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The Aftermarket Performance of Swedish Initial Public Offerings

A study about short- and long-term performance and underpricing of Initial Public Offerings on the Swedish stock markets

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The authors declare that they are the sole authors of this thesis and that they have not used any sources other than those listed in the bibliography and identified as references. They further declare that they have not submitted this thesis at any other institution to obtain a degree.

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Abstract

This thesis examines the performance of IPO firms in the Swedish markets during their first three years of trading to investigate what effects different factors have on the short- and long-term performance. The level of underpricing on Swedish IPOs are also investigated to detect any abnormalities from previous studies on larger markets in the US and Europe. A total of 175 IPO firms included in the sample in the period between 2000 and 2015. The method used to calculate the aftermarket performance is the buy-and-hold abnormal returns method in an event-time portfolio approach. These returns are used as a dependent variable in a multivariable linear regression analysis. The main findings from this study are that IPO firms in the Swedish markets underperform the OMX market index one month and three years after the offering. Conversely, IPO firms in the Swedish markets overperform after 18 months compared to the OMX market index. The results show that Swedish IPOs are on average underpriced and that underpricing has a significant effect on short-term performance. Firm age, offer size and the technology industry also have a significant effect on the first month's performance of IPO firms; however, there is little support for these factors to affect the long-term performance.

Keywords: IPO, Underpricing, BHAR, aftermarket performance

Sammanfattning

I denna studie kommer utvecklingen av företag som börsintroducerats via en Initial Public Offering (IPO) på svenska marknader följas under tre år. Faktorer som kan påverka utvecklingen kommer att analyseras både på kort och lång sikt. Nivån av underprissättning på svenska IPO kommer också att undersökas för att se om resultaten skiljer sig från tidigare studier på stora marknader i USA och Europa. Totalt har 175 IPO företag analyserats i studien inom tidsramen 2000 till 2015. Metoden som använts för att beräkna utvecklingen på företagen är buy-and-hold abnormal returns (BHAR) och applicerats genom ett event-time tillvägagångssätt. Dessa avkastningar som räknas ut som BHAR har använts som den beroende variabeln i en multipel linjär regression. De huvudsakliga resultaten från denna studie är att svenska IPO företag underpresterar mot OMX marknadsindex en månad och tre år efter börsintroduktionen. Motsatta resultat upptäcktes efter 18 månader, då svenska IPO företag överpresterar mot OMX marknadsindex. Resultaten visar att svenska IPO företag är underprissatta i genomsnitt och att underprissättningen har en signifikant effekt på utvecklingen under kort tid. Andra faktorer som åldern på företaget, storleken på börsintroduktionens erbjudande och teknikindustrin har också en signifikant effekt på första månadens utveckling för svenska IPO företag. Det är dock inget stöd för att dessa faktorer ska påverka utvecklingen under en längre tid.

Nyckelord: börsintroducering, underprissättning, BHAR, marknadsutveckling

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1. Introduction

Firms have several reasons to go public; however, going public is a choice and therefore, not a stage that every firm reaches (Pagano, et al., 1998). An Initial Public Offering (IPO) is often made by the issuing firm to raise equity capital (Ritter & Welch, 2002). Usually, firms go public not to finance future investments, but instead to rebalance after previous investments and growth (Pagano, et al., 1998).

When an IPO is performed, it is often subject to underpricing. The underpricing phenomenon is defined as when a stock generates a higher closing price the first day than the initial offer price (Berk & DeMarzo, 2014, p. 820). Underpricing in IPOs has been a topic for several years, with one of the first documenters of underpricing being Ibbotson (1975); however, the reasons behind it are still being investigated, and there are still many theories regarding underpricing in IPOs (Rock, 1986). The extent of underpricing is cyclical, which makes the average initial return much higher during different periods (Ritter, 1991). It is essential to consider these "hot issue" markets (Ibbotson & Jaffe, 1975), along with bubble periods (Ritter & Welch, 2002) such as the financial crisis in 2008 (Li, et al., 2018) or the dot-com bubble (Wilhelm & Ljungqvist, 2003), when studying both the short- and long-term performance of IPOs.

Some studies show that IPO firms do not follow the same development long-term as the stock market index on the US market (Ritter, 1991; Loughran & Ritter, 1995). These studies suggest that an IPO firm's long-term performance is worse than their benchmarks. Long-term effects on total return on IPO firms have also been studied in China (Chan, et al., 2004) and large European markets (Gandolfi, et al., 2018), with both mirroring the underperformance found in the US market. The reasons for this underperformance are not clear, and academics provide different explanations, with some being information asymmetry, firm maturity and market condition (Carter et al., 1998; Ritter, 1991; Brav & Gompers, 1997). The primary area of analysis on the long-term performance has been the stock return of three to five years (Ibbotson, 1975; Stern & Bornstein, 1985; Ritter, 1991; Loughran & Ritter, 1995). There are studies made on the level of underpricing on Swedish IPOs (Rydqvist, 1997); however, as far as we are aware, studies are absent regarding the long-term performance of the total return on Swedish IPO firms. In line with other research done on the Swedish markets, the design and liquidity of Nasdaq OMX forms an attractive index for investors (Metghalchi, et al., 2008). Therefore, this study will be conducted only on IPO firms in the Swedish markets: Nasdaq OMX Nordic Stockholm, Nasdaq First North Stockholm, Spotlight Stock Market and Nordic Growth Market. This could provide different results than previous studies in much larger markets, because of different efficiencies that could be apparent in the Swedish stock markets (Metghalchi, et al., 2008).

The main research topic for this study is the performance of IPO firms, both short-term and long-term. It is also of interest to investigate what factors influence the performance of IPO firms. Underpricing, industry, firm age, offer size and the volume of IPOs issued the same year are investigated to see if they have a significant effect on the long-term performance of an IPO firm. These factors have also been discussed to have a relationship with the amount of underpricing of an IPO and are also examined if they influence the short-term performance.

The sample period for the IPO firms is from the start of 2000 to the end of 2015. In total, 175 IPO firms that have been listed during this period are examined. In line with the other studies made (Ibbotson, 1975; Stern & Bornstein, 1985; Ritter, 1991; Loughran & Ritter, 1995), a time window of three years is used to measure the long-term performance of IPO firms, where the performance is measured after 18 months and after 36 months. The short-term performance in this study is measured with a time window of 21 trading days, as documented by Miller and Reilly (1987). This study has not been made previously on Swedish stock markets, which makes it an exciting field to study because of the value it might add to the investors. The long-term return can also be attractive for competitors, in the same market, that are considering an acquisition in the future. To conduct this study, a multivariable linear regression analysis is applied. The dependent variable used is the buy-and-hold abnormal return. The explanatory variables are the factors that were mentioned before: underpricing, industry, firm age, offer size and the volume of IPOs. The research question that is answered through this study is:

How do Swedish IPO firms perform on a short- and long-term basis?

2. Literature review

In this chapter, previous studies and literature regarding IPOs and the underpricing phenomenon are summarised. Initially, literature about IPOs and motives for going public is presented and discussed. After that, the underpricing phenomenon, together with previous research and theories about IPO underpricing, are demonstrated. The long-term underperformance of IPO firms and the main theories behind it is also be discussed. Factors that have a strong relationship with the long-term underperformance of IPO firms, which are researched later in the study, are demonstrated and discussed. Finally, with these factors, five different hypotheses are created and demonstrated.

Initial Public Offering

The act of a company transforming from having private ownership to becoming a publicly traded firm is called *Initial Public Offering* (IPO) (Berk & DeMarzo, 2014, p. 812). In most cases, firms choose to go public not to finance future investments, but instead to rebalance after previous investments and growth (Pagano, et al., 1998). All private companies do not go public and the action is, therefore, not a stage that every company reaches but instead a choice (Pagano, et al., 1998). To add to this definition, Ritter and Welch (2002) argue that the firms issuing an IPO, establish a public market where the founders and other stockholders can finance in the future from investments. Moreover, there are also nonfinancial reasons for a firm going public. Although these reasons, such as increasing publicity, only play a minor role for most firms (Ritter & Welch, 2002). When firms are issuing an IPO, there are three stages it can evolve into (Jain & Kini, 1999). It can either survive as an independent firm, fail completely or get acquired. While focusing on these three stages, Jain and Kini (1999) establish that high risk (standard deviation of the after-market returns) lead to firms having a smaller chance of survival as well as a decrease in the probability of acquisition. For a large firm, there is a notably bigger chance of remaining independent relative to the other two stages (Jain & Kini, 1999).

Underpricing

When investigating the pricing strategies of IPOs, Ibbotson (1975) describes the new adaptation of underpricing. The phenomenon of underpricing is defined as a stock which has a higher first-day closing price than the initial offer price (Berk & DeMarzo, 2014, p. 820). When a firm is issuing an IPO, they must hire an investment banker to take the firm public (Beatty & Ritter, 1986). According to Beatty and Ritter (1986), there is a relationship between expected underpricing of an IPO and the uncertainty regarding its value.

Why firms, and investment bankers, choose to underprice an IPO, has been heavily discussed by scholars. Loughran and Ritter (2002) describe underpricing as an act where the issuers leave money on the table. The money left on the table is described as the growth of the stock in the first day traded, multiplied with the number of shares issued (Loughran & Ritter, 2002). Furthermore, Loughran and Ritter (2002) conclude that firms leaving vast amounts of money on the table do not get upset as they simultaneously discover they are wealthier than they anticipated. Although underpricing has had an impact on IPOs throughout the years, the impact has changed over time (Loughran & Ritter, 2004). The explanation of the incentives to use underpricing while issuing an IPO is threefold. According to Loughran and Ritter (2004), the explanation can be stated as changing risk composition, realignment of incentives and change of the issuer's objective function. A hypothesis has been created for the level of underpricing to see how it affects the abnormal returns both short- and long-term.

Hypothesis 1:
The level of underpricing on an IPO has a positive relationship with short-term (1 month)/long-term (18 months and 36 months) abnormal returns.

Asymmetric information

Many theories created surrounding underpricing of IPOs are based on asymmetric information (Loughran & Ritter, 2004). Asymmetric information is the phenomenon where one agent, often managers, have superior information over another, often investors (Berk & DeMarzo, 2014, p. 564). Rock (1986) argues that information asymmetry in IPOs can occur between the issuing firm, investors and underwriters, where one often is said to be more informed about the actual values of the IPO. Baron (1982) analyses the asymmetric information between an issuer of new securities and an investment banker. In his model, issuers would delegate the pricing decision to underwriters, even though the issuing firm often is more informed about its correct value than the underwriters (Baron, 1982). Benveniste and Spindt (1989) argue that investors must be rewarded with more underpricing on deals with a high demand to reveal their demand to an underwriter. Additionally, they predict that private information must be taken into consideration to adjust the offer price; however, public information should not be considered (Benveniste & Spindt, 1989). In accordance with this study, Loughran and Ritter (2004) show empirical evidence that first-day returns on IPOs are predictable based on the public information readily available. This, in turn, leads to a theory of "hot issue" markets (Loughran & Ritter, 2004). A considerable number of studies suggest that asymmetric information affects the aftermarket performance for an IPO firm and argues that it is an essential factor in the long-term underperformance for IPO firms (Brav & Gompers, 1997; Teoh et al., 1998; Ritter, 1991).

A problem that arises from asymmetric information is the winner's curse. As described by Thaler (1988), winner's curse is the phenomenon when an actor overpays due to several different reasons, most often limited information (Thaler, 1988). When underpricing an IPO, it leads to a more lucrative share that both informed and uninformed investors would be interested in buying (Rock, 1986). According to Ritter (1987), the winner's curse model results in that underpricing will increase with uncertainty. In an early model of the winner's curse, Rock (1986) divided potential investors into two subsets: informed and uninformed investors. The two groups have asymmetric information relative to each other and will therefore value investment opportunities differently. The more informed group would only subscribe to new undervalued issues, while the uninformed group would instead, on average, participate regardless of the valuation (Rock, 1986). If the shares are underpriced following the issue, it will result in both informed and uninformed investors trading in the aftermarket (Ritter, 1984). According to Ritter (1984), this would lead to, a higher than usual chance, that the share will trade at a discount. Furthermore, Levis (1990) argues that an attempt to avoid the winner's curse problem by judicious selection is unlikely to be successful if you only rely entirely on publicly available information. He also states that, because of the winner's curse, it is difficult to get an excess return on a good IPO (Levis, 1990).

Signals are described by Spence (1973) as actions or attributes that contribute information about unobservable characteristics at the senders of the signals. One of the first mentions of signalling theory within the process of IPOs is made by Leland and Pyle (1977). The article mentions that a signal is essential for the market when going public; otherwise, asymmetric information will result in adverse selection in the IPO market (Leland & Pyle, 1977). Signalling is a well-discussed theory for the

underpricing of IPOs (Rock, 1986; Park & Patel, 2015). Leland and Pyle (1977) argue that a signal for IPO firms would be the issuing firm to retain part of the ownership when conducting an IPO. This is necessary to signal the firm's credibility to the public market (Leland & Pyle, 1977). Studies regarding the signalling theory agree that IPO underpricing is low when the prospectus contains less ambiguity regarding information, which in turn constructs a better signal to display the quality of the IPO firm (Park & Patel, 2015; Connelly et al., 2011). Another signalling theory involving underpricing is that underpricing of IPOs demonstrates that a firm is of higher quality (Ritter & Welch, 2002). This is described by Ibbotson (1975) as an incentive for the investors to invest in the firm and be positive towards the offering, while it also could affect the long-term performance of the IPO firm.

Hot issue markets

Over the years, it has been discussed that in some periods, IPOs have incredibly high traction and returns, which are referred to as “hot issue” markets (Ritter, 1984). According to Ritter (1984), a “hot issue” market occurs if, during a specific period, a high proportion of the IPOs issued have high risk. Consequently, if a high proportion of the IPOs have low risk, it will result in a “cold issue” market (Ritter, 1984). In his studies about the “hot issue” markets, Ritter (1984) discover that for firms with natural resources, the initial return rose from 18.3% in a “cold issue” market to 110.9% in a “hot issue” market. Through a study in the same field, Ibbotson and Jaffe (1975) discover that the series of the first month's residuals do not follow a random walk. Instead, investors could predict when a "hot issue" market is present and concentrate their purchases in those months (Ibbotson & Jaffe, 1975). During the millennial shift, or the so-called dot-com bubble period, the world, as well as the trading world, experienced a large amount of technical development. During this period, "direct share programs" showed an impact of issuers having a more significant incentive to underprice their IPO (Wilhelm & Ljungqvist, 2003). This period is a classic example of a "hot issue" market, and research done by Wilhelm and Ljungqvist (2003) shows that the average level of underpricing rose from 24.7% to 92.6% during the dot-com bubble. Research produced by Ritter and Welch (2002) explains that $66 billion were “left on the table” during the dot-com bubble. Another example of bubble periods that has happened recently is the financial crisis in 2008, lowering the number of IPOs issued and decreased the amount of underpricing substantially (Li, et al., 2018). In line with the hot issue markets, a hypothesis has been created to account for the volume of IPOs that are issued each year.

Hypothesis 2:
An IPO performed during a year with high volume of IPOs will perform worse long-term (18 months and 36 months) abnormal returns than IPOs performed in a year with low volume of IPOs.

Long-term underperformance

Long-term performance of IPO firms has been broadly investigated throughout the years (Ritter & Welch, 2002; Daily, et al., 2005). These studies find an underperformance for IPO firms when measured in the long-run, with numerous theories trying to explain this phenomenon (Ritter 1991). One of the first hypotheses about long-term underperformance of IPO firms is composed by Miller (1977). In his theory, Miller (1977) claims that the price in initial trading of an IPO is decided by the most optimistic investors. As the information increases in the future, the disparity of opinions diminishes, which makes the price of the issue adjust downwards and this makes the long-run performance of an IPO firm worse (Miller, 1977). Miller's model predicts the long-term underperformance that Ritter (1991) then provides empirical findings for, where the average holding

period return was lower for IPO firms than matching firms between 1975-1984. Ljungqvist, Nanda and Singh (2006) also contribute to Miller's theory with empirical findings, which confirm that the long-term performance of an IPO firm is negatively correlated with the disparity in opinions. Ritter (1991) also notes that underpricing and long-term performance of IPO firms are negatively related; however, Krigman, Shaw and Womack (1999) document a positive relation between underpricing and long-term performance. The model of Ljungqvist, et al. (2006) describes the relationship as only negative if it is likely that the "hot issue" market continues to exist. In line with these studies, Ritter (1991) argue that firms can find a "window of opportunity"; periods where the investors are overoptimistic about the earnings potential of newly public companies. This would mean that several IPOs happen around the same "window of opportunity" (Ritter, 1991). Loughran and Ritter (1995) add that the correction of the investors disproportionately high expectations of high earnings for new IPOs is the main reason that IPO firms perform poorly in the long-run. This over-optimism is studied by several scholars, with Teoh, Welch and Wong (1998) providing evidence that IPO firms aggressively manage their earnings before going public. These schemes could provide inflated earnings at the time of the IPO, which investors are not aware of and therefore, pay a higher price (Teoh, et al., 1998).

Many theories about long-term underperformance of IPO firms are being criticised, with the methodology used in the studies being the main problem. Fama (1998) argues that the findings instead are results of mismeasurements of significance, risk and return. Brav and Gompers (1997) discuss possible explanations of the recorded long-term underperformance of IPO firms, with small size and high risk being the main reasons why IPO firms are underperforming, and not because they are IPOs. Newer studies have been contrived with different methods suggested by critics; however, the studies still discover a general long-term underperformance of IPO firms (Gandolfi, et al., 2018).

Offer Size

The offer size of an IPO is an approximated value of the firm, calculated by multiplying the total number of shares offered and the offer price (Sahoo, 2017). In his study regarding the long-run performance of IPO firms, Ritter (1991) estimates the market value by multiplying the total number of shares and the closing market price for the share. These methods both have the same base, which can indicate a standardisation of the model. Depending on the trade result during the first day, these models' results can differ. As Ritter (1987) argues, the closing price of the first day illustrates the value of the firm according to the investors. Therefore, Ritter (1987) argues that his model may give a better estimation of the company's actual value. In more recent studies, the most common strategy to calculate offer size is via the offer price (Krishnan, et al., 2011; Sahoo & Rajib, 2010; Jia, 2017; Reber & Vencappa, 2016)

There is a positive relationship between the size of the offering and the long-term performance of the IPO firm, argued by Ritter (1991). The results from Bergström et al., (2006) also find the same positive relationship in large European markets. Beatty and Ritter (1986) describe an inverse relationship between offer size and the level of underpricing for the IPO. Further, they argue that the offer size approximates the uncertainty before the IPO is issued (Beatty & Ritter, 1986). In their study, Miller and Reilly (1987), discover that the extent of the initial return of an IPO has a high positive correlation with the ex-ante uncertainty. Other scholars argue that the relationship between the offer size and ex-ante uncertainty is small or non-existent (Booth & Chua, 1996). Booth and Chua (1996) argue that the expected relationship between offer size and uncertainty is negatively correlated, but

significant results are absent. To account for the size of the firm, a hypothesis has been created for the offer size.

Hypothesis 3:
There is a positive relationship between the offer size and short-term (1 month)/long-term (18 months and 36 months) abnormal returns.

Firm Age

A firm's age could provide insight into the observed uncertainty about IPOs since older firms are often apprehended as a lower risk investment (Carter et al., 1998; Ritter, 1984). Young firms have less information about themselves than old firms, which the investment bankers can make assessments regarding the performance of the firm (Ritter, 1991; Daily, et al., 2005). Because of this increased cost and lack of information, it could lead to investment bankers applying a greater offer price spread and thereby a lower offer price to younger IPO firms (Ritter, 1984; Daily, et al., 2005). Age of a firm and initial return has been discovered to have a negative relation because risky young issues require a higher average initial return and the age acts as a proxy for this risk (Muscarella & Vetsuypens, 1989; Ritter, 1991). Empirical evidence for firm age theory is discussed by Ljungqvist and Wilhelm (2003), where they found a firm age to have a significant relation with the underpricing of an IPO. Further, Ritter (1991) describes a positive relationship between the long-run performance of an IPO and the age of the firm. To find out if the age of a firm matters for abonormal returns, a hypothesis has been created for firm age.

Hypothesis 4:
Young firms performing an IPO have better short-term (1 month)/long-term (18 months and 36 months) abnormal returns than old firms.

Industry

The industry in which the firm serves during an IPO has been proven to have a high impact on the stock's performance, both short- and long-term (Borghesi, et al., 2015). Ritter (1991) discover that some industries, such as the financial and drug sectors, experience high initial return after an IPO, compared to matching firms. Other industries, such as the wholesale and commodities sectors, face lower, and in some cases negative, initial returns (Ritter, 1991). Based on Ritter's theories, Daily, Certo and Dalton (2005) emphasise the high level of initial returns for technological IPOs. This phenomenon may arise from Miller's (1977) theory about over-optimistic expectations of investors concerning a firm's prospects (Daily, et al., 2005). In their studies, Hsu, Reed and Rocholl (2010) analyse IPO firms impact on competitors' performance in the same industry. They discover that when an IPO is issued, competitors in the same industry face negative stock returns as a result (Hsu, et al., 2010). When instead an IPO is withdrawn, the opposite effect occurs, and the incumbent firms in the industry face positive returns (Hsu, et al., 2010). A hypothesis for the industry has been created, where the firms operating in the technological industry will be tested.

Hypothesis 5:
There is a negative relationship between short-term (1 month)/long-term (18 months and 36 months) abnormal returns and firms operating in the technological industry.

Skewness bias

Skewness bias occurs because extreme positive observations overrepresent the long-term abnormal stock returns compared to the distribution, which positively skews the results (Barber & Lyon, 1997). This positive skewness results in negative bias in the test statistics that are calculated, which contributes to an increased significance level for lower-tailed tests and a reduced influence for upper-tailed tests (Barber & Lyon, 1997). To combat the skewness bias, Lyon et al. (1999) propose a statistical method that controls for the skewness bias in t-statistic tests in long-term abnormal returns. A bootstrapped version of a skewness-adjusted t-statistics test is said to be a method that controls the skewness bias and adjusts for fragmented samples (Lyon et al., 1999).

3. Methodology

In this chapter, the data and the collection of data are presented. The methods used for this study are also discussed, and all relevant equations are presented. Lastly, the variables used in the regression are demonstrated.

3.1 Data

When collecting the IPO firms, many IPOs are deemed improper due to insufficient information or violations of set criterion and thus are excluded from the study, resulting in the total IPO sample of 175 firms. The total sample of 175 firms was all the available IPO firms that fit this study's criterion. Since the objective of the study is to investigate initial offerings, any secondary offerings are excluded from the study. A vast majority of these IPOs are from the larger Swedish markets, Nasdaq OMX Nordic Stockholm and Nasdaq First North Stockholm; however, a considerable number of IPOs are from Spotlight Stock Market and Nordic Growth Market, which still make them worth investigating. The time frame that is considered for the IPOs is all the available IPOs issued in the Swedish markets between 2000 and 2015. 2015 is the latest year to study IPOs issued because of the 36 months after the issuance that is considered. In Table 1, the total IPO sample is presented yearly together with the factors investigated; the volume of IPOs, age level, industry category and the level of underpricing. Interesting observations to make is that the number of IPOs issued each year has drastically increased recently, and there is a disparity in the level of underpricing each year. Furthermore, young firms make up a larger portion of the IPOs during the earlier years in the study; however, the sample size is relatively small.

Table 1: IPO data sample split by volume, age, industry and underpricing

		Age		*Industries*								
Year	Volume of IPOs	Young	Old	Basic Materials	Consumer Cyclicals	Consumer Non-Cyclicals	Energy	Financials	Healthcare	Industrials	Technology	Level of underpricing
2015	49	7 (4,0%)	42 (24%)	1	9	2	2	5	12	10	8	10,00%
2014	32	1 (0,6%)	31 (17,7%)	2	3	3	0	6	7	5	6	3,76%
2013	8	0 (0,0%)	8 (4,6%)	0	0	1	0	1	2	2	2	19,11%
2012	5	0 (0,0%)	5 (2,9%)	0	1	0	0	2	1	1	0	14,29%
2011	12	1 (0,6%)	11 (6,3%)	0	2	2	0	0	6	2	0	17,44%
2010	7	0 (0,0%)	7 (4,0%)	1	2	0	0	0	1	2	1	12,05%
2009	3	1 (0,6%)	2 (1,1%)	0	1	0	0	0	2	0	0	2,73%
2008	6	1 (0,6%)	5 (2,9%)	0	1	1	0	0	1	1	2	8,20%
2007	20	8 (4,6%)	12 (6,9%)	2	3	1	1	2	1	5	5	11,90%
2006	17	3 (1,7%)	14 (8,0%)	2	5	1	0	1	5	3	0	2,92%
2005	4	0 (0,0%)	4 (2,3%)	0	1	0	0	0	1	2	0	12,76%
2004	3	0 (0,0%)	3 (1,7%)	0	0	0	1	0	0	1	1	4,60%
2003	1	1 (0,6%)	0 (0,0%)	0	0	0	1	0	0	0	0	0,00%
2002	1	0 (0,0%)	1 (0,6%)	0	0	0	0	0	0	1	0	6,38%
2001	2	0 (0,0%)	2 (1,1%)	0	0	0	0	0	1	1	0	-6,31%
2000	5	2 (1,1%)	3 (1,7%)	0	2	0	0	0	1	0	2	-3,73%
All	**175**	**25 (14,3%)**	**150 (85,7%)**	**8 (5%)**	**30 (17%)**	**11 (6%)**	**5 (3%)**	**17 (10%)**	**41 (23%)**	**36 (21%)**	**27 (15%)**	**7,26%**

Most of the data collection made for this study has been through the Thomson Reuter database; Eikon. With various parameters and filters, Eikon provides a list of firms who have performed an IPO on the Swedish stock markets. The list is then complemented with a categorisation of several industries, and the issuing date for the IPO. With the individual data for each firm that the database provides, it is possible to gather the total stocks issued and the prices throughout the sample period. The offer price for the issuing shares are collected from different sources; *Swedish Tax Agency, Swedish Financial Supervisory Authority* and *Nyemissioner.se* were all used with the help of the firms' IPO prospectuses to find the offer price. The closing price of the first trading day must be collected. If the adjusted (for dividend and splits) closing price is used, it will give a false result for the level of underpricing for the

IPO. Therefore, the unadjusted closing prices are collected through data directly from the stock exchanges; Nasdaq Stockholm, Nordic Growth Market and Spotlight Stock Market. Additionally, a stock index for Swedish shares is added as a benchmark for normal return. This data is collected directly from Nasdaq Stockholm, with possibilities to calculate both short- and long-term returns during the whole sample period for the index.

All the data collected for this study is in the form of secondary data (Ghauri & Grønhaug, 2010, pp. 90-91). There is no possibility to use primary data, since all the variables examined are only available through databases. Some of the advantages of using secondary data are savings in resources (time and money) and the quality level that would not be obtained using self-collection (Saunders, et al., 2009, pp. 268-269).

3.2 Time considerations

To accurately measure the long-term performance of IPO firms, it is crucial to define the methodologies and the time horizons studied. Previous research on the performance of IPO firms studies both short- and long-term markets. Short-term performance studies on IPO firms have been performed on one month, six months and one year after the offering (Miller & Reilly, 1987; McDonald & Fisher, 1972). For this study, short-term performance is illustrated as the first month of trading. Long-term performance studies on IPO firms have been performed by other scholars, with the primary time horizons set at three-year and five-year performances (Jain & Kini, 1999; Hsu, et al., 2010; Eckbo & Norli, 2005; Ritter, 1991; Carter, et al., 1998; Loughran & Ritter, 1995). The long-term performance study conducted in this thesis is in line with Ritter (1991) and Carter, et al. (1998), where the three-year time horizon is considered, with measurements after 18 months and 36 months. The three-year performance of Swedish IPO firms is studied, with measurements on the performance monthly from the conduction of the IPO to 36 months after. The study is conducted on these IPO firms using an event-time portfolio approach.

According to Fama (1998), the most known approaches for measuring abnormal returns are event-time and calendar-time portfolios. It is significantly discussed amongst researchers about the reliability of the approaches when measuring long-run abnormal returns, with scholars taking different stances on which approach is preferable (Fama, 1998; Ritter & Welch, 2002; Lyon et al., 1999). The calendar-time portfolio approach is argued to be a less powerful approach than event-time, with the power decreasing as the holding period increases (Loughran & Ritter, 2000; Ang & Zhang, 2004). With the event-time approach, the issuance dates for the IPOs are not considered, which means that they are equally weighted in the portfolio, independent on which year the issuance happened (Fama, 1998). Calendar-time portfolio approach considers the issuance dates and groups IPOs together during specific periods (Fama, 1998). These bundling approaches require different methodologies to mediate the best results. With this information considered, this study will consist of a 36-month event-time portfolio approach together with the buy-and-hold abnormal returns methodology. Since all firms have the same event-time period, it is possible to compare all IPO firms in the study regardless of what date the issuance took place.

3.3 Buy-and-hold abnormal returns (BHAR)

When measuring the long-term performance, different methods are used to calculate abnormal returns. Barber and Lyon (1997) mention both cumulative abnormal returns (CAR) and buy-and-hold abnormal returns (BHAR), and scholars have different opinions on which method is more accurate and

favourable for measuring long-term performance (Barber & Lyon, 1997; Ritter, 1991; Fama, 1998). Both approaches measure the abnormal returns that arise when there is a difference between the return of the stock and the return of a selected benchmark for a given period (Fama, 1998). The main difference between BHAR and CAR is that the periodically returns in BHAR are exposed to a compounding effect, and the periodical returns in CAR disregards this compounding effect (Barber & Lyon, 1997). Barber and Lyon (1997) and Fama (1998) argue that BHAR generates abnormal returns that are closer to investors abnormal returns when they hold shares for a longer duration. It is discussed that both BHAR and CAR are subject to several biases; however, CARs are said to be affected by a measurement bias in the long-run (Barber & Lyon, 1997). This bias is not present when calculating with the BHAR method, which makes BHAR slightly better when measuring long-term abnormal returns (Barber & Lyon, 1997). With these statements considered, BHAR methodology is used in this study to calculate the abnormal returns. The methodology is followed, as explained by Barber & Lyon (1997). In order to calculate the abnormal returns, the raw returns have to be calculated from the data collected earlier; this is shown in Equation 1.

$$R_{it} = \frac{\left(P_{it} - P_{i(t-1)}\right)}{P_{i(t-1)}} \tag{1}$$

R_{it} is defined as the simple return on a sample firm i at a time t, whereas P_{it} is the price for a sample firm i at a time t. This is used as a safety check to see if the raw returns are reasonable, before using the returns to calculate BHAR.

$$BHAR_{i\tau} = \prod_{t=1}^{\tau}[1 + R_{it}] - \prod_{t=1}^{\tau}[1 + E(R_{it})] \tag{2}$$

The formula in Equation 2 describes the calculation of BHAR with the event-time approach. R_{it} is the average monthly return for an IPO firm and τ is the studied time horizon in months; in this case from the first month after the issuance to 36 months later. When calculating BHAR, daily closing prices for the share are obtained to calculate the average monthly return. A suitable benchmark for the sample of IPO firms is important to find. Benchmarks that have comparable risks to IPOs are of utmost importance to determine the expected returns (Bergström, et al., 2006). Certain prior long-term IPO performance studies use broad market indexes as benchmarks (Eckbo & Norli, 2005; Carter et al., 1998). In Equation 2, $E(R_{it})$ is the benchmark portfolio, which in this study is the average monthly return for the market index. The market index chosen is a total return index, which reinvests all dividends when they are distributed. The total return index that is chosen for this study as a benchmark portfolio is Nasdaq OMX Stockholm PI, which is a good representation for many IPOs issued on the Swedish market.

A statistical test must be conducted to validate the BHAR that is calculated. To measure the performance of IPO firms, a Student's t-test is used. The null hypothesis mediates that the mean BHARs are equal to zero, with the alternative hypothesis mediates the counterpart. According to Barber and Lyon (1997), it is assumed that BHAR samples are normally distributed, which makes Student's T-distribution useful for evaluating the validity. Equation 3 describes the calculation of the t-test:

$$t = \frac{\overline{BHAR_{i\tau}}}{\sigma(BHAR_{i\tau})} * \sqrt{N} \tag{3}$$

In Equation 3, $\overline{BHAR_{\iota\tau}}$ is the equally weighted average BHAR, and $\sigma(BHAR_{i\tau})$ is the standard deviation of BHAR, calculated in Equation 4.

$$\sigma(BHAR_{i\tau}) = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(BHAR_{\tau} - \overline{BHAR_{\iota\tau}})^2} \tag{4}$$

The main bias that BHAR is subject to because of the compounding is the skewness bias, which occurs because the extreme positive observations are overrepresented in the sample compared to the distribution (Barber & Lyon, 1997). Studies find that BHARs often are positively skewed, which affects the t-statistics by having a fragmented sample size. To counter this skewness, an improved test for the evaluation of BHAR has been created by Lyon et al. (1999). A bootstrapped skewness adjusted t-test reduces the skewness and is a favourable approach when evaluating BHAR (Lyon et al., 1999; Loughran & Ritter, 2002; Gompers & Lerner, 2003). The bootstrapped skewness adjusted t-test is presented in Equation 5:

$$t_{bs\_sa} = \sqrt{N_{bs}}(S_{bs} + \frac{1}{3}\hat{\gamma}_{bs}S_{bs}^2 + \frac{1}{6N_{bs}}\hat{\gamma}_{bs}) \tag{5}$$

where

$$S_{bs} = \frac{\overline{BHAR_{bs}}}{\sigma(BHAR_{bs})} \tag{6}$$

and

$$\hat{\gamma}_{bs} = \frac{\sum_{i=1}^{N}[\,BHAR_{bs_i} - \overline{BHAR_{bs}}]^3}{N_{bs}\sigma(BHAR_{bs})^3} \tag{7}$$

With N_{bs} being the number of observations in the bootstrapped sample, S_{bs} represents the mean of BHAR divided by the standard deviation of BHAR. $\hat{\gamma}_{bs}$ is the coefficient of skewness, an empirical estimate of the skewness of BHARs in the sample. The null hypothesis that the mean BHAR equals zero is rejected if the skewness-adjusted t-statistic t_{sa} is either below or above the critical values, derived from the distribution of ts_{bs_sa} in the samples. The analysis of BHAR is based on the skewness-adjusted t-statistic to achieve more reliable results.

3.4 Independent Variables

In this section, the variables which are used to explain both the short- and long-term BHAR are presented. The independent variables are determined through a review of the previous literature; therefore, the detailed description of them along with the hypotheses are found in Section 2, Literature review.

As discussed by Beatty and Ritter (1986), the underpricing phenomenon arises from uncertainty regarding the issuing firm's value during the IPO. Further, Bastıa, Kuzey and Delen (2015) find a relationship between the level of underpricing on an IPO and the short-term performance. In their studies, Otchere, Owusu-Antwi and Mohsni (2013) find that the long-term performance of IPO firms is positively related to the hypothesis of the signalling theory. Which brings up the theory of whether

underpricing, with roots in signalling theory, have a relationship with the long-term performance of IPO firms. In their study, Loughran and Ritter (2002) investigate the long-term performance of IPO firms with the result of significant underperformance. The results of Otchere, et al. (2013) contradicts with the findings of Ritter (1991), which instead argue that the relationship between IPO underpricing and long-term returns are negative. Therefore, in this study, the level of underpricing relation to the returns will be measured both on short- and long-term.

If periods, where there is a high volume of IPOs, are associated with impaired long-term performance, it would indicate that the issuers find ways to take advantage of "windows of opportunity" (Ritter, 1991). Studies on this phenomenon resulted in the same conclusion that a negative relationship exists between the volume of IPOs issued in a year and the long-term performance of IPO firms (Bergström et al., 2006; Levis, 2011). To find out if the findings from these previous studies also are applicable to the Swedish market, the volume of IPOs is used as an explanatory variable. To compare the volume of IPOs to each other, it is important to categorise high and low volumes. In this study, a low volume of IPOs is categorised as five or fewer IPOs done during a year, and high volume has been categorised over five IPOs done during a year. This is done in line with Ritter's (1991) work to differentiate the low traction years, where there was almost no IPOs issued, and the high traction years.

The offer size of an IPO is used as an approximation of the firm's value during the time of listing (Sahoo, 2017). Beatty and Ritter (1986) describe a relation between the offer size and the level of underpricing for an IPO. They argue that this relationship is due to the different levels of uncertainty regarding the firms (Beatty & Ritter, 1986). Large IPOs, offered by more established firms, are often easier to be valued, which results in less uncertainty of the firm's ex-post performance (Ljungqvist, 1997). The natural logarithm transformation of the offer size is used in the regression.

The age of a firm is occasionally used by investment bankers to provide insight into IPOs where the uncertainty of a firm is considerable (Carter, et al., 1998). The firm's age and initial returns have in previous studies been proven to have a negative relationship on some European markets, where the age acts as a proxy for the risk that young issuers require (Muscarella & Vetsuypens, 1989). It is also established that the age of the firm has a positive relationship with firms long-term performance (Ritter, 1991). In this study, the age is defined as the age of the firm before the IPO is issued. To convert the firm's age to a dummy variable, a threshold has to be set to separate young firms from old. Clark (2002) shows a differentiation in the firm's returns depending on the firm's age, with the age of two years as a separator. Therefore, in this study, two years is also the separator between young and old firms, with old firms taking the value zero and young firms taking the value one.

When an IPO is issued, the industry where the firm serves has been proven to have an impact on the performance of the stock both in short- and long-term (Borghesi, et al., 2015). Daily et al. (2005) discover that firms within the technological industry served higher initial return than other sectors. Therefore, the technological industry, among other major industries (Consumer Cyclicals and Financials), are used as independent variables to describe both short- and long-term returns. They take the form of dummy variables, where firms will take the value one if they are included in the industry and firms within other sectors will take the value zero.

3.5 Linear Regression Analysis

The analysis that is going to be performed in order to evaluate if and how the independent variables are connected to the dependent variable is through multiple linear regression. The dependent variables

that are analysed in this study are short- and long-term BHAR. The timeframe used for the short-term returns is the first month of trading, whereas for the long-term returns 18 and 36 months are used. With the regression analysis, some explanatory variables are confirmed to have a relationship with the dependent variable while other variables may be rejected due to lack of significance (Ghauri & Grønhaug, 2010, p. 177). The linear regression equation is phrased as:

$$BHAR_i^{\tau} = \beta_0 + \beta_1 Under\_Price_i + \beta_2 Age_i + \beta_3 \ln(\text{Offer\_Size}_i) + \beta_4 Volume\_IPO_i + \beta_5 Ind\_Tech_i + \beta_6 Ind\_CC_i + \beta_7 Ind\_Finance_i + \varepsilon_i \quad (8)$$

Where i is the firms in the sample and, τ is the time horizon of 1, 18 and 36 months. The beta values are coefficients for the independent variables which explain the in which degree they affect the dependent variable. ε are the error term of the equation, which compensates for variables that are not included in the regression. One of the most commonly used regression methods is *Ordinary Least Squares* (OLS) (Brooks, 2014, p. 78). OLS is used when the data analysed is normally distributed, therefore it will be applied in this thesis. The OLS method approximates a linear function where the squared distance from the observations to the function is minimised (Ghauri & Grønhaug, 2010, p. 177). The most common statistic for the goodness of fit is R^2 (Brooks, 2014, p. 152); however, the R^2 value does not take in account if the model uses more than one explanatory variable which the adjusted R^2 value does (Brooks, 2014, p. 155). In this study, a combination of the two statistics is used as a measure for the goodness of fit. The R^2 value gives a degree of how well the model fits, whereas the adjusted R^2 value helps determine which variables to include in the regression. The regression that is performed in this study will be done in IBM:s software SPSS.

3.6 Validity and Reliability

When performing the regression, there are certain assumptions made in order to apply the OLS method (Brooks, 2014, pp. 90-91). When testing for these assumptions, paramount importance will be applied to the test for heteroscedasticity and autocorrelation. The test that is used to examine whether there is heteroscedasticity or not is the Breusch-Pagan test. The Breusch-Pagan test uses the squared unstandardized residuals from the regression to check whether the data set is homo- or heteroscedastic (Breusch & Pagan, 1979). The test for the presence of autocorrelation in the data set is done with the Durbin-Watson test. The Durbin-Watson test examines whether there is a relationship between an error and the closest previous value (Brooks, 2014, p. 194).

4. Results

In the following chapter, the main results and findings regarding the short- and long-term returns for IPO firms are presented. The regression performed are presented in tables and graphs, with all necessary parameters.

4.1 Underpricing

During the sample period 2000-2015, the IPOs listed on the Swedish stock markets are exposed to an average level of underpricing of 8,65%. The highest level of underpricing is located in 2007 by the company *Online Brand Nordic AB* with 113%. The highest level of overpricing is instead in 2015, where *SpectraCure AB* suffered from 38% of overpricing.
The average yearly level of underpricing have, as seen in Figure 1, fluctuated during the sample period with the lowest sample in 2001 of -6,31% and highest in 2013 of 19,11%.

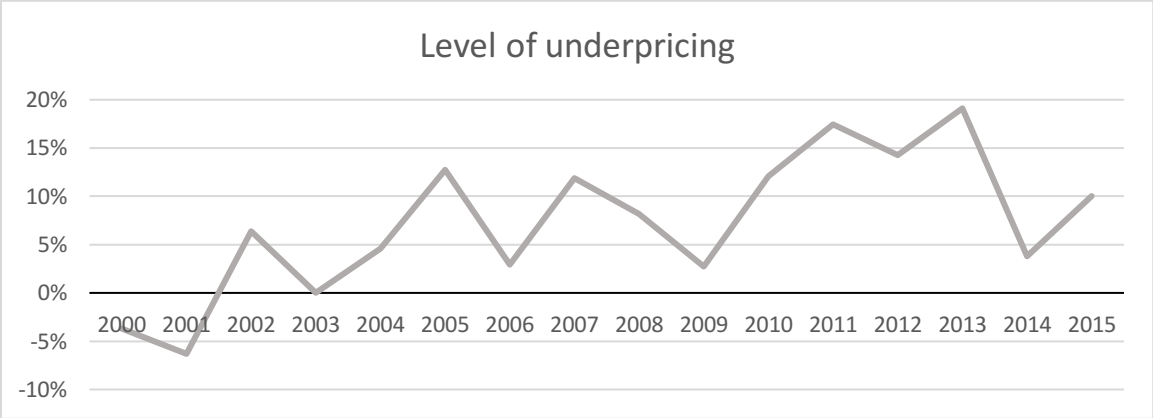

Figure 1: Average yearly level of underpricing in Swedish stock markets

During the sample period, Consumer Cyclicals is the industry with the highest level of underpricing with 23,66%. Whereas Energy is the industry with the lowest level of underpricing with -5,19%. All industries have a positive level of underpricing during the sample period except for the Energy sector. These observations are shown in Table 2.

Table 2: Average level of underpricing per industry

Industry	**Level of underpricing**
Basic Materials	2,10%
Consumer Cyclicals	7,96%
Consumer Non-Cyclicals	23,66%
Energy	-5,19%
Financials	8,69%
Healthcare	6,21%
Industrials	14,81%
Technology	3,25%

As illustrated in Figure 2, the average level of underpricing for an old firm is slightly lower than for a young firm. The distribution between the pricing differs in the groups, where the young firms are overpriced in general while most old firms are underpriced. The reason why this is not illustrated in the average underpricing for the groups is that the young firms that are underpriced often have higher underpricing in comparison to older firms.

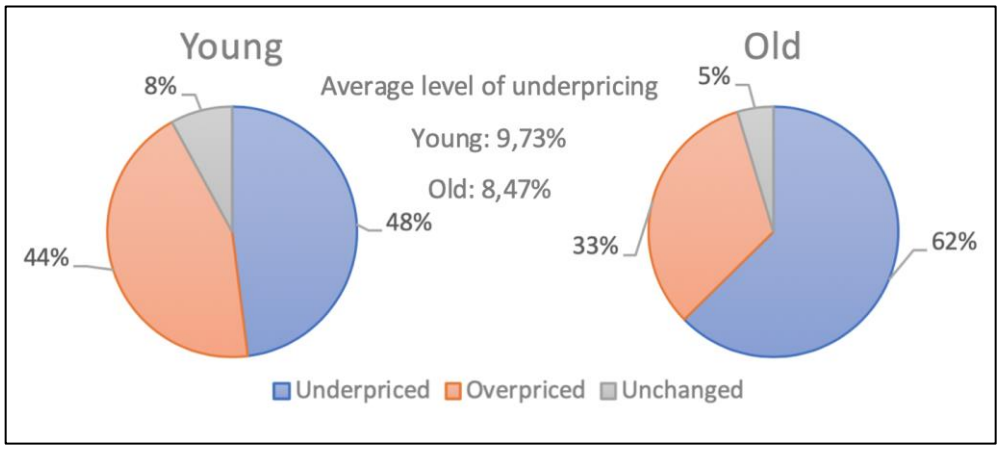

Figure 2: The level of underpricing for young and old firms

4.2 BHAR

In Table 3, the BHAR calculations in the event time approach are presented. These have been done using the bootstrapped skewness adjusted t-statistic to remove the common bias while calculating BHAR. BHAR is calculated for both short-and long-term performance with three sub-periods of 1 month, 18 months and 36 months. The results show all IPO samples; however, the results are also categorised into two subgroups, young and old firms.

Table 3: Buy-and-Hold Abnormal Returns for the full IPO sample

	ALL	YOUNG	OLD
1ST MONTH BHAR	-3,37%***	-0,04%***	-3,93%***
18TH MONTH BHAR	6,31%***	-15,11%***	10,22%***
36TH MONTH BHAR	-4,95%***	-31,76%***	0,12%***

*/**/*** denotes the significance at level 10%/5%/1%

Table 3 consists of the entire IPO samples BHAR. The results are statistically significant at level 1%, with the underperformance of -3,37% in the first month, overperformance of 6,31% after 18 months and underperformance of -4,95% after 36 months for all IPO firms.

During the first month, young firms perform better than older firms, with the underperformance of 0,04%, while older firms underperform by 3,93%. There is a vast difference between young and old firms in the long-term performance, where young firms underperform by -15,11% after 18 months, whereas old firms overperform by 10,22%. After 36 months, this difference persists between young and old firms with underperformance for young firms of 31,76% and overperformance for old firms of 0,12%.

4.3 Multivariable Linear Regression

This section will include the results derived from the three multiple regression analyses regarding BHAR from 1, 18 and 36 months. As illustrated in Table 4, four of the independent variables in the first months BHAR regression shows a significance at a 10% level, of which three of them also show significance at a 5% level. The variables that show significance are the constant, level of underpricing, age, offer size and technology. In the 18th months of BHAR regression, the only independent variable that shows significance was the level of underpricing, which was at the level of 10%. In the last regression, of the 36th Months BHAR, the volume of IPO was the only variable that shows significance, which was at the level of 5%. When performing the tests for heteroscedasticity and autocorrelation, the Breusch-Pagan and Durbin-Watson tests, significant results are present in all regressions.

Table 4: Coefficients conducted from regression analyses

	Coefficients		
Variables	1st Month	18th Month	36th Month
Constant	-28,458*	-34,804	-30,444
Level of Underpricing	0,103*	0,494*	0,901
Age (Dummy)	9,364**	-29,784	-65,854
Offer size (Logarithmic)	1,418**	3,004	2,811
Volume of IPO	-4,286	-3,949	105,624**
Technology	-10,012**	6,199	-6,239
Consumer Cyclicals	-5,455	2,064	-21,509
Finance	-6,002	12,006	19,330

*/**/*** denotes the significance at level 10%/5%/1%

The R^2 value collected from the regression are 0,094 for the 1st month, 0,043 for 18 months and 0,05 for 36 months. This indicates that the independent variables explain 9,4% of the 1st months BHAR in the regression. In the same manner, 4,3% of the 18-month regression is explained, and 5% of 36 months BHAR is explained. With the coefficients collected from the regression, the three multiple regression equations look as follows:

$$BHAR_i^1 = -28{,}458 + 0{,}103Under\_Price_i + 9{,}364Age_i + 1{,}418\ln(\text{Offer\_Size}_i) - 4{,}286Volume\_IPO_i - 10{,}012Ind\_Tech_i - 5{,}455Ind\_CC_i - 6{,}002Ind\_Finance_i \quad (9)$$

$$BHAR_i^{18} = -34{,}804 + 0{,}494Under\_Price_i - 29{,}784Age_i + 3{,}004\ln(\text{Offer\_Size}_i) - 3{,}949Volume\_IPO_i + 6{,}199Ind\_Tech_i + 2{,}064Ind\_CC_i + 12{,}006Ind\_Finance_i \quad (10)$$

$$BHAR_i^{36} = -30{,}444 + 0{,}901Under\_Price_i - 65{,}854Age_i + 2{,}811\ln(\text{Offer\_Size}_i) + 105{,}624Volume\_IPO_i - 6{,}239Ind\_Tech_i - 21{,}509Ind\_CC_i + 19{,}330Ind\_Finance_i \quad (11)$$

In Table 5, the results for the hypotheses stated earlier are be presented. It is illustrated whether there is support found for the hypotheses, and if so, at which significance level.

Table 5: Summary of Results

Hypothesis	1 month	18 Months	36 Months	Level
1. The level of underpricing on an IPO has a positive relationship with short-term (1 month)/long-term (18 months and 36 months) abnormal returns.	Yes	Yes	No	10%
2. An IPO performed during a year with high volume of IPOs will perform worse long term (18 months and 36 months) abnormal returns than IPOs performed in a year with low volume of IPOs.	–	No	Yes	5%
3. There is a positive relationship between the offer size and short-term (1 month)/long-term (18 months and 36 months) abnormal returns.	Yes	No	No	5%
4. Young firms performing an IPO have better short-term (1 month)/long-term (18 and 36 months) abnormal returns than old firms.	Yes	No	No	5%
5. There is a negative relationship between short-term (1 month)/long-term (18 months and 36 months) abnormal returns and firms operating in the technological industry.	Yes	No	No	5%

5. Analysis

In this section, the results are analysed and discussed with the help of previous literature and research. With the help of previous studies and the result collected, some conclusions are made. First the result of the underpricing will be discussed followed by the result of BHAR. Finally, the result of the regression for short- and long-term BHAR are discussed and analysed.

This study finds a compelling level of underpricing present in the Swedish markets. The level of underpricing is in line with previous studies on the Nordic markets (Rydqvist, 1997; Ljungqvist et al., 2006). These studies, however, do not include most IPOs studied here because of the dates the previous studies were published. The underpricing phenomenon is still existent in the Swedish markets today, although the reasons for it are still unclear. It is difficult to draw any conclusions on any "windows of opportunity" for the investor that could exist in the markets because of low traction years where the volume of IPOs was low. One could argue that the "windows of opportunity" for the issuers are the years where the volume of IPOs are large. It is possible that the financial crisis in 2008 could be a factor regarding the level of underpricing because it can be argued to be a "cold issue" market; however, no such argument can be made in this study. Market uncertainty could be an important factor that influences investors' confidence. It is discussed that investors' confidence can be an essential cause of underpricing due to the increased uncertainty (Beatty & Ritter, 1986). This could be a possible factor that explains the high level of underpricing after the financial crisis, when the confidence of the investors was low, which means that firms must compensate with a lower offering price to reassure the indecisive investors (Rock, 1986).Young firms report a higher average initial return than old firms, which mirrors the result on the US market recorded by Ritter and Welch (2002) and the German market by Ljungqvist (1997). Young firms often carry a more substantial risk; therefore, investors must be compensated with a lower offering price to be motivated into investing. This is not as prevalent in this study compared to previous studies, although there is a large enough average level of underpricing in young firms to be able to come to this conclusion.

The BHAR results from Section 4 can be compared to previous studies made. The long-term performance after three years shows the same results in this study that has been previously shown in the US market (Loughran & Ritter, 1995; Ritter, 1991; Carter et al., 1998). The results are based on the bootstrapped skewness t-test statistic, which is preferred by Lyon et al. (1999) to remove some of the skewness bias. It is not possible to entirely remove the skewness bias and get wholly accurate long-term BHAR; however, this method was still chosen because it contained the lowest amount of bias. The first trading month return is reported as negative for the IPO samples compared to the market index. This goes against most of the literature on the short-term returns of IPO firms, in which the average abnormal returns for the first month is mostly positive (Miller & Reilly, 1987). The interesting point is that BHAR performs very different long-term, dependent on what is defined as long-term. Previous studies have noted that the underperformance three years after the offering diminishes (Ritter, 1991; Ibbotson, 1975), although the long-term period up until three years after the offering indicates an apparent underperformance. In this study, the BHAR after 18 months contradicts previous studies made that show an underperformance for all months between the first and second year after the offering (Loughran & Ritter, 1995; Ritter, 1991; Carter et al., 1998). This could be because of factors separating the Swedish markets from the others. There is a much larger sample of IPO firms in previous studies because most of the other markets are considerably larger than the Swedish markets, which creates a more excellent sample distribution that might reflect more accurate results.

Young firms perform worse than the market in the long-run, with the underperformance of -31,76% after three years. This underperformance is also documented by Clark (2002) and Ritter (1991), where younger firms performed significantly worse than both older firms and matching firms after three years. Young firms that perform an IPO are largely in high-risk industries such as technology, which could explain the investors' confidence in the firm. Uncertainty can affect the long-term performance of a firm; however, no such conclusion can be made in this study.

As seen in the regression results in Section 4.3 and Appendix III, the level of underpricing have a positive relationship with the first months BHAR. The coefficient of the relation is 0,103, which indicates that for every percentage point, the underpricing increases the BHAR after a month will increase with 0,103 percentage points. It is possible to relate this to Loughran and Ritter's theory that underpricing changes the risk composition (Loughran & Ritter, 2004). According to Loughran and Ritter (2004), underpricing can lead to a lower risk for the issuer and in some cases, investors. This lower risk can, in some cases, compensate for the asymmetric information between the issuer and the investors (Baron, 1982). These results are in line with Miller and Reilly's (1987) work, who declare that there is a negative relationship between first months return and overpriced IPOs. In the regression for the 18 months BHAR, which are shown in Appendix IV, underpricing shows a significance with a coefficient of 0,494. Thus, underpricing affects BHAR's value more after 18 months than after one month. There are no previous studies found on that subject, but Baron (1982) and Miller and Reilly's (1987) theories might still be applicable. When comparing the initial underpricing phenomenon to the long-term underperformance, it raises questions about why IPOs are priced in a manner that yields great positive average initial returns. If the average long-term performance is negative, it could be that the offering price is not too low, and instead, the first aftermarket price is too high.

According to the regression performed, the firm's age shows significant results on the BHAR during the first month. The coefficient for the firm's age is 9,634, which shows a positive relationship with the first months BHAR. The variable for the age of the firm is by the form of a dummy variable, which means that it can only take the value zero or one. This means that, on average, if a firm is young, they will have a BHAR with 9,634 percentage points larger than an old firm. This result is in line with Carter et al.'s (1998) study, where they argue that a firm's age provides insight into the observed uncertainty about IPOs. A young firm with higher uncertainty might, therefore, take a longer time to adjust to the market. Out of the tested industries, the only sector that shows significant results is the technological sector. With a coefficient of -10,012, the firms within the technological industry show, on average, a lower BHAR during the first month. These results contradict with Daily et al. (2005), where they argue that technological firms serve higher short-term returns than other sectors. During the literature review, there were no studies found on this topic on the Swedish stock market, which may be a reason why the results differentiate.

Through the regressions performed, the offer size during an IPO is shown to have a significant influence on short-term BHAR (one month). The coefficient value collected was 1,418, which must be interpreted differently from the other coefficients since the offer size variable was in logarithmic form. The coefficient illustrates that for every percentage increase in offer size, the BHAR for the first month will increase with 1,418 percentage points. Ritter (1991) argues that small offers, which are shown to have a higher level of underpricing, have the worst aftermarket performance. This is in line with this study, where the results show a positive relationship between the logarithmic transformation

of offer size and the first months BHAR. This may be related to Miller and Reilly's (1987) study, where they discover that the offer size has a positive correlation with the ex-ante uncertainty.

From the regression performed for the three years BHAR, which can be found in Appendix V, the volume of IPO shows a significant positive relationship to the long-term performance. The coefficient obtained from the regression is 105,624, which indicates that the volume of IPO during the issuing-year have an enormous impact on long-term performance. The variable for the volume of IPO is in the form of a dummy variable, where one indicates years with a low volume of IPOs and zero indicates a high volume of IPOs. By interpreting the coefficient, it is shown that firms who issue an IPO during a period with a low volume of IPOs perform better during the first three years. The results from this study are in lines with Levis' (2011) findings, where he presents evidence that IPOs during a heavily active issuing period are linked with the highest underperformance.

On a short-term basis, Swedish firms who performed an IPO during the period of 2000-2015 had an average negative abnormal return. Old firms had a worse abnormal return than the young firms during the same period. Factors that could explain these abnormal returns has been collected through a multiple linear regression and they are: underpricing, offer size, age and the technological industry. On a long-term basis, the Swedish firms' abnormal performance varies where young firms suffer from a negative abnormal return while old firms have a positive abnormal return. There has not been found as many explanatory variables for the long-term as there were for the short-term. With the explaining factors being: the level of underpricing and the volume of IPOs.

6. Conclusion

The purpose of this thesis is to examine the performance of IPO firms in the Swedish markets during their first three years of trading, to examine what effects different factors have on the short- and long-term performance. The level of underpricing on Swedish IPOs is also investigated to detect any abnormalities from previous studies on different markets. Previous research has tried to explain the different factors between both underpricing and underperformance, which has had conflicting results. Methods used in previous research for the performance of long-term IPO firms have been widely discussed and are still a great debate today. The time frame in this study is between 2000-2015, and the method for calculating abnormal returns is the buy-and-hold abnormal returns.

The results of this study are partly in line with previous research on the US market. There is an apparent average underpricing present in the Swedish markets, and a long-term average underperformance was also found. Furthermore, the short-term performance was also negative on average; however, after 18 months, IPO firms on the Swedish markets overperformed on average. This is a surprising result since previous research generally states that IPO firms have a diminishing amount of returns during the first three years after the offering (Ritter, 1991; Ljungqvist & Singh, 2006). Factors affecting these results are not all significant, with most of the factors showing no significance in the long-term. In the short-term, firm age, level of underpricing, offer size and the technology industry all have significance on BHAR. After 18 months, only the level of underpricing is found to be a significant factor, and after 36 months, only the volume of IPOs issued in a year is significant. Based on these findings, the Swedish markets seem to have a few differentiating characteristics compared to the US market; however, the overall result seems to be mostly alike. A concluding remark on this study is that IPO firms on the Swedish markets imply that they are more affected in the short-term than in the long-term, and consequently they seem to be, on average, a poor investment option compared to the market index.

As an answer to the research question stated earlier in this study; Swedish IPOs perform with a negative abnormal return during the first month of trading. This does not necessary result in a negative return for the stock but are instead a comparison to the benchmark chosen. The average long-term abnormal performance for Swedish IPOs are positive during the first 18 months but is negative during the first 36. In the long-term performance it is shown how the firms age affect the abnormal returns for the stocks on the aftermarket.

Further research could include different factors that could influence the long-term performance of IPO firms, such as the ownership structure researched by Gandolfi et al. (2018). Different methods to calculate the abnormal returns are possible to use, as the CAR and BHAR methods both have been used thoroughly in previous studies. By utilizing the calendar-time approach instead of the event-time approach, a different result could be obtained because of different biases that occur in these methods. Conducting a larger study on more markets, for example, the Nordic markets, could increase the IPO sample while still maintaining markets that have similar characteristics. This could decrease the sample bias and yield more accurate results.

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Appendix I – One-Sample T test

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Level of underpricing (unadjusted)	175	8.6474%	24.22291%	1.83108%

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
Level of underpricing (unadjusted)	4.723	174	.000	8.64738%	5.0334%	12.2614%

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
BHAR1_Adjusted	175	.0706	.01765	.00133

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
BHAR1_Adjusted	52.894	174	.000	.07058	.0679	.0732

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
BHAR18_Adjusted	175	.2183	.07758	.00586

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
BHAR18_Adjusted	37.222	174	.000	.21828	.2067	.2299

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
BHAR36_Adjusted	175	.3648	.06792	.00513

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
BHAR36_Adjusted	71.045	174	.000	.36477	.3546	.3749

Appendix II – Independent-Samples T test

T-Test

Group Statistics

	Age_Level	N	Mean	Std. Deviation	Std. Error Mean
BHAR1_Adjusted	Old	150	.0711	.01628	.00133
	Young	25	.0677	.02459	.00492

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
BHAR1_Adjusted	Equal variances assumed	6.234	.013	.865	173	.388	.00330	.00382	-.00423	.01083
	Equal variances not assumed			.648	27.610	.522	.00330	.00509	-.00714	.01374

T-Test

Group Statistics

	Age_Level	N	Mean	Std. Deviation	Std. Error Mean
BHAR18_Adjusted	Old	150	.2146	.07876	.00643
	Young	25	.2403	.06734	.01347

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
BHAR18_Adjusted	Equal variances assumed	.843	.360	-1.539	173	.126	-.02569	.01669	-.05864	.00726
	Equal variances not assumed			-1.721	35.890	.094	-.02569	.01492	-.05596	.00458

T-Test

Group Statistics

	Age_Level	N	Mean	Std. Deviation	Std. Error Mean
BHAR36_Adjusted	Old	150	.3616	.07135	.00583
	Young	25	.3837	.03754	.00751

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
BHAR36_Adjusted	Equal variances assumed	2.514	.115	-1.507	173	.134	-.02204	.01462	-.05089	.00682
	Equal variances not assumed			-2.319	58.200	.024	-.02204	.00950	-.04106	-.00302

Appendix III – Regression 1st Month

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Ind_Finance, Level of underpricing (unadjusted), Volume_IPO, Age_Level, Ind_CC, Ind_TECH, Log_OS[b]	.	Enter

a. Dependent Variable: BHAR 1

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.306[a]	.094	.056	19.29173%

a. Predictors: (Constant), Ind_Finance, Level of underpricing (unadjusted), Volume_IPO, Age_Level, Ind_CC, Ind_TECH, Log_OS

b. Dependent Variable: BHAR 1

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-20.7987%	16.6016%	-1.2060%	6.07157%	175
Residual	-46.77359%	101.83190%	0.00000%	18.89970%	175
Std. Predicted Value	-3.227	2.933	.000	1.000	175
Std. Residual	-2.425	5.279	.000	.980	175

a. Dependent Variable: BHAR 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6414.336	7	916.334	2.462	.020[b]
	Residual	62152.538	167	372.171		
	Total	68566.874	174			

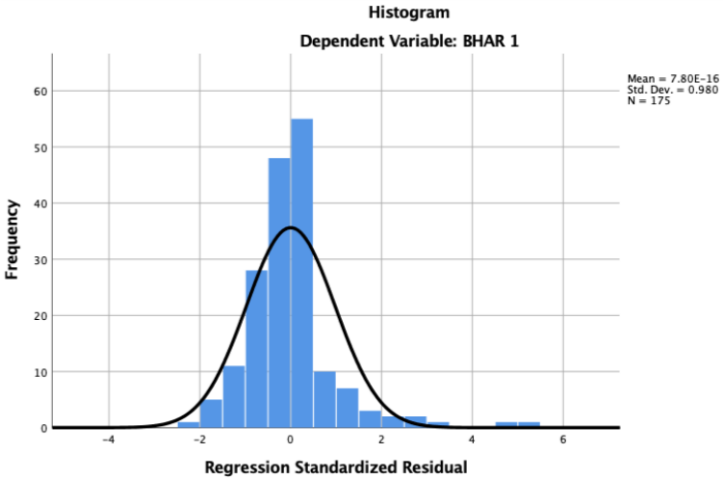
a. Dependent Variable: BHAR 1

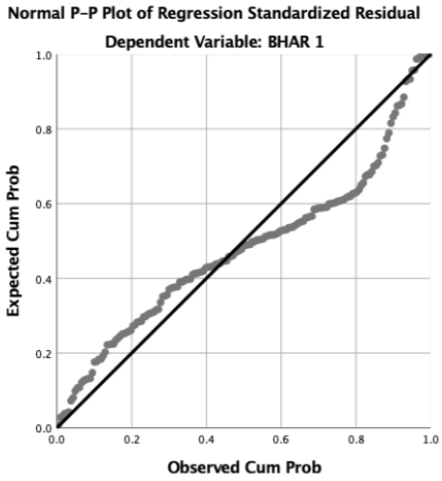
b. Predictors: (Constant), Ind_Finance, Level of underpricing (unadjusted), Volume_IPO, Age_Level, Ind_CC, Ind_TECH, Log_OS

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-28.458	14.847		-1.917	.057
	Level of underpricing (unadjusted)	.103	.061	.126	1.690	.093
	Age_Level	9.364	4.434	.166	2.112	.036
	Log_OS	1.481	.755	.157	1.960	.052
	Volume_IPO	-4.286	4.256	-.074	-1.007	.315
	Ind_TECH	-10.012	4.215	-.183	-2.376	.019
	Ind_CC	-5.455	4.041	-.104	-1.350	.179
	Ind_Finance	-6.002	5.241	-.090	-1.145	.254

a. Dependent Variable: BHAR 1





Appendix IV – Regression 18th Month

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Ind_Finance, Level of underpricing (unadjusted), Volume_IPO, Age_Level, Ind_CC, Ind_TECH, Log_OS[b]	.	Enter

a. Dependent Variable: BHAR 18

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.208[a]	.043	.003	87.87417%

a. Predictors: (Constant), Ind_Finance, Level of underpricing (unadjusted), Volume_IPO, Age_Level, Ind_CC, Ind_TECH, Log_OS

b. Dependent Variable: BHAR 18

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	58203.112	7	8314.730	1.077	.380[b]
	Residual	1289552.39	167	7721.871		
	Total	1347755.50	174			

a. Dependent Variable: BHAR 18

b. Predictors: (Constant), Ind_Finance, Level of underpricing (unadjusted), Volume_IPO, Age_Level, Ind_CC, Ind_TECH, Log_OS

Coefficients[a]

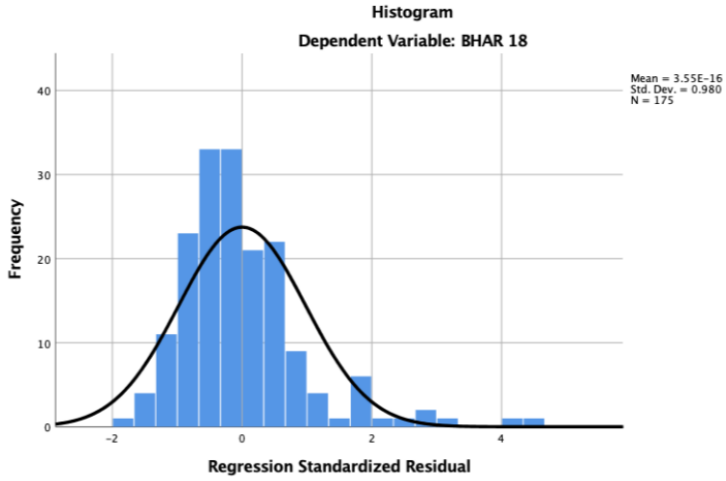
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-34.804	67.627		-.515	.607
	Level of underpricing (unadjusted)	.494	.277	.136	1.782	.077
	Age_Level	-29.784	20.197	-.119	-1.475	.142
	Log_OS	3.004	3.440	.072	.873	.384
	Volume_IPO	-3.949	19.388	-.015	-.204	.839
	Ind_TECH	6.199	19.197	.026	.323	.747
	Ind_CC	2.064	18.407	.009	.112	.911
	Ind_Finance	12.006	23.873	.041	.503	.616

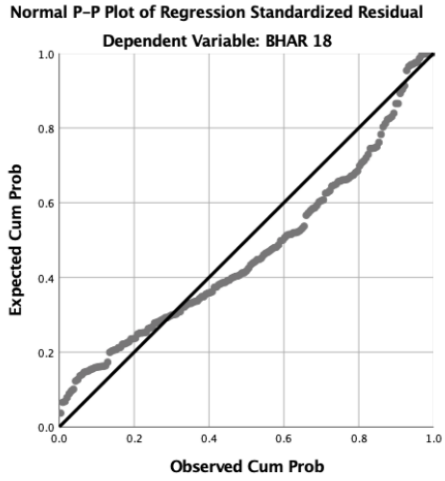
a. Dependent Variable: BHAR 18

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-34.1896%	63.2377%	25.3223%	18.28936%	175
Residual	-157.1545%	385.53406%	0.00000%	86.08845%	175
Std. Predicted Value	-3.254	2.073	.000	1.000	175
Std. Residual	-1.788	4.387	.000	.980	175

a. Dependent Variable: BHAR 18





Appendix V – Regression 36th Month

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Ind_Finance, Level of underpricing (unadjusted), Volume_IPO, Age_Level, Ind_CC, Ind_TECH, Log_OS[b]	.	Enter

a. Dependent Variable: BHAR 36

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.224[a]	.050	.010	217.36524%

a. Predictors: (Constant), Ind_Finance, Level of underpricing (unadjusted), Volume_IPO, Age_Level, Ind_CC, Ind_TECH, Log_OS

b. Dependent Variable: BHAR 36

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	416712.866	7	59530.409	1.260	.273[b]
	Residual	7890357.19	167	47247.648		
	Total	8307070.06	174			

a. Dependent Variable: BHAR 36

b. Predictors: (Constant), Ind_Finance, Level of underpricing (unadjusted), Volume_IPO, Age_Level, Ind_CC, Ind_TECH, Log_OS

Coefficients[a]

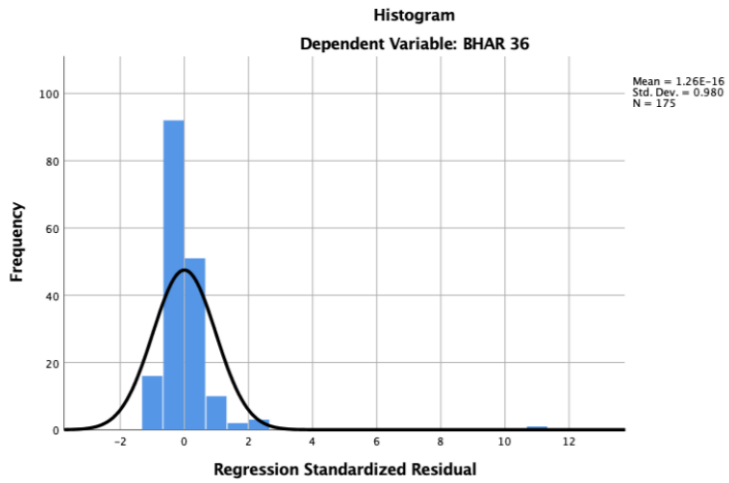
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-30.444	167.283		-.182	.856
	Level of underpricing (unadjusted)	.901	.686	.100	1.314	.191
	Age_Level	-65.854	49.959	-.106	-1.318	.189
	Log_OS	2.811	8.510	.027	.330	.742
	Volume_IPO	105.624	47.957	.167	2.202	.029
	Ind_TECH	-6.239	47.486	-.010	-.131	.896
	Ind_CC	-21.509	45.531	-.037	-.472	.637
	Ind_Finance	19.330	59.051	.026	.327	.744

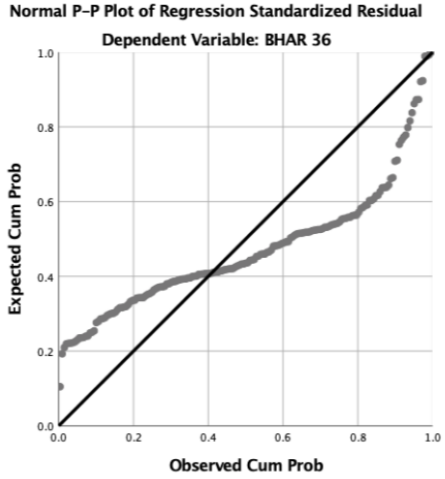
a. Dependent Variable: BHAR 36

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-90.4581%	169.6126%	34.0943%	48.93773%	175
Residual	-272.7818%	2340.1853%	0.00000%	212.94807%	175
Std. Predicted Value	-2.545	2.769	.000	1.000	175
Std. Residual	-1.255	10.766	.000	.980	175

a. Dependent Variable: BHAR 36



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