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IPO Underpricing and Management Quality

An Empirical Study of The Norwegian Equity Market

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This thesis was written as a part of the siviløkonom-degree program. Neither the institution, the advisor, nor the sensors are - through the approval of this thesis - responsible for neither the theories and methods used, nor results and conclusions drawn in this work.

Abstract

In this thesis I empirically examine 41 initial public offerings (IPOs), carried out on the Oslo Stock Exchange (OSE) between 2004 and 2006. In addition to investigating the underpricing in general, the focus of this thesis is to study the relationship between IPO underpricing and the quality of a company's management. I hypothesize that companies with better and more reputable managers will incur lower underpricing.

I find that the anomaly of underpricing is present in the Norwegian equity market, as the distribution of the data is positively skewed. The average company in the sample is underpriced by approximately 3%.

The analysis confirms the partial adjustment theory. In addition, I find that there are no significant differences in underpricing across industries, or between venture backed and non-venture backed companies.

Finally, I confirm my hypothesis that there is a negative relationship between management quality and underpricing.

Foreword

This thesis is written as part of the Siviløkonom-degree program at the Norwegian School of Economics and Business Administration (NHH). Studying financial economics throughout my major I have developed an increased interest in corporate finance, and in relation to this I discovered the anomaly of IPO underpricing. Studying the vast literature available on the subject boosted my fascination for this phenomenon, and I decided to devote my thesis to this field of research.

The information gathering process was hard and time consuming, as the data needed to conduct the analysis was difficult to retrieve. The reason for this is that there are no databases available which contain information of companies going public. All information therefore had to be searched for at the Oslo Stock Exchange website, or at Newsweb.

I would like to thank Johan Ailo Kalstad, a fellow NHH student, for excellent team work through the information gathering process as well as for being a great discussion partner.

Further I would like to thank the CFOs of a range of different companies, for supplying prospectuses.

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1. Introduction

An initial public offering, or IPO for short, is the first sale of a company's shares to the public. The common purpose of an IPO is to raise capital for the company. One of the most thoroughly studied phenomenon in the IPO literature is the anomaly of high initial returns, also known as underpricing. This is measured as the difference between the price at the end of the first day of trading, and the offer price. Effectively, underpricing means money 'left on the table' that otherwise would have been raised for the company. It is thus interesting to search for reasons which can explain its occurrence, and possible remedies.

A wide range of research documents the occurrence of underpricing globally, as they find that the distribution of initial returns is positively skewed. In a Norwegian context however, merely a handful of studies have investigated and documented this phenomenon[1].

With this thesis I want to take things a step further and in addition to analyse the presence of the phenomenon, investigate whether there is a relationship between management quality and underpricing of the IPO. This relationship has not been studied in the Norwegian equity market, and hence my thesis is a new contribution to the Norwegian IPO literature.

I have drawn inspiration from Chemmanur and Paeglis (2005), who empirically examine the relationship between the reputation and quality of companies' management and various aspects of the initial public offering. They hypothesize that better management result in less underpricing, more reputable underwriters, and less IPO costs. I find this study particularly fascinating and want to investigate whether the same effects are present in the Norwegian equity market. In this thesis I have studied IPOs in Norway between 2004 and 2006.

In 2005 the Oslo Stock Exchange (OSE) had second to most IPOs in Europe, only beaten by the London Stock Exchange. In 2006 a new record was set on the OSE, regarding NOK

[1] See among others Emilsen et al (1997), Edvardsen (2004), Kyllo and Skaar (2006) and Samuelsen and Tveter (2006).

amount raised by companies conducting an IPO. This is therefore a particularly interesting time for an in-depth investigation of the IPO activity in Norway.

One of the prevalent challenges for companies planning a flotation is the information asymmetry between the firm and the equity market. Beatty and Ritter (1986) argue that there is a positive relation between ex ante uncertainty regarding the issue and the expected underpricing, implying that companies subject to large ex ante uncertainty will incur large underpricing. Baron (1982) and Megginson and Weiss (1991) find that venture backed firms suffer less underpricing than do non-venture backed firms. They attribute this to the certification role of the venture capitalist. By this they mean that the venture capitalist reduces the information asymmetry between the issuing firm and the equity market, by verifying that the offering price reflects all information. This includes both publicly available and inside information, regarding the issue. A similar certifying effect can be attributed to the quality of the company's management. The reason for this, according to Chemmanur and Paeglis (2005), is that senior managers establish so-called "reputation capital" over their career. Most managers will presumably change jobs several times during their career, and hence interact with the labour market frequently. Future employers will take into consideration their reputation from past dealings with the equity market when deciding whether to hire them. If managers overprice an IPO, it may destroy their reputation in the equity market, and in effect reduce their attractiveness in the labour market. Therefore, the more "reputation capital" the managers have to protect, the greater is their incentive to price the IPO fairly.

An additional reason why companies with management of better quality may suffer less underpricing can be the managers' ability to create value for the investors. Managers of higher quality are likely to choose better projects and implement them more skillfully, resulting in better post-IPO operating performance (Chemmanur and Paeglis, 2005). Hence investors will demand less underpricing of companies with better managers.

In this thesis I test the following hypothesis:

"Companies with management of higher quality suffer less underpricing of their IPOs"

The rest of this thesis is organized as follows. Section 2 is an introduction to theories which have been developed to explain the phenomenon of underpricing. Section 3 describes the data I have gathered as well as the sample selection procedures. Section 4 explains the methodology I have used and presents some descriptive statistics. Section 5 provides the empirical analysis, regression results and robustness testing. Section 6 presents the interpretation of the results. Finally section 7 provides a summary.

2. Theories on underpricing

In this section I present some theories developed to explain the anomaly of underpricing. In general these theories are not mutually exclusive, and some theories may be more significant for some IPOs than others. In relation to the main focus of this thesis, I will concentrate on theories based on the problem of information asymmetry.

2.1 'The winner's curse'

One of the most famous theories on underpricing is developed by Kevin Rock (1986). He assumes that neither the underwriter nor the issuer have perfect information concerning the value of the issue. In the market, on the other hand, some investors are perfectly informed while the others find themselves at the same informational disadvantage as the issuer and underwriter. The informed investors will have high demand for underpriced issues, and no demand for overpriced issues. The uninformed investors will subscribe to all available issues, and as a consequence the underpriced issues will be oversubscribed and the overpriced issues will be undersubscribed. The uninformed investors will thus, on average, receive a larger portion of the oversubscribed issues, and hence their average return will be weighted towards the overpriced offerings. This is referred to as the 'winner's curse'. It implies that if the investors that are at an informational disadvantage relative to the others receive all the shares they request, the reason for this is that the informed investors did not want them. If the majority of the issues are overpriced, the uninformed investors will find it unprofitable to stay in the market, and they will therefore withdraw from it. To keep the uninformed investors in the market, the underwriters deliberately underprice their issues. This will not eliminate the allocation bias, but the uninformed investors will no longer expect a negative average return.

Welch (1989) and Benveniste and Spindt (1988) are critical to Rock's model. Welch argues that the issuer can either withdraw the offering, or compensate the uninformed investors if the informed investors do not show any interest in the issue. Benveniste and Spindt state that the winner's curse only exists if the allocation is symmetrical. That is, if the issuer (or

underwriter) can choose how to allocate the issue, the adverse selection problem is eliminated.

Beatty and Ritter (1986) extend Rock's model, arguing that there is a positive relationship between the expected underpricing, and the ex ante uncertainty regarding an IPO. Some investors will analyse the issues to determine which are likely to give positive initial returns. This creates a winner's curse problem for those who are trying to free ride. The free riders will not subscribe to issues unless they are, on average, underpriced. As ex ante uncertainty increases, so does the winner's curse, leading the free riders to demand an enhanced underpricing. This is what constitutes Beatty and Ritter's (1986) proposition number one: "*The greater is the ex ante uncertainty about the value of an issue, the greater is the expected underpricing" (p. 216).*

2.2 The partial adjustment theory (the market feedback theory)

Ibbotson et al (1988) introduce the 'partial adjustment phenomenon'. It refers to the fact that the issuer does not increase the offer price sufficiently to equal the company's market value of equity on the day of the flotation. The price is merely partially adjusted, and as a result higher levels of underpricing have been observed for issues with positive alterations to their offer prices.

Benveniste and Spindt (1989) use this theory to develop a model for setting the offer price and determine the allocation of shares in an offering. In addition they explain why the offer price is only partially adjusted to demand. During the offer period investors are encouraged to truthfully reveal information regarding the issue. For the investors with positive information to be motivated to make this information publicly available, they must be compensated so that they are better off by telling the truth than by giving no, or false information. By revealing positive information, the investors are allocated a larger portion of the issue, but simultaneously the offer price is increased. Thus, the profit from the enhanced allocation must exceed the decrease in expected initial returns, and as a consequence the truth-tellers will be better off than the liars (Hanley, 1993). When an issue is oversubscribed the underwriter needs to ration the shares. In this case, the investors who reveal good

information will be favoured, and those providing false negative information, risk having their allotment significantly reduced. When issues are rationed, underpricing is also used to compensate the investors who reveal positive information, if the demand from these investors exceeds the number of shares to be issued. Benveniste and Spindt argue in their theorem number one that *'Underpricing is directly related to the level of interest in the pre-market' (p. 353).* They also claim that 'I*ssues priced in the upper part of the offer range are likely to be more underpriced than other IPOs' (p. 353).*

2.3 Underwriter reputation

The model developed by Carter and Manaster (1990) has references to the model of Rock (1986) and Beatty and Ritter (1986). They argue that as underpricing is expensive, companies of high quality want to reveal their low risk to the equity market, and as a result suffer less underpricing of their IPOs. One way of showing their superior quality is to engage a prestigious underwriter who can serve as a certifying intermediate, and thus reduce the underpricing. Carter and Manaster find empirical evidence that underwriter reputation is negatively related to underpricing. Later, studies of Beatty and Welch (1996) and Cooney et al (2001) have reported the opposite, namely that underwriter reputation is positively related to underpricing. The research in this area is thus inconclusive.

In addition to the theories presented above, several others have been developed. I will not go in further detail regarding these, as a thorough review of the underpricing literature is beyond the scope of this thesis.

As an extension of this introduction to underpricing theory, it is interesting to look at one final aspect of underpricing; why don't issuers get upset about 'leaving money on the table'? The expression money 'left on the table' refers to the number of shares in the issue times the underpricing per share. Many IPOs experience enormous initial returns, which one would expect the pre-issue shareholders to be upset about, as they could have sold their shares at a higher price. We observe however the contrary; the pre-issue shareholders are rather content. Ritter (1998) explains this in relation to the partial adjustment phenomenon. The issues with the highest underpricing are those whose offer price was revised upwards from the expected offer price. Thus the negative news about the underpricing coincide with the positive news

about a higher than expected price. In addition, for most of these issues, the number of shares to be sold in the offering has also been increased, so that the total profit is even larger. All these positive factors are the reasons why the issuers hardly ever complain about ‘money left on the table’.

3. Data and sample selection

The list of companies which carried out an initial public offering in the period between 2004 and 2006 has been collected from the Oslo Stock Exchange's (OSE) website. In total, 100 companies went public in this period. From this sample I have excluded cross-listings, demergers, spin-offs, previous levered buy-outs (LBOs) and management buy-outs (MBOs) Prospectuses were not available for 18 companies. These were therefore excluded from the sample. In addition 20 companies had to be eliminated from the sample, due to lack of information in the prospectuses regarding the management group. This leaves me with a sample of 56 companies consisting of 41 straight IPOs, and 15 which came from the Norwegian over-the-counter market (NOTC). The latter group did not issue shares and have therefore been excluded from the main analysis. The prospectuses have been downloaded from the respective companies' websites or received by email or post from the companies' CFOs (Chief Financial Officer). Information about the management quality is hand-collected from the management section of the prospectuses. The data regarding prices, both IPO prices and the closing price on the first day of trading, in addition to other information about the issues, has been collected from OSE's website and Newsweb. Closing prices on the last day of trading at the NOTC have been supplied by The Norwegian Securities Dealers Association (Norges Fondsmeglerforbund).

Table 1: Data sample

	2004	2005	2006	Total
Total number of listings	22	47	31	100
Cross-listed	0	1	3	4
Demergers	0	0	1	1
MBOs/LBOs	1	0	0	1
Prospectus not available	10	5	3	18
Incomplete data	1	14	5	20
Final sample	10	27	19	56
From NOTC	1	8	6	15
Straight IPOs	9	19	13	41

Table 1 presents the distribution of the sample in terms of number of IPOs per year

4. Methodology

In this section I introduce the variables I use in the regression model. I start by presenting the management quality variables, which are inspired by Chemmanur and Paeglis (2005). These variables measure the human knowledge of the management team. To asses the marginal impact of the management quality measures, I include various other independent variables which have been used in a range of previous studies. I also present the dummy variables (also known as indicator variables) included as control variables. The short names used for each variable are included in parenthesis.

4.1 Measures of management quality

4.1.1 Education

The first aspect of management quality I look at is the educational background of the management team members, as the management team resources depend on this factor. I use the percentage of the management team members who have a business degree at Master level, including "Siviløkonom" degree and MBA (PBDEG). This measure is given in percentage terms; hence a value of 50 for PBDEG indicates that 50% of the members of the management group have a business degree. I believe that an increased portion of the management team with a business degree improves the management quality.

4.1.2 Professional experience

Moving on to the team members' professional experience, I look at three factors which I believe will increase management quality; executive experience (PFTEAM), experience from a law or an accounting firm (PLAWACC) and board memberships, both current and past (PBOARD). These measures are given in percentage terms in the same way as PBDEG. Experience of this nature can not merely serve as a contribution to the overall management quality. It can furthermore increase the management reputation, as they in addition provide linkages to external parties, which may further reduce the problem of asymmetric information. Intuitively, the larger the values of these variables the better is the management quality.

4.1.3 Tenure

Turning to look at management structure I have measured the average tenure of the team members. This refers to the average number of years they have been employed by the IPO company (TENURE). Chemmanur and Paeglis (2005) point out that average tenure is likely to be correlated with the age of the firm. To eliminate this problem I use the residuals from the regression of TENURE, on the natural logarithm of the firm age (XTENURE). This variable is uncorrelated with firm age, and in addition it shows less correlation with other independent variables. Higher average tenure in the firm can indicate consistency and shared experiences, and thus imply lower transaction costs among team members according to Chemmanur and Paeglis (2005). On the other hand, long average tenures can cause negative effects like self gratification i.e. It may therefore be advantageous to not have a too long average tenure. I am therefore ambiguous about the effect of this variable.

4.2 The dependent variable and the control variables

4.2.1 Underpricing

Underpricing is the dependent variable in my analysis. In the financial literature, closing initial return (CIR) is the typical measure of underpricing. I therefore choose to use this as my proxy for underpricing. CIR is defined as the ratio of the difference between the closing price on the first day of trading and the offer price, to the offer price (UNDERP). Underpricing is given in percentage terms meaning that a value of UNDERP of 3 translates to an underpricing of 3 % (a value of -3 translates to an overpricing of 3 %).

4.2.2 Firm age

According to Rock (1986), underpricing increases with the risk of the company. To empirically test this, one needs a measure of risk. Firm age at the time of the flotation can function as such a proxy. Several studies such as Ritter (1984 and 1991), Beatty and Ritter (1986) and Megginson and Weiss (1991) use this measure as a control for the degree of information asymmetry. According to Ritter (1984) firm age measures how ‘established’ the company is, implying that it will for smaller companies, with short operating history, be more difficult to establish the right price per share than for older firms. This will expose the

uninformed investors to the adverse selection problem. Therefore issuers of younger firms must compensate the investors for assessing their firms with relatively higher underpricing than do older firms.[2] This suggests that there is a negative relationship between the age of the firm and the initial return of the IPO. I use the natural logarithm of one plus the company's age (subtracting the year of incorporation or start of operation, which ever is earlier, from the year of the IPO) as a proxy for firm age (FAGE). This proxy controls for any systematic effect on underpricing caused by firm age.

4.2.3 Offer size

This is another measure of the uncertainty of the issue. Smaller issues are expected to be more risky than larger issues. I therefore anticipate that the former group will experience relatively higher underpricing than the latter. The results of Ritter (1984) and Hanley (1993), among others, support this as they both report a negative relationship between offer size and underpricing. I use the natural logarithm of the gross proceeds, calculated as the number of shares offered times the offer price, as a measure of the issue size, excluding over allotment options (LNOFF). This measure is intended to control for any systematic influence on underpricing due to the size of the issue.

4.2.4 Oversubscription

Rock (1986), as presented in section 2.1, argues that underpriced issues will be oversubscribed due to high demand from informed investors. Benveniste and Spindt (1989) and the partial adjustment theory, advocate the same relationship, but use a different explanation. Recall that when an issue is oversubscribed, shares are rationed. The issuer will therefore have to compensate the providers of good information with increased underpricing, as it is not possible to fully compensate them through increased share allocation. I include in my model a variable to capture the oversubscription ratio. This is measured as demand for

[2] This relates to Beatty and Ritter's (1986) proposition number one explained in chapter 2.1

the issue divided by the number of shares available in the issue (OVERSUB)[3]. According to Beatty and Ritter (1986), issues that are underpriced are much more commonly oversubscribed than those who are overpriced. I expect this variable to show a positive sign in line with the arguments above.

4.2.5 Width

According to Hanley (1993), a large offer range, meaning the difference between the higher and the lower price listed in the prospectus, results in a higher level of underpricing. A large range indicates a great deal of uncertainty regarding the issue, as it gives the issuer more flexibility in setting the final offer price. I measure the width as the ratio of the difference between the higher and the lower price in the interval, to the lower price (WIDTH).

4.2.6 Offer price position

I measure the percentage difference between the expected price and the final offer price to create this variable (OPP). The expected offer price is measured as the sum of the higher and the lower price in the interval, divided by two. This variable is meant to be a test of the partial adjustment phenomenon. Hanley (1993) finds that underpricing is positively related to percentage change in the offer price from the expected offer price. I anticipate a positive sign for this variable, meaning that a positive revision of the offer price leads to relatively higher underpricing.

4.2.7 Underwriter reputation

In the financial literature, several methods have been developed to measure underwriter reputation. I chose to measure it by market share, in line with Megginson and Weiss (1991). Calculating the underwriters' market shares I include all the IPOs between 2004 and 2006,

[3] Meaning that if 100 shares are available in an issue and the investors demand 200 shares the issue is oversubscribed by 2. Some of the companies included in the sample did not want to release information regarding the subscription of their IPO. I believe that if the demand for an IPO is high the issuer will be eager to make this information public. On the other hand, if the issue is not fully subscribed the IPO is unlikely to take place. I therefore set the oversubscription ratio to 1 for the companies which did not publish this information.

also those excluded from my sample. The underwriters are then allocated the whole issue size if they are the only underwriter, half the issue size if there are two underwriters, and so on. To find each underwriter's market share, I divide the amount raised by each underwriter by the total amount raised in the period between 2004 and 2006. As a proxy for underwriter reputation I take the natural logarithm of one plus the underwriter's market share (SREP). Concerning the effect of underwriter reputation on underpricing, previous studies have, as mentioned, delivered conflicting results. Carter and Manaster (1990) and Megginson and Weiss (1991) both report a negative relationship between underwriter reputation and underpricing. Later, Beatty and Welch (1996) report a contradictive result, namely that the relationship is positive. Cooney et. al (2001) supports this finding for offer prices set above the initial price range, while they find that the relationship is negative for prices within the range. As a consequence, I am ambiguous about the effect on underpricing from underwriter reputation. Samuelsen and Tveter (2006) study this relationship in the Norwegian equity market and find no relationship between underwriter reputation and underpricing[4].

4.3 Dummy variables

Dummy variables are used to include categorical data. To prevent perfect multicollinearity, one category must be left out. The omitted variable becomes the benchmark to which the other categories are compared. This means that the coefficient illustrates the difference between the included and the omitted category. The latter is often called the 'base level' or 'reference group'. Dummy variables take the value of one if the qualitative phenomenon it represents occurs, and zero otherwise (Kennedy, 2004).

4.3.1 Venture

Baron (1982) and Megginson and Weiss (1991) report that venture backed companies incur lower underpricing than do non-venture backed firms. Barry et al (1990) on the other hand, do not find a significant difference in initial returns between venture backed and non-venture

[4] They use the number of IPOs managed by each underwriter as their measure for underwriter reputation.

backed firms. Chemmanur and Paeglis (2005) exclude venture backed companies in their analysis to eliminate any certification effect they might have on the IPO. I include a dummy variable as I believe it will capture this effect, and as it allows me to keep these companies in the sample and avoid further reductions (VENTURE).

4.3.2 Year of the IPO

I include a dummy variable for each of the years, 2004, 2005 and 2006 to capture any difference in underpricing between the different years in the sample.

4.3.3 Industry

I include dummy variables for different industries based on the Global Industry Classification Standard (GICS). Most of the companies in the sample are either classified as being in the energy or information technology industries. Only a few companies from each of the other industries are registered. To avoid having a category with only a very small number of observations, I create three industry dummies; Energy, IT and Other (ENERGY, IT, OTHER).

4.4 Descriptive statistics

Table 2 presents descriptive statistics for the variables presented in the previous section in panel A. In addition various firm characteristics which illustrate some features of the companies in the sample are included in panel B.

As can be seen from panel A the underpricing in the sample range from -10% (i.e. an overpricing of 10%) to 16.57%, while the average IPO in my sample is underpriced by 3.15%. For the mean company 43.33% of the managers have a business degree, while 49.94%, 14.07% and 23.24% have previous experience from executive positions, an accounting or a law firm and board memberships respectively. On average, the IPOs are oversubscribed more than four times while the largest oversubscription ratio observed is 20. For the average firm, the final offer price is slightly lower than the expected price.

Panel B shows that the company age at the time of the offering range from 0.25 to 153 years, with a mean of approximately 21. Book value of assets and offer size also show great

variation, ranging from NOK 2 million to NOK 18,680 million and NOK 6 million to NOK 2,100 million respectively. This illustrates the huge differences in size of the companies going public during this period.

Table2: Descriptive statistics

	Mean	StDev	Min	Median	Max
Panel A: Summary Statistics for variables					
UNDERP	3,15	6,35	-10,00	1,68	16,57
PBDEG	43,33	24,67	0,00	40,00	100,00
PFTEAM	49,94	30,16	0,00	50,00	100,00
PLAWACC	14,07	18,84	0,00	0,00	67,00
PBOARD	23,24	27,33	0,00	20,00	100,00
XTENURE	0,00	3,14	-5,63	-0,30	11,77
FAGE	2,39	1,13	0,22	2,40	5,04
LNOFF	18,44	1,34	15,61	18,48	21,47
OVERSUB	3,97	5,19	0,00	1,60	20,00
OPP	-1,02	8,08	-23,08	0,00	15,07
SREP	0,17	0,08	0,01	0,17	0,31
Panel B: Summary Statistics for other firm caracteristics					
AGE	21,30	33,81	0,25	11,00	153,00
BVA (NOK mill)	1 357	3 363	2	159	18 680
TENURE	5,25	3,61	0,20	5,00	14,33
OFF (NOK mill)	256	462	6	106	2 100

Table 2: The sample consists of 41 IPOs between 2004 and 2006. UNDERP is the first-day return in percentage terms, defined as the closing price on the first day of trading less the offer price, divided by the offer price. PBDEG is the percentage of the company's management team with a business degree. PFTEAM and PLAWACC are the percentages of the management team with experience from executive positions and a law or an accounting company prior to joining the IPO firm. PBOARD is the percentage of managers who have served or are currently serving as member of one or more boards. XTENURE is the residuals from the regression of TENURE on the natural logarithm of firm age. FAGE is the natural logarithm of one plus firm age, where firm age is defined as the number of years between the time of incorporation or the start of operation (whichever is earlier) and the time of going public. LNOFF is the natural logarithm of offer size. OVERSUB is the number of times the issue was oversubscribed. OPP is the percentage difference between the actual and the expected offer price. WIDTH is the width of the offer price range in percentage terms. SREP is the natural logarithm of one plus the market share of the underwriter. AGE is the age of the firm at the time of the IPO. BVA is the book value of assets. TENURE is the average number of years the managers have been employed by the IPO company. OFF is the size of the offering measured as number of shares multiplied by the offer price.

5. Empirical testing and results

In this section the empirical tests and their results are presented. Starting by looking at the underpricing, I investigate the differences between the different years of the sample and the distribution of the data. Further, I test whether there are significant differences between underpricing across industries, and between venture and non-venture backed firms. In addition, I test if the partial adjustment phenomenon is present in the Norwegian equity market. Following this is a correlation analysis, where I investigate the correlations between the variables used in the regression model. The model and the results from the regression analysis are presented thereafter. The economic significance of the variables is then discussed, before I finish this chapter by testing the robustness of the model.

5.1 Underpricing

Firstly, I investigate the underpricing in the sample in detail. For all t-tests preformed, some caution must be applied when interpreting the results due to the small sample size.

Table 3: Underpricing in each year

Year	# observations	Mean	StDev	Min	Median	Max
2004	9	3,42 %	7,18 %	-2,89 %	0,00 %	15,29 %
2005	19	2,89 %	6,15 %	-10,00 %	1,89 %	16,33 %
2006	13	3,34 %	6,59 %	-3,85 %	1,79 %	16,57 %
Total	41	3,15 %	6,35 %	-10,00 %	1,67 %	16,57 %

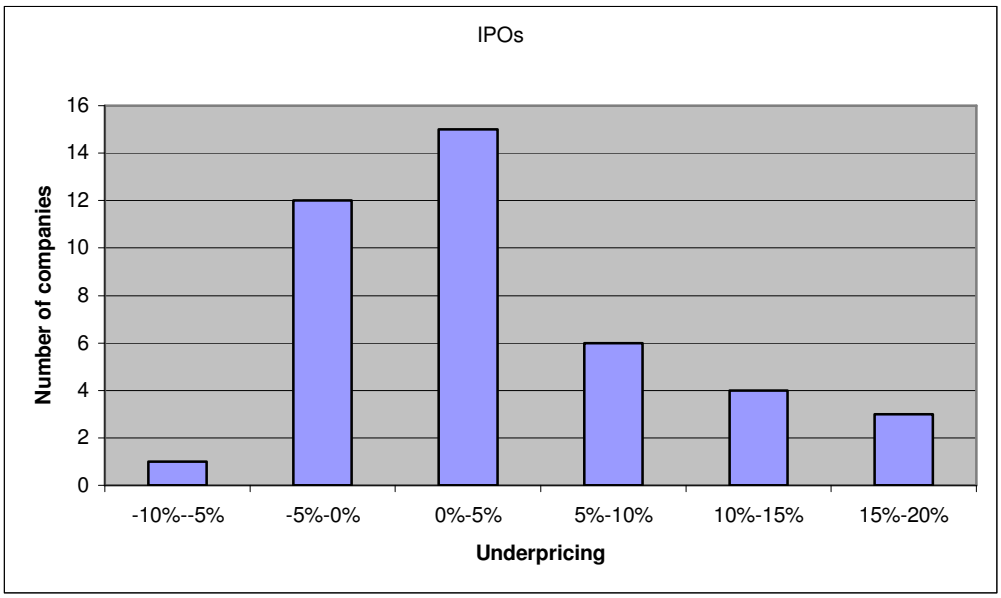
Table 3 presents an overview of equally weighted initial returns in each year.

As can be seen from table 3, the average underpricing in the sample period is 3.15%.[5] In addition, a positive mean and a median close to zero indicate a positively skewed distribution, as illustrated in graph 1. A simple t-test on the entire sample returns a value of 3.17, which indicates that the results are statistically different from zero. These results must

[5] The results are not directly comparable to other studies as I have excluded some offerings from the sample, due to lack of information in the prospectuses regarding management background etc.

however be interpreted with caution, as the sample size is small and the distribution is skewed.

The mean does not change much between the different years of the sample. The maximum values are substantially larger than the minimum values in each year, illustrating that there are larger values for underpricing than overpricing.



Graph 1 illustrates the distribution of underpricing in the sample. The ranges on the X-axis have been constructed as follows; the far right range includes companies which were overpriced by between 10% and 5%, not included those overpriced by 5%. The next range includes companies overpriced by between 5% and 0% not including those overpriced by 0%. It is apparent that the distribution is positively skewed, with a long 'tail' to the right.

Secondly, I look at underpricing differentials across industries. It is evident that companies in the IT end energy industries experience higher average underpricing than those operating in other industries. Nevertheless a simple t-test shows that the differences across industries are not statistically significant.[6]

[6] This is in line with the results of Samuelsen and Tveter (2006) who do not find any statistically significant difference in underpricing between companies in the oil industry and the rest. It should be noted however that they use underpricing adjusted for market return as their measure of underpricing.

Table 4: Average underpricing across industries

Industry	# observations	Underpricing
Energy	13	4,55 %
IT	8	4,86 %
Other	20	1,55 %

Table 4 presents underpricing differentials across industries.

Thirdly, I investigate the presence of the partial adjustment phenomenon. Looking at table 5, it is evident that the underpricing is higher for the firms who experience a positive revision to the offer price, than those whose offer price in negatively revised. The latter group, in fact, experiences a small overpricing on average. A simple t-test shows that the average underpricing for the issues with a positive revision to the offer price is statistically different from zero. This is not the case for the issues with a negative price revision. These results are consistent with the model of Benveniste and Spindt (1989), and the empirical findings of Hanley (1993). The model predicts that issues for which the revision to the offer price is positive will incur underpricing, while those who experience a negative price revision will not be underpriced.

Table 5: Offer price position and average underpricing

Revision of offer price	Underpricing
Negative	-0,87 %
Positive	5,08 %

Table 5 illustrates the partial adjustment phenomenon.

Fourthly, I analyse whether there are any differences in underpricing between venture-backed and non-venture backed firms. It is evident that the average underpricing for venture backed companies is larger than the average underpricing for non-venture backed companies in the sample. However, a simple t-test shows that this difference is not statistically significant.

Table 6: Underpricing and venture capital

	Underpricing
Venture backed	3,70 %
Non-venture backed	2,95 %

Table 6 presents the differences in average underpricing between companies backed by venture capitalists and non-venture backed companies.

5.2 Correlation analysis

The correlation coefficient indicates the strength and direction of a linear relationship between two variables. It is thus a sign of the independent variable's ability to predict the dependent variable. Correlation does not necessarily imply causation. It merely means that if two variables correlate, they move symmetrically. Hence a different method is needed to map the cause-and-affect relationships, for which the regression model is ideal (Garson, 2006). A correlation matrix is provided in table A1 in the appendix.

Studying the correlation matrix, I start by looking at the correlation between the independent variables. If the independent variables are uncorrelated they can explain a relatively larger portion of the variation of the dependent variable. If they are highly correlated their predictability is significantly reduced. Assuming that the independent variables are uncorrelated, variables can be removed from, or added to, the regression model without affecting the coefficients of the other variables. In the real world however, there will in most cases exist some correlation between the independent variables. It is therefore necessary to map the strength of the relationships. If the correlation is low, the impact on the regression model will be minor. Alternatively, if two or more of the independent variables are highly correlated, it can be a sign of multicollinearity.[7] This is a problem because it indicates that some of the variables may represent the same underlying phenomenon, and can cause so called 'over fitting' of the regression model. This means that the model has too many variables.

Secondly, I investigate the correlation between the dependent variable, UNDERP, and the independent variables. In contrast to the discussion in the previous paragraph, it is desirable that the dependent and the independent variables are highly correlated. In addition, the directions of the relationships are important. Regression models that contain independent variables which correlate only minimally with each other, and highly with the dependent

[7] This is discussed in greater detail in a section 5.5.3.

variable, are called “low noise”. In addition, they are said to be statistically robust (Van den Poel Dirk, 2004).

In the following I will comment on the most important issues regarding the correlation analysis.

As mentioned in section 4.1.3, TENURE is expected to be correlated with firm age and hence I use XTENURE as my proxy for tenure. Estimating TENURE’s correlations with firm age and FAGE, I arrive at 0.44 and 0.5, respectively. Adjusting for firm age, the new tenure proxy (XTENURE) shows less correlation with these measures with correlations coefficients of 0.16 and 0.05, respectively..

Examining the relationships between the different management quality variables, I find that the correlations between these are low, all under 0.3. Looking at the other variables, the correlations are more concerning with regard to the problem of multicollinearity. WIDTH shows positive correlations over 0.3 with PBDEG. In addition, OVERSUB shows a strong, positive relationship with OPP. This is not a surprising finding. Benveniste and Spindt (1989) argue that when good information regarding an issue is revealed through high demand, the offer price revision will be positive, implying that the final offer price will exceed the expected offer price. Multicollinearity may occur if these highly correlated independent variables are included in the same model.

The correlation between the dependent variable, underpricing, and firm age and underwriter reputation are both miniscule. This indicates the possibility that there is no relationship between underpricing and these variables.

Table 7 illustrates the desired and the actual direction of the relationships between the independent variables, and the dependent variable. WIDTH is the only variable which shows a different relationship with underpricing than expected. Concerning the variables for which I had ambiguous expectations, PBOARD, XTENURE and SREP, they all show a positive relationship with underpricing. I will discuss this further in chapter 6.

Table 7: Direction of the correlations

	UNDERP	
	Desired direction	Actual direction
PBDEG	-	-
PFTEAM	-	-
PLAWACC	-	-
PBOARD	-/+	+
XTENURE	-/+	+
FAGE	-	-
WIDTH	+	-
OPP	+	+
LNOFF	-	-
OVERSUB	+	+
SECSHARES	+	+
SREP	-/+	+

Table 7 illustrates the desired direction of the relationships between the dependent variable, UNDERP, and the independent variables. The second column shows the desired direction in relation to the discussions in section 4, where the variables are presented. The variables for which the expectations are ambiguous both a plus and a minus is used (-/+). In the right column the actual direction of the relationships are included. See table A1 in the appendix for a correlation matrix.

5.3 Regression model

In order to test my hypothesis that companies with management of better quality suffer less underpricing, I conduct an ordinary least square (OLS) regression analysis. I examine the marginal impact on underpricing from management quality by adjusting for several aspects of the IPO. I run the following regression:

$$UNDERP_i = \beta_0 + \beta_1 PBDEG_i + \beta_2 PFTEAM_i + \beta_3 PLAWACC_i + \beta_4 PBOARD_i + \beta_5 XTENURE_i + \beta_6 FAGE_i + \beta_7 LNOFF_i + \beta_8 OVERSUB_i + \beta_9 OPP_i + \beta_{10} WIDTH_i + \beta_{11} SREP_i + \beta_{12} VENTURE_i + \beta_{13} 2005_i + \beta_{14} 2006_i + \beta_{15} IT_i + \beta_{16} OTHER_i$$

5.3.1 Results

The main variables of interest are PDEG, PFTEAM, PLAWACC, PBOARD and XTENURE. In model one, these are the only variables included[8]. In model two, the variables controlling for any systematic effects caused by the size of the offer and the age of the firm, are in addition included. Model three and four include, besides the variables in regression two, different combinations of the other control variables. As mentioned in section 5.2, there are certain combinations of variables which are less desirable than others, due to the problem of multicollinearity. I therefore avoid using both OPP and OVERSUB in the same regression. I use both PBDEG and WIDTH in models three through six, as there does not seem to be a problem with multicollinearity arising from including them both in the same model. In addition, it is not likely that these two variables explain the same phenomenon, and thus there is no preliminary danger of 'over-fitting' the model[9]. See section 5.5.3 for further discussion regarding the problem of multicollinearity.

Model three through six contain dummy variables for industry and year in addition to the venture dummy.

The results from the regression analysis are presented in table 8.

[8] See appendix table A2 for simple regression models for each of the management quality measures.

[9] The opposite is the case for OPP and OVERSUB as mentioned in section 5.2.

Table 8: Results from the regression analysis

	UNDERP					
	1	2	3	4	5	6
Intercept	9,82	21,05	7,96	8,88	11,18	7,77
	(4,28)***	(1,66)	(0,67)	(1,00)	(3,51)***	(3,15)***
PBDEG	-0,09	-0,09	-0,06	-0,06	-0,06	-0,06
	(2,46)**	(2,34)**	(1,64)	(2,25)**	(1,67)	(2,39)**
PFTEAM	-0,04	-0,05	-0,1	-0,08	-0,09	-0,08
	(1,31)	(1,58)	(2,72)**	(3,13)***	(2,84)***	(3,41)***
PLAWACC	-0,07	-0,08	-0,04	-0,06	-0,04	-0,06
	(1,38)	(1,56)	(0,68)	(1,39)	(0,75)	(1,47)
PBOARD	0,01	0,03	0,04	0,07	0,04	0,07
	(0,41)	(0,76)	(1,26)	(2,64)**	(1,28)	(2,77)***
XTENURE	0,5	0,51	0,7	0,55	0,7	0,56
	(1,69)	(1,73)*	(2,65)**	(2,89)***	(2,84)***	(3,07)***
FAGE		-1,12	-0,54	-0,79	-0,49	-0,82
		(1,29)	(0,66)	(1,31)	(0,64)	(1,44)
LNOFF		-0,45	0,18	-0,07		
		(0,62)	(0,26)	(0,13)		
OVERSUB				0,71		0,71
				(5,91)***		(6,45)***
OPP			0,33		0,33	
			(2,99)***		(3,24)***	
WIDTH			-0,18	-0,17	-0,18	-0,17
			(2,51)**	(3,12)***	(2,65)**	(3,48)***
SREP			1,19	0,16		
			(0,12)	(0,02)		
VENTURE			2,1	-0,06	1,98	-0,03
			(1,08)	(0,04)	(1,09)	(0,02)
Industry dummies	No	No	Yes	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes	Yes	Yes
R-Sq(adj)	22,20 %	23,40 %	45,90 %	69,40 %	49,70 %	71,70 %
F-value	3,29	2,74	3,27	7,05	4,05	8,78
P-value	0,015	0,023	0,004	0,000	0,001	0,000
d	1,5	1,61	2,11	1,66	2,07	1,68

*,**,*** indicate statistical significance at the 10%, 5% and 1% levels respetively.

Table 8 illustrates the results from six regression models I have constructed. The dependent variable is UNDERP which is a proxy for initial return measured as the closing price on the first day of trading less the offer price, divided by the offer price. PBDEG is the percentage of the company's management team with a business degree. PFTEAM and PLAWACC measure the percentages of the team management who have experience from executive positions, or experience from a law or an accounting company, respectively, prior to joining the IPO firm. XTENURE are the residuals from the regression of TENURE on the natural logarithm of firm age. FAGE is the natural logarithm of one plus firm age, where firm age is defined as the number of years between the time of incorporation or start of operation (whichever is earlier) and the time of going public. LNOFF is the natural logarithm of offer size. OVERSUB is the number of times the issue was oversubscribed. 'Industry dummies' refer to the IT and OTHER dummy variables. The former takes the value of one if the company is classified as IT company according to GICS and zero otherwise. The latter takes the value of one if the company is neither an IT nor energy company according to GICS and zero otherwise. ENERGY is the base level for the 'industry dummies'. 'Year dummies' refer to dummy variables for the years of 2005 and 2006, which take the value of one if the IPO took place in that specific year, and zero otherwise. 2004 is the base level for the 'year dummies'. T-statistics are in parentheses, negative signs are not shown. "d" is the Durbin-Watson statistics.

The results from the regression analysis confirm my hypothesis that companies with management of higher quality incur lower underpricing. This is apparent as the coefficients of the management quality variables PBDEG, PFTEAM and PLAWACC are negative in all models. The coefficients of PBOARD and XTENURE are on the other hand positive[10]. In models one and two, PBDEG is the only management quality variable which is statistically significant at the 5% level. In model two XTENURE is, in addition, statistically significant at the 10% level. PFTEAM and XTENURE are both statistically significant at the 1% level in models four through six. PBDEG and PBOARD are statistically significant at the 5% level in models four and six, but not three and five. In regression six all management variables but PLAWACC are statistically significant at the 5% level or higher.[11]

The implications of the signs of the coefficients are that PBDEG, PFTEAM and PLAWACC reduce underpricing while PBOARD and XTENURE increase underpricing.[12]

Looking at models three through six it is evident that the management quality variables are statistically significant at a higher level in models four and six, than in models three and five as t-statistics for all coefficients are larger in the former two. Comparing the models which include LNOFF and SREP (three and four) to those which exclude these measures (five and six) all variables but FAGE are statistically significant at a higher level in the latter two.

The coefficients for both LNOFF and SREP are far away from being statistically significant and it is evident that excluding these variables improves the model.

The coefficients of OVERSUB[13] and OPP are positive, which is in line with my expectations. Besides they are statistically significant at the 1% level. The coefficient of

[10] Running regression one on the full sample the results are approximately the same. See table A3 in the appendix.

[11] PLAWACC is nearly statistically significant at the 15% level in regression six.

[12] Table A4 in the appendix illustrates statistical significance of the coefficients for different ways of measuring the management proxies. This is to test whether a relationship different from the linear better explains the relations between the management quality proxies and underpricing. The squared term of PBDEG is significant at a higher level (1% compared to 5% in regression six) than the normal term indicating that there is a better fit than the linear for this proxy. As PBDEG is statistically significant at the 5% level (which is a common benchmark in most analysis) I chose to use this instead of the squared term.

WIDTH is negative and statistically significant at the same level as OVERSUB and OPP. The negative sign for WIDTH is not according to my expectations.

Looking at model six in more detail we see that PFTEAM, PBOARD and XTENURE are all statistically significant at the 1% level, while PBDEG is merely statistically significant at the 5% level. PLAWACC is the only management quality variable which is statistically insignificant. FAGE is also statistically insignificant as it is in all the other models. Both OVERSUB and WIDTH are statistically significant at the 1% level, as they also are in model three. The coefficient of VENTURE shows a positive sign, but it is statistically insignificant.

5.4 Economic significance and implications of the results

The results of my analysis indicate an economically meaningful relationship between management quality and reputation on one hand, and IPO underpricing on the other. In the following I present the economic effects of changes in some of the independent variables, based on model number six. All effects presented results from a change in one variable, while the others are held constant. The results must be interpreted with caution as the sample size is small.

A ten percentage point change in the percentage of the management team with a business degree (PBDEG), previous executive experience (PFTEAM) or experience from a law or an accounting company (PLAWACC) results in a 0.6, 0.8 and 0.6 percentage point decrease in underpricing, respectively. On the other hand a ten percentage point increase in the percentage of the management team with current or previous memberships of boards (PBOARD) results in a 0.7 percentage point increase in IPO underpricing. Considering that the average underpricing in the sample is 3.51%, a 0.6 percentage point decrease translates to a reduction of almost 20%.

[13] Also a different measure of pre-offer demand, namely the percentage of the offer consisting of secondary shares, was used. This measure however was not statistically significant at the same level as OVERSUB.

One unit increase in OVERSUB corresponds to 0.71 percentage point increase in underpricing, while a one percentage point increase in WIDTH results in a 0.17 percentage point decrease in underpricing.

To calculate the economic significance of OPP, I base the calculations on model number five. A one percentage point increase in the positioning of the final offer price compared to the expected offer price, leads to a 0.33 percentage point increase in underpricing.

The values calculated above are referred to by Achen (1982) as the 'potential influence' of the independent variables, on the dependent variable. He argues that level-importance, that is the mean of the independent variable multiplied with its coefficient, is the variables' 'actual influence'. The reasoning behind this is that the higher the coefficient, the larger the influence on the dependent variable. On the other hand the lower the mean, the fewer unit changes are likely to occur. By also taking the mean into account, level-influence is a better indicator of the expected effect of the independent, on the dependent variable (Garson, 2006). The level importance of PBDEG, PFTEAM, PLAWAC and PBOARD based on regression six are; -2.60, -3.99, -0.84 and 1.63. This indicates that PBDEG and PFTEAM are the most influential management team variables by Achen's measure.

Lastly, I turn to perhaps the most interesting aspect of the regression analysis, namely the NOK value of money 'left on the table' changes in the variables above correspond to. I base these calculations on the amount the average company 'leaves on the table', defined as the initial return multiplied by the number of shares sold in the offering (Loughran and Ritter, 2002). With respect to model six, a ten percentage point increase in PBDEG and PFTEAM for the average firm result in NOK1,147,000 and NOK 1,528,000 reductions in money 'left on the table', respectively. The effect of PLAWACC is the same as for PBDEG, as the coefficients are identical. A ten percentage point increase in PBOARD leads to an increase in money 'left on the table' by NOK 1,337,000. One unit increase in OVERSUB leads to the same amount. See table A6 in the appendix for an overview of the economic significance of all the independent variables.

5.5 Testing the robustness of the model

5.5.1 Heteroscedasticity

Heteroscedasticity refers to a condition where the variance of the residuals is not constant. This is a violation of the assumptions of the regression model. In case of the presence of heteroscedasticity, the estimated variance will be biased. Usually it is not possible to determine the direction of the bias, and the problem can not be remedied by using larger samples. As the variance and the standard errors are biased, they are no longer valid for t-statistics. The presence of heteroscedasticity can be detected by examining the residual plots. If the plot is "funnel-shaped", heteroscedasticity may be a problem (Woolridge, 2006). Examining the residual plots suggests there is no heteroscedasticity in the sample.

5.5.2 Autocorrelation

The errors should not be correlated according to the assumptions of the regression model. If they are, autocorrelation exists. This is a problem because it can lead some significance statistics, such as the t-test, to be upward biased. I use the Durbin-Watson test (d) to investigate the presence of autocorrelation in my model. A value of "d" between 1.5 and 2.5 indicate, according to Garson (2007), independence of observations. The Durbin-Watson statistics from table 8 suggest there is no autocorrelation in the sample.

5.5.3 Multicollinearity

As can be seen in the correlation matrix, some of the independent variables are correlated to a greater extent than others. The higher the correlation between independent variables, the more severe is the multicollinearity. If a dependent variable is regressed on two highly correlated variables the variation in the latter two can come from either variation unique to one of them or variation common to both. Estimating the coefficients of each independent variable, only variation unique to each of them can be used. The shared variation cannot be used as it would be impossible to know whether a change in the dependent variable came from a change in the first, or the second independent variable. If a large portion of the variance of the two variables is shared, little variance is left to create the coefficients. This is a problem similar to having a small sample size. When two independent variables are highly

correlated it is difficult to know which one deserves 'the credit' for the change in the dependent variable and thus the estimates of their coefficients become uncertain (Kennedy (2004).

We distinguish between perfect and imperfect multicollinearity. The former refers to two variables being perfectly correlated, and the latter to two variables being correlated, but that this correlation is less than perfect. Detecting imperfect multicollinearity can be done by either examining the correlation matrix or investigating the variance inflation factors (VIFs)[14]. If VIF for variable X equals 1, which is the minimal value, there is no correlation between X and the other independent variables. According to Kennedy (2004) a VIF larger than 10 suggests harmful collinearity. Examining the VIFs of the independent variables in the different models it is evident that multicollinearity is not present in the sample. Not even in the models where both PBDEG and WIDTH are included is multicollinearity a problem. See table A5 in the appendix for an overview of the VIFs in all regression models.

[14] $VIF_i=1/(1-R_i^2)$. R_i^2 is the multiple correlation coefficient.

6. Interpretation of the results

6.1 Underpricing

Comparing the average underpricing of 3.15% to previous studies, my results are substantially lower than the findings from similar studies conducted several years ago, but in line with more recent studies[15]. It is apparent that the underpricing depends largely on the specific years included in the study, in addition to the length of the sample period[16]. In addition it is important to keep in mind that many observations had to be excluded from my sample due to missing information regarding management quality.

Ibbotson et al (1988, 1994) find that there is a relationship between cycles in volume of IPOs and initial return. These cycle patterns indicate that periods with large initial returns are followed by periods with large volumes of IPOs, which again are followed by periods of declining initial returns. With regard to the period from which my data is collected, it followed a time of high initial returns and increasing volume of IPOs. Hence, the theory of cycle patterns in the equity market is a plausible explanation for the low average return in my sample. See Ibbotson et al (1994) for further explanations on the cyclical movements of IPO returns**.**

A different reason for the recent reduction in underpricing of IPOs could be that the awareness of the problem of underpricing has increased lately, and that issuers thus are less willing to 'leave money on the table'.

[15] Emilsen et al (1997) studies underpricing from 1984-1996, and find an average underpricing of 12.5%. Kyllo and Skaar (2006) find an average underpricing in the period 2001-2005 of 2.18%.

[16] This could be due to so-called 'hot-issue' markets. See Ritter (1984) for more information.

6.2 Management quality

In addition to investigating the phenomenon of underpricing, the focus of this thesis has been to examine the relationship between a company's management quality and the initial return of the IPO. I hypothesised that better management quality would result in reduced underpricing.

The results of the regression analysis indicate that the hypothesis holds, and that companies with management of better quality are in fact associated with lower underpricing. Beatty and Ritter (1986) argue that underpricing will increase with ex ante uncertainty. I believe that my results, as those of Chemmanur and Paeglis (2005) show that management of higher quality are able to communicate the value of the company better to outsiders, and hence reduce the information asymmetry between themselves and the equity market. Better managers, with more experience and educational background, are also more likely to select better projects and implement them better (Chemmanur and Paeglis, 2005). Due to the prospects of good post-IPO operating performance, investors will demand less underpricing when the company's management are of high quality. Companies with managers of poorer quality are possibly more likely to forego good investment opportunities i.e. due to the inexperience of their managers. Investors may regard an investment in such companies as more risky and hence demand more underpricing. The observed reduction in the underpricing for firms with management of high quality can therefore be attributed to the reduction in ex ante uncertainty and/or the good prospects for the company.

All the coefficients of the management quality variables used in the regression models, for which I had strong expectations, show the anticipated sign. That is, they have a negative impact on underpricing. The two variables for which I had ambiguous expectations, PBOARD and XTENURE, both show positive coefficients. I will now discuss possible explanations for why these variables have an impact on underpricing in conflict with my hypothesis.

It is possible that the positive relation between PBOARD and underpricing is due to the way the variable is measured. Recall that both current and past memberships of boards are included. It is possible that managers with a wide range of present responsibilities outside the IPO firm affect the management quality negatively. In relation to this it would perhaps

have been better to include only past memberships of boards, and leave out current responsibilities. As many prospectuses do not explicitly mention whether the managers' board memberships are current or past, it is difficult to test if changing the measurement of the proxy alters the results.

XTENURE shows a positive relationship with underpricing. This can be attributed to the fact that long average tenures of the management team can, as discussed earlier, cause self-satisfaction within the team and result in team interactions becoming less flexible and possibly discourage creativity and make it difficult to suggest new approaches. A management team should ideally be able to get new inflows of ideas and viewpoints, and thus long average tenures may not affect management quality in a positive manner (Chemmanur and Paeglis, 2005). [17]

Both the measures capturing the age of the firm and the size of the issue are statistically insignificant. This indicates that there is no systematic effect of these variables on underpricing[18]. However, the problem regarding the small sample size is important to consider. In addition it makes it difficult to conclude whether there truly is no relationship between these variables and underpricing, or if the findings are caused by the sample size.

I find a significant positive relationship between the revision of the offer price (OPP) and underpricing, in line with the findings of Hanley (1993). This confirms that the partial adjustment phenomenon is present in the Norwegian equity market. In addition the coefficient of oversubscription is positive and statistically significant. This indicates that the suggestion of Beatty and Ritter (1986) holds, namely that issues that are underpriced are much more commonly oversubscribed than those who are overpriced.

[17] I analysed whether there is a non-linear relationship between XTENURE and underpricing. I found it plausible that there would be an ideal level for average tenure, meaning that management quality would increase until a certain level and from there and onwards it would decrease. I found no evidence of this kind of relationship in the sample.

[18]Conducting simple regressions of underpricing on each of these variables the coefficients are still statistically insignificant. Data for both variables are approximately normally distributed, i.e. there is relatively little skewness in the data. Despite this the statistical insignificance must be interpreted with caution as the sample size is small.

The only control variable for which I had strong expectations that showed an opposite sign is WIDTH. According to my model, an increase in the width of the offer range leads to a decrease in underpricing, while I expected it to lead to an increase. Firstly, this effect could be attributed to the data. Many prospectuses include only one single price and hence the offer range is zero[19]. Excluding these observations from the sample causes the correlation between underpricing and width to change to be positive. It is not desirable to remove these from the sample as this would reduce the sample size significantly. Kirkulak and Davis (2005) also find a negative relationship between underpricing and the width of the offer range. They attribute this effect to the confidence of the underwriter due to high demand for the issue. I can not find any strong relationship between oversubscription and the width of the offer range in my sample and thus believe that the nature of the data is the main contributor to my results.

The relationship between underwriter reputation and underpricing is positive, but statistically insignificant. Hence, the proposal of Carter and Manaster (1990) is not confirmed in the Norwegian equity market. They argue that less prestigious underwriters must underprice issues to be able to fully subscribe them. My findings are, on the other hand, in line with those of Samuelsen and Tveter (2006). They use the number of issues handled by each underwriter as their measure of underwriter reputation. This suggests that the relationship between underwriter reputation and underpricing is not sensitive to method of measure. A possible explanation for the results is the problem regarding the small sample size. Two underwriters dominate in the Norwegian market, and between them they have managed approximately 50% of the IPOs between 2004 and 2006. Despite this, there is no strong effect of their dominant market position on underpricing. This suggests that there is no significant underwriter reputation established in Norway.

The venture dummy is statistically insignificant, indicating that the coefficient is not statistically different from zero. Again the problem regarding the small sample size arises. A

[19] One reason why there is only one offer price listed in the prospectus could be that fixed pricing methods have been used instead of book building. A possible remedy could be to include a dummy variable for fixed price to try to capture differences between the pricing methods.

reason why I find no relationship between underpricing and support by venture capitalists may be that the venture capital market in Norway is not as developed as, for example, the venture capital market in the USA. This is essential as the majority of the research on the subject in done with respect to the American equity market. A possible effect of this is that the venture capitalists in Norway do not have the certifying effect on the IPO suggested by Megginson and Weiss (1991). Secondly, in my sample there is a vast majority of non-venture backed companies, and as a consequence each venture backed company has a large influence on the results.

7. Summary

The results of my study are in line with previous studies, namely that IPOs are on average underpriced. Even though the average underpricing in my analysis is substantially lower than what has been found internationally, it is similar to the results other Norwegian studies from the same period.

I find that there are no significant differences in IPO underpricing across industries or between venture and non-venture backed firms. In addition there does not seem to be any strong link between underwriter reputation and IPO underpricing in the Norwegian equity market.

My results suggest the occurrence of the partial adjustment phenomenon, meaning that issues whose offer price has been positively adjusted incur higher underpricing than those whose final offer price is set below the expected price.

Finally, my findings conclude that better and more reputable management are able to reduce the level of asymmetrical information between the firm and the market and certify the quality of the firm. This results in lower underpricing of the IPO and hence less money 'left on the table'.

Appendix

Correlation matrix

Table A1: Correlations between variables

	UNDERP	PBDEG	PFTEAM	PLAWACC	PBOARD	XTENURE	FAGE	WIDTH	OPP	LNOFF	OVERSUB	SREP
UNDERP	1											
PBDEG	-0,502	1										
PFTEAM	-0,273	0,147	1									
PLAWACC	-0,222	0,183	0,031	1								
PBOARD	0,017	-0,016	0,289	-0,109	1							
XTENURE	0,223	-0,022	-0,265	0,21	0,008	1						
FAGE	-0,137	-0,042	-0,207	-0,222	0,179	0,056	1					
WIDTH	-0,268	0,344	-0,127	0,211	-0,044	0,079	0,092	1				
OPP	0,352	-0,207	0,103	0,168	0,186	-0,172	-0,212	-0,132	1			
LNOFF	-0,27	0,214	0,103	0,104	0,127	-0,076	0,212	0,257	0,066	1		
OVERSUB	0,455	-0,11	-0,135	0,14	-0,124	-0,005	-0,028	0,076	0,528	0,097	1	
SREP	-0,004	0,148	0,041	-0,089	-0,025	0,084	-0,001	0,302	0,078	0,2	0,173	1

Table A1: The sample consists of 41 IPOs conducted between 2004 and 2006. UNDERP is the first-day return in percentage terms, defined as the closing price on the first day of trading less the offer price, divided by the offer price. PBDEG is the percentage of the company's management team with a business degree. PFTEAM and PLAWACC are the percentages of the management team with experience from executive positions or a law or an accounting company prior or joining the IPO firm. PBOARD is the percentage of managers who have served or are currently serving as members of one or more boards. XTENURE is the residuals from the regression of TENURE on the natural logarithm of firm age. FAGE is the natural logarithm of one plus firm age, where firm age is defined as the number of years between the time of incorporation or the start of operation (whichever is earlier) and the time of going public. WIDTH is the width of the offer price range in percentage terms. OPP is the percentage difference between the actual and the expected offer price. LNOFF is the natural logarithm of offer size. OVERSUB is the number of times the issue was oversubscribed. SREP is the natural logarithm of one plus the market share of the underwriter. Correlation coefficients lager than 0.3 are marked grey.

Regression models

In this section a range of tables are provided to illustrate different aspects of the analysis.

Table: A 2: Simple regressions with each of the management variables

	UNDERP				
	1	2	3	4	5
Intercept	7,76	6,31	4,17	2,97	3,16
	(4,16)***	(3,37)***	(3,39)***	(2,24)**	(3,27)***
PBDEG	-0,11				
	(2,83)***				
PFTEAM		-0,06			
		(1,95)*			
PLAWACC			-0,07		
			(1,37)		
PBOARD				0,008	
				(0,2)	
XTENURE					0,54
					(1,77)*
R-Sq (adj)	14,9%	6,7%	2,2%	0,0%	5,0%
F-value	8,03	3,88	1,88	0,04	3,12
P-value	0,007	0,056	0,178	0,84	0,085
d	1,65	1,13	1,5	1,39	1,24

*,**,*** indicate statistical significance at the 10%, 5% and 1% levels respetively.

Table A 2: PBDEG is statistically significant at the 1% level, while PFTEAM and XTENURE are statistically significant at the 10% level only. The other two variables are not statistically significant in the simple regressions.

Table A 3: Regression 1 on full sample

	1
Intercept	10,23
	(3,58)***
PBDEG	-0,1
	(2,00)*
PFTEAM	-0,05
	(1,16)
PLAWACC	-0,09
	(1,29)
PBOARD	0,04
	(0,88)
XTENURE	0,55
	(1,38)
Industry dummies	No
Year dummies	No
R-Sq(adj)	11,10 %
F-value	2,42
P-value	0,048
d	2,13

Table A 3 presents the results from regression model number one, run of the entire sample, also including those companies which did not issue shares. In the regression run on the reduced sample, PBDEG is statistically significant at the 5% level, while when run on the full sample the variable is statistically significant at the 10% level only.

Table A 4: Testing management proxies

	t-value	Significant at higer level
PBDEG^2	(3,29)	Yes
sqrt PBDEG	(2,34)	No
ln(1+PBDEG)	(1,40)	No
PFTEAM^2	(2,18)	No
sqrt PFTEAM	(2,10)	No
ln(1+PFTEAM)	(1,60)	No
PLAWACC^2	(0,81)	No
sqrt PLAWACC	(1,08)	No
ln(1+PLWACC)	(1,06)	No
PBOARD^2	(1,40)	No
sqrt PBOARD	(1,59)	No
ln(1+PBOARD)	(1,48)	No

Table A 4 illustrates the statistical significance of different proxies for the management quality variables, based on model six. First the quadratic term is listed, then the square root and lastly the natural logarithm of one plus the variable. The only variable which is statistically significant at a higher level when I change the way it is measured is PBDEG. The quadratic term is statistically significant at the 1 % level, compared to the "normal" term which is statistically at the 5 % level only.

Table A 5: VIFs for the independent variables

	VIF					
	1	2	3	3	5	6
PBDEG	1,04	1,09	1,46	1,42	1,43	1,39
PFTEAM	1,23	1,32	2,05	2,07	1,93	1,92
PLAWACC	1,1	1,18	1,98	1,88	1,88	1,82
PBOARD	1,13	1,2	1,58	1,54	1,55	1,52
XTENURE	1,16	1,16	1,3	1,21	1,23	1,17
FAGE		1,24	1,61	1,6	1,5	1,49
LNOFF		1,13	1,39	1,39		
OVERSUB				1,16		1,11
OPP			1,48		1,39	
WIDTH			1,66	1,66	1,48	1,47
SREP			1,3	1,28		
VENTURE			1,51	1,49	1,48	1,45

Table A 5 presents the VIFs for all the coefficients in the models from table 8. It is evident that multicollinearity is not a problem in the sample as all values are very low. Recall that the minimum value for VIF is 1.

Table A 6: Economic significance

	Increase in variable	Change in underpricing		NOK
Panel A: Percentage point increase in variable				
PBDEG	10	-19 %	kr	(1 143 000)
PFTEAM	10	-25 %	kr	(1 505 000)
PLAWACC	10	-19 %	kr	(1 143 000)
PBOARD	10	22 %	kr	1 320 000
OPP	1	11 %	kr	662 000
WIDTH	5	-27 %	kr	(1 625 000)
Panel B: Unit increase in variable				
XTENURE	1	18 %	kr	1 083 000
FAGE	1	-26 %	kr	(1 565 000)
OVERSUB	1	23 %	kr	1 385 000
Panel C: Dummy variable takes the value of one				
VENTURE		1 %	kr	60 200

Table A 6 illustrates the economic significance of the different variables based on model six, except for OPP for which model five is used. Panel A contains the variables for which percentage point changes makes most sense as the variables as given in percentage terms. Panel B features the variables for which a unit change is the suitable measure. Finally panel C features the venture dummy, where the economic significance illustrated is the difference between a venture backed and a non-venture backed company.

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