Barbarians at the bell? A study on private equity-sponsored companies' post-IPO operating performance in relation to analysts' estimates in the Nordics

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Abstract

This study examines the association between private equity (PE) sponsorship and analysts' forecast errors in the context of initial public offerings (IPOs) in the Nordics. The sample of 90 observations is collected using offering data from firms listed on the main lists in Sweden, Finland, Denmark and Norway covering the time period 2011-2016. We perform multivariate robust regression analyses investigating the association between PE backing and analysts' forecast errors on earnings per share in the context of IPOs. The results show a positive correlation between forecast error and PE sponsorship, significant at a 5 percent significance level. Performing robustness checks, we find that the association is insignificant when excluding Swedish observations from the sample. For Swedish observations only, we find a positive association significant at a 1 percent significance level. We conclude that while the results are ambiguous in the Nordic setting, they indicate a Swedish pattern which potentially could be applicable in a larger setting.

Keywords: Initial public offering, private equity, analyst forecast, forecast error

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1 Introduction

1.1 Background

Recently, there has been some controversy regarding Swedish private equity-sponsored (PE-sponsored) initial public offerings (IPOs) showing unsatisfactory short-term share price development. Some investors accuse e.g. PE firm Nordic Capital of squeezing out every last dime of the IPO investors in the sense that they try to market the IPO company at what the investors in hindsight believe to have been an unjustly high valuation (Dagens Industri, 2018a). Only a couple of days after one of the larger private equity-sponsored IPOs in the Nordics in recent years, FSN Capital's IPO of Bygghemma Group in March 2018, one of the cornerstone investors[1] of the IPO, the Swedish investment company Creades, publicly vented their dissatisfaction regarding the offering price which they felt was too high in hindsight (Dagens Industri, 2018b).

There is arguably a market sentiment that PE-sponsored IPOs are more aggressively priced than other IPOs. "I am not against private equity in general, but when it comes to IPOs they are in the business to get the highest price for their investors. This means there is a tendency to flatter the books to make the investment look a lot better than it is." said James Laing, deputy head of Pan-European equities at Aberdeen Asset Management in an interview with Financial Times (2014). In a Nordic context, the sentiment in the end of 2014 regarding PE-sponsored IPOs was in the Swedish business paper SvD Näringsliv (2014) described stating that Swedish private equity firms in general and Altor in particular are toasted on the stock exchange. This, after a series of market-wise poorly performing PE-sponsored IPOs in the Nordics, which reached zenith with Altor Equity Partners' DKK 5.3bn IPO of Danish OW Bunker, which filed for bankruptcy only seven months after its IPO. Research on the subject suggest that PE-sponsored IPOs are significantly less underpriced[2] than other IPOs, and argue that the facts that (a) PE firms generally use IPOs as a method of exiting investments, and (b) PE firms are recurring customers of the underwriting investment banks induce the banks to minimise underpricing to maximise the proceeds from the sold shares in the IPO (Mogilevsky & Murgulov, 2012).

[1] Cornerstone investors in an IPO are investors which prior to the IPO agree to purchase a set amount of shares at the set price, and are guaranteed share allocation in the IPO. They are customarily under lock-up to sell their shares for a period of time.

[2] Underpricing refers to the first-day return of a stock after an IPO, see e.g. Zheng and Stangeland (2007).

Sell-side analysts from the underwriting investment banks play an important role in a normal IPO marketing process in the Nordics. Typically, during the weeks leading up to the offering date, the IPO company's management team is on a so-called "roadshow" to meet with prospective institutional investors to market the company as an investment. Prior to this, the analysts from the underwriting banks usually have already had more extensive meetings with the management, in order to be able to market the company in the form of a distributed pre-IPO research report, including i.a. estimates of future earnings, as well as analyst-investor meetings.[3] After the IPO, the analysts release "initiating coverage" research reports of the company.

Although the analysts' role is to be unbiased and well-informed regarding companies, managers can influence analysts' forecasts regarding the company's operating performance by displaying one-off costs in their reporting to make the analysts believe that certain items are not recurring (Bowen et al., 2005). Another phenomenon to consider regarding analysts in the context of IPOs is that analysts affiliated with the IPO underwriters (affiliated analysts) generally issue higher recommendations and estimate higher earnings than unaffiliated analysts (Dugar & Nathan, 1995).

1.2 This study

While there is plenty of previous research to read on the subjects private equity, IPOs and sell-side analysts' forecast accuracy, both in general and in the context of IPOs, there appears to be a gap in the previous research regarding the association between PE sponsoring and forecast error in the context of IPOs. In light of recent turbulence regarding PE-sponsored IPOs in the Nordics, we find it relevant to try to begin to cover this gap in the literature.

In our study we aim to investigate if there is an association between the post-IPO operating performance relative to the initiating coverage analysts' consensus forecasts, and private equity backing. A significantly worse performance in relation to the analysts' forecasts could be an indication of possible explanations such as overly aggressive marketing towards the analysts to maximise IPO valuation, or that the investment banks' analysts are biased to give high earnings estimates to recurring customers such as private equity companies. On the other hand, a relatively stronger performance compared to other

[3] For clarity, it should be noted that analysts, while having the opportunity to spend more time with the management team to learn about the company, are not allowed to receive any sensitive non-public information.

companies could be a sign of the private equity model's strength with regards to operational efficiency achieved through close managerial monitoring.

Our main research question is *"What is the association between private equity backing and analysts' forecast errors in the context of IPOs?"*.

Using a dataset comprising all IPOs on the Nordic main lists, excluding Iceland, we perform multivariate robust regression analyses investigating what the association between private equity sponsorship and analysts' forecast errors is in the context of IPOs. We control for various factors, including firm size and industry-, year- and country fixed effects. We compare the first analysts' consensus estimates on earnings per share after an IPO with the actual earnings per share for the first uncommenced fiscal year after the IPO[4]. Our results show a positive correlation between forecast error and private equity sponsorship, significant at a 5 percent significance level. Performing robustness checks, we find that the association is insignificant when excluding Swedish observations, comprising approximately half the sample, from the analysis. For Swedish observations only, we find a positive association significant on a 1 percent significance level.

The study is limited in the sense that:

1. We can only look at the first published analyst estimates following the IPOs, rather than the ones distributed pre-IPO that could actually affect IPO valuation,
2. The limited number of observations (n=90) and the narrow geographic scope limit the general explanatory value of our findings,
3. Due to data limitations, we look at the first uncommenced fiscal year earnings rather than the four quarters following the IPOs, with the consequence that our observations have more varying forecast window lengths,
4. The study only uses earnings per share as a measurement of forecast error, instead of adding complementary measurements, e.g. EBITDA or sales growth, which could provide nuances to the results, and
5. We adjust for outliers by conducting robust regression analyses, and the results from the standard regression analyses are insignificant.

The study is to our best knowledge the first study to investigate the association between private equity sponsorship and forecast error, and its main contribution is that we have found indications of a positive association between forecast error and private equity backing, which could be further investigated in a larger setting.

[4] The first uncommenced fiscal year refers to the first year post-IPO that the IPO company has not published any quarterly reports from at the time of the IPO.

2 Previous literature and hypothesis development

2.1 Overview of the previous literature

There is, to the best of our knowledge, no previous research on the association between forecast error and PE backing in the context of IPOs. Our studies of the previous literature are instead focused around three related areas: (a) IPOs and post-IPO performance, (b) analyst estimates and forecast accuracy in relation to IPO companies, and (c) PE firms and their role in IPOs. We describe the IPO process, when firms choose to IPO, what happens to their performance post-IPO, and what determines the level of underpricing in IPOs. We discuss what the previous literature has concluded regarding analysts' forecast accuracy, their compensation, and their role in IPOs and how this correlates with their optimism to their projections of companies' earnings. We examine the definitions of PE firms, what characterises PE firms and their portfolio companies, what has been concluded regarding post-IPO performance of PE-sponsored companies, and differences in underpricing between PE-sponsored companies and other companies.

2.2 IPOs and post-IPO performance

The purpose of an IPO is to offer private stocks in a company to the public on a stock exchange. It is common that smaller, younger companies raise capital to be able to expand financially, but it is also done by large firms that seek to become publicly traded, e.g. Spotify (Bloomberg, 2018). The firms that go public often use assistance from an underwriting firm, in most cases an investment bank, for advice regarding e.g. what form of security to issue and to determine the optimal price of the issued security.

Pagano et al. (1998) state that there are several benefits and costs of going public. The issuer has in general more information about the firm than investors which creates information asymmetries. This leads to an adverse selection when the quality of the average company seeking a listing is likely to be low. Hence, small, young companies which have little track record will endure an adverse selection cost when listing compared to larger more proven companies. The underwriters of the IPO use their reputation as a certification for the IPO company. There are also several direct and fixed costs in connection with and after the IPO, underwriting and registration fees and yearly expenses on auditing, certification etc. Both these factors make it less likely for smaller, younger firms to go public. However, an IPO enables a firm to gain access of equity capital as an alternative to debt financing such as

bank credits. This helps firms to overcome borrowing constraints, and increases their bargaining power against banks which leads to lower borrowing interest rates.

Jain and Kini (1994) find that operational performance, measured as e.g. earnings per share (EPS), on average declines significantly for IPO companies after the offering. They find that performance correlates with the level of equity retention from the original entrepreneurs in the IPO. According to their research there are several possible explanations for the declining operational performance after IPOs. Firstly, it is likely that an IPO will lead to increased agency costs when management ownership is reduced. The performance of the firm could suffer from increased perquisite consumption by managers, as well as less focus on performance due to conflict of interest between the initial owners and shareholders. Secondly, owners could time their issues to periods when performance is unusually good, to maximise the proceeds from the IPO. Thirdly, managers could attempt to window-dress their accounting numbers prior to going public which will lead to pre-IPO performance being overstated and post-IPO performance being understated.

Previous research of post-IPO performance suggest that the quality of the IPO firms is related to the IPO underpricing (Allen & Faulhaber, 1989). Zheng and Stangeland (2007) conclude that underpricing is positively related to post-IPO growth in sales and EBITDA-margin but did not find a significance association to the growth in earnings. They found evidence that reversal of accruals, possibly a sign of earnings management, can explain the discrepancy. Revenue and EBITDA-margin are less influenced by accruals and earnings management than earnings. They also found that while analysts generally are positively biased in their forecasted earnings, they are less positively biased towards firms with greater underpricing.

2.3 Analyst estimates and forecast accuracy in relation to IPO companies

Rajan and Servaes (1997) studied analysts' forecast accuracy in relation to IPO companies during 1975-1987 and found that analysts on average are overly optimistic about IPO companies' future earnings. They also found that stock price performance is significantly higher when analysts' growth projections are lower, which they interpret as an indication of that investors believe in the analysts' estimates, yielding higher initial prices for companies with higher projections. Eames el al., (2001) conclude that analysts' earnings forecasts, and their forecast errors, the difference between forecasted earnings and actual earnings, are

positively correlated with their trading recommendation, i.e. that forecasting overly optimistic earnings correlates with a buy-recommendation. This implies that earnings measurements are important valuation metrics from an analyst perspective.

Michaely and Womack (1999) recognise two major factors on which the analyst compensation is based on at most brokerage firms. The first is the analyst's perceived external reputation that is partly determined by the forecast accuracy that the analyst achieves. The second factor is the analyst's ability to generate revenues and profits where involvement in underwriting deals contributes to a large share of the analyst's income. Analysts who help to attract underwriting for clients may receive a portion of the fees or bonuses that are far larger of those of analysts without underwriting contributions. They document that the long- and short-term performance[5] of affiliated analysts', defined as analysts who works for an investment bank that is part of the syndicate that is underwriting the IPO, recommendations are significant although lower than for non-affiliated analysts' recommendations. This goes hand in hand with what Dugar and Nathan (1995) concluded, that affiliated analysts' estimates are significantly more optimistic than non-affiliated.

O'Brien et al. (2005) reach several conclusions on the topic of affiliated analysts in the context of IPOs. They find that affiliated analysts generally issue recommendations sooner after an IPO than non-affiliated analysts. Hence, investors' access to analyst research following an IPO are largely limited to affiliated analysts' research. In line with other research, they also find that affiliated analysts are more optimistic in their forecasts and recommendations than other analysts. They discuss two potential explanations for this: (a) investment banking ties create a conflict of interest, causing affiliated analysts to give stronger forecasts and recommendations, and (b) managers select banks with already favourable views on the firm to conduct their IPO. They however conclude that one cannot say which one is more likely than the other generally. Ertimur et al. (2011) conclude that the main explanation why analysts in general issue optimistic recommendations is what they refer to as "The reporting explanation" or "The conflict of interest", meaning that analysts bias their recommendations upward to generate investment banking business and trading commissions and to gain access to management.

Both Bowen et al. (2005) and Brown and Caylor (2005) conclude that management can influence analysts' assessment of historical performance by labelling certain expenses as one-offs, adjusting the picture of the firms' true performance and allowing them to meet or

[5] Defined as excess returns based on trading recommendations.

beat analyst forecasts. This implies that differences in analyst optimism between companies and type of companies also can be explained by the companies' actions.

2.4 Private equity firms and their role in IPOs

Private equity in a broad sense is defined as capital not listed on a public exchange. Kaplan and Strömberg (2009) state that what is commonly defined as PE firms typically are formed as partnerships or limited liability corporations that raise private equity capital through private equity funds. Most funds are "close-end" vehicles, meaning that investors commit to provide capital for a certain time period. The limited partners that commit the capital often have little to say, the general partners deploy and manage the funds rather independently. The funds usually have fixed lives of ca. 10 years in order to ensure turnarounds of distressed companies and enable an IPO or a sale of the investments. Like Kaplan and Schoar (2005), we distinguish between venture capital firms and private equity firms, or "buyout firms". The main differences are that venture capital firms make investments in early stage-companies and often hold minority posts, while PE firms generally acquire majority posts, to a large extent financed with debt.

Metrick and Yusada (2010) studied and described the general economics of PE firms. PE professionals act as both agent and principal with the regards to the capital invested in the fund, with capital invested in the fund as well as a fixed and variable remuneration. The remuneration of a private equity firm is popularly named "2 and 20", describing the customary ca. 2 percent management fee on the total capital invested, and the ca. 20 percent so-called carried interest, i.e. the share of excess return on the fund that the PE firm is entitled to. The carried interest is often split among the professionals of the firm, aligning everyone's incentives with the investors to maximise the return of the fund. Aside from the direct monetary incentivisation, previous fund performance is perceived as one of the main criteria for future fundraising, further strengthening the incentive to maximise returns.

Meuleman et al. (2009) discuss PE firms' efficiency in ownership and find several explanatory variables. The main themes in PE-owned companies found in previous studies are cost focused initiatives such as streamlined organisational processes, reduced workforce and decreased unit cost, but also alignment of interest through incentivising management through e.g. share purchasing programs. However, they also find that the monitoring forces associated with PE, such as high leverage and financial monitoring, can hamstring the strategic flexibility and risk willingness associated with growth.

Levis (2011) investigates the performance of PE-backed IPOs in UK and finds that private equity-backed IPOs outperform other IPOs both operationally and marketwise. He suggests that this could be because of operational efficiencies achieved by closer monitoring, management expertise and higher leverage. While these attributes primarily hold true for PE-sponsored firms prior to the IPO, Levis suggests that it is reasonable to expect that these effects to some extent maintain after the IPO. He also finds that PE-sponsored IPOs on average are significantly less underpriced, which he discusses is the result of a mix of lower company risk, a positive "certification effect" from being a PE-sponsored company and more aggressive IPO pricing from PE firms. Mogilevsky and Murgulov (2012) conclude that PE firms to a larger extent use IPO as a tool to exit investments, and could therefore be more incentivised to reach a higher valuation in the IPO. They also find that PE-sponsored IPOs are significantly less underpriced, and argue that this is because investment banks are induced to maximise the proceeds from the offering to satisfy the PE firm. This, because PE firms are recurring and lucrative customers of the investment banks.

Teoh et al. (1995) find evidence that IPO firms on average have abnormal issue-year accruals and earnings followed by poor long-term performance. They argue that this is a case of earnings management in relation to the IPO. They also find that firms with extensive discretionary accruals perform worse in the aftermarket. Rajan and Servaes (1997) discuss this phenomenon and suggest that one reason behind this is that investors receive poor information from analysts, who in their financial analysis do not properly capture these effects. These findings further support that managers can influence analysts' forecasts. Katz (2009), however, finds that PE-sponsored IPO companies generally have higher earnings quality, engage less in earnings management and report more conservatively before as well as after IPO than other IPO companies.

2.5 Summary and hypothesis development

We have digested much research regarding post-IPO performance, analyst forecasts and forecast accuracy and the relationship between PE sponsoring and operational performance. A large proportion of the previous research has not been conducted using Nordic data, hence some of the conclusions discussed in the previous literature section may as such not be completely applicable in a Nordic setting.

The long-run operational performance tends to decline for IPO companies after the offering (Jain & Kini, 1994), and the analysts are on average overly optimistic about IPO

companies' future earnings (Rajan & Servaes, 1997). It's further stated that affiliated analysts' recommendations are significantly more optimistic than non-affiliated analysts' (Dugar & Nathan, 1995; Michaely & Womack, 1999;). Studies also indicate that analysts generate positively biased estimates in order to gain access to management and generate investment banking business (Ertimur et al., 2011; O'Brien et al., 2005).

PE-sponsored IPOs are less underpriced which is explained by a certification effect from being PE-sponsored as well as more aggressive pricing from the PE firm (Levis, 2011). However, studies show that the operational performance is higher in PE-backed firms both before and after an IPO due to higher operational efficiencies caused by close monitoring, management expertise and leverage (Levis, 2011; Meuleman et al., 2009). Our study's purpose is not to investigate the comparative operational performance with other types of owners but rather the performance in relation to the analysts' estimates. Given the earlier studies, our interpretation is that a higher forecast error generated by operational underperformance could indicate a propensity to overvalue the firm during an IPO.

We acknowledge the fact that we have not found previous literature on pre-IPO analyst reports, but rather use research on post-IPO analyst reports as an indication of the role of pre-IPO analyst reports. Due to the larger information asymmetry prior to an IPO, with less information in the market and no market price to look at, it can be argued that pre-IPO analyst reports might be of higher valuation relevance to investors than post-IPO analyst reports.

As discussed in the previous literature, PE firms generally use IPOs as a method of exiting investments (Mogilevsky & Murgulov, 2012). Generally, the funds are limited in their time frame, after which all investments must be exited, and the capital must be returned to the limited partners (Kaplan & Strömberg, 2009). It can therefore be expected that PE firms have less of a long-term perspective with regards to the companies they IPO than other issuers. As described in the literature, IPOs are in many cases conducted mainly to open the equity capital markets for a company, in order to decrease the dependence on debt financing (Pagano et al., 1998). This motive could be more common for other issuers than PE firms, which more often IPO to exit an investment (Mogilevsky & Murgulov, 2012).

As PE professionals are very much incentivised, both in monetary and reputational terms, to maximise the return of the fund, it can be expected that they want to maximise the proceeds from an IPO by maximising the valuation of the IPO company (Metrick & Yusada, 2010). We argue that the fact that many PE professionals have experience from previous IPOs, and often a background in investment banking, gives them a better understanding of

what drives valuation of a company in an IPO process. Through previous employments and transactions PE professionals should also have closer ties with the investment banks, through which they could exercise influence over the investment banks. Previous studies argue that the fact that PE firms are recurring customers of the banks induce the banks to issue the IPO at a relatively higher valuation, i.e. less underpricing (Mogilevsky & Murgulov, 2012). Hypothetically, it could simply be good business for the investment banks to issue at a lower relative valuation in the one-time entrepreneurs' IPOs to keep the stock market satisfied, and higher relative valuation in the PE firms' IPOs to keep the recurring customers, the PE firms, satisfied.

Developing a hypothesis regarding differences in forecast error between PE-sponsored companies and other companies is dependent on the IPO environments' ability to affect analysts' forecasts. As discussed in the previous literature, managers of IPO companies can influence analysts with the use of e.g. one-off costs in the accounting (Bowen et al., 2005; Brown & Caylor, 2005). It can be expected that the information asymmetry between managers and analysts is larger at IPOs than when the company has been listed for a while, which should increase managers' ability to influence analysts' forecast in an IPO context specifically. Also, the information asymmetry between managers and investors is extra large in IPOs (Pagano et al., 1998). We argue that PE professionals, highly incentivised to maximise the IPO valuation, can influence the companies' managers to, in turn, influence analysts. Previous studies argue that analysts also are influenced by their ties to the underwriting investment banks, partly explaining the phenomenon of overly optimistic affiliated analysts (Ertimur et al., 2011; O'Brien et al., 2005).

We therefore hypothesise that the forecast error is higher for PE-sponsored companies compared to other companies in the context of IPOs. Hence, we arrive in the following hypothesis:

H_1: There is a positive association between private equity backing and analysts' forecast errors in the context of IPOs.

3 Methodology and data

3.1 Tool for analysing: forecast error

To investigate the post-IPO operational performance of IPO companies in relation to the analysts' consensus estimates of their performance we used forecast error, in the regression model referred to as FE, as a measurement. We looked at the accounting measurement earnings per share (EPS) for multiple reasons, e.g. it is a commonly used IFRS accounting measure for evaluating shareholder value creation, all companies listed on the Nordic main lists are obliged to report it[6] and it is very common among Nordic analysts to estimate EPS, making it suitable for our study. It has also been frequently used in previous studies (Capstaff et al., 1999; Zheng & Stangeland, 2007). We followed Zheng and Stangeland (2007) who used the following formula for determining forecast error:

$$Forecast\ Error\ = \frac{Consensus\ EPS\ Forecast\ - Actual\ EPS}{Consensus\ EPS\ Forecast}$$

where they calculated the Consensus EPS Forecast as the average of all available analysts' EPS forecasts at the relevant point in time. Actual EPS is the EPS disclosed by the company in the relevant annual report. We define absolute forecast error as the absolute value of forecast error.

A closely related accounting measure to look at would be net earnings (i.e. not dividing net earnings by number of shares outstanding, compared to EPS). However, that would not take into consideration earnings-affecting activities that are not operationally related, such as acquisitions financed through share issues. Without necessarily creating shareholder value, this could potentially affect net earnings to a large extent, while EPS would capture the dilution effect from the share issue.

Criticism towards looking at EPS as a measurement for performance include concerns regarding its relevance as a measurement for shareholder value creation, and the lack of ability to predict future EPS (Machuga et al., 2002). Another concern that could be raised regarding forecast error based on EPS is that the measurement is very sensitive to fluctuations when the consensus EPS forecast, i.e. the denominator, is a low figure.

[6] As it is required in IFRS accounting, IAS 33. Please refer to Nasdaq (n.d.), Oslo Børs (n.d.) and IFRS (2003) for more information.

For robustness checking, we also performed an analysis on forecast error based on share price defined as:

$$Forecast\ Error\ Based\ on\ Share\ Price\ = \frac{Consensus\ EPS\ Forecast\ - Actual\ EPS}{Share\ price}$$

similar to what Capstaff et al. (1999) did. While not as intuitive as our main forecast error measurement, this removes the problem of extreme values due to very low earnings forecasts in the denominator. Instead, this measurement relativises the difference between estimated EPS and actual EPS by share price. Similarly, Eames et al. (2001) calculated forecast error looking at total earnings forecast less total earnings, divided by total equity value. This is essentially mathematically identical to the approach used by Capstaff et al. (1999), but it does not take into consideration the dilution effect of earnings-affecting activities such as acquisitions financed through share issues, if not separately adjusted for.

3.2 Multivariate regression model

In order to conduct a more refined test of the relationship between forecast errors and PE-firms than a univariate regression, we estimated the following regression model:

$$FE_i = \beta_0 + \beta_1 PE_i + \beta_2 FW_i + \beta_3 MIN_i + \beta_4 BANK_i + \beta_5 TECH_i + \beta_6 ln(SIZE)_i + \beta_7 ln(ANA)_i + Country\ and\ Year\ fixed\ effects + \varepsilon_i$$

Table 1: Overview of independent variables used

Variables	Description	Expected sign of coefficient
PE = Private equity-sponsored firm	Companies backed by private equity firms at IPO.	+
FW = Forecast Window	Time between the publishing of the forecast and the end of the period for which the forecast is made.	+
MIN = Mining, oil and gas extraction	Companies within the industries classified as mining, oil and gas extraction. SIC code 1011-1499.[7]	+
BANK = Finance, insurance and real estate	Companies within the industries classified as finance, insurance and real estate. SIC code 6011-6799.[8]	-
TECH = Technology	Companies within the industries classified as technology. Three-digit SIC code of 283, 357, 366 and 737 or two-digit SIC code of 38 or 48.[9]	+
ln(SIZE) = Firm size	The natural logarithm of the market capitalization 30 days after the IPO, expressed in billion Swedish Krona.	-
ln(ANA) = Number of analysts	The natural logarithm of the number of analysts that partake in the consensus estimate.	-

Table 1 summarises the independent variables in our regression model.

Private equity-sponsored firm (PE):

The independent variable that we investigated is the binary variable capturing whether a company is owned by a PE firm at the IPO[10]. The definition of PE firms is from the Factset database, which distinguishes between e.g. venture capital firms and what in this context is considered private equity firms. We hypothesised the coefficient of PE to be positive.

We have identified a set of relevant control variables:

[7] Please refer to United States Department of Labor (n.d.) for more information.
[8] Please refer to United States Department of Labor (n.d.) for more information.
[9] Please refer to United States Department of Labor (n.d.) for more information.
[10] Specifically one day before the first day of trading.

Forecast Window (FW):

Due to limited available data on quarterly analysts' estimates, we based the study on fiscal year estimates and actuals. As IPOs as well as companies' fiscal years are distributed across the year, the forecast window, defined as the length of time between when the analysts publish the forecast and the end of the period for which the forecast is made, will differ from observation to observation. Rajan and Servaes (1997) conclude that not only does the absolute forecast error increase (i.e. earnings are harder to predict) the larger the forecast window is; they also conclude that forecast error increases (i.e. analysts are more overly optimistic about more distant future earnings) when the forecast window increases. This implies that we needed to control for length of forecast window in our analysis, and we predicted the coefficient of FW to be positive.

Industry fixed effects:

Different industries have different inherent variances in earnings, making forecasting earnings varyingly difficult depending on industry. Due to the limited number of observations, we had to limit the number of industries controlled for. Due to the arguably discretionary nature of singling out only a few industries to control for, we performed the regression analyses both including and excluding the industry fixed effects.

Mining, oil and gas extraction (MIN):

We also control for firms with SIC division "Mining" as defined by the United States Department of Labor, i.e. SIC code 1011-1499.[11] This group include industries within mining, oil, and gas extraction. This is because we identified this as a group of companies whose earnings can be expected to be hard to predict due to their sensitivity to macro events such as oil prices. We hypothesised that these companies have relatively large absolute forecast errors as well as relatively large forecast errors, as we expected that companies with higher absolute forecast errors have higher forecast errors. Our expectations of a positive correlation between absolute forecast error and forecast error is based on the previous literature's finding that forecast error generally is positive (Zheng & Stangeland, 2007; Dugar & Nathan, 1995; Rajan & Servaes; 1997). Therefore, we hypothesised a positive coefficient of MIN.

Finance, insurance and real estate (BANK):

Zheng and Stangeland (2007), investigating forecast error in relation to underpricing, remove banking firms from their sample. Due to our limited sample, we instead controlled for the

[11] Please refer to United States Department of Labor (n.d.) for more information.

industry fixed effect within banking, insurance and real estate by including a binary variable for firms with SIC code 6011-6799, i.e. the SIC division "Finance, Insurance and Real Estate".[12] We controlled for these industries, as we expected their earnings to be relatively stable compared to other firms. We therefore expected absolute forecast error to be lower for these firms, and also forecast error. Hence, we predicted a negative coefficient of the variable.

Technology (TECH):

Zheng and Stangeland (2007) and Chan et al. (2003) control for technology firms due to their overall high growth profile. Following this, we included this control variable for firms with three-digit SIC code of 283, 357, 366, 737, or a two-digit SIC code of 38 or 48.[13] We expected the high growth profile to cause higher earnings volatility, and we therefore predicted the coefficient of the variable to be positive.

Natural logarithm of market capitalisation (ln(SIZE)):

As Thomas (2002) finds, firm size is expected to increase forecast accuracy why we need to control for firm size. We expected a lower absolute forecast error, and as we expected a positive correlation between absolute forecast error and forecast error, we expected the coefficient of ln(SIZE) to be negative. More specifically, we looked at market cap for the companies 30 days post-IPO rather than at the IPO. Varying underpricing and price stabilising measures taken by the underwriters, as discussed by Jenkinson and Jones (2007), have artificial effects on the stock price and hence the firm size. We therefore look at market cap of the companies 30 days after the IPO rather than at IPO, as price stabilizing measures are only allowed during 30 days after the IPO. Following e.g. Zheng and Stangeland (2007), we use the natural logarithm of size.

Natural logarithm of the number of analysts covering the company (ln(ANA)):

Increasing number of analysts covering the company might mitigate the affiliated analyst bias as companies that are only covered by one or a few analysts are likely to be covered by only the underwriters' analysts, i.e. affiliated analysts.[14] As discussed in the literature review, studies have shown that affiliated analysts are more overly optimistic in their estimates (O'Brien et al., 2005; Ertimur et al., 2011). We expected this control variable to correlate positively with firm size as larger firms generally attract more analyst attention. We used the

[12] Please refer to United States Department of Labor (n.d.) for more information.
[13] Please refer to United States Department of Labor (n.d.) for more information.
[14] The distinction of which analysts are affiliated and non-affiliated can not be made in this study due to inaccessible data.

natural logarithm to better capture what we expected to be a diminishing effect of additional analysts. We predicted the coefficient of the variable to be negative as more analysts could limit the effect of the affiliated analysts' bias.

Country fixed effects:

We controlled for country fixed effects to capture any systematic differences in financial environment between the Nordic countries. Country refers to the country in which the company is listed.

Year of IPO fixed effects:

While the time period chosen is characterised by stable economic development, we controlled for year fixed effects. More specifically, year refers to the year in which the first day of trading in the IPO occurs.

3.3 Data

3.3.1 Data collection

The dataset used is based on all IPOs performed in Sweden, Denmark, Finland and Norway during 2011-2016, on the main lists. Listings of companies that were already listed on other exchanges are excluded, as they are not considered IPOs. We chose to exclude the IPOs on Iceland due to the limited analyst estimate coverage, the smaller size of the companies and the relative trading illiquidity compared to the other Nordic exchanges. The selected time period, 2011-2016, was characterised by the aftermath of the financial crisis with slow and stable economic recovery and gradually increased earnings in the region (Nordic Council of Ministers, 2017). The main reason why we chose this time span is the relatively stable economic environment that decreases the risk of forecast errors caused by sudden, dramatic macro factors. We have made the assessment to exclude the year of the crisis and the immediate following years, 2008-2010, due to the low number of IPOs and the high uncertainty during this time period.

We only looked at IPOs on the main lists in each of the countries, meaning we excluded IPOs from e.g. First North in Sweden and Oslo Axess in Norway. This, because the companies generally are much smaller, the analyst coverage is much less extensive and the trading less liquid on the non-main lists.

There are some companies without analyst coverage shortly after IPO which were excluded. We set a threshold at 90 days, meaning that all companies without analyst coverage 90 days after their IPO are excluded from the study.

Related to this, another phenomenon we had to take into consideration is the so-called "blackout period" that occurs during the first 40 days following an IPO. During this period, analysts working for the syndicate of investment banks working with the IPO are not allowed to submit research reports, including e.g. earnings forecasts. Hence, the first relevant analysts' consensus estimates are generally available first after ca. 50 days after IPO. In some cases, often in relation to larger IPOs, consensuses comprising only one or a few analysts' estimates are available before the blackout period is over. After the blackout period, when the analysts affiliated with the investment banks working with the IPO are allowed to make estimates, the consensus comprises some 10-15 estimates. In these cases, we used the more accurate consensus after the blackout period.

Companies with negative EPS forecasts cannot properly be analysed using the forecast error measurement introduced in the methodology section. Following Zheng and Stangeland (2007), we therefore excluded all companies with negative EPS consensus estimates.

While not considered an official stock exchange, Norwegian companies already listed on the "NOTC-system" were excluded due to e.g. the rather extensive analyst coverage of the NOTC-system. NOTC is a marketplace for unlisted shares. NOTC is owned 100% by the operator of the Norwegian main market, Oslo Børs ASA.[15]

Like Zheng and Stangeland (2007), we removed real estate investment trusts (REITs)[16] which means we dropped one observation. While Zheng and Stangeland (2007) also dropped all banking firms (SIC codes between 6000-6199) we kept them in the dataset, but controlled for them with a binary control variable due to the limited number of observations.

[15] For more information regarding the NOTC-system, please refer to NOTC's webpage: https://www.notc.no/eng

[16] SIC code 6798.

Table 2: Overview of sample selection

Criteria	Observations
Total number of IPOs in the Nordic main markets, excluding Iceland, during 2011-2016	**113**
Less companies without consensus estimates available for the fiscal year investigated	-9
Less companies that have not yet reported the relevant fiscal year	-1
Less companies that went bankrupt/was bought out before reporting the relevant fiscal year	-2
Less companies with negative EPS estimates	-7
Less companies previously listed on the NOTC-system	-3
Less companies classified as REITs	-1
Sample	**90**

Table 2 summarises the sample selection process, from all IPOs in the Nordics, excluding Iceland, main markets during 2011-2016, to the dataset used in the study comprising 90 observations.

3.3.2 Databases

Our main source of data is the Factset database, provided by an employer. Factset contains information regarding e.g. analysts' estimates, companies' earnings as well as information regarding ownership and company industry classifications. To some degree, we checked the accuracy of the Factset database by randomly choosing some observations of e.g. earnings per share, market capitalisation and date of IPO. As far as we checked, there were no errors.

Gross lists of listings on the Swedish, Danish, Finnish and Norwegian main lists were retrieved from OMX Nordics (Sweden, Denmark and Finland) and Oslo Stock Exchange (Norway).

3.3.3 Descriptive statistics

Table 3: Descriptive statistics of sample: Country distribution

Country	PE-sponsored	Non-PE-sponsored	Sum	% of total
Sweden	25	21	**46**	51%
Norway	7	21	**28**	31%
Finland	5	5	**10**	11%
Denmark	3	3	**6**	7%
Total	**40**	**50**	**90**	**100%**

Table 3 shows the frequency of IPOs categorised by country.

The division of PE-sponsored and non-PE-sponsored companies is fairly even. The dataset is rather weighted towards Sweden, which may question the representative value of the study as an investigation of the Nordic market. We therefore performed separate analyses on Subsample 1, comprising all observations excluding Sweden, and Subsample 2, comprising only observations from Sweden.

Table 4: Descriptive statistics of sample: Year distribution

Year	PE-sponsored	Non-PE-sponsored	Sum	% of total
2011	3	6	**9**	10%
2012	0	4	**4**	4%
2013	2	10	**12**	13%
2014	10	11	**21**	23%
2015	16	9	**25**	28%
2016	9	10	**19**	21%
Total	**40**	**50**	**90**	**100%**

Table 4 summarises the number of IPOs in the dataset distributed by whether the company was PE-sponsored at IPO. The figures show an increasing frequency of IPOs during the selected time period. The share of PE-sponsored IPOs is also increasing during the selected time period.

Table 5: Descriptive statistics of sample: Industry distribution

SIC group	PE-sponsored	Non-PE-sponsored	**Sum**	% of total
MIN	0	4	**4**	4%
BANK	3	10	**13**	14%
TECH	4	6	**10**	11%
Other	33	30	**63**	70%
Total	**40**	**50**	**90**	**100%**

Table 5 summarises the distribution of the sample over the selected industry classifications. MIN refers to companies engaged in mining, oil and gas extraction. BANK refer to companies engaged in finance, insurance and real estate. TECH refers to technology companies.

Table 6: Descriptive statistics of sample: Forecast window length, in years

Category	<1	1-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8<	**Total**
PE-sponsored	0	11	5	12	9	4	**41**
Non-PE-sponsored	1	13	6	13	12	4	**49**
Total	**1**	**24**	**11**	**25**	**21**	**8**	**90**

Mean: 1.45 *Std: 0.28* *Min: 0.99* *Max: 2.23*

Table 6 summarises the distribution of forecast window length in the dataset, distributed by whether the IPO company was PE-sponsored at IPO. Forecast window refers to the time between when the analyst forecast is published and the end of the period forecasted.

Table 7: Descriptive statistics of sample: Market capitalisation, in SEK billion

Category	<1	1-3	3-5	5-10	10-20	20<	**Total**
PE-sponsored	5	9	9	9	5	4	**41**
Non-PE-sponsored	9	18	8	9	5	0	**49**
Total	**14**	**27**	**17**	**18**	**10**	**4**	**90**

Mean: 6.94 *Std: 15.19* *Min: 0.21* *Max: 135.75*

Table 7 summarises the distribution of the market capitalisation of the companies in the dataset, distributed by whether the IPO company was PE-sponsored at IPO. The figures show that PE-sponsored companies on average are in the higher brackets to a larger extent.

Table 8: Descriptive statistics of sample: Number of analysts

Category	1	2	3	4-5	6-10	10<	**Total**
PE-sponsored	4	11	7	13	5	1	**41**
Non-PE-sponsored	12	15	8	6	6	2	**49**
Total	**16**	**26**	**15**	**19**	**11**	**3**	**90**

Mean: 3.54 *Std: 2.90* *Min: 1* *Max: 18*

Table 8 summarises the distribution of the number of analysts comprising the consensus estimates of the companies in the dataset, distributed by whether the company was PE-sponsored at IPO. PE-sponsored companies appear in the lower brackets to a lesser extent.

Table 9: Test of multicollinearity

	PE	FW	MIN	BANK	TECH	ln(SIZE)	ln(ANA)
PE	**1.00**						
FW	-0.01	**1.00**					
MIN	0.27	-0.01	**1.00**				
BANK	0.29	0.11	0.10	**1.00**			
TECH	0.05	-0.08	0.09	0.13	**1.00**		
ln(SIZE)	-0.22	-0.15	0.03	-0.29	0.10	**1.00**	
ln(ANA)	0.03	0.23	-0.26	0.27	-0.06	-0.74	**1.00**

Table 9 displays a cross-correlation scheme of the independent variables used in the multivariate regression model. The only multicollinearity indicated is between ln(analysts) and ln(firm size).

The multicollinearity between ln(analysts) and ln(firm size) can be explained by the tendency that larger firms often attract more analyst coverage. We conducted a variance inflation test (VIF) to examine if we needed to adjust the multivariable regression model.

Table 10: VIF test

Variable	VIF	1/VIF
ln(SIZE)	3.72	0.269
ln(ANA)	3.16	0.317
MIN	1.45	0.691
PE	1.37	0.732
BANK	1.37	0.732
FW	1.35	0.738
TECH	1.13	0.885
Mean VIF	**2.82**	

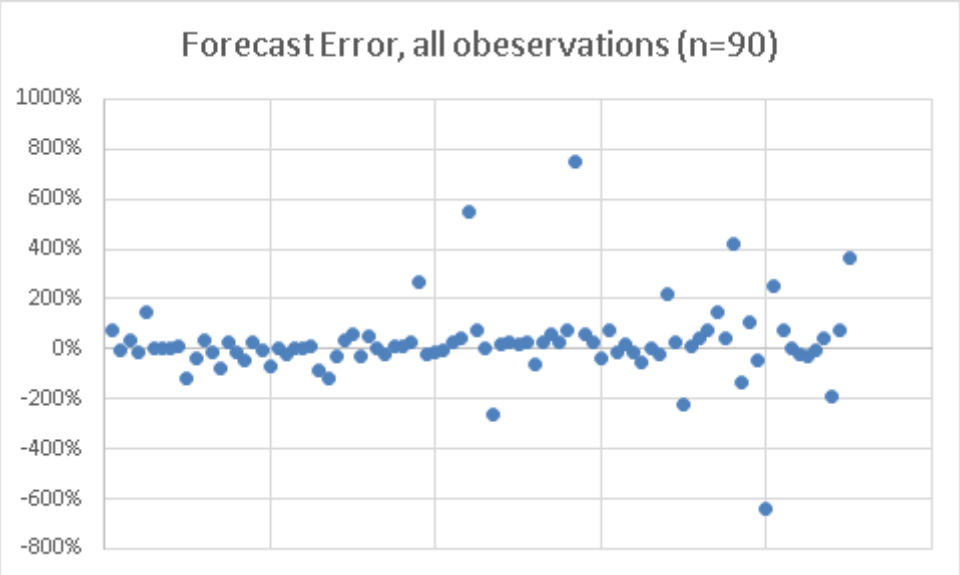
Table 10 summarises the results from the VIF test.

Conducting a variance inflation factor test we found that the highest value is 3.72. We therefore did not remove any variables from the multivariate regression model.

We conducted a Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, from which we cannot reject heteroskedasticity on a 10 percent significance level (p = 0.098).

Our dataset includes a number of outliers. Figure 1 illustrates this phenomenon.

Figure 1: Sample overview: Outliers



The scatter plot in Figure 1 illustrates the forecast error expressed in percentage points (y-axis) for each observation (x-axis). The graph indicates that there are outliers in the dataset.

To mitigate these effects in the regression model we used a robust regression to perform our analysis.

3.4 Empirical strategy

We initiated our empirical investigation by performing a univariate robust regression of forecast error and the variable PE. We used robust regression due to the number of outliers in our dataset, as lessens outliers' effect on the regression analysis. As our full multivariable regression model contains multiple control variables, we added a few of them at a time into the regression to track any unexpected changes in sign of coefficients and their effect on the coefficient and significance of the variable PE, and to increase transparency.

Our dataset is to a large extent consisting of observations from Sweden, comprising 46 out of in total 90 observations, and 25 out of 40 PE observations[17]. It should be noted that our dataset comprises all IPOs included in our criteria, and is not a random sample of a larger population. As this study is based on Nordic IPOs, we controlled for this factor by performing the same regression analyses, but excluding all observations from Sweden.

[17] See Table 3 for an overview of the dataset with regards to countries.

However, the lower number of observations limits the explanatory value of this supplementary analysis.

As a supplementary robustness analysis, we performed similar regression analyses using forecast error based on share price. We acknowledge that our main tool for analysis, forecast error, is sensitive to large fluctuations for companies with low forecasted EPS. Hence, we also used the secondary measurement of forecast error, forecast error based on share price, found in the previous literature for robustness checking (Capstaff et al., 1999).

4 Results

In this section, we present the results from our regression analyses of forecast error and forecast error based on share price on the binary variable PE and multiple variations of our selected control variables. The results are discussed further in section 5: Discussion.

4.1 Results from regression analyses

4.1.1 Univariate robust regression

Table 11: Univariate robust regression of Forecast error

Variables	Forecast error
PE[18] (+)	.203**
	(2.03)
Constant	-.023
	(-0.34)
Observations	90

T-statistics in parentheses below coefficient. Expected sign of coefficient in parentheses after variable name.

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

Table 11 shows the results from a univariate robust regression of forecast error on the independent variable PE for the whole sample. The results imply a positive association between forecast error and private equity sponsorship, significant at a 5 percent significance level.

[18] Performing regular regressions render insignificant results for the variable PE.

4.1.2 Multivariate robust regression

Table 12: Multivariate robust regression of Forecast error

Variables	FE	FE	FE	FE
PE[19] (+)	0.234**	0.241**	0.261**	0.258**
	(2.21)	(2.23)	(2.29)	(2.53)
FW (+)	-0.026	0.163	-0.003	0.146
	(-0.14)	(0.80)	(-0.01)	(0.81)
MIN (+)			0.531*	0.568**
			(1.93)	(2.24)
BANK (-)			-0.032	-0.133
			(-0.19)	(-0.89)
TECH (+)			0.059	0.02
			(0.36)	(0.14)
ln(SIZE) (-)	-0.549***	-0.289	-0.488***	-0.088
	(-3.46)	(-1.62)	(-2.87)	(-0.51)
ln(ANA) (-)	0.576**	0.258	0.436	0.031
	(2.19)	(0.94)	(1.52)	(0.12)
Constant	1.679***	0.737	1.461***	0.313
	(3.13)	(1.01)	(2.67)	(0.45)
Country fixed effects	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Observations	90	90	90	90

T-statistics in parentheses below coefficient. Expected sign of coefficient in parentheses after variable name.

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

Table 12 shows the results from a multivariate robust regression of forecast error for the whole sample. The results imply a positive association between forecast error and private equity sponsorship, significant at a 5 percent significance level. For all variations of control variables displayed in the table, the results are significant at a 5 percent significance level at least.

[19] Performing regular regressions render insignificant results for the variable PE.

4.2 Results from robustness analyses

4.2.1 Results from regression analyses of forecast error based on share price

Table 13: Multivariate robust regression of Forecast error based on share price

Variables	FE	FE	FE	FE
PE[20] (+)	0.020**	0.019*	0.019**	0.019*
	(2.16)	(1.88)	(2.04)	(1.98)
FW (+)	0.014	0.023	0.013	0.019
	(0.87)	(1.23)	(0.80)	(1.12)
MIN (+)			0.105***	0.086***
			(4.55)	(3.59)
BANK (-)			-0.011	-0.015
			(-0.78)	(-1.03)
TECH (+)			-0.003	-0.001
			(-0.23)	(-0.09)
ln(SIZE) (-)	-0.046***	-0.024	-0.04***	-0.02
	(-3.31)	(-1.49)	(-2.82)	(-1.22)
ln(ANA) (-)	0.041*	0.021	0.026	0.005
	(1.77)	(0.83)	(1.08)	(0.20)
Constant	0.12	0.059	0.109	0.06
	(2.56)	(0.88)	(2.40)	(0.90)
Country fixed effects	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Observations	90	90	90	90

T-statistics in parentheses below coefficient. Expected sign of coefficient in parentheses after variable name.

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

Table 13 shows the results from a multivariate robust regression of forecast error based on share price for the whole sample. The results imply a positive association between forecast error based on share price and private equity sponsorship, significant at a 10 percent significance level. For all variations of control variables displayed in the table, the results are significant at a 10 percent significance level at least.

[20] Performing regular regressions render insignificant results for the variable PE.

4.2.2 Results from regression analyses of subsamples

Table 14: Multivariate robust regression of Forecast error: Subsample 1: Excluding observations from Sweden from the whole sample

Variables	FE	FE	FE	FE
PE[21] (+)	0.308	-0.064	0.234	-0.144
	(1.33)	(-0.34)	(0.90)	(-0.85)
FW (+)	0.268	0.492	0.348	0.605*
	(0.65)	(1.35)	(0.80)	(1.92)
MIN (+)			0.461	0.461
			(1.03)	(1.58)
BANK (-)			-0.624	-0.368
			(-1.52)	(-1.39)
TECH (+)			-0.142	0
			(-0.32)	(-0.00)
ln(SIZE) (+)	-0.974***	-0.465	-0.864**	-0.458*
	(-2.83)	(-1.58)	(-2.39)	(-1.79)
ln(ANA) (+)	1.065*	0.092	0.735	0.041
	(1.96)	(0.20)	(1.24)	(0.10)
Constant	2.483**	1.176	2.212**	0.954
	(2.49)	(0.98)	(2.12)	(0.89)
Country fixed effects	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Observations	44	44	44	44

T-statistics in parentheses below coefficient. Expected sign of coefficient in parentheses after variable name.

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

Table 14 shows the results from a multivariate robust regression of forecast error for subsample 1 comprising the whole sample excluding observations from Sweden. The results imply a negative association between forecast error and private equity sponsorship, but are insignificant at a 10 percent significance level. For all variations of control variables displayed in the table, the results are insignificant at a 10 percent significance level.

[21] Performing regular regressions render insignificant results for the variable PE.

Table 15: Multivariate robust regression of Forecast error: Subsample 2: Observations from Sweden only

Variables	FE	FE	FE	FE
PE[22] (+)	0.358**	0.453***	0.361**	0.441***
	(2.66)	(3.13)	(2.44)	(2.83)
FW (+)	-0.075	-0.078	-0.317	-0.344
	(-0.33)	(-0.30)	(-1.28)	(-1.25)
MIN[23] (+)			n.a.	n.a.
			n.a.	n.a.
BANK (-)			-0.093	-0.16
			(-0.40)	(-0.65)
TECH (+)			0.415**	0.432**
			(2.11)	(2.14)
ln(SIZE) (-)	-0.289	-0.05	-0.093	0.153
	(-1.47)	(-0.19)	(-0.34)	(0.45)
ln(ANA) (-)	0.102	-0.218	-0.27	-0.637
	(0.28)	(-0.54)	(-0.55)	(-1.19)
Constant	0.91	0.332	0.686	0.112
	(1.21)	(0.38)	(0.76)	(0.11)
Country fixed effects[24]	n.a.	n.a.	n.a.	n.a.
Year fixed effects	No	Yes	No	Yes
Observations	46	46	46	46

T-statistics in parentheses below coefficient. Expected sign of coefficient in parentheses after variable name.

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

Table 15 shows the results from a multivariate robust regression of forecast error for subsample 2 comprising only observations Sweden. The results imply a positive association between forecast error and private equity sponsorship, significant at a 1 percent significance level. For all variations of control variables displayed in the table, the results are significant at a 5 percent significance level at least.

[22] Performing regular regressions render insignificant results for the variable PE.
[23] No observations from Sweden (please refer to Table 5 for industry overview).
[24] Included in the table for consistency, but not applicable as all observations are Swedish.

5 Discussion

Our results, looking at the dataset as a whole, suggest that there is a positive association between analysts' consensus estimates forecast error and PE sponsorship in relation to IPOs on the Nordic main markets. Conducting robust regression analyses, the results are significant at at least 5 percent significance level tested for multiple variations of control variables. The results are significant at a 10 percent level using a measurement of forecast error based on share price for robustness checking.

However, our robustness analyses on a country level imply that the significant positive association can be isolated to IPO companies listed in Sweden. Excluding observations from Sweden, the association between forecast error and private equity sponsorship is negative and insignificant at a 10 percent significance level.

Our results from the Swedish observations suggest that there is a positive association between analysts' consensus estimates forecast error and private equity sponsorship in relation to IPOs on the Swedish main market. Performing robust regressions, the results are significant at a 1 percent significance level for the full regression model, and at least 5 percent significance level tested for multiple variations of control variables.

To examine whether this is a country-specific phenomenon in Sweden, or applicable to the PE industry in large, is neither within the scope of, nor possible to conclude from, this study. However, as the first study on the topic, we feel entitled to discuss possible explanations behind the results.

Drawing general conclusion on the Nordics when investigating Nordic capital markets as a single group is arguably overly generalising. This could in particular be true for the PE industry. Figure 2 illustrates that the Swedish private equity industry has raised funds of more than double its share of GDP compared to Nordic average for many years. It can be expected that regional private equity industries with funding corresponding to much larger share of GDP for many years differs from the regions with vastly lower relative funding. As Sweden has had larger GDP than the Nordic average for the entire time period referred to in the graph, the difference in funding is relatively larger in absolute terms. According to Private Equity International (2018), the three largest PE firms in the Nordics are EQT, Nordic Capital and Altor Equity Partners, all of which are Sweden-based. Including IK Investment Partners, a London-based PE firm with its roots in Sweden, the four largest PE firms in the Nordics are Swedish.

Figure 2: PE funding as percentage of GDP

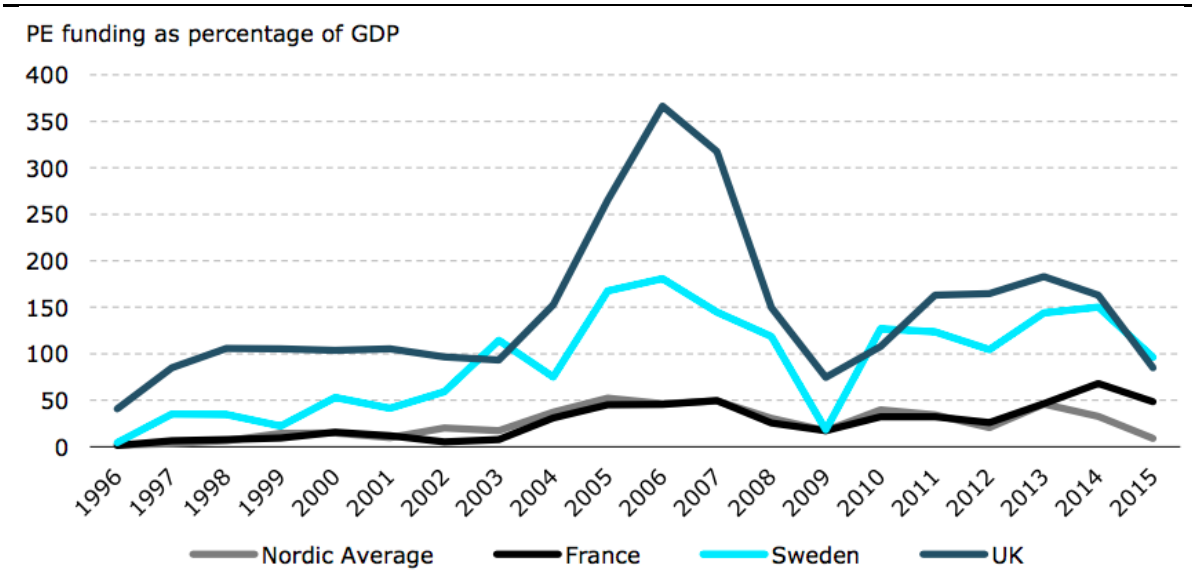


Figure 2 shows for each year, PE funding over the last three years relative to total GDP over the same period (SVCA, 2017).

Considering the higher degree of maturity in the Swedish PE industry compared to its Nordic peers, it could be argued that the Swedish PE industry has more in common with the larger, more developed PE regions, such as UK and USA, than the Nordic average. Therefore, we argue that it cannot be ruled out that the significant positive association between forecast error and PE backing found in Sweden, could be found in a larger setting as well, rather than being just a country-specific pattern for Sweden.

6 Conclusion

The main purpose of this paper is to investigate if there is any association between private equity sponsorship and analyst forecast error in the context of IPOs. Looking at Nordic IPOs between 2011 and 2016, the paper is arguably limited in its explanatory value on a larger scale. However, the interest for, and growth in, the Nordic private equity industry from this time period and onwards alone should provide sufficient relevance for our investigation.

Vast amounts have been written on private equity, forecast error, and post IPO performance. However, in this three-dimensional matrix we appear to have found a gap, and to our knowledge we perform the first study examining the association between forecast error and PE sponsorship in relation to IPOs.

We use a sample of 90 observations which covers all Nordic, excluding Iceland, IPOs on the main markets after some exclusions[25]. Due to a number of outliers in the dataset, we conduct robust regressions as our main analysis. The coefficient for the variable PE is not statistically significant for any of our regression analyses using standard regression.

The results from the regression analyses conducted on the full sample indicate that there is a positive association, significant at a 5 percent significance level, between analysts' consensus estimate forecast error and private equity sponsorship in the context of IPOs in the Nordics. However, we cannot conclude that this is a Nordic pattern, but rather indications of a Swedish pattern. This, because our robustness analyses on a country level are insignificant when excluding Swedish observations, but significant at a 1 percent significance level for Swedish observations only. We argue that this could either be a country-specific phenomenon or be related to the fact that the Swedish PE industry is more developed than the Nordic average.

In conclusion, the study supports our hypothesis that there is a positive association between PE backing and analysts' forecast errors in the context of IPOs in the Nordics on a 5 percent significance level. However, in our robustness analysis, we find that there is no significance when excluding the observations from Sweden. Hence, we draw no conclusions based on the Nordic setting that the study is based on. However, our results indicate that there is a positive association between PE backing and analysts' forecast errors in the context of IPOs in Sweden. We discuss that the Swedish PE industry is more developed than its Nordic peers, and that research on other developed PE regions such as UK or USA could bring explanatory value to whether this is merely a country-specific phenomenon for Sweden. Due

[25] Please see Table 2 for more information.

to the lack of previous research available on the subject, we limit our conclusions to that we have found evidence that support further investigations regarding our hypothesis that there is a positive association between private equity backing and analysts' forecast errors in the context of IPOs.

7 Limitations and directions for future research

Our study is limited in the sense that the analyst forecasts that we ideally would want to investigate, the forecasts used in the IPO marketing research reports which are distributed to investors before the IPO, are unavailable. These are the forecasts that potentially could be used to inflate the IPO valuation. However, these reports are distributed under strict confidentiality undertakings, and in many cases only distributed in physical copies. We use the initial coverage analyst reports' forecasts as a proxy for the IPO analyst reports.

One limitation in our study is the relatively small dataset being the total population of IPOs on the main lists in the Nordics excluding Iceland during 2011-2016. This limits us in our ability to e.g. control for industry fixed effects to a large extent, as we cannot include too many industry classifications. Being a rather narrow geographical scope, it also lessens the broader explanatory value for the PE industry as a whole as well as renders a dataset with rather few observations. Performing a similar study on for example EU, UK or USA should increase the explanatory value on a general level as well as a larger dataset.

Ideally, we would want to look at the earnings from the four quarters following an IPO, to limit the effect of varying forecast window length. However, due to limited data available on quarterly forecasts, we used fiscal year earnings figures.

Regarding methodology, future research on the topic could include supplementary results by including forecast error measurements based on e.g. EBITDA-margin and sales growth, as Zheng and Stangeland (2007) did when looking at firm quality from an underpricing perspective. Arguably, these are more stable metrics than EPS, and could provide nuances to the results from analyses of forecast error based on EPS.

Using the measurement of forecast error that is used in this study, our dataset includes a number of outliers affecting the regression analysis to a large extent. Arguably, this is a result of the measurement itself rather than the dataset, hence, it's likely that potential future researchers would face this issue as well. In this study, we settle on using robust regression as a method to adjust for the impact of the outliers. More advanced researchers conducting research on the subject might find more sophisticated ways of adjusting for outliers, improving the accuracy of the results.

The limited amount of previous research on the subject also limits the study in the sense that we cannot draw conclusions with support from previous findings to a large extent.

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