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The Performance of Private Equity and Non-Private Equity Backed Initial Public Offerings

- A Study of Underpricing and Long-Run Stock Performance on the European Stock Exchanges -

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Purpose:	The purpose of this thesis is to examine the stock performance of private equity backed IPOs compared to non-private equity backed IPOs. This is investigated by analyzing what drives underpricing and long term stock performance for PE and non-PE backed firms, as well as the effect of underpricing on long-run performance. The purpose is also to investigate what variables explain underpricing and long-run stock performance, depending on the firm being PE and non-PE backed.
Methodology:	A quantitative approach is applied and the data is further analyzed in several multiple regressions as well as in regressions with interaction effects.
Theoretical perspective:	The trade off theory, agency theory, corporate governance literature, lemons problem and information asymmetries theories
Empirical foundation:	The data is based on 695 IPOs completed on European stock exchanges between 1999 and 2010. Datastream, Dealogic and CapitalIQ are the primary sources for the data.
Conclusions:	The analysis shows that underpricing exists on the European market during 1999-2010 and that PE backed firms usually experience a lower underpricing than non-PE backed companies. Maturity, earnings management and company size are variables explaining underpricing for PE firms. For non-PE backed IPOs, earnings management is the only statistically significant variable explaining the underpricing. In the sample used, there is no difference in long-run stock performance between PE and non-PE backed firms. However, different variables explain the long-run stock performance depending on the firm being PE and non-PE backed. Operating margin affects the long-run stock performance for PE backed IPOs, while company size explains the long-run performance for non-PE backed firms. In addition, the underpricing size does not affect long-run stock performance.

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1   INTRODUCTION

1.1   Background and Problem Discussion

At the time of an initial public offering (IPO), there is an antagonism between the firm and investors. The investors have the intention to buy the stocks as cheap as possible, in order to maximize returns. Meanwhile, the firm intends to sell the stocks to the highest potential price to accumulate as much funds as possible. Thus, the firms aim at minimizing the underpricing of IPOs. In the long-run, however, both the firm and the investors strive for maximizing the stock price development. The variables explaining the underpricing and the long-run stock performance varies depending on the firm being private equity (PE) or non-PE backed. Firms as well as investors will benefit from an understanding of what drives this variation. According to existing research presented below, PE backed firms experience a lower underpricing and a better long-run development, than non-PE backed firms. Hence, it is interesting for non-PE backed firms to determine what drives the better performance. Accordingly, this thesis makes a valuable contribution to the underpricing and long-run stock performance topics.

The underpricing phenomenon of IPOs is shown in previous academic research. The initial and most recognized studies are performed by Ibbotson[1] and Ritter[2] in the USA. Even though there are some studies analyzing the European market, the main focus of these researches is on the US markets. In addition, there are not numerous recent studies. Thus, it is interesting to complete a more thorough and updated analysis of the underpricing phenomenon in Europe.

A general criticism concerns the PE firms' short term value creation focus and strong attention to their own profit generation. The critics argue that PE firms sacrifice long-run value creation for short term gains and do not contribute enough to the long term prospering of the corporate sector. One measure of value creation is the stock development. According to Levis[3], the results regarding PE backed firms having a better long-run stock performance are not conclusive outside the US market. The lack of recent studies covering the entire European market enables this thesis to contribute to filling the gap in the academic research. In addition, this thesis will analyze if

[1] Ibbotson, R.G., 1975, *"Price Performance of Common New Stock Issues"*
[2] Ritter, J., 1984, *"The "Hot Issue" Market of 1980"*
[3] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*

underpricing affects the long-run stock performance, something that has not been previously studied.

According to "Better Year Expected for Private Equity IPOs", recently published in the Financial Times, PE backed IPOs have increased in volume in the EMEA countries during the last year and will continue to do so in 2011.[4] The increased number of PE floated firms and IPOs as an exit for PE-firms, contributes to making this topic interesting for further research, both from an underpricing and long-run stock performance perspective.

Based on the information presented above, the main question to investigate is; *"What different features describe the underpricing and long-run stock performance for PE and non-PE backed IPOs?"*

1.2 Delimitations

The focus, in this thesis is to examine the European IPO market regarding underpricing and long-run stock performance as well as the underpricing effect on long-run stock development of PE and non-PE backed firms. Europe is chosen as the geographic base due to the lack of previous research covering this area. The thesis covers IPOs completed during 1999 to 2010, since it includes both boom and bust periods. The period encloses periods of historical events such as the IT-boom and hot issue market in 1999 and the financial crisis in 2008. In addition, the PE market has grown substantially since the mid 90's and there are few IPO exits made by PE firms before this time.[5] The sample used also excludes IPOs with deal values below $160m, in order to assure a book building approach for the offering price. Deals above $160m attract institutional investors, which affects the pricing.[6] The long-run performance is defined as the stock development during three years following the IPO.

In this thesis, a PE backed IPO means that the firm, about to be floated on the stock exchange, is at the time of the IPO owned by a PE firm. Venture capital backed firms are not included in the expression PE backed companies.

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[4] Sakoui, A., 2011, *"Better Year Expected for private equity IPOs"*
[5] Database: Dealogic
[6] Terslow, C., Associate Director, Danske Bank Corporate Finance, 03/02/2011

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1.3   Purpose

The purpose of this thesis is to examine the stock performance of private equity backed IPOs compared to non-private equity backed IPOs. This is investigated by analyzing what drives underpricing and long term stock performance for PE and non-PE backed firms, as well as the effect of underpricing on long-run performance. The purpose is also to investigate what variables explain underpricing and long-run stock performance, depending on the firm being PE and non-PE backed.

1.4   Disposition

The thesis starts with a description of the theoretical framework, introducing the reader to the previous related academic research. This part introduces the underpricing phenomenon in relation to both PE and non-PE backed IPOs. Subsequently, IPOs as an exit for PE firms is described. Furthermore, theories regarding long-run stock performance and value creation in PE and non-PE floated firms are presented, as well as the underpricing effect on long-run performance. The theory sections are recapped with hypotheses, which are the foundation for the empirical study in later chapters. The data collection and the procedure are described in the method part, and the data and the results are presented in the following chapters. Finally, conclusions drawn from the results combined with the theoretical framework and previous research is summarized, and suggestions for further research are given.

2 THEORETICAL FRAMEWORK AND PREVIOUS RESEARCH

2.1 Introduction to Underpricing

IPOs can be undertaken by large companies, which might benefit from sourcing capital in the public market, and by smaller corporations with a purpose to reach capital in order to grow further. The pricing of companies' stocks can be determined either by the issuing company, that sets a fixed price of the stock, or the initial stock price can be based on *book building*. During the process of book building, investor demand is captured in order to set a suitable price of the stock.[7]

IPOs are, according to Ibbotson[8] and Ritter[9], in general underpriced. In the study by Ritter[10], underpricing can be described and calculated as the difference between the first closing price and the offer price, divided by the offer price. This definition is widely used in previous empirical studies. Underpricing can be explained by either the firm issuing the stocks at a discount or by overoptimistic market reactions. The studies by Ibbotson[11] and Ritter[12], based on IPOs on the US Stock Exchanges, indicate that the average initial returns are exceptionally large, especially during the first day of trading, but a positive average return can also be registered one month after the IPO. Welch[13] extends Ibbotson's statements about potential reasons for underpricing. A firm's quality is one factor determining the underpricing. The quality can be defined in terms of development and growth potential, as well as earnings; the better the development potential for example, the higher the quality. The conclusions are that low-quality firms tend to underprice stocks, and thereby incur costs in order to appear as high-quality firms, which induces their stocks' attractiveness. A large first day return makes companies appear as high-quality firms. High-quality firms, whose quality is not identified by the market, tend to underprice stocks as well, in order to prove their high-quality. In conclusion, the underpricing is used to signal to the market that the IPO is of high quality. Later, when the stock price has appreciated, the firm can conduct a seasoned offering and thereby compensate for the incurred cost of underpricing the stocks at the IPO.[14]

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[7] Ritter, J., 1998, *"Initial Public Offerings"*

[8] Ibbotson, R.G., 1975, *"Price Performance of Common New Stock Issues"*

[9] Ritter, J., 1984, *"The "Hot Issue" Market of 1980",* and Ritter, J., 1998, *"Initial Public Offerings"*

[10] Ritter, J., 1998, *"Initial Public Offerings"*

[11] Ibbotson, R.G., 1975, *"Price Performance of Common New Stock Issues"*

[12] Ritter, J., 1984, *"The "Hot Issue" Market of 1980"*

[13] Welch, I., 1989, *"Seasoned Offerings, Imitation Costs, and the Underpricing of Initial Public Offerings"*

[14] Jain, B.A. *et al.*, 1994, *"The Post-Issue Operating Performance of IPO Firms"*

Beatty *et al.*[15] combines Ibbotson's study and Ritter's study from 1984 in order to conclude the size of the initial return between 1960 and 1982. They calculate an average initial return of 18.8 percent.

Information asymmetry as another explanation for underpricing of stocks is explained by Rock[16]. Information asymmetry is based on the assumption that owners know more about their firms than investors do. Rock's model includes two categories of actors; the informed investors on one hand and the uninformed investors, on the other hand. Informed investors accept paying a price in order to gather information about the issuing company, and can thereby easier predict the subsequent performance of the offering. The informed investors are only interested in stocks that trade at a premium of the initial offering price. Conversely, the uninformed investors do not accept paying a price for superior information and do therefore bid on randomly new issuances on the market. This might result in uninformed investors holding overpriced IPO stocks, something they are not keen to do. To be able to keep the uninformed investors on the market, the stocks must be offered at a discount in relation to the future performance. This means that IPOs must be underpriced in order to attract uninformed investors, who suffer from adverse selection. The underpricing is furthermore important to informed investors by compensating for the costs of gathering information.

The expression winner's curse, is based on information asymmetry present in an auction of stocks. The winner of the auction, who will pay the highest price, will always be overpaying due to an overestimation of the stocks' intrinsic value.[17] According to Rock[18], the underpricing of IPOs, is a result of the winner's curse that uninformed investors face when engaging in new issuances. Underpricing IPOs, can act as a guarantee for the issuing firm to attract uninformed investors.

Beatty *et al.*[19], concludes that although IPOs in general are underpriced, there still exists an uncertainty for investors about the true value of stocks before the first day of trading. The uncertainty is called *ex ante uncertainty*, which expects to be positively correlated to the degree of underpricing. The greater the *ex ante* uncertainty, the greater the underpricing of the IPO. Another conclusion from this article is that the IPO market might be a question of the lemons

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[15] Beatty, R.P. *et al.*, 1986, *"Investment Banking, Reputation, and the Underpricing of Initial Public Offerings"*
[16] Rock, K., 1986, *"Why Issues are Underpriced"*
[17] Thaler, R., 1989, *"Anomalies: The Winner's Curse"*
[18] Rock, K., 1986, *"Why issues are underpriced"*
[19] Beatty, R.P. *et al.*, 1986, *"Investment Banking, Reputation, and the Underpricing of Initial Public Offerings"*

problem, introduced by Akerlof[20]. If the issuing firm only enters the public market once, the firm needs not to "leave money on the table", in order to attract investors in the future. This leaves only low-quality firms in the IPO market, since high-quality firms will not accept underpricing their stocks as much as needed to be able to attract investors. In order to reduce the lemons problem, intermediary firms can engage in the issues pricing. Since intermediaries will underwrite offerings more than once, they are more concerned about setting a reasonable price, in order to attract investors in the future.

Times with high volumes of IPO completions are called *hot issue periods*. During such periods investors' demand are high and the average first month stock performance of newly issued firms are generally higher than normal. The high demand and enhanced expectations usually result in a high underpricing as well.[21]

2.2   IPO as an Exit

In the introductory paragraph of the theory chapter, two reasons for initial public offerings are mentioned; the opportunity for mature companies to source money publicly, or a chance for small firms to source money in order to grow. For PE firms, IPOs of portfolio companies is one way to gradually exit the investment. PE firms usually divest the portfolio company within five to ten years from the investment. A PE backed IPO is sold to the public market in different stages. The PE funds do not usually sell all shares at once, but rather undertake a *lock-up* agreement with the underwriters. This lock-up agreement prohibits the PE firm from selling shares during a specified period of time, usually six to twelve months after the IPO.[22] In this way, the PE firm mitigates the previous mentioned lemons problem.

In addition to IPOs, there are several exit types a PE firm could utilize. The portfolio company can be sold to a strategic buyer, which is called a trade sale, it can be divested in a secondary buyout and thereby sold to another PE firm, or it can be sold to the management of the company in a management buyout (MBO). The most common exit is the trade sale, which accounts for 38 percent of the exits between 1970 and 2007 worldwide. Secondary buyouts are the second most common route, occurring in 24 percent of the exits. Exits via an IPO accounted for 14 percent.[23] IPOs are often considered to be the least desired way of exiting a company for PE firms and

[20] Akerlof, G.A., 1970, *"The Market for "Lemons": Quality Uncertainty and the Market Mechanism"*
[21] Ibbotson, R.G. *et al.*, 1975, *"Hot Issue Markets"*
[22] Povaly, S., 2006, *"Private Equity Exits: An Analysis of Divestment Process Management in Relation to Leveraged Buyout"*
[23] Kaplan, S. *et al.*, 2009*, "Leverage Buyouts and Private Equity"*

hence it is one of their last options. If a trade sale or a secondary buyout is not possible, due to the lack of buyers willing to pay enough, an IPO is undertaken. Reasons for why an IPO can be seen as a last alternative are that the process is expensive, time consuming and that the lock-up agreements prohibits the PE firm from selling all shares at once.[24]

2.3 Private Equity Backed IPOs and Underpricing

The first day returns and underpricing of IPOs can be related to information asymmetries, the quality of the issuing company or ex ante uncertainty.[25] If the issuing company is PE backed, this is another characteristic that effects the underpricing. Van Frederikslust *et al.*[26] find evidence indicating that PE backed and VC backed IPOs show less underpricing than non-PE backed firms on the Amsterdam Stock Exchange. Megginson *et al.*[27] find the same to be true on the US market. Thus, the underpricing of PE floated firms is most likely less severe than for other firms.

There are numerous theories explaining the lower underpricing for PE backed IPOs, but almost all of them are based on the certification hypothesis.[28] Barry *et al.*[29] and Megginson *et al.*[30] prove the certification hypothesis to be true and show that it led to less underpricing of PE floated firms on the US market. This hypothesis concludes that PE involvement in the issuing firm certifies the quality of the IPO and stock introduction. There are three criteria that need to be fulfilled in order for investors to view PE firms as a form of certification. These criteria work as incentives for providing accurate data and valuations. Firstly, the certifying party's reputation has to drop if the IPO is overpriced. Secondly, the possible future monetary return has to be higher than the gain associated with the overpricing. The third criterion states that it should be costly to employ a certifying third party.[31] The PE firms are considered to meet these three criteria and thereby provide a guarantee for potential investors, which result in a reduction of the risk premium and thus less underpricing. The guarantee also encourages uninformed investors to invest in the IPO. As mentioned in the previous section, PE firms might exit portfolio companies through IPOs, which means that they have to consider their reputation or otherwise

[24] Terslow, C., Associate Director, Danske Bank Corporate Finance, 03/02/2011
[25] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*
[26] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*
[27] Megginson, W. *et al.*, 1991, *"Venture Capitalist Certification in Initial Public Offerings"*
[28] Booth, J.R. *et al.*, 1986, *"Capital Raising, Underwriting and the Certification Hypothesis"*
[29] Barry, C.B. *et al.*, 1990, *"The Role of Venture Capital in the Creation of Public Companies"*
[30] Megginson, W. *et al.*, 1991, *"Venture Capitalist Certification in Initial Public Offerings"*
[31] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*

they will not be able to attract investors and complete such transactions next time. Hence, PE firms decrease the lemons problem in the same way as intermediaries.

Carter *et al.*[32] prove that the certification hypothesis also applies to the manager's role at the time of the IPO. Companies which are run by managers with superior reputation and status, experience less underpricing. The management of PE backed firms is often very qualified with extensive work experience and should therefore have a good reputation.

Another feature of PE backed IPOs, which relate to the certification hypothesis, is the earnings quality. Normally, firms with PE sponsorship have higher earnings quality and use less earnings management. The reports of these firms are also more conservative *ex ante* and *ex post* an IPO, contributing to the trustworthiness.[33] Altogether, this offer insight to why PE backed IPOs are less underpriced.

In general, PE backed IPOs are larger in terms of market capitalization, total assets and total sales than non-PE backed IPOs.[34] Larger and more well-known companies are usually considered to be safer investments. The larger IPOs also receive more attention in the press, which increases the information available and thereby decreases the information asymmetries. In addition, PE transactions, as such, are often well covered by the media and the publicity contributes to an enhanced transparency for the investors. Besides, PE firms usually disclose more information of higher quality than other private companies when floating a firm.[35] Due to the uncertainty surrounding an IPO, stemming from information asymmetries and uninformed investors, the media coverage is one important explanation to why PE floated companies suffers from less underpricing.[36]

In addition to the larger company size, PE backed firms are also often more mature. The PE firms are not prepared to divest their portfolio companies until they are developed to their full potential.[37] A fully developed and thus more mature company enables the PE firms to maximize profits, since all planned changes on how to improve the company have been undertaken. The mature stage of the floated company means stable profits, cash flows, investment ratios and

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[32] Carter, R.B. *et al.*, 1998, *"Underwriter Reputation, Initial Returns, and the Long-Run Performance of IPOs Stocks"*

[33] Katz, S., 2009, *"Earnings Quality and Ownership Structure: The Role of Private Equity Sponsors"*

[34] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*

[35] Nilsson, D. *et al.*, 2005, *"Underpricing and Long Run Performance of European Private Equity Backed and Non Private Equity Backed IPOs"*

[36] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*

[37] *Ibid*

etcetera. This steady state reduces the risk associated with the company and the IPO. The decreased risk of the issue results in a lower premium for investors and as a consequence the underpricing declines.

An opposing theory explaining a lower underpricing for PE backed IPOs is related to the investors' reservation to these kinds of issues. PE owned firms tend to be highly leveraged, since financial engineering is an important and frequently used method of creating value in a portfolio company.[38] Higher debt ratios lead to a higher enterprise value through the increased tax shields and hence lowering the cost of capital. More debt also reduces the free cash flow and improves the monitoring of managers and hence, decreasing agency costs is an additional advantage of higher leverage. However, increasing leverage can also result in financial distress according to the trade off theory.[39] The high debt levels of PE backed firms can thus pose a higher risk to investors since the risk of financial distress and bankruptcy increases with leverage. The investors become more cautious and accordingly the stock price does not rise as much for this type of firms, resulting in a smaller underpricing.

PE firms are known for always wanting to maximize their returns. A high profit can be obtained by acquiring a target cheap, but also by selling it at a high price. Therefore, many investors believe that PE firms employ an aggressive pricing strategy on the issuing firm. If the issuing price is already equal to the intrinsic value there is no premium left and the stock will not increase in value the first day of trading. Thus, this could be another explanation to why companies floated by PE firms are less underpriced.[40]

2.3.1 Underpricing Hypotheses

Based on the theoretical and empirical discussion above, regarding underpricing of IPOs from both a PE backed and a non-PE backed perspective, the first two hypotheses in this thesis are the following.

H1.1: Underpricing of IPOs exists on the European market
$H_{0.1}$: Underpricing of IPOs does not exist on the European market

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[38] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*
[39] Modigliani, F., *et al.*, 1963, *"Corporate Income Taxes and the Cost of Capital: A Correlation"*
[40] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*

$H_{1.2}$: The underpricing of PE backed IPOs is less than for non-PE backed IPOs

$H_{0.2}$: The underpricing of PE backed IPOs is higher than for non-PE backed IPOs

In addition to the first two hypotheses, the explaining variables for underpricing in general are analyzed. This creates a broader understanding for what drives underpricing. Additionally, the underpricing can be explained by different variables, depending on the firm being PE or non-PE backed and this is also studied.

Earnings quality is one explaining variable for underpricing, since the trustworthiness of the company can be attributed to the firms' reports, *ex ante* and *ex post* the IPO, which have less earnings management. A high earnings quality should be negatively correlated to underpricing, and a third hypothesis can therefore be stated as follows.[41]

$H_{1.3}$: Less earnings management leads to a lower underpricing for PE and non-PE backed firms

$H_{0.3}$: Less earnings management does not lead to a lower underpricing for PE and non-PE backed firms

The larger the firm, in terms of total assets, to be offered to the public markets, the more transparency of the firm and therefore the less information asymmetries created. The company size can therefore explain a lower underpricing, and company size should thereby be negatively correlated to underpricing.[42]

$H_{1.4}$: The company size explains a lower underpricing for PE and non-PE backed IPOs

$H_{0.4}$: The company size does not explain a lower underpricing for PE and non-PE backed IPOs

The maturity of a company can be explained by stable growth, cash flows and investments, which reduce the risk of a company. A mature firm is thus less risky to invest in and it can therefore be said that a firm's maturity explains a lower underpricing. This variable is expected to be negative correlated to underpricing.[43]

$H_{1.5}$: The firm's maturity explains a lower underpricing for PE and non-PE backed IPOs

$H_{0.5}$: The firm's maturity does not explain a lower underpricing for PE and non-PE backed IPOs

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[41] Katz, S., 2009, *"Earnings Quality and Ownership Structure: The Role of Private Equity Sponsors"*
[42] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*
[43] *Ibid*

Higher levels of leverage increase the potential for financial distressed firms, which create skepticism against the company and risk for the investors. The stock price does therefore not rise as much, which explains a lower underpricing. The leverage ratio is expected to have a negative correlation to underpricing.[44]

$H_{1.6}$: A higher leverage ratio explains a lower underpricing for PE and non-PE backed firms
$H_{0.6}$: A higher leverage ratio does not explain a lower underpricing for PE and non-PE backed firms

2.4 Introduction to Long-Run Performance

Every company strives for a pleasing stock performance in order to maximize the returns for its owners. The annualized real return on equities is approximately nine percent according to the book "Triumph of the Optimists: 101 Years of Global Investment Returns"[45]. The book states that, on a long term horizon, it is more beneficial to invest in stocks than in other securities, such as corporate bonds or treasury bills. Over a short period of time there is a positive autocorrelation in returns, meaning that a superior stock will continue to do well in the near future. Over longer horizons, there is however a negative autocorrelation. This means that both the over- and underperforming stocks will revert to the mean.[46]

In order to achieve a superior stock performance and to create value for its owners, companies ought to develop its operations constantly. Rappaport[47] cite seven value drivers that firms should focus on, namely; sales growth, weighted average cost of capital (WACC), taxes, working capital, fixed assets, operating margins and duration of competitive advantages. If a firm can minimize the WACC, taxes, working capital and fixed assets and at the same time maximize their sales growth, operating margins and duration of competitive advantage, it will maximize shareholder value. In addition, a solid development of the drivers will help firms generating an excellent long-run performance, and a positive stock performance. However, companies have different main value drivers, which vary with business model.

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[44] Modigliani, F., *et al.*, 1963, *"Corporate Income Taxes and the Cost of Capital: A Correlation"*
[45] Dimson, E. *et al.*, 2002, *"Triumph of the Optimists: 101 Years of Global Investment Returns"*, p. 224
[46] Poterba., J. *et al.*, 1989, *"Mean Reversion in Stock Prices: Evidence and Implications"*
[47] Rappaport, A., 1986, *"Creating Shareholder Value"*

Jain *et al.*[48] find that floated firms exhibit a decline in their operating performance subsequent to the issue. The operating performance is measured by operating return on assets and operating cash flows reduced by assets. However, these firms, at the same time, experience a high sales growth as well as growth in capital expenditures, relative to peers. Accordingly, the drop in operating performance cannot be due to insufficient growth in sales or reductions in post-IPO capital expenditures. The reduction in operating performance is not consistent with the high P/E multiples that IPO firms were priced at. A high price to earnings (P/E) multiple indicate that investors believe the company will exhibit satisfying earnings growth in the future. In reality, these firms do not live up to the expectations. There are several explanations to why operating performance decline. One reason could be that agency costs increase when the company goes public and the management reduces their ownership. Thus, the alignment between the principal and the agents will decrease. Secondly, the firm might engage in earnings management and try to window-dress their accounts prior to the IPO. As a result, the pre-IPO performance will be overstated, and lead to a decline in stock performance. The issuing firm could also time their IPOs to periods with unusually good performance, which later cannot be sustained. The article also discovers that issued firms, where the founder or entrepreneur retains a large percentage of the shares, generally show superior operating performance.

The long-run stock performance following an IPO depends on firm characteristics prior to the issuance. These features include firm age[49], underwriter reputation[50], VC backing[51], initial price multiples[52], firm size and book-to-market ratios[53]. IPOs in general, are considered to perform worse than peers. The underperformance is measured as the return based on the closing price of the first trading day. According to Ritter[54] and Loughran *et al.*[55], both IPOs and seasoned equity offerings suffer from significant underperformance compared to non-issuing firms, from 1970 to 1990. In addition, Doeswijk *et al.*[56] find that IPOs on average underperformes their benchmark by a cumulative ten percent, during three years following the listing. Thus, the underpricing described in previous sections appears to be a short term phenomenon. Underperformance is

[48] Jain, B.A. *et al.*, 1994, *"The Post-Issue Operating Performance of IPO Firms"*
[49] Ritter, J., 1991, *"The Long-Run Performance of Initial Public Offerings"*
[50] Carter, R.B. *et al.*, 1998, *"Underwriter Reputation, Initial Returns, and the Long-Run Performance of IPOs Stocks"*
[51] Brav, A. *et al.*, 1997, *"The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Non-Venture Capital-Backed Companies"*
[52] Purnanandam, A., 2004, *"Are IPOs Really Underpriced?"*
[53] Brav, A *et al.*, 2000,*"Is the Abnormal Return Following Equity Issuance Anomalous?"*
[54] Ritter, J., 1991,*"The Long-Run Performance of Initial Public Offerings"*
[55] Loughran, T. *et al.*, 1995, *"The New Issues Puzzle"*
[56] Doeswijk, R.Q. *et al*, 2006, *"25 Years of Dutch Ipos: An Examination of Frequently Cited Ipo Anomalies Within Main Sectors and During Hot- and Cold-Issue Periods"*

described in the following way by van Frederikslust *et al.*[57]: "Where the long-run return of the new public company has a lower stock performance than the benchmark". Five years subsequent to an IPO the shareholders receive, on average, only five percent per year. This implies that, in order to obtain the same wealth after five years, an investor would have to invest 44 percent more in an IPO than in a non-issuing firm. Ibbotson[58] finds that firms underperform during the first four years after going public but have no underperformance at all during the fifth year. The underperformance can be explained by risk mismeasurement or overoptimism.[59] A pattern that Ritter[60] finds is that underperformance is more usual among young growth companies. Brav *et al.*[61] do not agree that IPOs underperform their peers but mean instead that it is mainly caused by small, non-VC backed IPOs. Their results indicate that the underperformance is not unique to firms completing IPOs.

The degree of underperformance is related to the number of IPOs being done at time of the issue. Firms that are conducting IPOs during years with high issuing activity suffer from large underperformance whereas firms that issue stock in low-volume periods show almost no underperformance at all.[62] One recent example of a hot issue period is 1997 to 2001, when IT-bubble took place. In hot issue markets IPOs usually experience higher than average premiums in the aftermarket, which means that the investors' expectations on the issuing firms are large.[63] This can, to some extent, explain the severe underperformance. Thus, in order to minimize the underperformance, firms should issue shares in cold issue periods.

However, the owners of the floated firms would like to maximize the issuing price and hence their income. The firms therefore tend to complete IPOs during hot issue markets, when investors are overly optimistic and the demand for new issues is high. In this way, firms take advantage of these *windows of opportunity*, which further could clarify the underperformance of IPOs.[64]

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[57] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*
[58] Ibbotson, R.G., 1975, *"Price Performance of Common Stock New Issues"*
[59] Ritter, J., 1991, *"The Long-Run Performance of Initial Public Offerings"*
[60] *Ibid*
[61] Brav, A. *et al.*, 1997, *"Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies"*
[62] Loughran, T. *et al.*, 1995, *"The New Issues Puzzle"*
[63] Ibbotson, R.G. *et al.*, 1975, *"Hot Issue Markets"*
[64] *Ibid*

When measuring long-run stock performance of IPOs it is important to take the *greenshoe option*, also referred to as an *over-allotment option*, into account. A greenshoe option is a provision that allows the underwriter to short, at the offering price, up to fifteen percent more shares than originally were intended. The option is generally exercised when investors' demand for the stock exceeds expectations and the share trades above the initial offering price. After the completion of the IPO, when the stock is traded, the underwriters can buy back fifteen percent of the issued shares. If the shares' market price is higher than the offering price, the underwriters would incur a loss when buying back the shares. However, the greenshoe option protects them since it allows the underwriters to re-buy the shares at the offering price. Thus, the greenshoe option provides stability to an issued stock since it enables the underwriters to increase or decrease the supply of shares adjusted to the demand.[65]

2.5   Private Equity Backed IPOs and Long-Run Performance

Criticism against the PE firms' shortsighted business strategy has increased during the last decade. Harald Mix, the CEO of the PE firm Altor Equity Partners, discusses this criticism. Mix admits that the years prior to the financial crisis, financial engineering in combination with a time of global prosperity and capital inflow, created shortsightedness. Mix also states that PE firms do not have the intention of being shortsighted, their focus lies rather on the improvement and development of companies. The returns are earned from the development and increased efficiency of the companies.[66]

One way of determining whether the PE firm is creating long term value or applies a shortsighted approach is to look at long term stock returns after the IPO of the PE backed firm, compared to non-PE backed firms. Brav *et al.*[67] study the aftermarket performance of PE backed IPOs, which indicates that VC backed firms, as one kind of PE backed IPOs, outperform non-VC backed firms in the US during 1972 until 1992. The study also concludes that this superior performance by VC backed firms is related to better corporate governance structure and management. A few years after Brav *et al.*'s study, van Frederikslust *et al.*[68] investigate long-run performance of PE backed firms (including VC backed) on the Amsterdam stock exchange in comparison to non-PE backed corporations during 1985 until 1998. They find that PE backed firms do not

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[65] Stoneham, P., 1993, *"The Wellcome Share Offering: Part Two: Technical execution"*
[66] Veckans Affärer; "*Investerare kommer bli besvikna*", 05/11/2009
[67] Brav, A. *et al.*, 1997, *"Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies"*
[68] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*

underperform the stock market index during a three-year period after the IPO compared to non-PE backed, which do underperform during the same period. Van Frederikslust et al.[69] highlight the phenomenon of *double selection* as an explanation for the outperformance by PE backed firms. Double selection can be attributed to PE firms' opportunities of both investments and exits of subsidiaries. A PE firm will not invest in a company if there is no potential of meeting the return goals. Meanwhile, PE firms will not repeatedly take low-quality companies public due to the risk of bad reputation for future IPOs. These two opportunities contribute to outperformance of PE backed firms in relation non-PE backed.

A more recent study by Cao et al.[70] is based on so called *reverse leverage buyouts* (RLBOs). An RLBO is a form of PE backed IPOs. These firms have previously been listed on a stock exchange and later bought out from the public market by a PE firm through an LBO process. The PE backed firm is then taken public and listed on a stock exchange again, thereof the name: reverse leverage buyout. Cao et al.'s study, which is based on offerings between 1981 and 2003 show that RLBOs perform better than, or similar to, other newly floated firms five years after the IPO. The study also concludes that RLBOs have more leverage, are larger and more profitable, and also backed by underwriters with a superior reputation than other IPO firms. A recent study made by Levis[71], based on IPOs on the London Stock Exchange between 1992 and 2005, proves, like other studies mentioned above, that PE backed IPOs (not including VC backed) perform better than non-PE backed over a three-year period after the IPO. The superior performance is connected to both the level of leverage and the PE firm's shareholding proportion directly after the IPO. The higher the leverage ratio and the higher the shareholding proportion, the better the performance by PE backed firms.

Several researchers look at the value creation process by PE firms, and what firm characteristics that might contribute to the long-run outperformance on the stock market. According to Kaplan[72] value creation by LBOs is connected to the firm's improvements in operating performance, higher levels of leverage and thereby better monitoring of managers. Jensen[73] discusses the value drivers of PE held firms. Jensen states that the value drivers, determining operational efficiencies of companies under PE control, are closer monitoring, better expertise

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[69] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*

[70] Cao, J. *et al.*, 2009, *"The Performance of Reverse Leverage Buyouts"*

[71] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*

[72]Kaplan, S., 1989, *"The Effects of Management Buyouts on Operations and Value"*

[73] Jensen, M., 1986, *"Agency Costs of Free Cash Flow, Corporate Finance and Takeovers",* and Jensen, M., 1989, *"Eclipse of the Public Corporation"*

among the management team and higher levels of debt. These characteristics are mainly applicable for companies that are owned by PE firms, but since the PE firm usually holds a large share even after the IPO exit, these characteristics can be true for firms some years after the introduction to the public market. A more recent study by Katz[74] explores firms' ownership structures and long-run performance after an IPO. Katz concludes that PE backed firms that are owned, to a major part by PE firms, and where the PE firm is large (with more available capital to invest), show a superior long term stock performance. These results are due to the management expertise, closer monitoring, and the PE sponsor's reputation.

Rappaport[75] discusses seven value drivers, mentioned in the previous section. The operating profit margin, measured by operating income to sales, is the value driver that explains the operating performance of PE backed firms after an IPO. According to Kaplan[76], improvements in operating performance, is one characteristics of value creation by PE firms.

Both Kaplan[77] and Jensen[78] states that the higher the leverage ratio, the better the value creation by the firm. PE backed firms have a capital structure containing a major part of debt, since the leverage buyout process is financed with a large debt part. This statement of high leverage ratio can be applied to the previous mentioned trade-off theory, first invented by Modigliani *et al.*[79]. The PE backed firms that show a long-run stock outperformance are financed with an optimal capital structure in order to benefit from the interest tax shield and decreased agency costs.

Kaplan[80], Jensen[81] and Katz[82] indicate that value creation and long term excess performance after an IPO can be due to the PE firms' closer monitoring of the firm they previously controlled in full, compared to other companies offered to the public market at the same time. Although, the IPO can be viewed as an exit for the PE firm, mentioned in previous sections, the PE firm will remain a part of the company and can thereby continue monitoring the firm. The occurrence of monitoring derives from the *agency theory*[83]. The agency theory that is based on the potential

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[74] Katz, S., 2009, *"Earnings Quality and Ownership Structure: The Role of Private Equity Sponsors"*

[75] Rappaport, A., 1986, *"Creating Shareholder Value"*

[76] Kaplan, S., 1989, *"The Effects of Management Buyouts on Operations and Value"*

[77] *Ibid*

[78] Jensen, M., 1986, *"Agency Costs of Free Cash Flow, Corporate Finance and Takeovers"* and Jensen, M., 1989, *"Eclipse of the Public Corporation"*

[79] Modigliani, F., *et al.*, 1963, *"Corporate Income Taxes and the Cost of Capital: A Correlation"*

[80] Kaplan, S., 1989, *"The Effects of Management Buyouts on Operations and Value"*

[81] Jensen, M., 1986, *"Agency Costs of Free Cash Flow, Corporate Finance and Takeovers"* and Jensen, M., 1989, *"Eclipse of the Public Corporation"*

[82] Katz, S., 2009, *"Earnings Quality and Ownership Structure: The Role of Private Equity Sponsors"*

[83] Jensen, M., *et al.*, 1976, *"Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure"*

conflict between shareholders (principals) and managers (agents), is due to information asymmetry and the conflict of interest, which might arise between the two parties. The Board of Directors' duties are to act on the behalf of the principals, and one way to control the agent's performance is to increase the monitoring of the agents by the Board of Directors. This can be applied to the PE firms, which represent both the managers and the shareholders. The value creation by PE firms can be explained by the lack of information asymmetry and interest conflicts between principals and agents. The monitoring process of managers is easily executed since this type of corporate structure allows for superior cooperation between managers and shareholders.

2.5.1 Long-Run Performance Hypotheses

From the discussion above regarding the difference in long-run stock development between PE backed and non-PE backed firms, the first hypothesis regarding long-run stock performance can be stated.

$H_{1.7}$: The long-run stock price development of PE backed IPOs is superior to non-PE backed IPOs

$H_{0.7}$: The long-run stock price development of PE backed IPOs is not superior to non-PE backed IPOs

Variables explaining the long-run stock development will be presented in the following hypotheses.

An increased level of debt decreases the agency costs and increases the monitoring by banks and other financial institutions. The corporate governance structure also contributes to better monitoring of the managers. The monitoring increases the performance by managers, leading to a positive stock development and the leverage ratio is therefore positively correlated with long-run stock performance.[84]

$H_{1.8}$: A higher leverage ratio explains a superior long-run stock price development for PE and non-PE backed IPOs

$H_{0.8}$: A higher leverage ratio does not explain a superior long-run stock price development for PE and non-PE backed IPOs

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[84] Modigliani, F., *et al.*, 1963, *"Corporate Income Taxes and the Cost of Capital: A Correlation"*

The operating performance, measured as operating margin, is a value driver that should explain the long-run superior stock price development for firms. [85] A positive correlation with underpricing is expected.

$H_{1.9}$: A higher operating margin explains a superior long-run stock price development for PE and non-PE backed firms

$H_{0.9}$: A higher operating margin does not explain a superior long-run stock price development for PE and non-PE backed firms

According to Ritter[86], young companies with a low degree of maturity, measured as sales growth, usually experience a lower stock performance than more mature firms. Sales growth should therefore be negatively correlated with stock price development.

$H_{1.10}$: A low sales growth explains a superior long-run stock price development for PE and non-PE backed firms

$H_{0.10}$: A low sales growth does not explain a superior long-run stock price development for PE and non-PE backed firms

2.6 The Underpricing Effect on Long-Run Performance

There has not been extensive previous research on the possible effect of underpricing on companies' long-run performance. However, Ritter[87] finds an observable pattern of IPOs done during hot issue periods on the US market. In this article, underperformance is measured as cumulative average return and three-year buy and hold return relative to comparable firms. The underperformance is proved to be larger for firms going public in high-volume years. Since underpricing usually also is higher in hot issue periods, this implies that underpricing affects long-run stock performance negatively. In addition, he finds that underperformance is more common for young companies that experience high growth.

Doeswijk et al.[88], also suggest a negative correlation between floatings done in hot issue markets and the long-run performance, on the Dutch market. However, the correlation was not

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[85] Kaplan, S., 1989, *"The Effects of Management Buyouts on Operations and Value"*
[86] Ritter, J., 1991*,"The Long-Run Performance of Initial Public Offerings"*
[87] *Ibid*
[88] Doeswijk, R.Q. *et al.,* 2006, *"25 Years of Dutch IPOs: An Examination of Frequently Cited IPO Anomalies within the Main Sectors and during Hot- and Cold-Issue Periods"*

statistically significant. This means that the study do not support the over-optimism hypothesis coined by Tinic[89]. This hypothesis states that a high underpricing should result in a negative long-run relative performance.

2.6.1 Hypotheses Regarding the Underpricing Effect on Long-Run Performance

The over-optimism hypothesis and the long term performance of IPOs done in a hot issue market, suggests that there might be a negative correlation between underpricing and long-run performance.[90]

$H_{1.11}$: The underpricing size affects the long-run stock performance
$H_{0.11}$: The underpricing size does not affect the long-run stock performance

$H_{1.12}$: The underpricing size affects the long-run stock performance for PE backed firms
$H_{1.12}$: The underpricing size does not affect the long-run stock performance for PE backed firms

$H_{1.13}$: The underpricing size affects the long-run stock performance for non-PE backed firms
$H_{1.13}$: The underpricing size does not affect the long-run stock performance for non-PE backed firms

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[89] Tinic, S.M.,1986, *"Atonomy of Initial Public Offerings of Common Stock"*
[90] *Ibid*

3   METHOD

3.1   Research Design

According to Backman[91], methods can be either qualitative or quantitative. The quantitative method is primarily used for examining large amounts of numerical data from surveys and questionnaires. The qualitative method, as opposed to the quantitative one, results in a more thoroughly analysis of one or a few units. In order to accept or reject the hypotheses in this thesis, a quantitative study of the numerous IPOs and their stock price development is suitable.

A deductive approach means that the research has a starting point in the theory, and later is applied on the reality. This can for example include tests of hypotheses on real cases. An inductive procedure starts in the reality and is then finished by a comparison of the results and existing theories.[92] This thesis builds on an empirical study, where hypotheses are tested, and can therefore be categorized as a deductive study.

3.2   Procedure

In order to answer the main question mentioned in the background and to discard false hypotheses, a substantial amount of data is needed. With the aim to analyze both the underpricing and the long-run performance of IPOs, records of all IPOs on European stock exchanges completed from 1999 to 2010 are collected from the Dealogic. Via Dealogic the data is divided into PE backed (sponsor backed) and non-PE backed transactions. A PE backed company is defined as a firm that, at least, has one PE firm as an owner. The percentage of the ownership is irrelevant. In the selection process, IPOs with deal values below $160m (SEK1bn) is excluded since these do not attract any institutional investors. In smaller IPOs, a fixed price is usually utilized instead of a book building process. The sample mentioned in this paragraph contains 563 non-PE backed companies and 132 PE backed firms. This sample, of totally 695 observations, is the basis for all analyses in the thesis. In the underpricing regression including year 2000, a sample of 170 observations (159 observations in the underpricing regression excluding year 2000) is used and in the long-run part, including year 2000, 141 observations are incorporated (131 observations in the long-run regression excluding year 2000). The smaller

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[91] Backman, J., 2008, *"Rapporter och uppsatser"*, p. 33
[92] Bryman, A. *et al.*, 2003, *"Business Research Methods"*, p. 10*ff*

samples, for underpricing and long-run performance, all contain a randomly selected quarter of the original 563 non-PE backed companies. This choice is based on the need to facilitate the data handling. In addition, a number of observations are excluded, in all samples, due to lack of data for all variables. For details regarding the samples, see appendix 1.

The method chapter presents the procedure of the empirical study and the cross sectional data set is further described and presented in the data description chapter.

3.2.1 Procedure for the Underpricing Study

In order to find the underpricing size for all IPOs in the selected sample, the offer price and first day closing price is collected from Dealogic. In the theory chapter, Ritter's [93] method of calculating underpricing (U) is described as the difference between the first closing price (P_c) and the offer price (P_o), divided by the offer price. In the thesis the same method of calculating underpricing is used.

$$U = \frac{(P_c - P_o)}{P_o}$$

After calculating the underpricing for the total sample, an average for the whole period is computed, both for PE and non-PE backed IPOs. Additionally, a similar average is calculated each year. To able to overlook the IPO market, a compilation of the number of deals made throughout the period is done. A one sample T-test is performed in order to see if underpricing exits on the European market between 1999 and 2010. In order to test the significance of the difference in underpricing between PE and non-PE backed IPOs, a two sample T-test is completed. To perform the most rigid t-test for this sample, a two-tailed distribution and an unequal variance are selected. The same t-test is also performed on the sample when year 2000 is excluded.

A similar T-test is also completed on the smaller sample, containing a randomly included quarter of the original non-PE backed IPOs and the firms that have data available for all variables. In total, the sample includes 170 companies; 90 non-PE backed and 80 PE backed.

The explaining variables for underpricing of PE and non-PE backed IPOs are analyzed in a regression. A PE dummy is added as an independent variable in order to see if PE backing can

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[93] Ritter, J., 1998, *"Initial Public Offerings"*

explain underpricing. In order to be able to include all variables in a regression, the multicollinearity is tested through calculating the correlation (see appendix 8).

Katz[94] measures earning management as total discretionary accruals in relation to change in sales. Although, in this thesis a slightly modified measure is used, namely accruals to sales. The choice of using sales instead of earnings, which might seem more accurate, as a reference is due to sales being positive by definition. If earnings were used, the measure would not be correct in some cases since earnings can be negative. In addition, the definition of accruals has been simplified to net income minus cash flows from operations in the year of the IPO. Both net income and cash flows are collected from CapitalIQ. The more elaborate definition used by Katz is probably more correct, but it requires data from the year before the IPO which is not possible to find since the reports are not public. It would, however, be possible to use this definition based on data from the year of the IPO and the subsequent year, but this would not reflect the earnings management at the time of the floating as well as the simplified definition used in this thesis.

The size of the floated companies is another explaining variable, and is measured through the natural logarithm of total assets at the time of the IPO, in line with Levis's[95] research. Data on the total assets is gathered from Datastream.

Maturity of the firms is measured as the sales growth from the year of the IPO to the year after the IPO. The sales numbers are collected from Datastream. This proxy is chosen since it is considered to accurately reflect the stability of the company at the time of the floating. The smaller the growth, the more stable and mature company, and the less ex ante uncertainty. Van Frederikslust *et al.*[96] also analyze maturity, but use firm age as a proxy. Since data on firm age is not accessible in the used databases, this proxy is not used in this thesis.

Cao *et al.*[97] uses total debt to assets, as a leverage ratio variable, explaining underpricing. The variable used in this thesis is the very similar measure, debt-to-equity at the time of the IPO, gathered from Datastream.

In addition to the explaining variables mentioned above, the thesis includes several control

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[94] Katz, S., 2009, *"Earnings Quality and Ownership Structure: The Role of Private Equity Sponsors"*
[95] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*
[96] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*
[97] Cao, J. *et al.*, 2009, *"The Performance of Reverse Leverage Buyouts"*

variables. A dummy for hot and cold issue periods, collected from Dealogic, represents one such variable and is, in line with Levis's[98] previous research. This variable can be seen as a proxy for measuring the windows of opportunity. The hot issue period, marked as zero, is defined as the years between 1999-2000 and 2005-2007. Cold issue periods, marked as one, took place in 2001-2004 and 2008-2010. Additionally, the natural logarithm of issue size, collected from Dealogic, is included in accordance with van Frederiklust *et al.*[99]. IPO type, i.e. fixed price or book building IPOs, is also considered a control variable, but since deals with values below $160m and fixed price strategies are excluded, the vast majority of the IPOs are completed with an open price strategy and are thus the same IPO type.

The country, in which the IPO was completed, is another control variable that is gathered from Dealogic. Countries are chosen as a variable since different countries have different features such as the business and bank environment, legal and political systems, as well as the degree of society development. This control variable is tested separately, as dummies, in a multiple regression since it would not be possible to incorporate in the main regression due to the loss of degrees of freedom. The sector is also a control variable that is tested in a separate regression due to the same reason. The statistically significant dummy variables are added as dummy variables to the main multiple regression. In this case Slovenia is the only statistically significant variable. However, there is only one observation made in the country.

All the above mentioned independent and control variables are tested in two multiple regressions. Before the main regression is performed, country and sector regressions are completed.

In addition to the main multiple regression, including the 170 observations from 1999-2010, another multiple regression is performed. This regression includes the same observations with one exception: IPOs made during 2000 are excluded. The abnormally large average underpricing in 2000, see figure 4, is the reason for the exclusion of the observations during this year in the second multiple regression. The total number of firms analyzed in the new regression is 159; 74 PE backed and 85 non-PE backed. The statistically significant countries; Poland, Turkey and Slovenia are added as dummy variables. There were no statistically significant sectors. This regression is completed in order to eliminate the effects of the extreme hot issue period that occurred in 2000. The results are thereby not driven by year 2000.

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[98] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*
[99] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*

Thereafter, a regression with interaction effects is performed. The aim with this regression is to see if the variables have different impact on underpricing, depending on the company being PE or non-PE backed. An interaction variable, used in this regression, is a variable that combine the PE-dummy with each of the independent variables. The interaction variable then explains underpricing for PE backed firms. The different impact of PE or non-PE backed firms could then be an explanation to the absence of significant variables in the multiple regressions.

The regression coefficient (unstandardized beta) is used to analyze the effects of independent variables on the dependent variable.

3.2.2 Procedure for the Long-Run Performance Study

The long-run stock performance is, in this thesis, measured by an average buy and hold return (BHR), describing the return from the closing price on the issue day and three years onwards. Thus, the raw return is used since dividends are not incorporated. The choice of a three year period is based on Ritter[100] and Loughran's[101] previous studies. The stock prices for all companies are collected from Datastream.

$$BHR = \left(\frac{SP_{i,t=3}}{SP_{i,t=0}}\right) - 1$$

Where SP is the stock price for each IPO and t=0 is the time of the floating.

To compare the floated firms with each other, a buy and hold abnormal return (BHAR) is calculated, similar to Ritter[102] and Loughran *et al.*[103] The MSCI index return for each country and three year period is used as a benchmark. The MSCI indices are collected from Datastream.

$$BHAR = BHR - \left[\left(\frac{SI_{i,t=3}}{SI_{i,t=0}}\right) - 1\right]$$

Where SI is equal to the MSCI index for each country and t=0 is the time of the IPO.

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[100] Ritter, J., 1991,*"The Long-Run Performance of Initial Public Offerings"*
[101] Loughran, T. *et al.*, 1995, *"The New Issues Puzzle"*
[102] Ritter, J., 1991,*"The Long-Run Performance of Initial Public Offerings"*
[103] Loughran, T. *et al.*, 1995, *"The New Issues Puzzle"*

In addition to the BHAR, a wealth relative (WR) measure is calculated as a performance measure. This is in line with Brav *et al.*[104], Frederikslust *et al.*[105] and Ritter.[106]

$$WR = \frac{1 + average\ 3 - year\ total\ return\ on\ IPOs}{1 + average\ 3 - year\ total\ return\ on\ matching\ firm}$$

A wealth relative that is greater than 1.0 is interpreted as the IPOs outperforming the equivalent index. Conversely, a wealth relative below 1.0 means that the IPOs underperform.

From the original sample of 563 non-PE backed companies and 132 PE backed firms, the same non-PE backed firms randomly selected in the underpricing part, are included in this analysis. In addition, selected companies where one or more long-run variables are missing for both PE and non-PE backed firms are excluded. This leaves a total sample of 141 firms, 69 PE backed and 72 non-PE backed, to be analyzed in this section.

To start the analysis of the long-run stock performance, a T-test for examining the difference in long-run stock performance between PE and non-PE backed is completed. A two-tailed distribution and an unequal variance are selected.

A main multiple regression is completed after testing for multicollinearity in the same manner as in the underpricing section (see appendix 13). The regression analyzes the in long-run stock performance for PE and non-PE backed firms and a PE dummy is incorporated as an explaining variable. Firstly, country and sector regressions are performed and the statistically significant variables are added as dummies to the main regression for the same reasons as in the underpricing section. The added variables are Germany and Spain for countries and "Leisure & recreation" for sectors. There are twenty four observations made in Germany, fifteen in Spain and eight in "Leisure & recreation". The BHAR is used as the dependent variable in the main multiple regression.

Additionally, a multiple regression excluding the observations in year 2000 is completed. This regression is performed in the same way as the main regression and includes the same IPOs, with

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[104] Brav, A. *et al.*, 1997, *"Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies"*

[105] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*

[106] Ritter, J., 1991,*"The Long-Run Performance of Initial Public Offerings"*

the exception of the observations in year 2000. The total number of observations is 131; 66 PE backed and 65 non-PE backed IPOs. The statistically significant countries and sectors, tested in a separate regression, are included as dummy variables. "Dining & lodging", "Leisure & recreation" and "Mining" are added from the sector regression while Germany is added from the country regression.

The average debt-to-equity ratio over the three years following the IPO is the leverage ratio, used as an independent variable in the regression. This is similar to the recognized studies of Kaplan[107] and Jensen[108]. The data is collected from Datastream.

Levis[109] includes a measure of operating margin, EBITDA to sales, as an explaining variable. However, in this thesis, operating margin is measured as EBIT to sales, and the data is gathered from Datastream. The average three year operating margin is then used as an additional independent variable.

Like Ritter[110], this thesis includes average sales growth as an independent variable in the regressions. The sales number is collected from Datastream and the growth is then calculated as a three year average, subsequent to the IPO.

A number of control variables are then included in the regression. Country is chosen as a control variable for the same reasons mentioned in the underpricing section. A sector variable is included, in line with Ritter's[111] study. Levis[112] looks at total assets as a company size measure and this variable is therefore added. A hot issue period dummy is incorporated as a control variable, in accordance with Ritter[113]. The hot and cold issue periods are defined as mentioned in the previous section. The underpricing is also included as a control variable to examine the potential correlation with long-run stock performance.

Subsequent to the two multiple regression, a regression with interaction effects is completed. This regression explains which variables affect the long-run stock development, in combination

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[107] Kaplan, S., 1989, *"The Effects of Management Buyouts on Operations and Value"*
[108] Jensen, M., 1986, *"Agency Costs of Free Cash Flow, Corporate Finance and Takeovers"* and Jensen, M., 1989, *"Eclipse of the Public Corporation"*
[109] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*
[110] Ritter, J., 1991,*"The Long-Run Performance of Initial Public Offerings"*
[111] *Ibid*
[112] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*
[113] Ritter, J., 1991,*"The Long-Run Performance of Initial Public Offerings"*

with whether the firm is PE or non-PE backed. The variables might have different impact on the long-run stock performance, depending on type of firm; PE or non-PE backed. This could also explain the lack of statistically significant variables in the multiple regressions.

3.3 Method Criticism

The random selection of companies used in the thesis, can be questioned since the remaining companies might not be representative of the population. However, the selection is completely random since no deliberate sorting of the firms is done. A method of reducing the number of firms in the sample could have been done through matching one PE firm to a non-PE firm, with similar characteristics, such as company size, country, sector, year of IPO, and etcetera.

Within the time period chosen for this thesis, several companies included in the analysis have been delisted due to different reasons. These companies have not been included in the regression, and a survivorship bias might therefore exist.

The underpricing defined as the first day stock return could be questioned. An alternative way of defining underpricing could be a five days average return. In this thesis the choice of calculating underpricing is based on the vast majority and leading researchers' method. The use of the definition by recognized researchers makes the measure adequate and the thesis's results comparable.

The underpricing is in some cases affected by greenshoe options, which means that the underpricing registered in this thesis might not reflect the intrinsic underpricing size. The underwriter with a greenshoe option can influence the underpricing through maintaining a high stock price. However, data on effect of greenshoe options is not easily accessed.

The sales growth variable in the underpricing regression might not be representative as a maturity measure. This is due to only one year of sales growth being used. The growth could hence be temporary and not reflecting the authentic maturity. In order to improve the maturity measure, it could be beneficial to include sales growth from a few years before the IPO. However, the data for these years are not available since the reports are not public.

4   DATA DESCRIPTION

4.1   Data Description for the Underpricing Study

Figure 1 shows the total number of IPOs, with deal value above $160m, completed each year between 1999 and 2010 for both PE and non-PE backed firms. A trend that can be identified is that IPOs increase during years of prosperity. In the years subsequent to the IT-bubble and in the years following the financial crisis, the activity is significantly lower. The stock price index is added in order to clarify the years of prosperity and recession. The sample consists of 563 non-PE backed IPOs and 132 PE backed.

Figure 1. *Total number of IPOs completed in Europe, with deal values above $160m and the UK Stock Index Development*
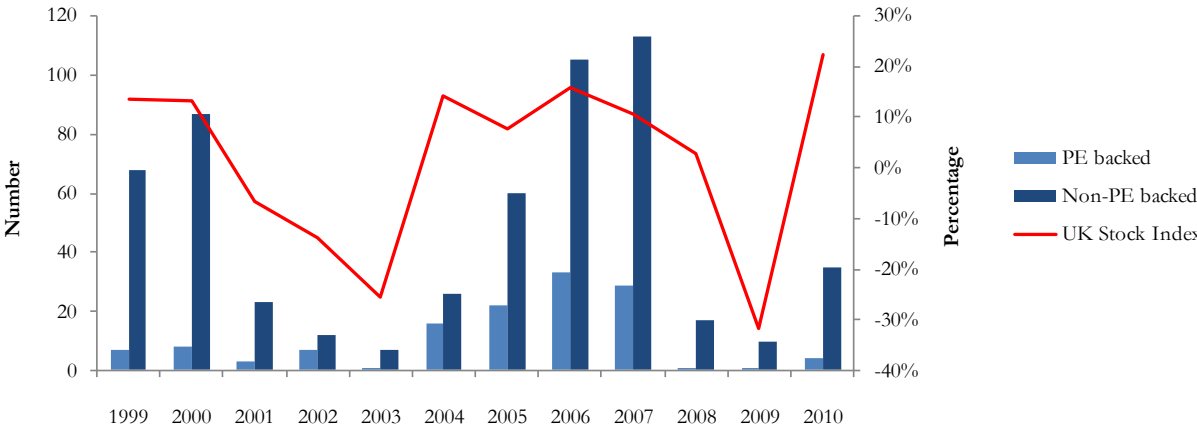
The analyzed IPOs are performed within different sectors and countries. Most of the IPOs were made within the finance (10.8%), healthcare (8.2%) and transportation (7.7%) sectors. For more detailed information about each sector, see appendix 2. The countries where most of the IPOs were completed were United Kingdom (22.6%), Germany (12.3%) and Italy (12.3%). Information about IPOs in each country is displayed in appendix 3.

The sector regression coefficients including year 2000 are shown in appendix 4, while sector coefficients excluding year 2000 is shown in appendix 5. The country coefficients including year 2000 are shown in appendix 6 and in appendix 7 the country coefficients excluding year 2000 are featured.

The underpricing regression including year 2000, contains 170 observations; 80 PE backed and 90 non-PE backed. The multicollinearity tested between the independent variables is shown in appendix 8. The results show no extensive correlations between the variables, and therefore all of them are included in the regressions. In table 1, descriptive statistics of the underpricing regression is presented. The minimum, maximum, mean and standard deviation values of the underpricing variable can be studied. The measures of the other variables can also be seen in table 1.

Table 1. *Descriptive Statistics of the Underpricing Regression, 170 observations, including year 2000*

	Minimum	Maximum	Mean	Std. Deviation
Underpricing	(19,433)	100,429	6,198	12,618
Maturity	(0,756)	4,921	0,248	0,565
Leverage Ratio	0,000	9,030	0,677	1,111
Earnings Mgmt	(15,357)	(1,114)	(9,070)	1,878
Issue Siize	5,083	8,675	6,149	0,800
Company Size	8,651	20,020	13,668	1,472

The underpricing regression, excluding year 2000, contains 159 observations; 74 PE and 85 non-PE backed IPOs. Descriptive statistics of this sample is presented in table 2.

Table 2. *Descriptive Statistics of the Underpricing Regression, 159 observations, excluding year 2000*

	Minimum	Maximum	Mean	Std. Deviation
Underpricing	(10,000)	36,137	5,197	8,305
Maturity	(0,756)	3,118	0,228	0,456
Leverage Ratio	0,000	9,030	0,699	1,150
Earnings Mgmt	(15,357)	(1,114)	(9,099)	1,888
Issue size	5,083	8,675	6,173	0,811
Company Size	8,651	20,020	13,659	1,461

The descriptive statistics for the regression with interaction effects is shown in table 3.

Table 3. *Descriptive statistics of the underpricing regression with interaction effects, 170 observations, including year 2000*

	Mean	Std. Deviation
Underpricing	5,798	11,308
Interaction term: maturity x PE	0,122	0,395
Maturity	0,252	0,582
Dummy: 1=PE	0,460	0,500
Interaction term: leverage ratio x PE	0,419	1,134
Leverage Ratio	0,734	1,169
Interaction term: Earnings Mgmt x PE	(4,394)	4,874
Earnings Mgmt	(9,090)	1,929
Interaction term: isssue size x PE	2,853	3,110
Issue Size	6,143	0,804
Interaction term: company size x PE	6,371	6,919
Company Size	13,656	1,390

The results regarding assumptions for the underpricing regressions; heteroskedasticity, autocorrelation and normality, are presented in appendix 14, 15 and 17.

4.2   Data Description for the Long-Run Performance Study

In appendix 9, the coefficients for the regression, including year 2000, performed for sectors in relation to long-run stock performance are presented. The sector coefficients excluding year 2000 are presented in appendix 10. The country coefficients for the long-run stock performance regression, including year 2000, are presented in appendix 11, and the country coefficients excluding year 2000 are shown in appendix 12.

The long-run stock performance regression including year 2000 contains 141 observations; 69 PE and 72 non-PE backed firms. The multicollinearity is tested and shown in appendix 13, in which the correlation between the long-run stock performance and the different variables can be studied. The correlation between the variables is not extensive and they can thus be included in the regressions. In table 4 below, descriptive statistics of the long-run regression is presented. The minimum, maximum, mean and standard deviation values of the BHAR variable can be studied.

Table 4. *Descriptive statistics of the long-run stock performance regression, 141 observations, including year 2000*

	Minimum	Maximum	Mean	Std. Deviation
BHAR	(1,722)	3,046	0,055	0,726
Leverage Ratio	(7,894)	10,050	0,657	1,359
Sales Growth	(1,514)	3,046	0,097	0,573
Company Size	10,515	20,293	13,976	1,451
Op. Margin	(13,513)	0,828	(0,007)	1,250
Underpricing	(19,433)	36,137	4,972	8,611

The long-run stock performance regression, excluding year 2000, contains 131 observations; 66 PE and 65 non-PE backed IPOs. Descriptive statistics of this sample is presented in table 5 below.

Table 5. *Descriptive statistics of the long-run stock performance regression, 131 observations, excluding year 2000*

	Minimum	Maximum	Mean	Std. Deviation
BHAR	(1,722)	3,046	0,074	0,057
Leverage Ratio	(7,894)	10,050	0,688	0,120
Sales Growth	(1,514)	3,046	0,076	0,046
Company Size	10,515	20,293	13,973	0,121
Op. Margin	(13,513)	0,732	0,029	0,100
Underpricing	(10,000)	36,137	5,275	0,628

The descriptive statistics for the regression with interaction effects is presented in table 6.

Table 6. *Descriptive statistics of the long-run stock performance regression with interaction effects, 141 observations, including year 2000*

	Mean	Std. Deviation
BHAR	0,120	0,758
Interaction term: leverage ratio x PE	0,358	1,145
Leverage Ratio	0,686	1,412
Dummy: PE = 1	0,470	0,501
Interaction term: sales growth x PE	0,042	0,524
Sales Growth	0,100	0,546
Interaction term: company size x PE	6,440	6,936
Company size	14,041	1,457
Interaction term: op. margin x PE	0,059	0,127
Op. Margin	0,127	0,210
Interaction term: underpricing x PE	2,516	6,158
Underpricing	4,745	8,558

The results regarding assumptions for the BHAR regressions; heteroskedasticity, autocorrelation and normality, are presented in appendix 14, 16 and 17.

5 RESULTS AND ANALYSIS

5.1 Underpricing Results

Figure 2 confirms that underpricing exists on the European market during 1999-2010. The sample consists of totally 695 observations; 563 non-PE backed and 132 PE backed IPOs. Underpricing occurs in approximately 70 percent of the cases. For the rest of the IPOs, there is either overpricing or a zero first day return. The T-test performed shows that the underpricing phenomena is statistically significant on the one percent level, which leads to an acceptance of the first hypothesis regarding whether underpricing of IPOs exists on the European market or not. This finding is in line with Ibbotson's[114] study regarding underpricing existence, based on the US stock exchange.

Figure 2. *Proportion of the total number of IPOs, completed in Europe during 1999-2010 with issue size above $160m, showing underpricing or not, including year 2000, 695 observations*
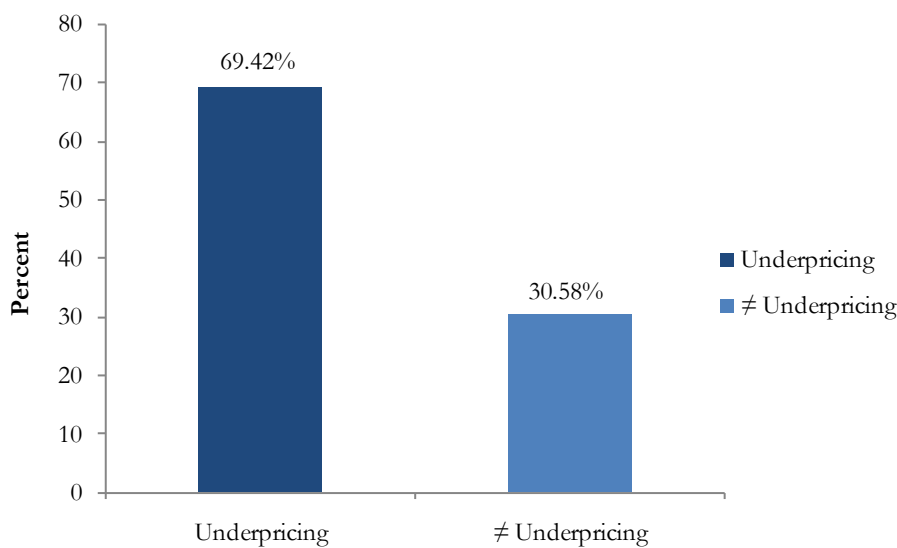
In figure 3, the average underpricing for the whole sample, including 563 non-PE backed and 132 PE backed IPOs, is featured. The figure demonstrates the difference in underpricing between PE backed and non-PE backed IPOs. While the average underpricing for a PE floated firm is 5.69 percent, it is 10.70 percent for non-PE backed companies. The performed T-test shows that the difference was statistically significant, with a p-value of 0.003. All p-values below 0.1 is generally considered be statistically significant, meaning that the results did not occur by chance.

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[114] Ibbotson, R.G., 1975, *"Price Performance of Common New Stock Issues"*

Figure 3. *Average underpricing of IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000, 695 observations*
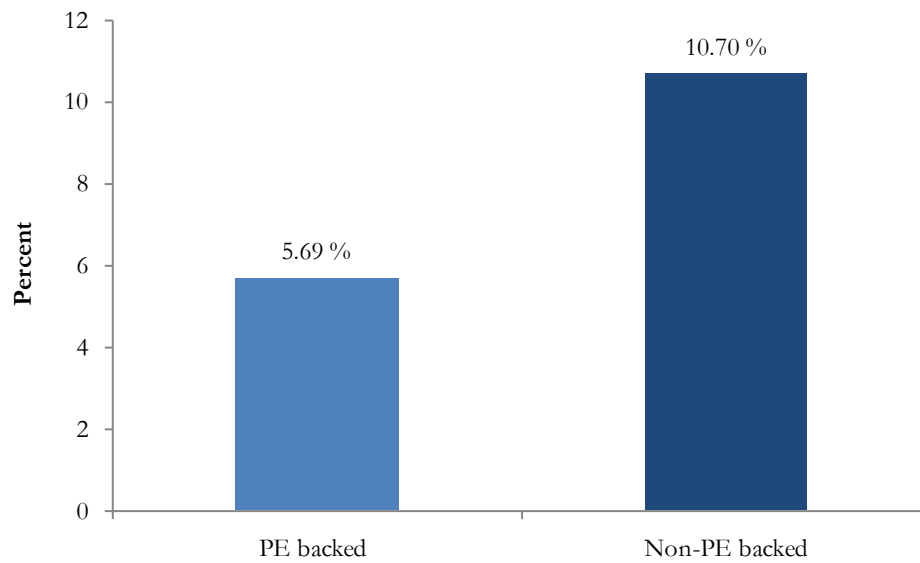
In figure 4, the underpricing can be observed on a yearly basis for PE and non-PE floated firms. During the major part of the period, the underpricing is lower for PE backed IPOs. There are two deviations from this pattern, in 2008 and 2010. However, there are only one PE backed IPO in 2008 and four in 2010. Additionally, there is only one PE backed IPO in 2003 and 2009. Therefore, it is difficult to draw any certain conclusions regarding these years. In 1999 and 2000, the underpricing pattern is significantly higher for, especially, non-PE floated firms. Since there were numerous IPOs completed in 1999 and 2000, this is in line with previous academic findings, reporting that the underpricing is higher during hot issue markets. Moreover, the IT-bubble contributed to the abnormally high underpricing.

Figure 4. *Average underpricing of IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000, 695 observations*
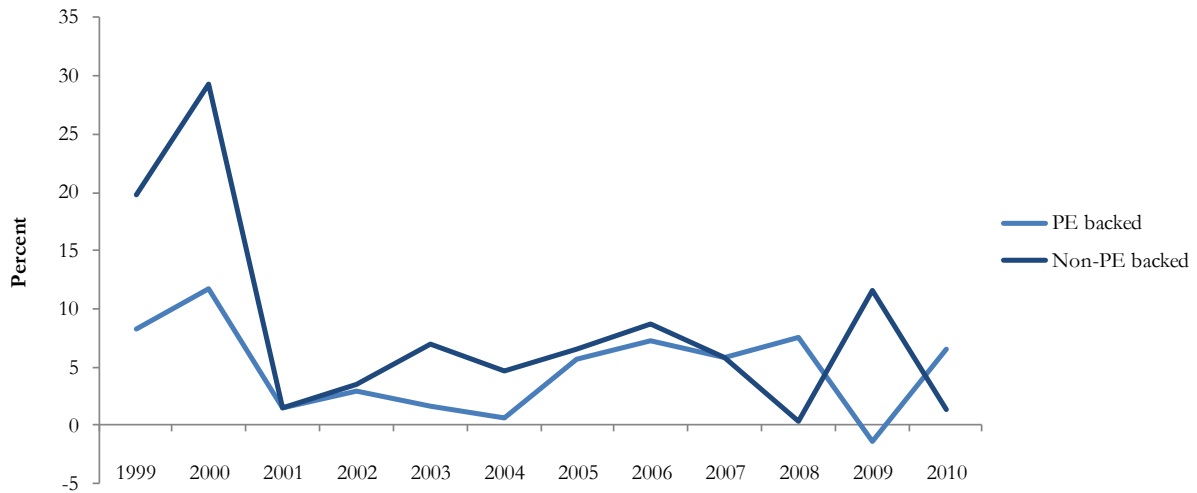
In figure 5, the average underpricing of the same sample as used in figure 2-4, but excluding IPOs during year 2000, is shown. The lower underpricing for PE backed firms is still statistically significant, with a p-value of 0.05. However, the underpricing for both groups is slightly lower than for the whole sample including year 2000.

Figure 5. *Average underpricing of IPOs completed in Europe during 1999-2010 with issue size above $160m, excluding year 2000, 604 observations*
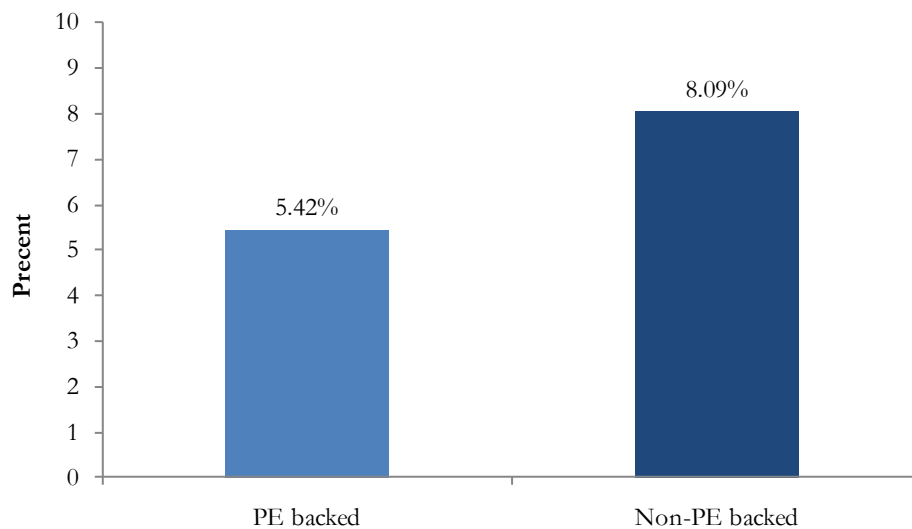
Figure 6 below shows the average underpricing for the smaller sample described in the method chapter, including 170 IPOs completed from 1999 to 2010 on the European markets. The average underpricing for PE backed firms is 5.44 percent and 6.82 percent for non-PE backed

IPOs. However, the completed T-test does not show that the difference in underpricing, in this sample, is statistically significant. The p-value is 0.29.

Figure 6. Average underpricing of 170 IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000
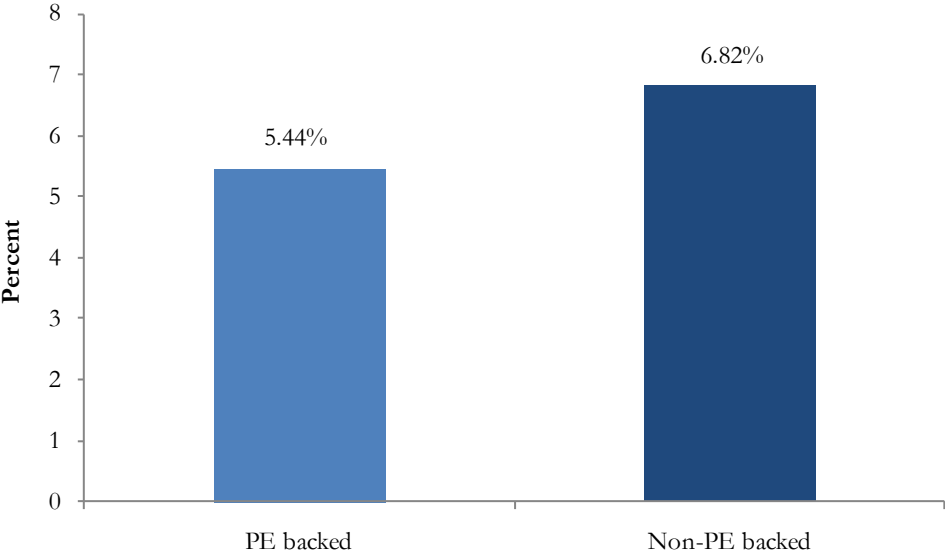
The difference in underpricing between PE and non-PE backed IPOs is statistically significant for the large sample, including 695 observations, and for the large sample excluding year 2000 with 604 observations, but not for the smaller sample, consisting of 170 IPOs. This suggests that the smaller sample might not fully be representative for all IPOs completed on the European market between 1999 and 2010, with issue size above $160m. The second hypothesis, saying that the underpricing is lower for PE backed IPOs can hereby be accepted. This result is in accordance with van Fredreikslust *et al.*'s[115], Barry *et al.*'s[116] and Megginson *et al.*'s[117], research showing a lower underpricing for PE backed firms. Thereby, this thesis confirms the certification hypothesis, also accepted by Barry *et al.*[118] and Megginson *et al.*[119].

The results from the multiple regression for underpricing, including year 2000, exhibited in table 7, show that it is statistically significant that the hot issue variable and the Slovenia dummy affect

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[115] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*

[116] Barry, C.B. *et al.*, 1990, *"The Role of Venture Capital in the Creation of Public Companies"*

[117] Megginson, W. *et al.*, 1991, *"Venture Capitalist Certification in Initial Public Offerings"*

[118] Barry, C.B. *et al.*, 1990, *"The Role of Venture Capital in the Creation of Public Companies"*

[119] Megginson, W. *et al.*, 1991, *"Venture Capitalist Certification in Initial Public Offerings"*

the underpricing. The negative correlation between cold issue markets and underpricing is in line with previous research and shows that companies completing an IPO during a cold issue period will experience a lower underpricing. The beta coefficient is (3.87), means that a change from cold to hot issue markets leads to a 3.87 percentage points increase in underpricing. The high demand and expectations from investors are characteristics of a hot issue market and contributes to the larger underpricing. The firms choosing to complete an IPO during periods of high floating activity should thus be aware of this phenomenon in order to maximize their initial valuations. No conclusions regarding the Slovenia dummy can be drawn since it is based on a single observation.

Table 7. *Coefficients for underpricing of 170 IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000*

	B	Std. Error	t	Sig.
Maturity	(0,194)	1,541	(0,126)	0,900
Leverage Ratio	(1,119)	0,757	(1,478)	0,141
Earnings Mgmt	(0,073)	0,481	(0,151)	0,880
Issue Size	1,005	1,075	0,934	0,352
Dummy: 1=PE	2,313	1,749	1,323	0,188
Dummy: Hot issue = 0	(3,869)	2,256	(1,715)	0,088
Company Size	0,502	0,627	0,801	0,425
Dummy: 1=Slovenia	27,986	11,222	2,494	0,014

Dependent Variable: Underpricing

In table 8, the model summary for the underpricing regression including year 2000 is exhibited. The R-square is fairly low at 0.094, which implies that 9.4 percent of the variables explain the underpricing.

Table 8. *Model summary for the underpricing regression, of 170 IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000*

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
0,306	0,094	0,049	11,029	0,094	2,081	8	161	0,041

Dependent Variable: Underpricing

The outcome from the second multiple regression for underpricing, excluding year 2000, is presented in table 9. This regression also results in hot issue markets being a statistically significant explaining variable. In addition, it is statistically significant that the maturity variable and the Poland dummy have an effect on underpricing. The maturity, measured as sales growth, is negatively correlated with underpricing, meaning that a more mature company would

experience a higher underpricing. An increase of one standard deviation in sales growth leads to a 3.62 ((2.537) x 1.426) percentage point decline in underpricing. This finding is not supported by Rock's[120] model, stating that lower information asymmetries surrounding a more stable company leads to a reduced underpricing. An explanation for the negative correlation could be that mature firms attract more investors, which will increase the stock price on the first trading day. When excluding IPOs completed in year 2000, several non-mature companies might be excluded due to the many IT-firms issued at that time. This is one explanation to why maturity is statistically significant in the regression excluding year 2000, but not in the regression including year 2000. Since the Poland dummy is based on three observations, it is not certain that a Polish IPO results in underpricing.

Table 9. *Coefficients for underpricing of 159 IPOs completed in Europe during 1999-2010 with issue size above $160m, excluding year 2000*

	B	Std. Error	t	Sig.
Maturity	(2,537)	1,426	(1,779)	0,077
Leverage Ratio	(0,813)	0,555	(1,466)	0,145
Earnings Mgmt	(0,215)	0,353	(0,608)	0,544
Issue size	1,296	0,805	1,610	0,110
Dummy:PE=1	2,079	1,328	1,565	0,120
Dummy: Hot issue = 0	(3,388)	1,680	(2,017)	0,045
Company Size	0,075	0,474	0,158	0,874
Dummy:Slovenia= 1	0,341	8,193	0,042	0,967
Dummy:Poland =1	10,391	5,744	1,809	0,072
Dummy:Turkey=1	3,330	4,178	0,797	0,427

Dependent variable: Underpricing

The model summary for the underpricing regression excluding year 2000 is presented in table 10. In conclusion, the R-square of 0.125, means that 12.5 percent of the variables explain the underpricing.

Table 10. *Model summary for the underpricing regression, of 159 IPOs completed in Europe during 1999-2010 with issue size above $160m, excluding year 2000*

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
0,354	0,125	0,066	8,007	0,125	2,120	10	148	0,026

Dependent variable: Underpricing

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[120] Rock, K., 1986, *"Why Issues are Underpriced"*

In table 11, the results from the underpricing regression with interaction effects are presented. For PE backed firms, maturity, earnings management and company size are statistically significant explaining variables for underpricing. Thereby, the hypothesis, based on Modigliani *et al.*'s[121] trade off-theory, stating that high leverage ratio leads to high financial distress potential, risk for investors and thereby a decrease in demand and a lower underpricing for PE firms is rejected.

The maturity variable, measured as sales growth, ("Interaction term: maturity x PE") is significant on the one percent level and is negatively correlated to underpricing. This indicates a lower underpricing for high growth PE companies, i.e. non-mature firms. An increase of one standard deviation in sales growth results in an underpricing decline of 26.71 percentage points. Hence, Levis's[122] study regarding maturity as an explaining variable for PE backed firms' underpricing, is not supported by this thesis. Investors' higher demand for growing non-mature firms, can be an explanation to the larger underpricing for this type of company. The hypothesis regarding more mature firms leading to lower underpricing for PE backed firms is thus rejected.

The positive correlation between earnings management ("Interaction term: earnings mgmt x PE"), measured as the natural logarithm of accruals, and underpricing supports Katz's[123] research, mentioned in the theory chapter. Less earnings management leads to lower underpricing for PE backed IPOs, since the investors perceive the company as more trustworthy. If the natural logarithm of accruals changes upwards one standard deviation, the underpricing will fall 1.81 percentage points. The hypothesis regarding less earnings management leading to lower underpricing for PE backed firms is hereby accepted.

The company size ("Interaction term: company size x PE") is also positively correlated with underpricing for PE backed firms, demonstrating that the larger total assets, the larger the underpricing for PE backed IPOs. A large company attracts more investors due to the lower risk, but also since it is more recognized. This high demand elevates the stock price during the first trading day. However, it is important to remember that a high demand should make it easier for the firm to sell the shares at a higher price prior to the floating. The effect on underpricing for PE firms is 3.30 percentage points if company size changes one standard deviation. Levis's findings, that a larger company has more transparency and therefore less underpricing, is not

[121] Modigliani, F., *et al.*, 1963, *"Corporate Income Taxes and the Cost of Capital: A Correlation"*
[122] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*
[123] Katz, S., 2009, *"Earnings Quality and Ownership Structure: The Role of Private Equity Sponsors"*

supported by the findings in this thesis. The hypothesis stating that the larger the company size, the less underpricing for PE backed firms is rejected.

Earnings management ("Earnings Management") is also statistically significantly correlated to underpricing for non-PE backed firms. However, the correlation is negative. More earnings management would thus lead to a lower underpricing for non-PE backed IPOs. A reason for this could be that the better earnings quality increases the demand for the stock. In addition, the high earnings management could lead to better looking accounts that mislead the investor to believe that the company is of higher quality than it actually is. If the natural logarithm of accruals changes upwards one standard deviation, the underpricing will rise 0.64 percentage points. The hypothesis stating that less earnings management results in lower underpricing for non-PE backed firms is rejected.

Since earnings management is the only statistically significant variable for non-PE backed firms, the hypotheses regarding maturity, leverage ratio and company size, can be rejected.

Table 11. *Coefficients for underpricing, in the regression with interaction effects, of 170 IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000*

	B	Std. Error	t	Sig.
Interaction term: maturity x PE	(8,637)	3,093	(2,792)	0,006
Maturity	3,216	2,015	1,596	0,112
Dummy: 1=PE	(23,346)	23,968	(0,974)	0,332
Interaction term: leverage ratio x PE	1,622	1,861	0,871	0,385
Leverage Ratio	(2,523)	1,662	(1,518)	0,131
Interaction term: earnings mgmt x PE	1,805	1,004	1,797	0,074
Earnings Management	(1,059)	0,607	(1,744)	0,083
Interaction term: issue size x PE	1,329	2,196	0,605	0,546
Issue size	0,507	1,348	0,376	0,707
Interaction term: company size x PE	2,574	1,281	2,010	0,046
Company Size	(0,603)	0,829	(0,727)	0,468

Dependent Variable: Underpricing

The R-square for the underpricing regression with interaction effects is featured in table 12, and can be interpreted as a 13.0 percent coefficient of determination.

Table 12. *Model summary for the underpricing regression with interaction effects, of 170 IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000*

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
0,361	0,130	0,070	10,907	0,130	2,150	11	158	0,020

Dependent variable: Underpricing

The different statistically significant independent variables for PE and non-PE backed IPOs could be contributing factors explaining the difference in underpricing between the two groups. Another explaining variable that could clarify the difference in underpricing is associated with the PE owned firm's managers and their superior reputation and status. The PE firms attract numerous talented managers to their portfolio companies, whose expertise will have an effect on the firm to be introduced to the stock market. The reputation of the managers of the firm can therefore possibly explain a lower underpricing for the PE backed firms. However, this variable is not tested since a reasonable measure for reputation could not be found.

5.2 Long-Run Performance Results

Figure 7 describes the average long-run BHAR, of the sample containing 141 IPOs (described in the data description chapter) during 1999 to 2010 in Europe. PE backed IPOs have a three year average BHAR of 9.20 percent, which is significantly higher than the 2.31 percent for the non-PE backed firms. The superior stock performance for PE backed firms is, however, not statistically significant since the T-test shows a p-value of 0.26. This leads to a rejection of the hypothesis stating that the three year stock price development of PE backed IPOs is superior to non-PE backed IPOs. This finding is not in line with Brav *et al.*'s[124], van Frederikslust *et al.*'s[125] and Levis's[126] studies concluding that PE backed firms experience a better long-run stock performance. The positive BHAR indicates an overperformance of the corresponding index for both of the IPO groups. This contradicts Doeaswijk *et al.*'s[127] and Ibbotsson's[128] studies stating that IPOs underperform their benchmark. However, a T-test completed, results in a p-value of 0.15, which indicates no statistically significant superior performance to index.

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[124] Brav, A. *et al.*, 1997,*"The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Non-Venture Capital-Backed Companies"*

[125] Van Frederikslust, R. *et al.*, 1999, *"Initial Returns and Long-Run Performance of Private Equity-Backed Initial Public Offerings on the Amsterdam Stock Exchange"*

[126] Levis, M., 2010, *"The Performance of Private Equity-Backed IPOs"*

[127] Doeswijk, R.Q. *et al.*, 2006, *"25 Years of Dutch IPOs: An Examination of Frequently Cited IPO Anomalies within the Main Sectors and during Hot- and Cold-Issue Periods"*

[128] Ibbotson, R.G., 1975, *"Price Performance of Common New Stock Issues"*

Figure 7. *Average three year BHAR of 141 PE and non-PE backed IPOs completed in Europe with an issue size above $160m, including year 2000*
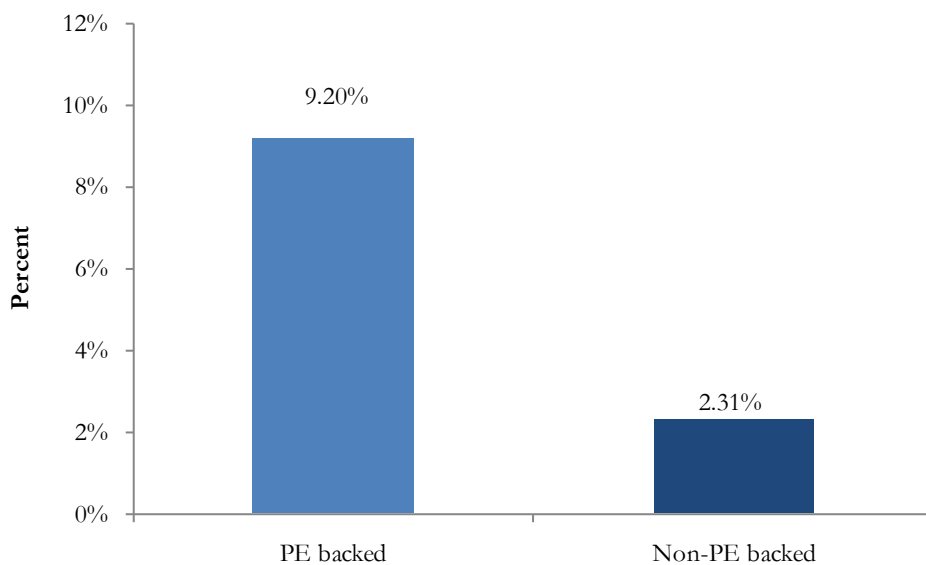
In figure 8, the average wealth relative for the sample containing 141 PE and non-PE backed firms is presented. The WR of 1.10 for PE backed and 1.08 for non-PE backed firms, indicates that both groups overperform the corresponding index since the WR is larger than 1. The difference in WR is not statistically significant.

Figure 8. *Average wealth relative for 141 PE and non-PE backed IPOs completed in Europe during 1999-2010 with an issue size above $160m, including year 2000*
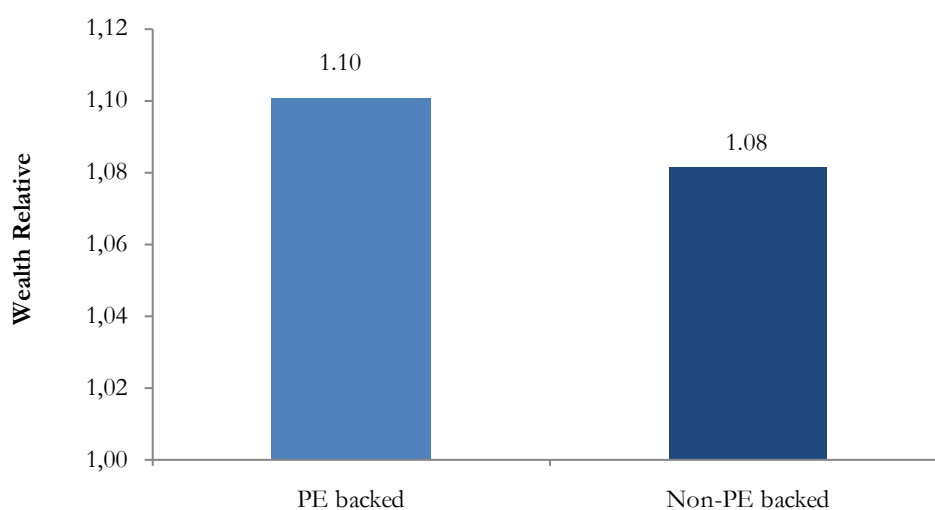
Table 13 features the result of the first multiple regression, regarding long-run performance. The hot issue variable is statistically significant on the one percent level. The cold issue periods are positively correlated with long-run performance. This implies that an IPO completed in a hot issue market, will have an inferior long-run stock development and that the firms take advantage of the windows of opportunity during a hot issue market, in accordance with Ibbotson *et al.*[129]'s study. The beta of 0.66, suggests that long-run performance will improve 0.66 percentage points if the company complete the IPO in cold instead of hot issue periods. The result is expected since stock prices usually are higher in hot issue periods and the abnormally high stock prices are not easy to maintain. The three year development will therefore be poorer for these IPOs and this is something companies should consider before deciding on the timing for the floating. Additionally, the "Leisure & recreation" variable is statistically significant, but since there are only eight observations made in the category it is not plausible to draw any conclusions from this.

Table 13. *Coefficients for BHAR of 141 IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000*

	B	Std. Error	t	Sig.
Leverage Ratio	(0,020)	0,041	(0,485)	0,629
Sales Growth	(0,077)	0,103	(0,750)	0,454
Company Size	0,042	0,041	1,026	0,307
Op. Margin	0,751	0,272	2,761	0,007
Dummy: Hot issue = 0	0,661	0,141	4,672	0,000
Dummy: PE = 1	0,054	0,115	0,467	0,641
Underpricing	0,007	0,007	1,054	0,294
Dummy: Leisure & recreation = 1	1,093	0,336	3,255	0,001
Dummy: Germany=1	(0,260)	0,194	(1,338)	0,183
Dummy: Spain=1	(0,245)	0,205	(1,191)	0,236

Dependent Variable: BHAR

The model summary for the BHAR multiple regression, including year 2000, is shown table 14. The R-square of 0.33 means that all variables incorporated in the regression explains 33 percent of the three year stock performance.

Table 14. *Model summary for the BHAR regression, of 141 IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000*

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
0,571	0,326	0,274	0,646	0,326	6,285	10	130	0

Dependent variable: BHAR

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[129] Ibbotson, R.G. *et al.*, 1975, *"Hot Issue Markets"*

In table 15, the results for the BHAR multiple regression, excluding year 2000, is shown. These results are similar to the regression where year 2000 is incorporated. The difference is that operating margin and "Mining" also becomes statistically significant variables. The "Mining" variable, however, only consists of six observations which lead to difficulties in drawing any conclusions. The operating margin is positively correlated to long-run performance and has a beta of 0.58. Thus, a positive change of one standard deviation in operating margin results in a 0.24 percentage point increase in BHAR. The findings are consistent with Kaplan's[130] theory, stating that operating margin is an important value driver. The hot issue variable has a beta of 66.74, significantly higher than in the regression including year 2000. Hence, the effect on long-run stock performance is a 66.74 percentage points increase if an IPO is completed during a cold issue period instead of in a hot issue market.

Table 15. *Coefficients for the BHAR regression, of 131 IPOs completed in Europe during 1999-2010 with issue size above $160m, excluding year 2000*

	B	Std. Error	t	Sig.
Leverage Ratio	(0,025)	0,041	(0,618)	0,537
Sales Growth	(0,088)	0,105	(0,834)	0,406
Company Size	3,962	4,331	0,915	0,362
Op. Margin	0,583	0,297	1,964	0,052
Dummy: Hot issue = 0	66,742	14,800	4,510	0,000
Dummy: PE = 1	9,410	11,982	0,785	0,434
Underpricing	0,666	0,719	0,926	0,356
Dummy: Dining & Loging=1	99,945	68,032	1,469	0,144
Dummy: Leisure & Recreation =1	121,748	34,240	3,556	0,001
Dummy: Mining = 1	145,306	67,107	2,165	0,032
Dummy: Germany = 1	(21,943)	18,645	(1,177)	0,242

Dependent variable: BHAR

In the model summary, shown in table 16, the R-square for the multiple BHAR regression, excluding year 2000 is presented. The conclusion is that 35.6 percent of the included variables can explain the three year stock performance.

Table 16. *Model summary for the BHAR regression, of 131 IPOs completed in Europe during 1999-2010 with issue size above $160m, excluding year 2000*

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
0,597	0,356	0,297	0,654	0,356	5,982	11	119	0

Dependent variable: BHAR

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[130] Kaplan, S., 1989, *"The Effects of Management Buyouts on Operations and Value"*

In table 17, the outcomes of the BHAR regression with interaction effects are displayed. For PE backed IPOs, operating margin ("Interaction term: op. margin x PE") is the only statistically significant variable. Consequently, the hypotheses stating that leverage ratio and sales growth affects the long-run performance for PE backed firms can be rejected. Thus, the results contradict Modigliani's[131]trade off theory regarding the monitoring of the agents. The monitoring enhances the performance by managers, which creates positive financial results. Ritter[132] states that companies with high degree of maturity experience a higher stock price development. The results in this thesis oppose Ritter's statement.

The operating margin is positively correlated to long-run stock performance. An increase of one standard deviation in operating margin, thus results in an upward change of 1.09 percentage points in BHAR. The finding indicates that operating margin drives the stock price development for PE backed firms, in accordance with existing theory by Kaplan[133]. Kaplan states that the operating margin is an important value driver for PE backed firms and that is has a large impact on the operating performance and thereby also on the stock price. The hypothesis stating that higher operating margin explains a superior long-run stock performance for PE backed firms is hereby accepted.

For non-PE backed IPOs, the company size variable ("Company Size") is statistically significant. Thus, hypotheses regarding leverage ratio, sales growth and operating margin affecting long-run performance, are rejected. The correlation with long-run stock performance is positive, implying that the larger the company size the better the BHAR. This is in line with Brav et al.'s[134] study stating that small firms underperform the benchmark. In smaller IPOs, there are not many institutional investors. Instead, the majority are private investors, which means that these types of firms are likely to be subject to investor sentiment. This can be an explanation to the larger firms having a better long-run performance. A positive change of one standard deviation in size leads to an increase of 0.01 percentage points in long-run stock development for non-PE backed firms.

A possible explaining variable for PE backed firms of the three year BHAR is the lock-up agreement. The PE firm usually holds a large share of stocks even after the IPO. The larger the PE ownership proportion, the better the monitoring of managers. This will result in a better

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[131] Modigliani, F., *et al.*, 1963, *"Corporate Income Taxes and the Cost of Capital: A Correlation"*

[132] Ritter, J., 1991*,"The Long-Run Performance of Initial Public Offerings"*

[133] Kaplan, S., 1989, *"The Effects of Management Buyouts on Operations and Value"*

[134] Brav, A. *et al.*, 1997, *"Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies"*

performance by the managers and the firm thereby increases the long-run stock price development. However, the variable is not included in this thesis due to inaccessible data.

Table 17. *Coefficients for the BHAR regression with interaction effects, of 141 IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000*

	B	Std. Error	t	Sig.
Interaction term: leverage ratio x PE	0,115	0,093	1,228	0,222
Leverage Ratio	(0,109)	0,073	(1,489)	0,139
Dummy: PE = 1	0,256	1,362	0,188	0,851
Interaction term: sales growth x PE	(0,177)	0,443	(0,398)	0,691
Sales Growth	0,128	0,425	0,301	0,764
Interaction term: company size x PE	(0,031)	0,097	(0,320)	0,750
Comapny Size	0,100	0,054	1,856	0,066
Interaction term: op. margin x PE	1,538	0,711	2,164	0,032
Op. Margin	0,547	0,392	1,395	0,165
Interaction term: underpricing x PE	0,001	0,015	0,059	0,953
Underpricing	(0,001)	0,010	(0,116)	0,908

Dependent Variable: BHAR

The R-square for the long-run regression with interaction effects is featured in table 18 and can be interpreted as a 14.9 percent coefficient of determination.

Table 18. *Model summary for the BHAR regression with interaction effects, of 141 IPOs completed in Europe during 1999-2010 with issue size above $160m, including year 2000*

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
0,386	0,149	0,077	0,729	0,149	2,056	11	129	0,028

Dependent variable: BHAR

5.3 Results for the Underpricing Effect on Long-Run Performance

Underpricing as an explaining variable for long-run stock performance is tested in the multiple regressions. The results, presented in table 13 and 15 above, shows that the underpricing is not a statistically significant variable in the sample used. Thus, the hypothesis regarding the underpricing's effect on long-run stock performance and Tinic's[135] over-optimism hypothesis can be rejected. Table 17 shows that the results are the same independent of the firm being PE or non-PE backed. Hence, the last two hypotheses stating that underpricing affects the long-run stock performance for PE and non-PE backed firms can be rejected.

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[135] Tinic, S.M.,1986, *"Atonomy of Initial Public Offerings of Common Stock"*

6   CONCLUSIONS

The analysis in this thesis shows that underpricing exists on the European market during 1999-2010. Hot issue market is a statistically significant explaining variable for underpricing and during hot issue periods, the underpricing rises. Consequently, it is more beneficial for a short-term investor to buy shares prior to an IPO during years of hot issue markets, compared to years of cold issue markets. From a company perspective, a hot issue market means an enhanced demand for the stocks, which drives up the underpricing. If floating the company during a cold issue period, the underpricing is generally lower. However, the company might not be able to maximize the stock price prior to the IPO since the demand is lower than in hot issue markets, i.e. there is a tradeoff between completing an IPO in a cold and hot issue market.

The results show statistically significance for PE backed firms experiencing a lower underpricing than non-PE backed companies. However, this difference is not statistically significant in the smaller sample, including 170 observations, used in the two multiple regression. Since the results from the small and the full sample differ, this might indicate that the small sample is not totally representative and that the difference is weak.

For a short-term investor, the lower underpricing for PE backed firms implies that a non-PE backed firm would be better to invest in prior to the floating. This enables the investor to gain from the rise in stock price. The fact that PE firms experience lower underpricing indicates that non-PE backed firms can profit from understanding the mechanism behind the difference in underpricing. Maturity, earnings management and company size are variables explaining underpricing for PE firms. The non-PE backed firms should further analyze these variables in order to fully comprehend the difference in underpricing. Additionally, the PE backed firms should look closely at these firm characteristics since they will affect the underpricing size. Through a low degree of maturity, low earnings management and small company size, underpricing will be minimized. For non-PE backed IPOs, earnings management is the only statistically significant variable explaining the underpricing.

The average three year stock performance is superior, for both PE and non-PE backed IPOs, to the corresponding stock index. The average indicates that it would be more favorable to invest in an IPO and hold it for three years, than holding an older company that performs equal to the

index, for the same period. However, the results are not statistically significant and no certain conclusions can therefore be drawn.

In the sample used, there is no difference in long-run stock performance between PE and non-PE backed firms. Hence, from an investor's point of view it would not matter which type of firm to invest in if having a three year buy and hold strategy. However, different variables explain the long-run stock performance for PE and non-PE backed companies. Operating margin affects the long-run stock performance for PE backed IPOs, while company size explains the long-run performance for non-PE backed firms. Thus, an investor would prefer to invest in a PE-backed firm with high operating margin, comparatively to invest in a PE-backed firm with lower operating margin. The operating margin is thereby the most important value driver to base this kind of investment decision on. This characteristic is also important for PE-backed firms to improve and maintain, in order to achieve a high the stock price and to satisfy the owners. Conversely, an investor of a non-PE backed firm should choose to invest in a large company, in order to maximize the three year buy and hold return.

The results show that the underpricing size does not affect long-run stock performance. The underpricing is therefore not a factor that should influence an investor's choice of stock for a three year buy and hold strategy. In addition, the underpricing should not be a reason when deciding on how long the holding period should be. A low underpricing does not necessarily result in a higher long-run stock development.

7 SUGGESTIONS FOR FURTHER RESEARCH

Since the difference in underpricing between PE and non-PE backed firms is statistically significant in the larger sample, containing 695 observations, it would be interesting to repeat the long-run analyses on a larger sample than used in this thesis, in order to see if any difference in BHAR between PE and non-PE backed firms exists. It would also be relevant to further analyze what variables that can explain the difference in underpricing.

The proportion of PE ownership subsequent to an IPO was not included as a variable in this thesis due to time constraints and difficulties finding data, but it would be interesting to study what impact this has on the long-run stock performance. In addition, including an adequate measure of manager's reputation would improve the underpricing regressions.

It would also be interesting to look at long-run operating performance, instead of long-run stock performance. A longer time frame than three year would possibly generate a different result and would therefore be relevant to study.

8 SOURCE CRITICISM

The main criticism against the sources and theories used as a basis for this thesis are the publication dates. Several of the published articles are written during the late 20th century and might therefore not be up to date. Many of the previous studies, presented in the theory chapter, are completed in geographical areas other than Europe. Therefore, some of the conclusions might not be suitable to apply on this thesis.

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10 APPENDIX

Appendix 1 – Sample description, number of observations

Sample	PE backed	non-PE backed	Total
Base sample	132	563	695
Underpricing ind. year 2000	80	90	170
Underpricing exd. year 2000	74	85	159
Long-run Performance ind. year 2000	69	72	141
Long-run Performance exd. year 2000	66	65	131

Appendix 2 – Number of IPOs in each sector

Sector	No of IPOs	Percent
Finance	21	10,77%
Healthcare	16	8,21%
Transportation	15	7,69%
Telecommunications	12	6,15%
Computers & Electronics	11	5,64%
Consumer Products	11	5,64%
Retail	11	5,64%
Real Estate/Property	10	5,13%
Oil & Gas	9	4,62%
Utility & Energy	9	4,62%
Construction/Building	8	4,10%
Leisure & Recreation	8	4,10%
Machinery	8	4,10%
Professional Services	7	3,59%
Auto/Truck	6	3,08%
Mining	6	3,08%
Food & Beverage	5	2,56%
Metal & Steel	5	2,56%
Chemicals	3	1,54%
Publishing	3	1,54%
Forestry & Paper	2	1,03%
Holding Companies	2	1,03%
Insurance	2	1,03%
Aerospace	1	0,51%
Agribusiness	1	0,51%
Defense	1	0,51%
Dining & Lodging	1	0,51%
Textile	1	0,51%

Appendix 3 – Number of IPOs in each country

Country	No of IPOs	Percent
United Kingdom	44	22,56%
Germany	24	12,31%
Italy	24	12,31%
Spain	15	7,69%
Switzerland	13	6,67%
France	12	6,15%
Sweden	9	4,62%
Norway	8	4,10%
Greece	6	3,08%
Netherlands	6	3,08%
Russian Federation	5	2,56%
Turkey	5	2,56%
Belgium	4	2,05%
Austria	3	1,54%
Poland	3	1,54%
Czech Republic	2	1,03%
Denmark	2	1,03%
Finland	2	1,03%
Ireland	2	1,03%
Estonia	1	0,51%
Gibraltar	1	0,51%
Hungary	1	0,51%
Portugal	1	0,51%
Slovenia	1	0,51%
Ukraine	1	0,51%

Appendix 4 – Sector coefficients underpricing, including year 2000

Sector	Beta	t	Sig.
Aerospace	(0,035)	(0,455)	0,650
Agribusiness	(0,094)	(1,232)	0,220
Auto/Truck	(0,020)	(0,240)	0,811
Chemicals	0,059	0,750	0,454
Computers & Electronics	0,084	0,958	0,339
Construction/Building	0,027	0,319	0,750
Consumer Products	(0,084)	(0,938)	0,349
Defense	0,016	0,209	0,835
Dining & Lodging	0,005	0,066	0,947
Food & Beverage	(0,066)	(0,809)	0,419
Forestry & Paper	0,049	0,635	0,527
Healthcare	0,099	1,050	0,295
Holding Companies	0,003	0,044	0,965
Insurance	0,000	0,003	0,998
Leisure & Recreation	0,080	0,929	0,354
Machinery	0,112	1,313	0,191
Metal & Steel	(0,008)	(0,093)	0,926
Mining	(0,025)	(0,299)	0,765
Oil & Gas	0,069	0,792	0,429
Professional Services	0,017	0,200	0,842
Publishing	(0,097)	(1,233)	0,219
Real Estate/Property	(0,057)	(0,647)	0,519
Retail	0,019	0,209	0,835
Telecommunications	(0,067)	(0,763)	0,447
Textile	(0,073)	(0,960)	0,338
Transportation	0,021	0,221	0,825
Utility & Energy	(0,007)	(0,079)	0,937

Appendix 5 – Sector coefficients underpricing, excluding year 2000

Sector	Beta	t	Sig.
Aerospace	(0,037)	(0,468)	0,640
Auto/Truck	(0,021)	(0,247)	0,806
Chemicals	0,063	0,771	0,442
Computers & Electronics	0,082	0,925	0,357
Construction/Building	0,029	0,329	0,743
Consumer Products	(0,027)	(0,296)	0,767
Defense	0,017	0,215	0,830
Dining & Lodging	0,005	0,068	0,946
Food & Beverage	(0,070)	(0,833)	0,406
Forestry & Paper	0,052	0,653	0,515
Healthcare	0,139	1,442	0,151
Holding Companies	0,004	0,046	0,964
Insurance	(0,016)	(0,202)	0,841
Leisure & Recreation	0,085	0,956	0,341
Machinery	0,120	1,351	0,179
Metal & Steel	(0,008)	(0,096)	0,924
Mining	(0,026)	(0,308)	0,759
Oil & Gas	0,073	0,815	0,416
Professional Services	0,018	0,205	0,837
Publishing	(0,104)	(1,269)	0,206
Real Estate/Property	(0,051)	(0,562)	0,575
Retail	(0,025)	(0,277)	0,782
Telecommunications	(0,030)	(0,343)	0,732
Textile	(0,078)	(0,988)	0,325
Transportation	0,010	0,101	0,920
Utility & Energy	(0,007)	(0,082)	0,935

Dependent variable: Underpricing

Statistically significant sectors in bold

Appendix 6 – Country coefficients underpricing, including year 2000

Country	Beta	t	Sig.
Austria	0,003	0,035	0,972
Belgium	0,024	0,311	0,756
Czech Republic	0,017	0,232	0,817
Denmark	(0,076)	(1,019)	0,310
Estonia	(0,034)	(0,464)	0,644
Finland	0,046	0,614	0,540
France	(0,060)	(0,703)	0,483
Germany	(0,064)	(0,680)	0,497
Gibraltar	0,055	0,747	0,456
Greece	(0,048)	(0,605)	0,546
Hungary	(0,037)	(0,511)	0,610
Ireland	0,033	0,443	0,658
Netherlands	(0,039)	(0,503)	0,616
Norway	(0,015)	(0,179)	0,858
Poland	0,111	1,459	0,146
Portugal	(0,008)	(0,109)	0,914
Russian Federation	(0,083)	(1,061)	0,290
Slovenia	**0,265**	**3,621**	**0,000**
Spain	0,091	1,029	0,305
Sweden	(0,039)	(0,467)	0,641
Switzerland	0,004	0,048	0,962
Turkey	0,091	1,168	0,244
Ukraine	0,023	0,319	0,750
United Kingdom	0,046	0,431	0,667

Dependent variable: Underpricing
Statistically significant variables in bold

Appendix 7 – Country coefficients underpricing, excluding year 2000

Country	Beta	t	sig.
Austria	0,014	0,181	0,857
Belgium	0,038	0,489	0,625
Czech Republic	0,028	0,363	0,717
Denmark	0,014	0,187	0,852
Estonia	(0,030)	(0,399)	0,690
Finland	0,058	0,763	0,447
France	(0,091)	(1,066)	0,288
Germany	(0,039)	(0,409)	0,683
Gibraltar	0,065	0,870	0,386
Greece	(0,035)	(0,438)	0,662
Hungary	(0,033)	(0,448)	0,654
Ireland	0,044	0,584	0,560
Netherlands	0,074	0,942	0,348
Norway	0,046	0,566	0,572
Poland	**0,129**	**1,672**	**0,097**
Portugal	(0,002)	(0,027)	0,978
Russian	(0,074)	(0,929)	0,354
Slovenia	**0,289**	**3,883**	**0,000**
Spain	0,120	1,337	0,183
Sweden	(0,022)	(0,262)	0,794
Switzerland	0,091	1,084	0,280
Turkey	**0,133**	**1,694**	**0,092**
Ukraine	0,031	0,422	0,674
United Kingdom	0,079	0,736	0,463

Dependent variable: Underpricing

Statistically significant variables in bold

Appendix 8 – Correlation variables underpricing

	Underpricing	Maturity	Leverage Ratio	Earnings Mgmt	Issue Size	Dummy: 1=PE	Dummy: 0=Hot issue	Company Size	Dummy: 1=Slovenia
Underpricing	1,000	(0,016)	(0,129)	(0,013)	0,071	0,096	(0,148)	0,076	0,207
Maturity	(0,016)	1,000	(0,011)	0,296	(0,007)	0,019	(0,034)	(0,079)	(0,025)
Leverage Ratio	(0,129)	(0,011)	1,000	(0,178)	(0,038)	0,134	0,192	0,033	(0,017)
Earnings Mgmt	(0,013)	0,296	(0,178)	1,000	0,101	(0,177)	0,012	0,049	(0,048)
Issue size	0,071	(0,007)	(0,038)	0,101	1,000	(0,006)	(0,014)	0,136	(0,071)
Dummy: 1=PE	0,096	0,019	0,134	(0,177)	(0,006)	1,000	0,079	0,036	0,083
Dummy: 0=Hot issue	(0,148)	(0,034)	0,192	0,012	(0,014)	0,079	1,000	0,107	(0,036)
Company Size	0,076	(0,079)	0,033	0,049	0,136	0,036	0,107	1,000	0,099
Dummy: 1=Slovenia	0,207	(0,025)	(0,017)	(0,048)	(0,071)	0,083	(0,036)	0,099	1,000

Appendix 9 – Sector coefficients long-run, including year 2000

Sector	Beta	t	Sig.
Aerospace	(0,052)	(0,672)	0,503
Agribusiness	0,030	0,384	0,701
Auto/Truck	(0,075)	(0,879)	0,381
Chemicals	(0,062)	(0,775)	0,439
Computers & Electronics	(0,042)	(0,469)	0,640
Construction/Building	0,065	0,734	0,464
Consumer Products	(0,040)	(0,441)	0,660
Defense	(0,036)	(0,465)	0,643
Dining & Lodging	(0,047)	(0,604)	0,547
Food & Beverage	0,003	0,037	0,971
Forestry & Paper	0,030	0,379	0,705
Healthcare	0,037	0,382	0,703
Holding Companies	0,108	1,366	0,174
Insurance	0,004	0,048	0,962
Leisure & Recreation	**0,177**	**2,076**	**0,040**
Machinery	0,032	0,368	0,713
Metal & Steel	(0,003)	(0,030)	0,976
Mining	(0,011)	(0,135)	0,893
Oil & Gas	0,027	0,309	0,758
Professional Services	0,076	0,874	0,384
Publishing	(0,069)	(0,852)	0,396
Real Estate/Property	(0,047)	(0,521)	0,603
Retail	0,050	0,557	0,578
Telecommunications	0,082	0,910	0,364
Textile	(0,048)	(0,618)	0,537
Transportation	(0,025)	(0,259)	0,796
Utility & Energy	0,120	1,348	0,180

Dependent variable: BHAR
Statistically significant variables in bold

Appendix 10 – Sector coefficients long- run, excluding year 2000

Sector	Beta	t	Sig.
Aerospace	(0,056)	(0,730)	0,466
Auto/Truck	(0,126)	(1,482)	0,141
Chemicals	0,037	0,465	0,643
Computers & Electronics	0,043	0,487	0,627
Construction/Building	0,058	0,670	0,504
Consumer Products	(0,028)	(0,311)	0,756
Defense	0,001	0,008	0,993
Dining & Lodging	**0,196**	**2,543**	**0,012**
Food & Beverage	0,011	0,128	0,899
Forestry & Paper	(0,021)	(0,272)	0,786
Healthcare	(0,017)	(0,173)	0,863
Holding Companies	(0,024)	(0,302)	0,763
Insurance	0,002	0,023	0,982
Leisure & Recreation	**0,234**	**2,757**	**0,007**
Machinery	0,012	0,141	0,888
Metal & Steel	(0,010)	(0,126)	0,900
Mining	**0,179**	**2,143**	**0,034**
Oil & Gas	0,110	1,258	0,211
Professional Services	0,029	0,342	0,733
Publishing	(0,028)	(0,347)	0,729
Real Estate/Property	(0,101)	(1,153)	0,251
Retail	(0,007)	(0,078)	0,938
Telecommunications	(0,036)	(0,414)	0,679
Textile	(0,052)	(0,676)	0,500
Transportation	(0,099)	(1,050)	0,295
Utility & Energy	0,087	0,979	0,329

Dependent variable: BHAR
Statistically significant variables in bold

Appendix 11 – Country coefficients long-run, including year 2000

Country	Beta	t	Sig.
Austria	0,014	0,179	0,858
Belgium	(0,121)	(1,582)	0,116
Czech Republic	(0,051)	(0,694)	0,489
Denmark	(0,067)	(0,914)	0,362
Estonia	(0,118)	(1,617)	0,108
Finland	0,002	0,027	0,979
France	(0,009)	(0,110)	0,913
Germany	**(0,260)**	**(2,769)**	**0,006**
Greece	(0,017)	(0,220)	0,826
Hungary	(0,072)	(0,980)	0,328
Ireland	(0,014)	(0,190)	0,849
Netherlands	(0,121)	(1,530)	0,128
Norway	0,073	0,915	0,361
Poland	(0,079)	(1,063)	0,290
Portugal	0,114	1,566	0,119
Russian Federation	0,073	0,955	0,341
Slovenia	(0,069)	(0,942)	0,348
Spain	**(0,155)**	**(1,767)**	**0,079**
Sweden	(0,048)	(0,584)	0,560
Switzerland	(0,071)	(0,827)	0,409
Turkey	(0,124)	(1,589)	0,114
Ukraine	0,110	1,502	0,135
United Kingdom	0,021	0,205	0,838

Dependent variable: BHAR

Statistically significant variables in bold

Appendix 12 – Country coefficients long- run, excluding year 2000

Country	Beta	t	Sig.
Austria	0,030	0,372	0,711
Belgium	(0,121)	(1,457)	0,147
Czech Republic	(0,050)	(0,639)	0,524
Estonia	(0,118)	(1,505)	0,135
Finland	0,003	0,043	0,966
France	0,000	0,005	0,996
Germany	**(0,209)**	**(2,088)**	**0,039**
Greece	(0,015)	(0,178)	0,859
Hungary	(0,071)	(0,907)	0,366
Ireland	(0,013)	(0,160)	0,873
Netherlands	(0,015)	(0,177)	0,860
Norway	0,015	0,174	0,862
Poland	(0,078)	(0,979)	0,329
Portugal	0,117	1,484	0,140
Russian Federation	0,076	0,920	0,359
Slovenia	(0,061)	(0,774)	0,440
Spain	(0,119)	(1,268)	0,207
Sweden	(0,045)	(0,512)	0,610
Switzerland	(0,025)	(0,279)	0,781
Turkey	(0,124)	(1,476)	0,142
Ukraine	0,119	1,515	0,132
United Kingdom	(0,014)	(0,121)	0,904

Dependent variable: BHAR
Statistically significant variables in bold

Appendix 13 – Correlation variables long-run

	BHAR	Leverage Ratio	Sales Growth	Company Size	Op. Margin	Dummy: Hot issue = 0	Dummy: PE = 1	Underpricing	Dummy: Leisure & recreation	Dummy: Germany=1	Dummy: Spain=1
BHAR	1,000	(0,014)	(0,078)	0,144	0,259	0,433	0,019	(0,021)	0,313	(0,149)	(0,108)
Leverage Ratio	(0,014)	1,000	(0,051)	0,061	0,208	(0,008)	0,052	(0,060)	(0,030)	(0,022)	0,192
Sales Growth	(0,078)	(0,051)	1,000	0,168	(0,065)	(0,097)	(0,019)	0,039	0,009	(0,019)	(0,047)
Company Size	0,144	0,061	0,168	1,000	0,054	0,248	(0,184)	(0,077)	(0,067)	0,049	(0,077)
Op. Margin	0,259	0,208	(0,065)	0,054	1,000	0,076	(0,001)	(0,138)	0,130	(0,054)	0,025
Dummy: Hot issue = 0	0,433	(0,008)	(0,097)	0,248	0,076	1,000	(0,018)	(0,155)	0,116	(0,110)	(0,039)
Dummy: PE = 1	0,019	0,052	(0,019)	(0,184)	(0,001)	(0,018)	1,000	0,069	0,011	0,143	(0,133)
Underpricing %	(0,021)	(0,060)	0,039	(0,077)	(0,138)	(0,155)	0,069	1,000	(0,024)	(0,061)	0,126
Dummy: Leisure & recreation = 1	0,313	(0,030)	0,009	(0,067)	0,130	0,116	0,011	(0,024)	1,000	(0,054)	(0,052)
Dummy: Germany=1	(0,149)	(0,022)	(0,019)	0,049	(0,054)	(0,110)	0,143	(0,061)	(0,054)	1,000	(0,097)
Dummy: Spain=1	(0,108)	0,192	(0,047)	(0,077)	0,025	(0,039)	(0,133)	0,126	(0,052)	(0,097)	1,000

Appendix 14 – Heteroskedasticity: White's test

Underpricing

n x r-square	15,980	White's statistic
p =	8	

significant on the one percent level

BHAR

n x r-square	45,966	White's statistic
p =	10	

significant on the one percent level

Appendix 15 – Autocorrelation: Durbin-Watson, underpricing

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0,168	0,028	(0,001)	11,315	1,965

Appendix 16 – Autocorrelation: Durbin-Watson, long-run

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0,315	0,099	0,063	0,755	1,786

Appendix 17 – Normality

Underpricing variables

BHAR variables

Underpricing

Skewness	3,756
Kurtosis	28,327

BHAR

Skewness	0,735
Kurtosis	0,927

Maturity

Skewness	4,600
Kurtosis	29,297

Leverage Ratio

Skewness	1,467
Kurtosis	24,693

Leverage Ratio

Skewness	4,091
Kurtosis	21,369

Sales Growth

Skewness	1,455
Kurtosis	6,269

Earnings Management

Skewness	0,688
Kurtosis	2,423

Company Size

Skewness	0,624
Kurtosis	1,912

Issue Size

Skewness	0,878
Kurtosis	0,234

Op. Margin

Skewness	(1,494)
Kurtosis	10,291

Company Size

Skewness	0,179
Kurtosis	0,876

Underpricing

Skewness	0,721
Kurtosis	0,232