The relationship between employee stock option grants and share price on the Swedish market

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Master Thesis in Accounting and Financial Management

Abstract: Since January 1\textsuperscript{st} 2005, Swedish firms listed on the OMX Stockholm exchange are required to recognize expenses related to employee stock option programs. In this paper, we examine the relationship between a firm’s market value of equity per share and the fair value of newly granted employee stock options, disclosed under the IFRS 2, for a sample of firms listed on the OMX Stockholm exchange. We investigate whether investors incorporate the value of employee stock option grants into the share price, and if so, if they believe that the benefits of granting employee stock options outweigh the costs. The study is performed as a value relevance study based on Ohlson’s (1995) valuation framework, where we also control for expected earnings. Further, we test for the possibility of a non-linear relationship between ESO grant value and share price. Our findings are, however, inconclusive, and we suggest further research on the area, where this thesis can be used as a point of reference.

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1. Introduction

1.1. Background

Employee stock option (ESO) programs have often been a hot topic during the last decades. During the 1980:s, the number and size of stock option programs directed to employees increased rapidly, which to a large extent was due to the favorable accounting treatment of these programs (Aboody 1996). In some industries, mainly in high-tech sectors, the costs of the ESO programs were particularly high. Explanations offered are that these firms are both dependant on talented individuals, and often grow fast, needing all possible funds available for investments (Bell et al., 2002). Even though the programs were popular, recognition of the expenses related to ESO programs was not mandatory. This phenomenon was recognized in America by the Financial Accounting Standards Board (FASB), who in 1993 proposed a requirement for firms to charge the cost of ESO programs to earnings. However, after severe resistance from many firms, the FASB stopped at a compromise that permitted firms’ discretion over whether the value of stock options for employees would be charged to earnings or disclosed in footnotes.¹

Stock option programs for employees have continued to gain popularity, and for a long time firms had the discretion over whether to recognize or disclose ESO costs. However, in America this changed with the issuance of new FASB regulations that became effective from fiscal years starting on June 15th, 2005, that made recognition mandatory. This materially affected earnings for some firms and industries. For the Standard & Poor 500 Index, earnings would have dropped 8.6 and 7.4 percent in 2003 and 2004 respectively if ESO costs had been expensed (Bulow & Shoven, 2005). In 2005, the International Accounting Standards Board (IASB) changed their rules regarding ESO programs as well, with the issuance of the International Financial Reporting Standard (IFRS) 2.² It became effective from January 1th 2005, and requires Swedish firms to charge the value of the ESO programs to earnings.

Despite their popularity, there is no consensus on the effects of ESO programs on employee behavior, which is supposed to affects firm performance, which in turn affects share

¹ The proposal from the FASB requiring recognition, Exposure draft: Accounting for stock based compensation, was released on June 30th 1993. However, in 1995 the FASB released the Statement of Financial Accounting Standards (SFAS) No. 123, which gave firms discretion over the decision whether to recognize or disclose the ESO expenses.
² The IASB, with its seat in London, is the organization that develops the IFRS standards. Firms listed on the OMX Stockholm exchange are required to report according to the IFRS standards.
price. The arguments in the debate regarding employee behavior can be summarized in two theoretically founded standpoints.

One side of the debate argues that external rewards such as ESO programs are necessary for the alignment of shareholders’ and the management’s interests. We label this perspective the agency theory perspective. The other side of the debate argues that the positive effects of ESO programs do not offset the dilution effect of the shares outstanding. Some even argue that external rewards might hurt management performance. We label this perspective the rent extraction perspective. The theoretical arguments behind the two perspectives will be developed under the section 3.5 and 3.6.

We thus have two contrasting perspectives on the effects of executive stock option programs; the agency theory perspective and the rent extraction perspective. In the corporate world, the agency perspective has a strong support, which partly explains the rapid increase in executive compensation that we have experienced during the last decades. Moreover, stock option programs are a growing component of executive compensation. Media, politicians and labor unions among others on the other hand, often criticize this development. The effects of ESO programs, is therefore an interesting area of research.

1.2. Purpose

In our study, we examine the relationship between a firm’s market value of equity per share, and the fair value of newly granted ESO:s disclosed under the IFRS 2, for a sample of companies listed on the OMX Stockholm exchange. Our aim is to examine whether investors believe that granting new ESO:s creates more value than it destroys. It is possible that ESO expenses are more accurately described as investments, because of the ‘intellectual capital’ that ESO programs may create. A similar argument has been made by Lev & Sougiannis (1995) regarding R&D expenses, which can give rise to positive returns in the future in the form of improved products or processes, and can thereby be seen as investments. To answer this question, we perform a value relevance study where we examine whether investors incorporate the value of

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4 Historically, the debate regarding ESO programs has hardened in Sweden in connection with events that have put the compensation of executives in the spotlight, such as the Skandia scandal in 2003 (see for example Sundén Jemini in Svenska Dagbladet, 2003) and the bank crisis in 2008 (see for example Cervenka & Almgren in Svenska Dagbladet, 2009). A recent trend is that institutional investors have started to work against ESO programs; especially politically influenced investors such as the state owned Swedish pension funds (see Magnusson & Ekdahl in Dagens Nyheter, 2010).
ESO:s granted during the year, in the share price. We perform a price-level regression that builds on the Ohlson (1995) valuation framework, where we also control for expected earnings growth through the inclusion of earnings forecasts. The study ranges back to 2005 (the first year when IFRS 2 was effective). We also test for the possibility of a non-linear relationship between ESO grant value and share price, in the form of diminishing marginal revenue.\(^5\)

1.3. Contribution

Much of the research conducted on the topic of stock option programs has covered American firms and the American stock market. Differences as to general level of compensation (where American firms can be said to compensate more generously in comparison to Swedish firms), as well as other cultural features, may have an impact on how investors value executive compensation in form of ESO:s. While previous research has mainly focused on the whole portfolio or expenses related to ESO:s, we examine only newly granted options.

Moreover, most previous research has been made before the implementation of IFRS 2 in 2005. Under the assumption of a perfect market this would not make a difference, for as long as certain information, in this case about ESO programs, is disclosed, informed investors would estimate the impact on firm value themselves. However, the concept of an efficient market rests on strong assumptions that do not always accurately describe the real world. In an event study by Espahbodi et al. (2002), American firms showed abnormal negative returns at the time when the FASB announced its plans to require recognition of ESO program expenses. Their study gave support for the theory that recognized numbers have a greater impact than disclosed information. Because of the above mentioned, it would be valuable to perform a value relevance study on ESO programs in a Swedish context.\(^6\)

1.4. Study outline

The remainder of this study will be organized as follows. In section 2 we present previous research that is relevant to our study. Section 3 describes the theoretical frameworks around which this thesis is built; we describe the basic characteristics of ESO:s and how they are accounted for under the IFRS 2, and develop the contrasting perspectives around the effects of

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\(^5\) See section 4.4.

\(^6\) The American studies referred to in this paper paint a picture – if however incomplete – of how ESO costs relate to share price, and Aboody (1996) found that newly granted ESO:s have a positive impact on share price. However, in social sciences knowledge cannot be completely separated from its context. Thus results are not always applicable in other contexts than the one where the results were obtained.
ESO programs on firm performance. We also elaborate on the value relevance approach and the valuation theory assumptions behind it. Section 4 describes the data collection, the sample characteristics and outlines the method used. The empirical tests and results obtained are presented in section 5. Section 6 presents an analysis of the results and section 7 summarizes the thesis, points at caveats and limitations and suggests further research.

2. Related research
The effects of ESO programs is a field of research that has received much attention in the past, although most research is done before the issuance of IFRS 2, and performed on the American market. In this section we present relevant previous research and place our own study in relation to it.

2.1. Research on the relationship between ESO grants and future earnings
One approach is to study the relationship between ESO grants and future performance, in terms of earnings measures. Previous research with this approach includes Hanlon et al. (2003) who found a positive relationship between ESO value granted to the top five executives of firms (calculated with the Black & Scholes pricing model) and future operating income, with an increase in operating income of $3.71 per dollar invested in ESO:s. Their findings contradict the rent extraction perspective.

Our study is similar to Hanlon et al:s (2003) in the respect that we, when constructing our hypotheses, view ESO costs as investment expenditures. Another similarity is that we test for the possibility of a diminishing marginal return on ESO grants. We do this by introducing a dummy variable for the relative size of the total number of ESO:s outstanding to shares outstanding. How this is done will be presented under section 4.4.

The advantage of Hanlon et al:s (2003) approach, of using accounting measures as the dependent variable, is that it does not rely on market efficiency. However, it is dependent on the ability of accounting measures to capture value, and it is sensitive to the time horizon chosen. For example, Hanlon et al. chose to include \((t – 5)\) years of ESO grants and regress it against operating income at the time \(t\). The rationale of the chosen period was that Aboody et al. (2004) had found the average ESO life to be 5.5 years. However, it is not evident that all effects of the ESO programs will be caught in operating income during this period.
2.2. Research on the relationship between ESO programs and share price

Studies with a value relevance approach, similar to ours, do not have these problems, given the assumption that the market reacts on information when it becomes available and incorporates the net effect into the share price. Thus, ESO values could very well have a positive effect on accounting earnings for a specified period of time, and still have a negative effect on share price. Value relevance studies of ESO programs have been conducted before by, among others, Aboody (1996) and Aboody et al. (2004) for broad cross-industry samples, and by Bell et al. (2002) for a smaller sample limited to profitable computer firms. While Bell et al. (2002) found an overall positive relationship between the disclosed ESO expense and share price, Aboody (1996) and Aboody et al. (2004) found negative overall relationships, indicating that the findings of Bell et al. (2002) cannot be generalized to other sectors.

The negative relationships found in large samples can be seen as support for that ESO grants are net costs, and not investments, i.e. the benefits do not cover the cost of dilution. However, Aboody’s (1996) and Aboody et al’s (2004) studies were not designed to capture the net benefits and costs of ESO grants.

While we only study newly granted ESO:s and their relation to share price, Aboody (1996) studied the effects on share price of the total value of the portfolio of ESO:s outstanding, which means that the ESO term in his study consisted of ESO:s in different stages of the vesting cycle. However, he argued that if an option grant is associated with future benefits, which are realized as the options gets closer to the exercise date, and thus transferred to profit and then accumulated profit, then options with longer time left until vesting should have a more positive net present value (NPV) for investors than options that are close to the exercise date. According to this line of reasoning, newly granted ESO:s can have a positive NPV, while the portfolio as a whole has a negative relation to share price, depending on the structure of the ESO portfolio. Aboody (1996) found a positive impact on share price, by ESO:s that were granted in the year preceding measurement, but increasingly negative impact of ESO:s in later stages of the vesting cycle, resulting in an overall negative relationship. Thereby, his findings are not inconsistent with the theory that the expected NPV of ESO:s is positive at grant.

Our study further differs from Aboody’s (1996), by the fact that he only included observations that had ESO:s outstanding that constituted at least five percent of the total shares outstanding, while we have chosen to include companies that have a smaller potential dilution
effect as well. If granting ESO:s follows the rule of diminishing marginal return, the relationship found by Aboody (1996) can be biased by the fact that it is possible that marginal return of ESO:s is low, or even negative, for firms with larger ESO programs.

Finally, our study differs from Aboody’s (1996) in the sense that that we rely on the reported values for ESO:s, as opposed to estimating the value ourselves. Aboody’s (1996) arguments for adjusting the fair value himself were that the FASB (and the IASB) does not allow revaluations from year to year when new information about the share price is available, and that the models commonly used in practice, such as the Black & Scholes and binominal models, are not well suited for valuing ESO:s. In our study, we do not recalculate the reported fair values of ESO:s, and our arguments for this are as follows: we only value newly granted options, and therefore our problem with changing share prices from the grant date until the measurement date is not as serious as in Aboody’s (1996) case. We also believe that investors, on average, are more likely to accept the values reported than to modify the pricing models themselves. Even if they did, it is unlikely that they would end up with the same value as we would. It should be commented, however, that the underlying assumptions to the option pricing models are subject to management discretion, and that these could be manipulated to decrease the reported fair value of the options (Hodder, Mayew, McAnally, 2006). Nevertheless, we perceive this as a minor issue. A further advantage of relying on reported numbers is that we reduce the problem of a possible mechanical relationship between share price and fair value of ESO:s.

Aboody et al. (2004) studied the value relevance of the SFAS No. 123 expense of ESO programs, and is therefore not designed to capture the NPV of ESO grants, since the cost of the program is distributed over the vesting period. Thus, their findings do not contradict a positive relationship between ESO grants and share price.

In summary, our study adds the following to the current body of research on the area.

1) In difference to previous research, we perform our study on the Swedish market, after the implementation of the IFRS 2.

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7 See section 3.3.
8 The share price is used as an input in the option pricing models used. Thus, the fair value of ESO:s is a positive function of the spread between share price and exercise price of the option. However, at grant date, the share price is known to the firms granting the ESO:s, and hence the main value driver is the exercise price. Hence, the fair value at grant is rather a function of how the exercise price is set in relation to a known share price. Therefore, we should not have a problem with this mechanical relationship. Aboody (1996), on the other hand, revalued the options every year, and hence he gave increased importance to the development to share price, increasing the risk of a reversed causal relationship.
2) We examine the effect of newly granted ESO:s in order to, more accurately than previous research, capture the expected net benefits of ESO programs.

3. Theoretical framework
In this section we describe the theoretical frameworks that constitute the foundation of our study. The different theoretical aspects of the paper are diverse, and therefore we present them without apparent connections to each other. This section should rather be seen as a reference when reading the paper. We refer to the theory section when we find that a clarification of something is in order, in the other sections of the paper.

3.1. Value relevance
One purpose of producing financial statements is to provide investors with information for the purpose of valuation. Given this goal, accounting measures that are relevant for the determination of the market value of equity are good and useful measures. If an accounting measure has a high correlation with share price, it can be inferred that the measure is relevant to investors for valuation of the firm. Value relevance studies are studies that examine how certain accounting measures correlate with the market value of equity (Barth, Beaver, Landsman, 2001). Starting with Ball & Brown (1968), who showed that earnings capture information that is incorporated in share prices, a large body of literature has been developed, which examines the relationship between accounting information and share prices. For example pension components (Barth, Beaver, Landsman, 1993) and R&D expenses (Lev & Sougiannis, 1995) have been the subject of value relevance studies.

As pointed out by Penman (1989), an important assumption behind value relevance studies is that the market value of equity is sufficient to determine the value of the firm, and that the market value thus can be used as a benchmark, against which accounting measures can be evaluated. This in turn, rests on a certain trust in market efficiency. The opposite view can be adopted, that the market value can differ from the ‘intrinsic’ value of a firm because of market inefficiency, and that the ‘intrinsic’ value can be found by proper fundamental analysis.

In our value relevance study, we use the market value as a benchmark, from which we seek to draw conclusions about the perceived net benefits and costs of ESO programs, and are thus implicitly making the assumption that it is meaningful to do so. With this said, we are aware
of the fact that markets are not fully efficient, and that the assumptions of an efficient market can be highly inaccurate, especially during periods of turbulence, such as the 2008 financial crisis. Thus, we do not aspire to give an answer to the net benefits and costs of granting ESO:s, but we can aspire to say how investors view ESO grants.

3.2. The Ohlson valuation framework
To be able to draw conclusions about the impact of the independent variables in a model that aims to explain a dependent variable, it is important to design the model in such a way that the part of the dependent variable explained by the model is as large as possible. The model used in this study builds on the Ohlson (1991, 1995) extended residual income valuation (RIV) framework, which is well suited for the insertion of additional accounting measures, and has been proved to have empirical support.9 Conceptually, Ohlson’s model is a restatement of the Present Value of Expected Dividends (PVED) model, which rests on the assumption that the market value of a firm is equal to the present value of future expected dividends. However, as opposed to the PVED model, Ohlson’s model does not rely on estimates of future dividends. Instead the RIV model, assuming a clean surplus relationship, restates the expected dividends as a function of the accounting numbers net income and book value of equity. Hence, it is well suited for incorporation of additional, informative accounting number (such as, in our case, the reported fair value of granted ESO:s). Ohlson’s model is presented below:10

\[ P_{i,t} = \alpha_{1,t} \left( x_{i,t} - (d \cdot r) \cdot (1 + r)^{-1} \right) + \alpha_{2,t} Y_{i,t} + \beta v_{i,t}, \]

where

- \( P_{i,t} = \) Market value of a firm at time t (the measurement point in time).
- \( x_{i,t} = \) Net income for the period (t-1) to t.
- \( d_{i,t} = \) Dividend related to the measurement period.11
- \( r = \) Risk-free interest rate.
- \( Y_{i,t} = \) Book value of equity at the time t.
- \( v_{i,t} = \) Additional accounting information

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9 See for example Dechow, Hutton, Sloan (1999). Earlier studies that have examined ESO programs, such as Aboody (1996), Bell et al. (2002) and Aboody et al. (2004) have also used versions of Ohlson’s (1995) model.
10 We use the denotation used in Aboody (1996).
11 The dividend is defined as the net capital flow from equity, i.e. capital contributions and share repurchases included. Hence \( d \) may take on negative numbers.
If the clean surplus relationship holds, that is, if:

\[ Y_t = Y_{t-1} + x_t - d_t, \]

then the present value of expected dividends can be stated as a function of expected abnormal earnings and book value of equity at time of measurement, as stated below:

\[ P_0 = Y_{t-1} + \sum_{t=1}^{\infty} \frac{(x_t - x_{r,t})}{(1+r)^t} \]

where

\[ x_{r,t} = \textit{required earnings for the period } t \]

If this implication of equation [3] is applied on equation [1], the term \( x_t - (d_t \cdot r) \cdot (1+r)^{-1} \), can be viewed as a proxy for future earnings. Strict application of the Ohlson model implies that the predicted net income year \((t+1)\) is linearly related to net income year \(t\), adding on any additional effect from the variable for other information. Further, Ohlson’s (1995) model relies on the assumption that, as clean surplus relationship holds, paying out dividends does not affect current earnings but do decrease the underlying asset, i.e. the book value of equity. This in turn, will reduce future earnings, since the abnormal earnings are a function of the underlying asset at time \((t-1)\), multiplied by the spread between expected and required rate of return. In equation [1] this assumption is captured by the reduction of future expected income lost due to paying out dividends. Future expected income decreases with is \( d \cdot r \), discounted to a present value by division by \((1+r)\). Ohlson uses the risk-free rate as he, for simplicity, assumes no risk aversion. One can relax this assumption by replacing the risk free rate with a proxy for a risk adjusted rate, which can easily be done using the capital assessment pricing model (CAPM). However, it is important to keep in mind the drawbacks of CAPM, as it tells us nothing about where the risk is derived from, and it does not incorporate leverage or risk of failure.\(^\text{13}\)

### 3.3. Stock option theory

A stock option is an instrument that gives the option holder the right, but not the obligation, to buy a share in a company at a specified price, sometime in the future. Given the limited downside but the unlimited upside, options can be very valuable to the option holder. There are often

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\(^{12}\) Calculated as the required return on equity times the opening book value of equity.

\(^{13}\) Moreover, the empirical support for the CAPM has proven to be weak, see Fama & French (1993).
certain conditions tied to options granted to employees that have to be met in order for the employee to be able to exercise the option, called *vesting conditions*. The *vesting period* is the period during which there are vesting conditions to be met. Vesting conditions can be divided into *market* vesting conditions and *non-market* vesting conditions. A market vesting condition is a condition where the exercise of the option is dependent on how the company’s share performs. Conversely, a non-market vesting condition is a condition that does not involve the share’s performance. The most common non-market vesting condition is that the employee has to stay in service over a specified period of time. Other examples include reaching a certain level of return on investment, income measure or other key performance indicator. The distinction between market- and non-market vesting conditions is important to keep in mind when calculating the fair value of the options for reporting purposes. Market vesting conditions are adjusted for in the pricing models used, since they are required as inputs, while non-market conditions are not. Instead, these conditions are accounted for by adjustment of the number of options expected to vest.

3.4. The IFRS 2

The IFRS 2 is the IFRS standard that regulates the measurement and recognition principles of all share based compensation, under which ESO programs fall. Under the IFRS 2, the fair value of the options granted is calculated on the grant date, which is defined as the date at which the parties have reached a “shared understanding of the terms and conditions of the arrangement”. After the grant date, the fair value is not adjusted for changes in share price. The fair value is recognized as an expense linearly over the vesting period, and a corresponding increase in equity is made.

In addition to recognizing the expense, the IFRS 2 requires firms to disclose further information regarding the ESO program. In the disclosed information, fair values and the number of options granted at specific grant dates are found. Thus, it is possible to calculate the total value of the grant, even though the expense is distributed over the vesting period.

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14 The IFRS 2 explicitly mentions the Black & Scholes model and the binominal model as two acceptable models.
15 It has been argued by Aboody (1996), among others, that because of the special characteristics of ESO:s, with non-transferability and vesting conditions, the common option pricing models are inappropriate for valuation of ESO:s.
16 IFRS 2, Appendix A: Defined terms, p. 216.
3.5. The agency theory perspective
According to the theory of principals and agents, people are motivated by things that serve their own self interest. Thus, owners should tie external rewards to the targets that they want the management to achieve. Agency theory is supported by a large body of classic economic literature including Ross (1973) and Wilson (1968) among others. According to agency theory, management might hurt future earnings by taking on too little or too much risk, or taking on opportunistic behavior, if proper incentive systems are not in place. If on the other hand, managers are adequately rewarded, agency problems are reduced, and they will work harder and make wiser decisions. Hence, ESO programs, which align employees’ incentives with the owners’ incentives, should help creating value. Jensen and Meckling (1976) argued that costs of reducing agency problems are as real as any other cost for a firm. Core & Guay (1999) and Yermack (1995) have built on agency theory, and sought to model levels of employee compensation.

In addition to the possible behavior effects and their relationship to future earnings and share price, granting ESO:s might have other positive effects on the valuation of a firm. For example, by setting vesting conditions ESO:s can be used to bind current employees to the firm, reducing future costs for training new employees (Oyer, 2004). Further, the usage of ESO:s as compensation may untie means for investments which is especially important for companies facing rapid growth opportunities and limited funding, such as in fast growing technological firms, where ESO:s are vastly used as a way of compensation (Bell et al., 2002). These effects would lead us to expect a positive relationship between ESO grants and share price, as investors in such case would view ESO grants, not merely as costs, but also as investments. We label this perspective the agency theory perspective.

3.6. The rent extraction perspective
The other side of the debate argues that the positive effects on future performance do not offset the dilution of the current shares. Some researchers have argued that ESO:s are inappropriate means of compensation (see for example Muelbroek, 2001, who suggests that ESO programs expose managers to too much firm specific risk for ESO programs to be cost effective). Some also argue that there are dysfunctional aspects of ESO programs such as the possibility that, if managers have influence over corporate governance issues such as their own remuneration program, they reward themselves above the optimal level for current shareholders, or use insider
information to time the exercise of ESO:s, at the expense of shareholder value (Carpenter & Remmers, 2001). Hanlon (2003) refers to this as the rent extraction perspective. Another possible adverse effect of option programs is that managers’ intrinsic motivation may decrease when the external reward increases, in this case in the form of stock options. This approach, called motivational crowding theory, is often promoted by behaviorists, and goes against economic theory and agency theory. These effects would lead us to expect a negative correlation between ESO grants and share price. We label this perspective the rent extraction perspective, following Hanlon’s (2003) terminology.

4. Method

4.1. Data sample selection
Our aim has been to perform our study with a data sample as large as possible from the Swedish market. We have examined all companies listed on the OMX Stockholm index (including the small-, mid-, and large cap lists), creating a data set of observations who have ESO programs in place and who report the fair value of the options granted. We have not taken observations from other Swedish stock markets such as First North or Aktietorget. The reasons for this are that these markets are possibly less efficient since they are less covered by media and analysts, and that these companies do not report according to the IFRS standards. For a value relevance study such as ours, assumptions regarding market efficiency and reporting standards are crucial for comparability between the observations, and therefore we cannot include companies from these lists.17

We have chosen not to focus on a specific industry in attempt to broaden our sample, generating as many observations as possible given the restriction of data only being available from 2005 and onwards. Further, as we aim to study investors’ attitude towards ESOs in general, committing ourselves to one, or a few, industries would likely distort any possible findings.

Data regarding the ESO programs was hand collected from annual reports, dating back to January 1 2005, which is the date when IFRS 2 became effective. To the extent that the 2009

17Information catalysts, such as analyst firms and media, are important for market efficiency, and costs of ESO programs are among the more complicated costs to evaluate. In its exposure draft to the Statement of Accounting Standard (SFAS) No. 123, the FASB made the assessment that “Only the most sophisticated users of financial statements can reasonably estimate the impact of recognizing all compensation costs. Many individual investors and other users of financial statements could not.”
annual reports had been published at the date of collection, they have been included. Our sample consists of 105 firm-year observations from 40 firms listed on the OMX Stockholm index.

4.2. Choices regarding the data
When collecting the data, we have been forced to make a number of somewhat arbitrary, but necessary decisions that will be explained in this section.

4.2.1. Choices related to employee stock options
1) The collected data for the value of ESO:s granted during the year is defined as the fair value per equity instrument granted times number of instruments granted, based on information published in the annual reports. If a firm has other share based programs than ESO programs in place, such as matching share programs and performance share programs, these have been included as long as these are reported according to IFRS 2. As these have similar characteristics, and theoretically the same effect on employee behavior, it would not be consequent to exclude them. Hence, when we refer to ESO:s we refer to these programs as well.

2) ESO:s granted at market conditions, i.e. when the employee purchase the stock options at a price corresponding to the fair value estimated are not included in the data since they fall outside the scope of IFRS 2. We also exclude grants issued at market conditions but which are later subsidized. This is due to the trouble of estimating the fair value at the grant date, as the late compensation would have to be discounted to a present value. Further, the amount to be subsidized is seldom known, as it is often conditioned on achieving certain goals.

3) Cash settled share-based remuneration programs have not been included, since the fair value of the total grant seldom is stated at grant date. In most cases, only the amount expensed over the current period and the corresponding increase in liabilities is disclosed.

4) Observations where the fair value at the grant date has only been stated in later annual reports (non-complying accounting that has been corrected in retrospect), have been excluded as this information has not been available to investors at the valuation date.

---

18 Some firms have stated the total value of the grant directly, without stating the fair value of each option granted. In these cases we have used this number directly.
5) Observations where all the *Black & Scholes model inputs* have been disclosed, but not the calculated fair value, have been excluded from the data, since we aim to perform the study only on actually reported numbers. In this respect, our study differs from Aboody’s (1996). It is possible to use the assumptions stated and perform a Black & Scholes valuation, to calculate the fair value of the ESO:s. However, this would then hinge upon a belief that investors perform the same valuation as an estimate of the value of the granted instruments for the found coefficient on ESO to be valid.

6) The effects of *non-market vesting conditions* on ESO value is supposed to be accounted for by adjustment of the number of options expected to vest, not the fair value of each granted instrument, as explained under section 2.3. Hence, when estimating the total value of granted ESO:s during the year the number of options expected to vest has been used instead of total number of granted instruments, whenever stated. However, since the expected number is not always disclosed, for observations where there are non-market vesting conditions involved but no expectations stated, the calculated value is based on the total number of options granted.

7) If information is available about the number of *options forfeited* between the grant date and the release of the annual report, we have adjusted the number of options granted downwards to reflect the latest information available. Sometimes it has not been possible to distinguish how many of the forfeited options that relate to this year’s grant, and how many that relate to earlier years’ grants. In these cases, no adjustments have been made.

### 4.2.2. Choices related to other components of the model

1) The share price, $P$, is defined as the average unadjusted share price over a four week measurement period, starting after the release of the annual report. This period is chosen in order to unquestionably capture the effect of the information from the newly released annual report. The unadjusted price is used since the measurement period lies directly after release of the annual report. Hence the dividend related to the measured year will not yet have been paid out, and the share price will thus include the right to receive this payment.
2) When a firm has two (or more) classes of shares traded on the OMX Stockholm exchange, we use a weighted average of the shares outstanding to estimate the price, $P$, in order to capture all equity interests in the company.

3) $BVE$ is defined as the reported book value of equity for the group, excluding minority interest, as disclosed in the annual report published at the beginning of the measurement period. Since the dividend for the reported year has not yet been paid out, and the unadjusted price is used, the value of $BVE$ is taken cum dividend.\(^{19}\)

4) $NI$ is defined as the net income for the group, excluding minority interest, as reported in the annual report published at the beginning of the measurement period.

4.3. Data characteristics
After gathering the sample according to the procedure outlined above, a sample was obtained consisting of 107 observations, covering 40 firms, over a period of five years. We do not have observations for every firm all years in our sample for a natural reason; many firms do not grant ESO:s each year, as it is common to grant ESO:s in reoccurring programs that stretch over a few years. Out of these 107 observations, two have been excluded due to their extreme values on granted ESO:s per share.\(^{20}\) Below we present a summary of how the data in our sample is distributed between industries, years and lists (the large-, mid- or small cap list on the OMX Stockholm exchange).

\(^{19}\) In strict application of Ohlson’s (1995) RIV model, the book value of equity should be used *ex dividend*. When running the regressions in section 5, we also tested for separation of $BVE$ and dividend. As this did not materially change our findings, we decided to use $BVE$ *cum dividend*, to keep the number of independent variables as low as possible due to our relatively small sample.

\(^{20}\) 1.61 and 2.24 SEK per share respectively, compared the cutoff point three std away from mean: 1.23, representing a approximate probability of 0,14 percent under a normal distribution.
Table 1: Data characteristics

<table>
<thead>
<tr>
<th>Industry</th>
<th>SIC-code</th>
<th>n</th>
<th>Year</th>
<th>N</th>
<th>List</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry &amp; Agriculture</td>
<td>0-9</td>
<td>3</td>
<td>2005</td>
<td>13</td>
<td>Large</td>
<td>55</td>
</tr>
<tr>
<td>Mining &amp; Construction</td>
<td>10-19</td>
<td>5</td>
<td>2006</td>
<td>22</td>
<td>Mid</td>
<td>28</td>
</tr>
<tr>
<td>Food &amp; Chemicals</td>
<td>20-29</td>
<td>6</td>
<td>2007</td>
<td>31</td>
<td>Small</td>
<td>22</td>
</tr>
<tr>
<td>Manufacturing (Pharmaceuticals)</td>
<td>30-39</td>
<td>24</td>
<td>2008</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation &amp; Utilities</td>
<td>40-49</td>
<td>15</td>
<td>2009</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wholesale &amp; Retail</td>
<td>50-59</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finance, Insurance &amp; Real Estate</td>
<td>60-69</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services (High-tech firms)</td>
<td>70-99</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>105</td>
<td></td>
<td>105</td>
<td></td>
<td>105</td>
</tr>
</tbody>
</table>

In Table 1 above, we see that our sample consists of mostly firms listed on large cap, followed by mid- and small cap. Compared to the OMX Stockholm exchange, where the number of firms listed on the small cap is twice as many as the number of firms listed on the large cap, our sample contains an overrepresentation of observations from firms listed on the large cap.\(^{21}\) The most common industries in our sample are “services”, which (in our sample) mostly contains high-tech firms, and “manufacturing”, which (in our sample) mostly contains pharmaceutical firms. Below we present comparisons of means of per-share values for the different subgroups in our sample:

Table 2: Comparison of variable means between 2008 and other years

<table>
<thead>
<tr>
<th>Year</th>
<th>P</th>
<th>ESO</th>
<th>NI_forecast</th>
<th>BE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Mean</td>
<td>133,0513</td>
<td>.2053</td>
<td>8,2725</td>
<td>52,3222</td>
</tr>
<tr>
<td>N</td>
<td>77</td>
<td>77</td>
<td>77</td>
<td>77</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>113,44480</td>
<td>.21465</td>
<td>11,27688</td>
<td>58,26513</td>
</tr>
<tr>
<td>2008 Mean</td>
<td>68,4451</td>
<td>.1890</td>
<td>5,4767</td>
<td>46,4932</td>
</tr>
<tr>
<td>N</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>71,48917</td>
<td>.27926</td>
<td>10,43685</td>
<td>51,25839</td>
</tr>
<tr>
<td>Total Mean</td>
<td>115,8229</td>
<td>.2010</td>
<td>7,5269</td>
<td>50,7678</td>
</tr>
<tr>
<td>N</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>107,49746</td>
<td>.23231</td>
<td>11,07939</td>
<td>56,29975</td>
</tr>
</tbody>
</table>

\(^{21}\) The distribution on the Stockholm list 2010-02-01 was 125, 74, 56 for large-, mid- and small cap respectively.
Table 3: Comparison of variable means between dilution groups

<table>
<thead>
<tr>
<th>Dilution</th>
<th>P</th>
<th>NI_forecast</th>
<th>BE</th>
<th>ESO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 2 Mean</td>
<td>42,1462</td>
<td>-2.708</td>
<td>19,7067</td>
<td>.2170</td>
</tr>
<tr>
<td>(d&gt;5%) N</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>78,86848</td>
<td>4,69260</td>
<td>20,65494</td>
<td>.30635</td>
</tr>
<tr>
<td>Group 1 Mean</td>
<td>125,3296</td>
<td>8,5331</td>
<td>54,7757</td>
<td>.1989</td>
</tr>
<tr>
<td>(d&lt;5%) N</td>
<td>93</td>
<td>93</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>107,33057</td>
<td>11,27728</td>
<td>58,22375</td>
<td>.22304</td>
</tr>
<tr>
<td>Total Mean</td>
<td>115,8229</td>
<td>7,5269</td>
<td>50,7678</td>
<td>.2010</td>
</tr>
<tr>
<td>N</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>107,49746</td>
<td>11,07939</td>
<td>56,29975</td>
<td>.23231</td>
</tr>
</tbody>
</table>

Table 4: Comparison between variable means between firms listed on large, mid and small cap.

<table>
<thead>
<tr>
<th>List</th>
<th>P</th>
<th>NI_forecast</th>
<th>BVE</th>
<th>ESO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>165,8989</td>
<td>13,3866</td>
<td>78,4934</td>
<td>.2083</td>
</tr>
<tr>
<td>N</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>116,02470</td>
<td>11,76848</td>
<td>64,89458</td>
<td>.24997</td>
</tr>
<tr>
<td>Mid</td>
<td>76,4834</td>
<td>2,6482</td>
<td>26,1664</td>
<td>.1780</td>
</tr>
<tr>
<td>N</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>64,39345</td>
<td>5,01159</td>
<td>16,54743</td>
<td>.17704</td>
</tr>
<tr>
<td>Small</td>
<td>40,7016</td>
<td>-9,130</td>
<td>12,8998</td>
<td>.2120</td>
</tr>
<tr>
<td>N</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>52,32782</td>
<td>4,81697</td>
<td>14,19710</td>
<td>.25558</td>
</tr>
<tr>
<td>Total</td>
<td>115,8229</td>
<td>7,5269</td>
<td>50,7678</td>
<td>.2010</td>
</tr>
<tr>
<td>N</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>107,49746</td>
<td>11,07939</td>
<td>56,29975</td>
<td>.23231</td>
</tr>
</tbody>
</table>

4.4. Specification of regression model

To address the question of how the value of newly granted ESO:s relates to the share price of a firm, we perform a regression analysis with share price as the dependent variable and the value of ESO:s granted during the year leading up to the measurement point in time as an independent variable. We base our regression model on Ohlson’s (1995) extended residual income valuation (RIV) model, as outlined in section 3.2. For application in our study, we have used the observed share price as a proxy for \( P \) in equation [1], which hinges upon an assumption of market efficiency, as explained under section 3.1. Further, we replace the expression for expected net
income at time \((t+1)\) by an average of forecasted net income for the year \((t+1)\), \(NI_{fc}\), derived from the database DataStream. The usage of forecasted net income is an attempt to control for future earnings growth. Hence, we implicitly assume that future net income is not perfectly linearly related to current net income, which can be a reasonable assumption given the measurement period covering the 2008 market drop. We will include the value of ESO grants as the variable for other accounting information, \(v\). From now on we will also refer to book value of equity, \(Y\), as \(BVE\). The model, [R1], is specified as follows:

\[
\begin{align*}
    P_{it} &= \alpha + \alpha NI_{fc}t + \alpha BVE_{it} + \beta ESO_{it} + \epsilon_{it} \\
\end{align*}
\]

To test for diminishing marginal revenue, we have divided our sample into two groups based on the number of options outstanding in relation to total shares outstanding for each observation, setting the second group equal to, or greater, than five percent. Based on this second group, a dummy variable has subsequently been created, yielding the value 1 if the observation \(i\) belongs to the second group, and 0 if it is not. This dummy is then multiplied by the value of granted ESO:s for observation \(i\), creating an additional slope variable to the original \(ESO\) variable, introduced as yet an additional variable for other accounting information in equation [1]. The coefficient for the original \(ESO\) variable will hence come to represent the “normal case”, i.e. the effect when outstanding options consist of less than five percent of outstanding shares, while the sum of the coefficients for the \(ESO\) and the \(ESO\) dummy variable (from now on \(ESOd\)) represents the effect when the outstanding options consist of more than five percent of outstanding shares. If the relationship between \(ESO\) grants and the share price shows a pattern of diminishing marginal revenue we expect to find negative coefficients for \(ESOd\), and that the coefficient for \(ESO\) is positive. If the sum of both coefficients equal 0, further granting of ESO:s will not contribute any additional value (that is the expected benefits equal the expected cost).

**4.5. Hypothesis**

As described under section 3.5 and 3.6, there are theoretical arguments that support both the agency theory perspective and the rent extraction perspective. Thus, the impact of ESO grants on share price could be either negative (and thereby value destroying) or positive (and thereby value creating). Granting ESO:s is value destroying if the future expense is not fully compensated by future gains, in which case the coefficient will be in the range between minus one and zero on
the ESO grant value in equation [R1]. A coefficient below minus one would indicate that the market believes that ESO grants destroys value in excess of the estimated fair value of the granted ESO:s. This would be in line with the motivation crowding theory argument, of intrinsic motivation being reduced when external motivation takes over. A further explanation could be that investors actually value ESO:s higher than the value disclosed in the annual reports.

If, on the other hand, the $E SO$ coefficient in equation [R1] is above 0, it would indicate that the market believes that newly granted ESO:s create value that more than compensates the expected expense. This would be in line with agency theory, but could also be explained by any positive effect of untying means for investments in growing firms facing positive NPV investments. A further possibility could of course be that investors fail to recognize the value of the granted options, especially if they are not in the money at the grant date - that is, investors might fail to recognize the time value of an option.

As stated under section 2.2, previous research has pointed at a negative relationship between disclosed ESO expenses and share price on the American market. However, Aboody (1996) found a positive impact on share price from the ESO:s granted in the year preceding the measurement point in time. Based on Aboody’s (1996) findings, we expect to find a positive correlation between newly granted options and share price. Hence the following hypothesis has been formulated:

$$H_0 = \beta_{ESO} \geq 0 \rightarrow \text{NPV of 0 or above}$$

$$H_1 = \beta_{ESO} < 0 \rightarrow \text{NPV below 0}$$

5. Empirical tests and results
In this section we give a detailed presentation of the empirical tests performed and the results obtained. The tests were performed using the software PASW, version 18 (2009).

5.1 Correlations
A natural initial step when investigating the relationship between a dependent and an independent variable used in a linear model, is to examine the correlations between the variables. In Table 5 below, the individual correlations between the dependent and independent variables are presented.
Table 5: Correlations

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>NI_forecast</th>
<th>BE</th>
<th>ESO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NI_forecast</strong></td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.808**</td>
<td>.572**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td><strong>BE</strong></td>
<td>Pearson Correlation</td>
<td>.808**</td>
<td>1</td>
<td>.586**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td><strong>ESO</strong></td>
<td>Pearson Correlation</td>
<td>.572**</td>
<td>.586**</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

The positive correlations between our dependent variable, P, and the independent variables NI_fc, BVE and ESO – all significant on a two-tailed, one percent significance level – tells us that all variables are somewhat linearly, positively related to price. NI_fc is closest to a perfect linear relationship, followed by BVE and then ESO. The correlations do not, however, tell us anything about the causal relationship between the variables. Neither does it tell us anything about the steepness of the slope of such a relationship. Further, only investigating the correlation to the dependent variable will not answer the question of how a certain independent variable relates to the dependent variable, since it is later put in relation to other independent variables in the regression model. We can, for example, see that NI_fc is significantly correlated to all the other independent variables, which indicates that the net effect of all the independent variables might differ from the individual effects. The correlation between the independent variables used in a regression model following ordinary least squares (OLS) cannot be too strong, as this would lead to a violation of the assumption of no collinearity. The question of whether the correlation between NI_fc and BVE poses such a problem is investigated under section 5.3.2.22 We find that all variables included in our model are significantly related to the share price, P. Thus we can

22 The correlation between NI_fc and ESO is perceived to be too small to be considered a problem.
conclude that we do not include irrelevant variables in our model and can hence go on to regressing the dependent variable to the independent variables.

5.2. Test of linear relation

We test our hypothesis by application of the Ohlson (1995) model, as outlined in section 3.2. and 4.4. The model includes the reported fair value of granted ESO:s as an additional accounting information variable. To begin with we assume linearity in the relationship between price and granted value of ESO, as stated under section 4.4. The first regression is then set as follows:

\[
R_1 \quad P_{i,t} = \alpha + \alpha NIfc_{i,t} + \alpha BVE_{i,t} + \beta ESO_{i,t} + \varepsilon_{i,t},
\]

where \(i\) refers to the individual observation and \(t\) is the measurement point in time. \(NIfc_{i,t}\) denotes the mean forecasted net income for the period following \(t\) (i.e. from \(t\) to \(t+1\)), and \(BVE_{i,t}\) denotes the closing book value of equity at time \(t\). \(ESO_{i,t}\) denotes the reported fair value of options granted in the period between \(t-1\) and \(t\), calculated as described under section 4.2.1. To mitigate heteroskedasticity and get comparable values, both the dependent and independent variables are deflated by the number of shares outstanding. We also run a second regression, where we relax the assumption of a linear relation between ESO grants and share price. We do this through the introduction of a dummy variable, denoted \(ESOd_{i,t}\), that captures any possible additional slope for firms having outstanding ESO:s greater than five percent of current shares outstanding. The second regression is thus set as follows:

\[
R_2 \quad P_{i,t} = \alpha + \alpha NIfc_{i,t} + \alpha BVE_{i,t} + \beta ESO_{i,t} + \beta ESOd_{i,t} + \varepsilon_{i,t},
\]

where the dummy variable is constructed in such a way that it yields the value 0 if an observation, \(i\), has an observed dilution effect below five percent. If the observed dilution lies equal to, or above five percent the dummy yields a value of 1. The dummy is then multiplied by the observed value of ESO per share. The regressions above yield the coefficients and significance values presented in Table 6:

\[23\text{ The information about the ESO:s granted between } t-1 \text{ and } t \text{ becomes available in the annual report at time } t.\]
Table 6: Results for regressions [R1] and [R2]

<table>
<thead>
<tr>
<th></th>
<th>Intercept</th>
<th>NIfc</th>
<th>BVE</th>
<th>ESO</th>
<th>ESOd</th>
<th>R²_adj</th>
<th>D-W</th>
<th>VIF_max</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R1 Coefficient</strong></td>
<td>32.436</td>
<td>6.683</td>
<td>.318</td>
<td>84.994</td>
<td>-</td>
<td>.752</td>
<td>1.704</td>
<td>1.576</td>
<td>-</td>
</tr>
<tr>
<td><strong>R1 Sig.</strong></td>
<td>.000</td>
<td>.000</td>
<td>.006</td>
<td>.000</td>
<td>-</td>
<td>.000</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>R1 Std. Error</strong></td>
<td>7.838</td>
<td>.601</td>
<td>.112</td>
<td>23.140</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>52.157</td>
</tr>
<tr>
<td><strong>R2 Coefficient</strong></td>
<td>32.455</td>
<td>6.583</td>
<td>.317</td>
<td>92.546</td>
<td>-32.131</td>
<td>.768</td>
<td>1.716</td>
<td>1.669</td>
<td>-</td>
</tr>
<tr>
<td><strong>R2 Sig.</strong></td>
<td>.000</td>
<td>.000</td>
<td>.006</td>
<td>.001</td>
<td>.499</td>
<td>.000</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>R2 Std.</strong></td>
<td>7.859</td>
<td>.620</td>
<td>.113</td>
<td>25.734</td>
<td>47.352</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>52.300</td>
</tr>
</tbody>
</table>

The coefficients found for the ESO variable are on a level high above what we would have expected; in fact they are unreasonable high.\(^{24}\) The adjusted R\(^2\) values in both regressions, tells us that the variation in the predicted values from our models manage to capture approximately 75 percent of the variation in \(P\). However, the standard error of estimate is large, close to 50 percent of the standard deviation in the independent variable price (107.5), indicating that the models are not good for prediction.\(^{25}\) Before any conclusions can be drawn out of these numbers, though, we must test if any of the underlying assumptions for the OLS regression technique has been violated, which is likely with such extreme coefficients.

5.3. Tests of the assumptions underlying the Ordinary Least Square regression technique

5.3.1. No autocorrelation

In time series data, the observed errors are likely to be correlated over time since the observed dependent, and independent, variables for one firm are likely to be correlated with the observed numbers in the previous measurement periods. This phenomenon, correlation between regression residuals, is called autocorrelation.\(^{26}\) Although autocorrelation does not cause the found coefficients to be biased, it can cause underestimation of the standard deviation of the estimates if the correlation is positive. In turn, the t-values may be overestimated leading to an increased probability of committing type I errors (Newbold, P. et al, 2006, p. 596). Since our dataset

\(^{24}\) Do notice, however, that the coefficient for ESOd is not significantly different from zero.

\(^{25}\) That is, the high value on R\(^2\) is more a result of high total variability in the dependent variable, than a low variation in the residuals.

\(^{26}\) Autocorrelation is sometimes also referred to as serial correlation or lagged correlation.
contains a mixture of time series and cross sectional data, it is possible that the assumption of no autocorrelation has been violated. However, we have a sample of 40 firms out of 105 observations over a period of five years (where 2009 only contains 11 observations), and hence a data set that consists of more cross sectional observations than time series observations. Thus, the problem with autocorrelation should not be severe and, as expected, the Durbin-Watson test indicated that we have no problem with autocorrelation.\textsuperscript{27}

5.3.2.\textit{No collinearity}

If two or more of the independent variables are strongly correlated to each other, the assumption of no collinearity may be broken.\textsuperscript{28} For the regression model as a whole, this causes no problem as the prediction power will remain unchanged. However, when independent variables are strongly correlated the individual, estimated coefficients will be unreliable as they reflect the intra relationship between variables and not the excluded effect by the individual variables themselves. As correlation moves away from zero the variance in the estimated coefficients will increase as will their sensitivity to changes in the other estimators (Newbold et al., 2006, p. 561). As we aim to investigate the exclusive effect of \textit{ESO} on price, low values of collinearity are crucial for the interpretation of our findings. Examination of the level of tolerance, and the corresponding VIF values (1/tolerance) indicates that the levels of collinearity, that is the level of linear relationship between the dependent variables, are manageable, with the highest VIF value being 1.595.

5.3.3. \textit{Normally distributed residuals}

We test for normally distributed residuals by performing the Kolmogorov-Smirnov test, and find that normal distribution lies on the border of being rejected on a 10 percent level of significance. We also see this visually, by plotting both the standardized residuals against the standardized predicted values, and by graphing a histogram over the distribution of the standardized errors surrounding the mean. In both graphs we find a large concentration of errors slightly below the mean, corresponding to a predicted value slightly below mean. The concentration of residuals below the predicted mean is expected, given our independent variable, \textit{P}, being skewed with tail

\textsuperscript{27} The Durbin-Watson \textit{d} value was 1.704, compared to the upper limit \textit{d} value \textit{(dU)} of 1.604 in a Durbin Watson table, at one percent significance level, for \textit{k} = 3, and \textit{n} = 100.

\textsuperscript{28} Collinearity is sometimes also referred to as multicollinearity.
to the right.\textsuperscript{29} The negative sign, although not greatly different from zero, on the plotted residuals tells us that our model predicts a slightly too high value in these cases. Studying the plotted relationship between the standardized residuals and the standardized predicted values also indicates that the variation in the residuals increase as the predicted value increases, indicating that we most likely have a problem with violation of the assumption of homoskedasticity, i.e. the assumption that the variance of the residuals is constant over all predicted values. Its counterpart, heteroskedasticity, could explain why the residuals lie on the border of not being normally distributed, since extreme observations are given too much importance when an OLS regression is run with heteroskedasticity present and as a result the estimated slope could be pulled in the direction of these extreme observations, yielding a either to step or flat slope.\textsuperscript{30}

\textbf{5.3.4. No heteroskedasticity}

We can hence conclude that we are likely to have a problem with heteroskedasticity, and formally test for the presence of heteroskedasticity by performing the White (1980) heteroskedasticity test. This results in rejection of homoskedasticity on a five percent significance level (although not on a 1 percent level), which means that we have an issue with detected heteroskedasticity. When heteroskedasticity is present, the coefficients estimated will still be unbiased. However, we can no longer say that the coefficients are the best linear unbiased estimators (BLUE), that is that the estimations are the ones that provide the smallest variance, increasing the risk of committing type I or type II errors (Newbold et al., 2006, p. 564).

\textbf{5.4. Sources of heteroskedasticity}

\textbf{5.4.1. Measurement errors}

One possible source of heteroskedasticity is the existence of measurement errors in the data. In our study, the treatment of non-vesting market conditions could possibly pose a measurement error, as we have not adjusted the number of ESO:s expected to vest downwards, when this information is not disclosed.\textsuperscript{31} The overstatement of the grant value is, however, systematic and we see no intuitive argument for it becoming greater, on per share values, as price increases.

\textsuperscript{29} A skewed distribution is natural as price cannot fall below zero.

\textsuperscript{30} After correcting for heteroskedasticity by regression using the weighted least square (WLS) technique, we also find that normal distribution of the residuals are no longer on the borderline of rejection, with a p-value of slightly above 0.2. The residuals have been retrieved by running a linear OLS regression through the origin, using the saved weights, \( w \), from the WLS regression and subsequently transforming the saved residuals by multiplication of \( w^{0.5} \).

\textsuperscript{31} See section 3.3.
Hence it is not likely that the presence of heteroskedasticity is caused by our treatment of non-vesting market conditions. Another possible measurement error is caused by the fact that we do not adjust the number of ESO:s granted downwards for forfeited options, when we do not know how many of the forfeited options that relate to the current year’s grants, as explained under section 4.2.1. However, these adjustments do not materially change the ESO grant values, and therefore we do not perceive this as an issue.

5.4.1. Weighted least squares regression

Heteroskedasticity can also be embedded in the data, which means that the variance of the residuals for some reason would increase, when any of the independent variables move. When the standardized residuals are plotted against the independent variables we see indications of heteroskedasticity, but no clear pattern that tells us which variable is causing the increase in variance. However, when we plot the independent variables NIfc, BVE and ESO respectively against the dependent variable P, we see that BVE or ESO are the probable causes of the heteroskedasticity.

One way of correcting the violation of homoskedasticity is to use the weighted least squares (WLS) regression technique. We perform WLS regressions on the equations [R1] and [R2]. To test which dependent variable that might be the cause, we perform the regression on weights based on both BVE and ESO and compare which regression yields the lowest standard error of estimate. The outcome from the WLS regressions is presented in Table 7 below:

---

32 We have made several other choices regarding the data, presented under section 4.2.1., but we perceive the treatment of non-market vesting condition as the most probable source of measurement errors. Another possible source of measurement errors is that we exclude other forms of compensation such as cash settled programs, programs where options are bought at market terms but later subsidized, and cash bonuses. This is, however rather a model error, and lies outside the scope of this thesis. We discuss this in section 9.

33 In our case if the variance of the residuals increases when the independent variables increases, as all independent variables are positively correlated to P.

34 The plot of NIfc against P shows a quite constant variance around positive, linear relationship. The plots of P against BVE and ESO are, on the other hand, clearly ‘fan-shaped’.

35 In OLS, the aim is to reduce the sum of the squared residuals in absolute numbers. A drawback of the technique is that extreme observations have a great impact on the estimated regression line as they will pull the line towards them. WLS uses a weight defined as (1/DV)x, denoted w, where DV refers to the dependent variable likely causing the heteroskedasticity, and x the level of power that minimizes the log-likelihood value, to minimize the sum of the squared residuals multiplied by w. That is, if a dependent variable is positively, linearly related to the residuals introducing a weight that reduces the impact of the residuals as the dependent variable increases will reduce the effect extreme values have on the regressed estimators.

36 Besides finding a quite constant variance around the relationship between NIfc and P, w is defined as (1/DV)x . We hence see that the dependent variable used as input cannot take on a negative number, as the sum of the squared
<table>
<thead>
<tr>
<th></th>
<th>Intercept</th>
<th>NIfc</th>
<th>BE</th>
<th>ESO</th>
<th>ESOd</th>
<th>R²</th>
<th>Power</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 Coeff. w_{ESO}</td>
<td>16.540</td>
<td>7.064</td>
<td>.277</td>
<td>138.707</td>
<td>N/A</td>
<td>.770</td>
<td>.490</td>
<td>N/A</td>
</tr>
<tr>
<td>R1 Sig. w_{ESO}</td>
<td>.001</td>
<td>.000</td>
<td>.006</td>
<td>.000</td>
<td>N/A</td>
<td>.000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>R1 Std. w_{ESO}</td>
<td>4.937</td>
<td>.709</td>
<td>.099</td>
<td>28.430</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>84.570</td>
</tr>
<tr>
<td>R1 Coeff. w_{BVE}</td>
<td>29.469</td>
<td>6.671</td>
<td>.337</td>
<td>89.744</td>
<td>N/A</td>
<td>.739</td>
<td>.170</td>
<td>N/A</td>
</tr>
<tr>
<td>R1 Sig. w_{BVE}</td>
<td>.000</td>
<td>.000</td>
<td>.008</td>
<td>.000</td>
<td>N/A</td>
<td>.000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>R1 Std. w_{BVE}</td>
<td>7.131</td>
<td>.640</td>
<td>.125</td>
<td>22.436</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>39.331</td>
</tr>
<tr>
<td>R2 Coeff. w_{ESO}</td>
<td>16.865</td>
<td>6.957</td>
<td>.280</td>
<td>145.021</td>
<td>-37.273</td>
<td>.768</td>
<td>.480</td>
<td>-</td>
</tr>
<tr>
<td>R2 Sig. w_{ESO}</td>
<td>.001</td>
<td>.000</td>
<td>.006</td>
<td>.000</td>
<td>.585</td>
<td>.000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R2 Std. w_{ESO}</td>
<td>5.011</td>
<td>.729</td>
<td>.100</td>
<td>31.335</td>
<td>68.039</td>
<td>-</td>
<td>-</td>
<td>83.845</td>
</tr>
<tr>
<td>R2 Coeff. w_{BVE}</td>
<td>26.400</td>
<td>6.364</td>
<td>.351</td>
<td>119.243</td>
<td>-78.888</td>
<td>.737</td>
<td>.260</td>
<td>-</td>
</tr>
<tr>
<td>R2 Sig. w_{BVE}</td>
<td>.000</td>
<td>.000</td>
<td>.009</td>
<td>.000</td>
<td>.057</td>
<td>.000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R2 Std. w_{BVE}</td>
<td>6.640</td>
<td>.677</td>
<td>.132</td>
<td>25.746</td>
<td>40.986</td>
<td>-</td>
<td>-</td>
<td>33.839</td>
</tr>
</tbody>
</table>

As we can see in Table 7, the coefficients found for ESO are still high and significant. This time, running regression [R2] on weights based on BVE, coefficient for ESO increases and is now also significant on a five percent level. When BVE is used as the weighted variable, the standard error of estimate is reduced whilst basing the weight on ESO yields a higher standard error of estimate. As a result BVE seems most efficient to use and we will hence focus on these results. However, the WLS technique can be quite arbitrary if one is not sure about the source of heteroskedasticity, which we are not. In these cases, an alternative approach is to use heteroskedasticity-consistent standard errors (HCSE) (White, 1980), but this procedure is advanced and time consuming to perform in PASW, and the usage of HCSEs only alters the t-scores, not the coefficients found using OLS. Thus, we have found it unnecessary to perform this correction. Our main problem is the high coefficients which are unreasonable, regardless of whether they are significant or not.

As a result, BVE seems most efficient to use and we will hence focus on these results. However, the WLS technique can be quite arbitrary if one is not sure about the source of heteroskedasticity, which we are not. In these cases, an alternative approach is to use heteroskedasticity-consistent standard errors (HCSE) (White, 1980), but this procedure is advanced and time consuming to perform in PASW, and the usage of HCSEs only alters the t-scores, not the coefficients found using OLS. Thus, we have found it unnecessary to perform this correction. Our main problem is the high coefficients which are unreasonable, regardless of whether they are significant or not.

residuals must stay positive. BVE and ESO both fulfill this criterion for all observations, but NIfc does not. Using NIfc would hence lead to a further reduction in sample size which is not desirable.
5.4.2. Model errors
The appropriate next step is to examine if the source of the extreme coefficients could be the result of a model error. Our model assumes a linear functional form between the dependent and independent variables, which may be inaccurate. However, when we plot the dependent variables against the independent variable we find no obvious signs of other relationships than linear. Moreover, we have already tested for a non-linear relationship between $P$ and $ESO$ through the dilution dummy variable. There is no theoretical support as to why the relationship between $NIfc$ or $BVE$ and $P$ should not be linear. An increase in realized earnings, or the flow of future earnings, belonging to equity owners can be expected to increase the market value of a firm without following diminishing marginal return.

5.5. Omitted variables
Having tested for all the above, it is probable that the high coefficients are caused by omitted variables that influence price. When this occurs, the estimators are usually biased and the standard error of estimate overstated, as they include the effect of the missing variables (Newbold et al., 2006, p. 558). If our model fails to incorporate important variables affecting $P$, it is likely that $ESO$ captures the effect of these variables, from now on also referred to as noise. The high values of the standard error of estimate found point in this direction. In the following section we describe the actions that we have taken to detect omitted variables.

5.5.1. Detecting noise
To investigate whether the coefficient for $ESO$ is capturing noise caused by omitted variables we run the original regression [R1] again, this time leaving out the $ESO$ variable (i.e. we regress $P$ against $NIfc$ and $BVE$). Theoretically, the variation in these two variables should capture the biggest part of the variance in price. If they do not, the observed share prices are not very well explained by the components of the RIV model. After running this regression, we exclude all cases that have a standardized residual greater than 2 (in absolute numbers) and run regression [R1] again on this sample, this time including the $ESO$ variable. $^{37}$ We refer to this regression as regression [R3]. In line with the arguments already presented, we use WLS and base the weight on $BVE$. The results are presented below in Table 8:

\[ \text{Table 8:} \]

\[ \text{37 We chose the cutoff point 2 instead of 3 as the standard deviation for the residual is quite high in comparison to the mean for the dependent variable (61.57 in comparison to 107.5). This leads to the exclusion of 7 observations.} \]
Excluding all observations outside two standard deviations from the residual mean, decreases the standard deviation overall. The intercept and coefficients for NIfc and BVE are quite unaffected by this exclusion, but worth noticing is that the coefficient for ESO drastically decreases from 89.744 to 55.505. Performing the procedure again we find that the coefficient for ESO decreases further, down to 41.471.\(^{38}\) We can hence conclude that ESO is most likely capturing noise from variables not included in the model which, in addition to NIfc and BVE, affects share price.

### 5.5.2. Market beta

In an attempt to address the question of omitted variables we introduce the market beta as an additional variable, to control for risk, since Ohlson’s (1995) model makes very simplistic assumptions regarding risk.\(^{39}\) We calculate the market beta using five years of monthly returns, and use it in regression [R1].\(^ {40}\) However, this did not materially change the coefficient on ESO, and the coefficient on beta proved not to be significant on a 10 percent significance level.

### 5.5.3. Industry

Another attempt to detect omitted risk variables was made by introducing dummy variables for industries. As seen in Table 1 under section 4.3, high-tech firms, pharmaceutical firms, as well bank and finance firms are highly represented in our sample. Moreover, we have reason to

---

\(^{38}\) That is, we run regression [R1] excluding the ESO variable again, this time on the reduced sample. The observations now outside two standard deviations from the residual mean is subsequently excluded from the sample on which [R1] including ESO, is ran.

\(^{39}\) See section 2.2.

\(^{40}\) When using five years of monthly data, we follow the practice of Standard & Poors’s and Value Line (Koller et al., 2005, p. 314). We correlated the returns against the return of the OMX Stockholm index. Ideally, a larger index than the OMX Stockholm Exchange would have been used as a proxy for the market return, since the OMX Stockholm index is small enough for individual companies to have a potential influence over the return. The reason we used the OMX Stockholm index is that the currency movements between the SEK and the Euro cause distortions that lead to unreliable values of the market betas.
suspect that these industries have characteristics that should be controlled for. We ran regressions where the dummy variables were included both separately and in relation to the ESO variable. However, in all four cases the introduction did not materially change the coefficient on ESO and none of the variables proved significant on a 10 percent significance level.

### 5.5.4 Size effect
A further possibility is that ESO captures noise related to our sample having an over-representation of firms traded on the large cap. Introduction of a dummy for large cap firms proved neither to change the net coefficients for ESO materially nor be significant on a 10 percent significance level. In addition, tests were made where the two firms with largest reported BVE were excluded, yielding no drastic change in the coefficient for ESO. These results are not very surprising, though, as we have already addressed the question of size by application of WLS.

### 5.5.5. Macroeconomic conditions
The last obvious effect that may be captured by the ESO variable that comes to mind is that conditions relating to specific years affect share prices. The annually reported data in our sample available reaches over three bull market years (2005-2007), one bear market year (2008), and one year where the market slowly recovers (2009). As the market took a steep dive after the default of Lehman Brothers in September 2008, the data from 2008 (released early in 2009) should show a much lower mean price than the other observations (2009 data included). Studying the compared means for the variables $P$, ESO, NIfc and BVE between 2008 and the other years, presented under section 4.3 in Table 2, we can see that the mean ESO grant in our sample is slightly lower in 2008 than in the other years, while the price is much lower. This could drive the high coefficient for ESO, as a slight drop in ESO could be related to a steep fall in price. However, both NIfc and BVE are also lower in 2008 than in the other years. This indicates that these variables capture at least parts of the macroeconomic effects as well. To test if the coefficient of ESO is sensitive to whether the observed years are bull or bear years, we create a dummy variable for ESO, using the same technique earlier described for the dilution dummy, and run a regression on the following model:

---

41 Small high-tech computer firms are often characterized by high growth but low profitability. These firms tend to use ESO programs extensively (Bell et al., 2002). The same argument is applicable on small pharmaceutical firms and biotech firms. Banks and finance firms were heavily affected by the financial crisis.

42 Autoliv and Investor were excluded, together consisting of 10 observations.
\[ P_{i,t} = \alpha + \alpha NIf_{i,t} + \alpha BVE_{i,t} + \beta ESO_{i,t} + \beta ESOY08_{i,t} + \epsilon_{i,t} \]

The results, again using WLS and basing the estimated weight on \( BVE \), are presented below:

**Table 9: Results from regression [R4]**

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Intercept</th>
<th>NIfc</th>
<th>BE</th>
<th>ESO</th>
<th>ESOy08</th>
<th>( R^2 )</th>
<th>Power</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R4 Coef. ( w_{BVE} )</strong></td>
<td>28.440</td>
<td>6.561</td>
<td>.363</td>
<td>117.390</td>
<td>-92.767</td>
<td>.757</td>
<td>.120</td>
<td>-</td>
</tr>
<tr>
<td><strong>R4 Sig. ( w_{BVE} )</strong></td>
<td>.000</td>
<td>.000</td>
<td>.003</td>
<td>.000</td>
<td>.013</td>
<td>.000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>R4 Std. ( w_{BVE} )</strong></td>
<td>7.199</td>
<td>.612</td>
<td>.118</td>
<td>24.862</td>
<td>36.529</td>
<td>-</td>
<td>-</td>
<td>41.477</td>
</tr>
</tbody>
</table>

As we see in Table 9, the coefficient for \( ESO \) increases somewhat in comparison to regression [R1] and [R2], but the most interesting result is the coefficient on the year dummy. The coefficient is high, negative and significant on a five percent level, which gives support to the argument that \( ESO \) is capturing the effect on price by other, omitted variables such as macro-economic effects.\(^{43}\)

6. Analysis

In this section we present an analysis of the results from our empirical tests in the previous section. We will also, even though this paper does not aspire to give qualitative explanations for our findings, present probable theoretical explanations for what we have found.

**6.1. An unrealistically large positive effect of ESO grants?**

As has been presented in section 5, and which we can also see in Table 10 below, our results indicate a large positive effect on price by ESO grants. Further, a non-linear relationship with diminishing marginal return is indicated by the negative coefficient on the \( ESOy \) variable in regression [R2]. However, after testing for violations of the assumptions underlying the OLS, we found that the value of the \( ESO \) coefficient is most likely driven by the effect on price by omitted variables that Ohlson’s (1995) model fails to capture, when applied in our sample. This theory is

\(^{43}\) One can argue that investor’s expectations on the effect of granting ESOs may be different, depending on good or bad times. However, the effect on management behavior ought not be perceived to be as severely affected as the results indicate above only due to the market taking a downturn, if one believes in agency theory. In any case, it is neither fruitful, nor within the scope of this thesis, to speculate in such matters with the data available.
supported by the results from regression [R3], where exclusion of observations with the greatest amount of noise, drastically changed the coefficient on ESO. Further, the introduction of a dummy variable for the year 2008 showed a significant, large, negative coefficient, indicating that the ESO variable was in fact capturing noise, to a large extent related to macroeconomic factors. This, as well as a discrepancy between findings in previous research and our own study, leads us to believe that the found ESO coefficients are highly unlikely to be reliable, even though we fail to reject our null hypothesis of the ESO coefficient being positive.44

Table 10: Summary of results from regressions [R1], [R2] and [R4]

<table>
<thead>
<tr>
<th>Model</th>
<th>Intercept</th>
<th>NIfc</th>
<th>BE</th>
<th>ESO</th>
<th>ESOd/ (ESOd08)</th>
<th>R²</th>
<th>Power</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 Coeff. wBVE</td>
<td>29.469</td>
<td>6.671</td>
<td>0.337</td>
<td>89.744</td>
<td>-</td>
<td>0.739</td>
<td>0.017</td>
<td>-</td>
</tr>
<tr>
<td>R1 Sig. wBVE</td>
<td>0.000</td>
<td>0.000</td>
<td>0.008</td>
<td>0.000</td>
<td>-</td>
<td>0.000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R1 Std. wBVE</td>
<td>7.131</td>
<td>0.640</td>
<td>0.125</td>
<td>22.436</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>39.331</td>
</tr>
<tr>
<td>R2 Coeff. wBVE</td>
<td>26.400</td>
<td>6.364</td>
<td>0.351</td>
<td>119.243</td>
<td>-78.888</td>
<td>0.737</td>
<td>0.260</td>
<td>-</td>
</tr>
<tr>
<td>R2 Sig. wBVE</td>
<td>0.000</td>
<td>0.000</td>
<td>0.009</td>
<td>0.000</td>
<td>0.057</td>
<td>0.000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R2 Std. wBVE</td>
<td>6.640</td>
<td>0.677</td>
<td>0.132</td>
<td>25.746</td>
<td>40.986</td>
<td>-</td>
<td>-</td>
<td>33.839</td>
</tr>
<tr>
<td>R4 Coeff. wBVE</td>
<td>28.440</td>
<td>6.561</td>
<td>0.363</td>
<td>117.390</td>
<td>(-92.767)</td>
<td>0.757</td>
<td>0.120</td>
<td>-</td>
</tr>
<tr>
<td>R4 Sig. wBVE</td>
<td>0.000</td>
<td>0.000</td>
<td>0.003</td>
<td>0.000</td>
<td>0.013</td>
<td>0.000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R4 Std. wBVE</td>
<td>7.199</td>
<td>0.612</td>
<td>0.118</td>
<td>24.862</td>
<td>(36.529)</td>
<td>-</td>
<td>-</td>
<td>41.477</td>
</tr>
</tbody>
</table>

Having drawn this conclusion, one important and obvious question comes to mind: what is causing the coefficient of the dilution group to be negative? We will address this question under section 6.2. In section 6.3, we reflect over the method that we have chosen in a broader sense. As a final remark, we then briefly comment on the found coefficients for NIfc and BVE in section 6.4.

6.2. Diminishing marginal return on ESO grants?
At first glance, the results from the regressions [R1] and [R2] point in a direction that supports our theory of diminishing marginal return on granted ESO:s. However, before we can draw any

44 Aboody (1996, p.382) found that the value of ESO:s outstanding that were up to 25 percent into the vesting period had a positive coefficient of 1.335. Bell et al. (2002, p.989) found that the total (capitalized) ESO value had positive coefficients ranging from 7.09 to 24.99 different years.
conclusions about these results, and especially in the light of regression [R4], we need first to take a look at the characteristics of the two groups, presented in Table 3 under section 4.3. When studying these values we see that the average $P$, $BVE$ and $NIfc$ are all lower for observations in the second group, while $ESO$ is quite similar.

First, remember the construction of the dummy variable, yielding a value of 1, if observation $i$ belongs to group 2, or 0 if the observation belong to group 1, multiplied by $ESO$. Keeping this in mind, the found negative coefficient for $ESOdY08$ is likely driven by an on average lower share price for observations in the second group, related to an on average higher $ESO$ value ($1 \cdot ESO$ compared to $0 \cdot ESO$). In other words, as $ESO$ increases, the price seems to decrease, a result of the construction of the dummy variable.

Ideally, the change in $P$ should be captured by the change in $BVE$ and $NIfc$, and we can see that they follow the relationship we would have anticipated. However, in light of the results in regression [R3] in such a small and firm specific sample as ours, it is likely that these variables will not be able to capture the whole change in price, especially as our observations are not evenly distributed over bull and bear years. Hence, $ESO$ is likely to captures noise that is not captured by $NIfc$ and $BVE$, especially if one considers the small number of observations in group 2.\(^{45}\) This indicates that the found coefficient is a result of the construction of the dummy variable in combination with lower means in the second group.

### 6.3. A broader perspective on agency theory

Our aim in this thesis has been to capture the net benefits and costs of ESO programs, on the premise that investors either believe in agency theory or not. We have under section 5 described how we have tried to detect different omitted variables in the model. We have so far, however, not taken a step back and asked ourselves if it is even fruitful to study ESO as an individual, independent component, or if it is executive compensation, defined more broadly, that captures investors’ attitude towards agency theory. We will now briefly comment on this matter.

Many firms (especially the large firms in ours sample) have large portfolios of compensation means, of which ESO programs included in this study constitute only one part. The portfolio may include cash settled share-based compensation packages, cash bonuses and pension benefits, to name a few examples. These types of compensation have somewhat different

\(^{45}\) As presented in Table 3, only 12 observations belong to group 2.
characteristics, but they all share the purpose of motivating employees, attracting and retaining talent thereby reducing agency costs. If the view is adopted that costs related to mitigating agency problems can be viewed as investments in intangible assets, as proposed in section 1.2, then all components of compensation are relevant for the results in our study. Some firms will lay resources on agency problem reduction in forms that are not captured by our method, while other firms lay most resources on ESO programs that we capture with our model. One possible source of the heteroskedasticity found in our data is that larger firms (with, on average, higher price, \( P \), as seen in Table 1), have more diverse forms of compensation than small firms, and that the variance therefore increases in the ESO term as \( P \) increases. To control for this conceptual problem, control variables for other types of compensation should be introduced in the model. However, this would lead to a large number of independent variables, and in our study the sample size is too small for the procedure to be meaningful.

6.4. Coefficients for BVE and NIfc

In addition of the discussion above regarding the ESO grants, we should briefly comment on the found coefficients for NIfc and BVE. These range from 6.364 to 6.671 and 0.337 to 0.363 respectively, with no great variation between the different regressions. The limited movement indicates that these variables are not very sensitive to the introduction of further variables or to being put in relation to BVE, which points to them being more robust than ESO, actually capturing the effect of NIfc and BVE on price. The coefficients are however a little surprising, with the coefficient for NIfc being quite high and BVE quite low. Keep equation [3] in mind; if the market price of equity corresponds to \( P \), the coefficient for NIfc would have to be interpreted as \( \rho/(r_E - g) \), where \( \rho \) denotes the percentage of earnings that lies in excess of the required earnings, and \( g \) denotes growth in earnings, by application of the Gordon Growth formula. Moreover, the estimated coefficient for BVE should be expected to lie close, or equal, to 1. A possible reason for this discrepancy can be related to the distribution between bull and bear years in our sample, with bull years being overrepresented. It could be the case that investors tend to place more emphasis on forecasted numbers in good times, whilst leaning more towards historical cost accounting and prudence in times of uncertainty.

Further, we should also comment on the implications of the amount of noise in our model. Francis & Schipper (1999) found that the relevance of accounting information for equity valuation has decreased, in relation to expected cash flows and other non-accounting
information. One implication of their findings is that the relative importance of different types of information changes over time. This could explain the relatively high standard error of estimate in our models, and consequently the amount of noise in excess of the effect on $P$ by $NIfc$ and $BVE$.

7. Concluding remarks
Share-based compensation, such as ESO programs, has frequently been debated in various contexts. Previous research has been concentrated to the American market, and has been performed before the implementation of the IFRS 2 (and the corresponding US GAAP regulation) in 2005, which requires mandatory recognition of ESO expenses. In this study, our aim has been to shed light over the relationship between share prices and ESO grants for firms listed on the OMX Stockholm exchange. We have performed a value relevance study on a sample of 105 observations divided between 40 firms, based on Ohlson’s (1995) extended RIV model, where we control for expected earnings. A further goal of this paper has been to investigate the possibility of diminishing marginal return on ESO grants, and thereby add a dimension to Aboody’s (1996) study.

Our model proved to have high explanatory power, indicating that Ohlson’s model is appropriate for value relevance studies in general, where accounting information is evaluated (which is further supported by studies that have used similar models; see for example Aboody 1996, Bell et al. 2002 and Aboody 2004). The empirical results from our study are, however, inconclusive. Though the coefficient of the ESO term in our model is significant and points in the direction predicted by our null hypothesis, our empirical tests show that the ESO term picks up noise from macroeconomic trends and firm specific trends. Moreover, the results are distorted by the fact that our sample is taken from three bull market years and one extreme bear market year in 2008. This makes the coefficients unreliable, and we cannot draw any conclusions from the results.

Some general limitations to our study will here be pointed out, which may explain our inconclusive results. First, we only have five years of observations available since the issuance of the IFRS 2, which makes it impossible to gather a sample that satisfies the properties of an un-

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46 Worth noticing is that the high standard deviation in the dependent variable, $P$, yields a high standard deviation in the estimated errors even if the explanatory power in high. In other words, the sum of the unexplained movements in $P$ is high, leading to the amount of noise (in absolute numbers and not related to variation in $P$) being substantial.
biased sample in terms of bull- and bear years. It also lays a constraint on the possible number of observations.

Secondly, the OMX Index is a relatively small market with only 350 listed firms, of which not all have ESO programs in place, which constrains the sample size further. Moreover, far from all firms that have granted ESO:s have disclosed the mandatory information required for us to be able to calculate the fair value of the total grants (which in itself is remarkable), resulting in a total of 40 firms that was included in our sample. This has resulted in a small sample that is heavily dependent on a few firms in a few industries, which distorts our results.

Thirdly, we have only included ESO grants in our study, leaving other forms of executive compensation out. This was a conscious choice, but one reason for our unreliable results may be that investors do not view ESO grants as independent variables, but as parts of the executive compensation portfolio, as discussed in section 6.3.

Fourth, our inconclusive results may be due to the fact that ESO grants are simply not value relevant in the eyes of investors. This, in turn, may be due to the fact that investors fail to recognize the value of granted ESO:s, since they are often out of the money at grant. Another reason may be that investors simply do not care enough about the executive compensation to incorporate it into the price.

To conclude this paper, we give our suggestions for future research, based on what we have learned from this thesis. There are many aspects of the effects of ESO programs that are still under debate – both qualitative and quantitative – that call for further exploration. This study has sought to quantitatively describe the relationship between share price and ESO grants. For future studies this thesis my serve as a reference and a benchmark in terms of approach and data collection. However, the question of the relation between ESO grants and share price remains unanswered, and we welcome future studies that use a similar method to ours, but where a larger data set would be used. This would be possible when the IFRS 2 has been effective for a longer time. Additional ways of increasing the sample size would be to widen the population to include other Nordic countries, where culture can be expected to be similar, or to widen the observation criteria, for example by including observations where the fair value of the ESO:s are not stated, but only the assumptions behind the Black & Scholes model.
8. References


