricing between the two datasets.

Given the small sample size, data outliers will have a very large impact on the overall result. One notable data point is Academedia, formerly owned by EQT, which stock rose more than 40% on its first trading day after its book was oversubscribed with c. 40 times. In this case, the presence of a private equity owner likely has no impact on the IPO, but likely other soft variables such as investor interest for the specific industry, niche or other factors.

4.2.2 Long-term performance

Bergström, Nilsson and Wahlberg (2006) conclude in their paper on the LSE that PE-backed IPOs in general outperform the non-PE-backed IPOs over the longer term, across all time horizons on an aggregated level. Long-run patterns, however, differ significantly between various methods and stock exchanges. The authors also conclude that large IPOs in general outperform smaller IPOs. These findings are supported by Levis (2010), who concludes in his paper that PE-backed IPOs outperform the market long-term. Levis also emphasises the impact of differences in underlying leverage between PE-backed and non-PE-backed IPOs as one the key differences for the variations, although subject to further research.

The median 2-year BHAR in this study has been calculated to be 9.4% for the PE-backed IPOs, in comparison to 17.2% for the non-PE-backed IPOs. These findings are thus not in line with previous research in the area. Based on the t-test for both datasets, one can draw the conclusion that both groups have enough statistical significance on the 5% confidence interval level to outperform the general stock market in the long-term. This result is on the contrary to the findings of Luukka (2020), who's sample was much larger including smaller IPOs, although he cannot find any statistical significance for the differences in long-term performance.

Looking at the regression for the long-term performance, the R-square received indicates that the regressions based on the presented independent variables have no correlation and no conclusion on the variables impact over the longer term to the long-term performance can be made. An alternative possibility to why the received results differ to previous research, is

most likely due to the sample size. The sample would have to be significantly larger, in order to be able to determine any significant result.

5 Conclusion

In this section, the author's conclusion is presented, followed by a short proposal for further research.

As stated in the first section of this paper, the overall purpose of this study is to evaluate the difference in underpricing (adjusted first day trading performance) and long-term performance (2-year trading performance) between PE-backed and non-PE-backed IPOs. The study has been based on the two questions below:

- Does the performance on the first trading day differ between PE-backed IPOs and non-PE-backed IPOs?
- Does the performance after two years of trading differ between PE-backed IPOs and non-PE-backed IPOs?

The study has found that there is a small difference in the underpricing between the PE-backed IPOs and the non-PE-backed IPOs, with the average adjusted first day trading performance for the first sample to be 8.5% and for the second to be 7.9%. Thus, the conclusion is that there is a difference, albeit a small one. However, this difference cannot be considered statistically significant.

For the long-term performance (2-year BHAR), the non-PE-backed IPOs have on average generated a far better return compared to the PE-backed IPOs, 18.8% compared to 9.4%. Although, based on the regression analysis, there is not a statistical significant difference that can be explained by the ownership type.

As a general conclusion compared to previous studies within the subject, adjusting the sample for size eliminates the large differences between the samples – as previously presented, PE-backed IPOs tend to be larger than non-PE-backed, while at the same time larger IPOs outperform smaller IPOs in the long-term. The size of the IPO has a strong correlation with investor interest, and an increase in the interest from investors could potentially decrease the

information asymmetry between informed and uninformed investors. However, the sample size for this study is likely too small to generate any sufficient results, and based on the analysis, the applied variables have not generated any statistical results either. In order to further understand the differences in trading between the two groups and to receive a higher degree of explanation for the variables, one should look into the data in more detail and make a qualitative assessment of the underlying data variables.

6 Sources

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7 Appendix

7.1 Data for IPOs

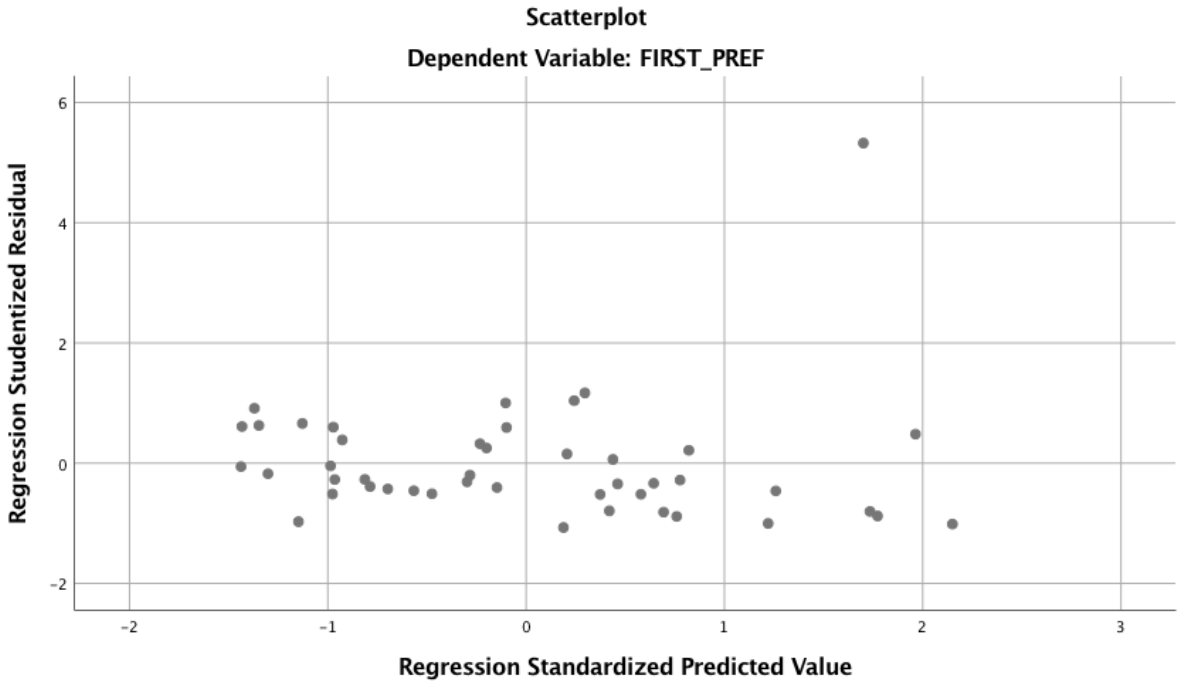
Company	Year	MAIR	BHAR
Arion Banki	2018	19.66%	-38.23%
Kojamo Oyj	2018	1.86%	106.00%
Netcompany Group A/S	2018	29.71%	87.73%
Bygghemma Group First AB	2018	-12.36%	31.72%
Altia plc	2018	3.36%	10.37%
ELKEM ASA	2018	-2.12%	-39.58%
Fjordkraft Holding ASA	2018	0.16%	117.65%
Terveystalo Oyj	2017	2.44%	-7.13%
Handicare Group AB	2017	10.18%	-31.29%
Rovio Entertainment Oyj	2017	-0.06%	-62.96%
EVRY ASA	2017	-9.40%	23.96%
SpareBank 1 Ostlandet	2017	0.16%	9.59%
Boozt AB	2017	24.78%	-24.51%
Saferoad Holding ASA	2017	0.32%	n.a.
Fjord1 AS	2017	13.00%	12.79%
Medicover AB	2017	16.06%	29.92%
Munters Group AB	2017	19.39%	-29.83%
Kamux Oyj	2017	4.92%	-24.32%
Instalco Intressenter AB	2017	18.26%	38.79%
Ambea AB	2017	9.53%	-5.47%
Arcus ASA	2016	0.47%	-10.54%
Volati AB	2016	14.62%	-49.77%
DNA Oyj	2016	-0.47%	54.94%
Ahlsell AB	2016	22.96%	-28.43%
Nets A/S	2016	-3.95%	n.a.
AcadeMedia AB	2016	46.50%	-24.64%
Nordic Waterproofing Holding A/S	2016	3.33%	-1.94%
Dong Energy A/S	2016	10.68%	33.03%
Resurs Holding AB	2016	1.75%	-4.64%
Tokmanni Group Oyj	2016	1.57%	-6.09%
LeoVegas AB	2016	15.49%	130.20%
Scandinavian Tobacco Group A/S	2016	-2.41%	-0.94%
Scandic Hotels Group AB	2015	-5.45%	64.27%
Attendo AB	2015	38.67%	21.08%
Dometic Group AB	2015	14.31%	33.38%
Skandiabanken ASA	2015	-5.94%	76.83%
Bravida Holding AB	2015	6.94%	16.80%

Capio AB	2015	1.03%	-5.10%
Europris AS	2015	-4.67%	-30.58%
Pandox AB	2015	1.25%	32.48%
Nobina AB	2015	-5.67%	45.10%
Alimak Group AB	2015	9.83%	30.24%
Nordax Group AB	2015	-1.48%	-5.41%
Coor Service Management Holding AB	2015	-0.73%	51.77%
Collector AB	2015	13.95%	43.04%
Multiconsult ASA	2015	18.51%	-9.93%
Asiakastieto Group Oyj	2015	2.66%	21.03%
Hoist Finance AB	2015	14.67%	16.13%
NNIT A/S	2015	26.14%	20.19%
Dustin Group AB	2015	15.86%	9.01%
Eltel AB	2015	7.29%	-39.25%
Ferratum	2015	-4.91%	-12.34%
Thule Group AB	2014	11.50%	57.96%
Lifco AB	2014	30.60%	82.39%
Entra ASA	2014	-0.19%	10.11%
Forward Pharma A/S	2014	-13.90%	-7.73%
Granges AB	2014	3.90%	74.63%
XXL ASA	2014	5.82%	63.49%
Inwido AB	2014	-5.37%	63.61%
Hoegh LNG Partners LP	2014	11.89%	-31.23%
Scandi Standard AB	2014	17.19%	21.05%
Com Hem Holding AB	2014	9.61%	5.71%
Recipharm AB	2014	10.57%	67.58%
OW Bunker	2014	20.24%	n.a.
Hemfosa Fastigheter AB	2014	5.39%	-21.39%
ISS A/S	2014	14.79%	21.44%
Bufab Holding AB	2014	5.99%	-3.83%
Aurora LPG Holding ASA	2014	-0.12%	23.63%
Sanitec Corp	2013	6.93%	n.a.
Odfjell Drilling Ltd	2013	-2.01%	-105.72%
Ocean Yield ASA	2013	3.64%	82.49%
Matas A/S	2013	4.14%	-29.36%
Seadrill Partners LLC	2012	11.69%	-3.46%
Borregaard A/S	2012	-2.36%	58.43%
Sevan Drilling ASA	2011	-1.72%	-56.91%
Aker Drilling ASA	2011	109.24%	n.a.
Gjensidige Forsikring ASA	2010	-0.92%	36.28%
STX OSV Holdings Ltd	2010	3.26%	87.91%
Statoil Fuel & Retail ASA	2010	4.12%	n.a.
Pandora A/S	2010	23.75%	-69.65%

Morpol ASA	2010	-11.05%	-61.26%
Wilh Wilhelmsen ASA	2010	-2.96%	73.04%
Chr Hansen Holding A/S	2010	3.70%	77.61%
Byggmax AB	2010	4.85%	-23.48%
Talvivaara Mining Co Ltd	2009	27.60%	17.02%
Duni AB	2007	-0.69%	56.40%
Systemair AB	2007	0.78%	20.56%
Pronova BioPharma ASA	2007	2.36%	18.23%
Foroya Banki P/F	2007	23.10%	4.71%
SRV Group plc	2007	11.29%	-7.84%
Electromagnetic GeoServices ASA	2007	7.64%	-38.90%
Fred Olsen Production ASA	2007	-4.07%	-24.60%

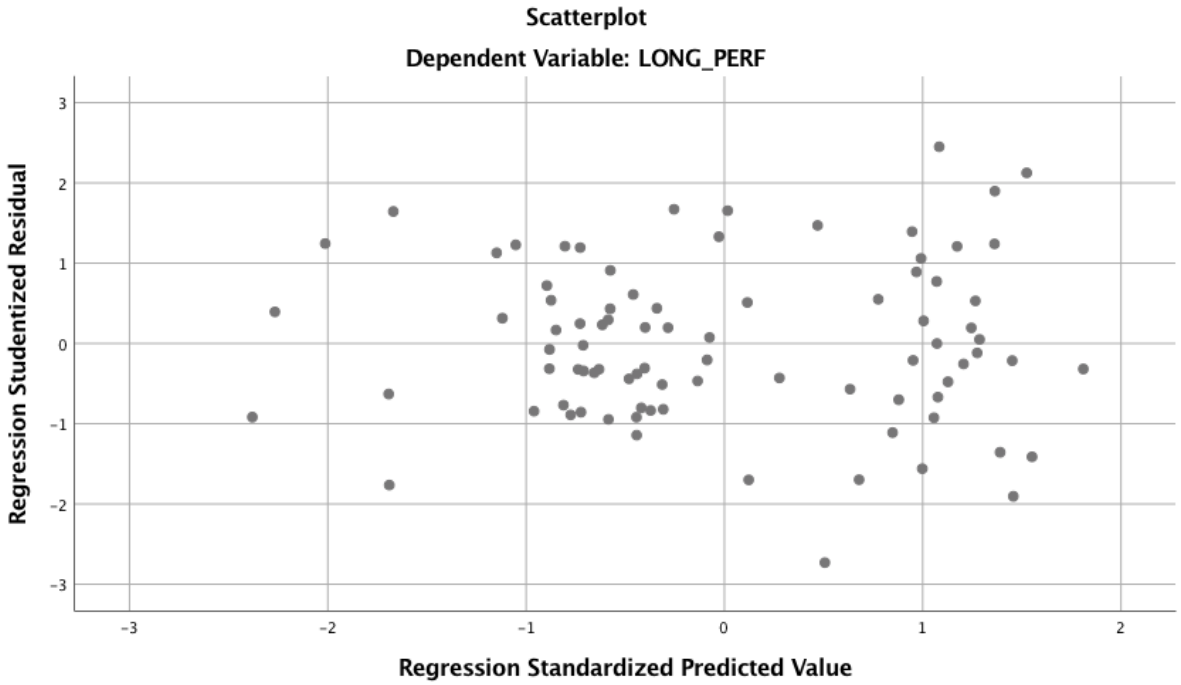
7.2 Charts on underpricing

Heteroscedasticity chart



7.3 Charts on BHAR

Heteroscedasticity chart


Scatterplot
Dependent Variable: LONG_PERF
Regression Studentized Residual
Regression Standardized Predicted Value
3
2
1
0
-1
-2
-3
-3
-2
-1
0
1
2