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SHARE REPURCHASES IN NORWAY

By

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The thesis is written within the specialisation area financial economics,
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ABSTRACT

This thesis provides updated statistics on all share repurchase announcements and all open market share repurchase executions for firms on the main list of the Oslo Stock Exchange (OSE) in the period from 1998 to 2013. Further, it explores which motives firms have for announcing and executing share repurchases. The transparent environment for share repurchases in Norway is reflected in our detailed dataset¹.

We find that an increasing amount of firms on the main list of the OSE announce share repurchases over the period, without it necessarily resulting in more firms executing open market share repurchases. Further, we do not believe this is caused by our dataset only containing open market share repurchase executions, since the other types of share repurchase executions are very rarely employed in Norway².

Using logit regressions, we test whether (i) the optimal capital structure hypothesis, (ii) the excess cash hypothesis, (iii) the payout preference hypotheses³, or (iv) the undervaluation signalling hypothesis explain why firms announce and execute share repurchases. We find evidence that an optimal capital structure motivate both share repurchase announcements and executions, although this could be related to profitable firms with low leverage actively repurchasing shares. In addition, the significance of the result is very sensitive to sample size for announcements, suggesting that there might not be any strong motives for announcing a share repurchase. Further, our results find no relation between dividends and share repurchases for either share repurchase announcements or executions, indicating support for the dividend complement hypothesis.

¹ Note that our share repurchase announcement statistics cover all types of repurchases, whereas share repurchase executions only cover open market share repurchases.

² Based on conversations with Magnus Tornling, head of ECM at ABG Sundal Collier.

³ Consists of both the dividend substitution hypothesis and the dividend complement hypothesis.

FOREWORD

This thesis represents the end of our studies within financial economics at the Norwegian School of Economics.

With a special focus on corporate finance and other investment banking related areas, the domain of financial transactions has caught our interest. The theme may be wide, encompassing everything from derivatives to initial public offerings. However, due to lack of coverage in any of the courses we have undertaken, we decided to focus our research on share repurchases.

The research process has been demanding. Especially the mapping of literature and gathering of data was time consuming. The literature on share repurchases is comprehensive and covers several fields within finance and other disciplines, the lack of previous exposure made the process even more demanding. Although we had access to good and detailed data sources, the sheer amount of manual labour related to gathering share repurchase announcement data made it very tedious.

However, through thorough planning and thought-provoking discussions we have been able to bring out the best in each other. This has been particularly evident when complex problems have arisen. In conclusion, we find that we have learned much from the process, and have attained new experiences that will be useful for our future careers.

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1 INTRODUCTION

As Brav et al. point out in their 2003 paper, the motives behind payout policy decisions are not clearly understood, despite extensive research on the topic. This thesis aims to make a small contribution to the understanding of an important part in payout policy, namely share repurchases. More precisely, this thesis focuses on the progress of the share repurchase environment in Norway, why firms listed on the main list of the Oslo Stock Exchange (OSE) announce share repurchases, and what makes an announcing firm execute an open market share repurchase.

Over the last decades, share repurchase expenditures in the U.S. have gone from constituting 4.8 % of net income⁴ in 1980 to 41.8 % in 2000, according to Grullon and Michaely (2002). The trend seems to have continued in more recent years as well; McKinsey and Co (2015) found that share repurchases for large U.S. firms went from 23 % of adjusted net income⁵ in the early 1990s to 47 % of adjusted net income in 2011. Grullon, Gustavo et al. establish that the portion of firms initiating share repurchases⁶ in the U.S. has gone from 26.6 % in 1972 to 82 % in 2000.

Few studies have explored the Norwegian share repurchase environment, as share repurchases were first allowed in Norway in 1999. In particular, little research has been targeted at uncovering the motives behind share repurchases in Norway. Requirements on disclosing information related to share repurchase announcements and open market share repurchase executions is very strict in Norway, as it is in many European countries, making it a suitable market to study.

1.1 MOTIVATION FOR WRITING THE THESIS

This thesis has been written for several reasons. First, share repurchases are in itself a relevant and important topic. Second, discerning why firms announce and execute share repurchases is interesting. Third, explaining the relation between motives for announcing share repurchases and executing share repurchases can reveal additional useful insights.

As Allen and Michaely (2003) point out, payout policy is not only important because of the sheer amount of money involved and its repetitive nature, but also because it interacts with most of the other financing and investment decisions that firms make.

⁴ Net income is before extraordinary items.

⁵ Adjusted net income is before extraordinary items, goodwill write-downs, and amortisation of intangibles associated with acquisitions.

⁶ Given that they paid out any cash at all in the year.

Given the large and increasing portion that share repurchases has come to represent of distributed cash in many markets, understanding share repurchases has become important. From figure 1, we see that the market reacts positively to a share repurchase announcement in the days surrounding the announcement, indicating that the market notices and values the signal.

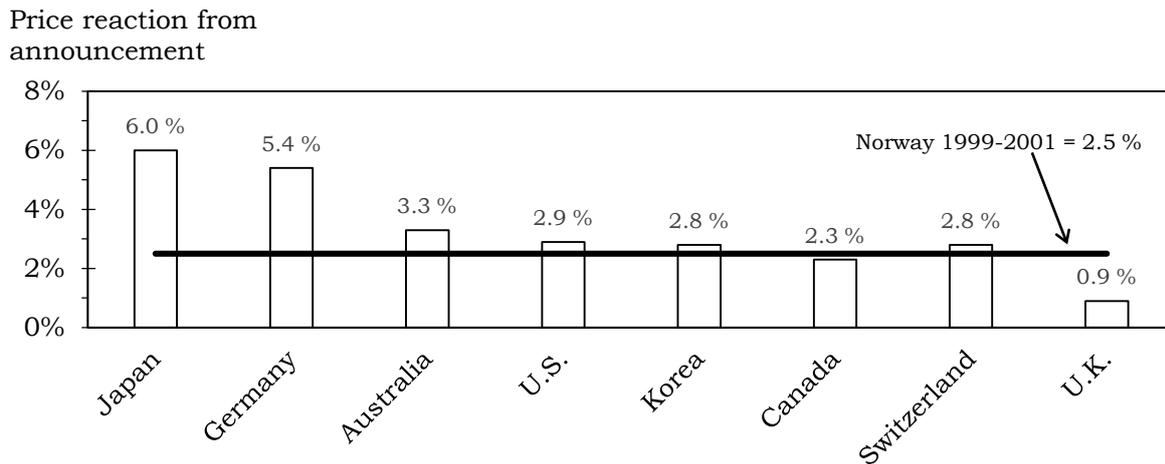


Figure 1. Price reaction in the days surrounding a share repurchase announcement.

The average share price reaction for firms announcing a share repurchase in different countries (Hackethal and Zdantchouk 2005; Skjeltorp 2004).

Further, the motives firms have for repurchasing shares can have implications for regulation, corporate governance and investments. If the underlying motives for repurchases are identified, one could see if they align with the interest of the firm and serve to maximise the value for shareholders. Or if perhaps the interests of management seem to play a more important role. To understand whether the same motives apply for share repurchase announcements and executions can also reveal useful insights. If motives for announcement and execution are similar, it might indicate that share repurchase announcements reflect a credible signal for execution. If there are weak motives for announcements and strong motives for execution, it could indicate that announcements represent a routine procedure to keep the option available for management at all times. This would require strong corporate governance and that the interests of the manager are aligned with the firm.

1.2 RESEARCH QUESTIONS

We aim to answer three research questions with this thesis:

1. *How has share repurchase statistics progressed for firms listed on the main list of the OSE from the introduction of share repurchases in 1999 until 2013?*
2. *What motives do firms listed on the main list of the OSE have for announcing a share repurchase?*
3. *Among firms listed on the main list of the OSE, what separates those that execute an open market share repurchase from those that do not?*

1.3 DISPOSITION

Section 2 contains an overview of share repurchases in general and the rules and regulations governing the Norwegian share repurchase environment. The theoretical foundation for our analysis is presented in section 3. The main emphasis is on the different hypotheses for what motivates firms to repurchase. In section 4, we introduce the econometrical framework used in our econometrical analysis, that is the logit regression. Variables used in the analysis are then presented in section 5. Section 6 takes a closer look at data sources we exploit to gather our dataset and which actions are taken to clean it. Section 7 presents a descriptive analysis of our share repurchase data, while the findings from our econometrical analysis is shown in section 8. First, we examine the findings from our logit regressions on share repurchase announcements. Second, we employ logit regression on open market share repurchase executions. Section 9 provides a short conclusion of our main findings and results. The bibliography and the appendix is located in section 10 and 11, respectively.

2 REPURCHASES IN GENERAL AND IN NORWAY SPECIFICALLY

The section reviews the different methods of share repurchases employed in Norway and the Norwegian repurchase process. In addition, a brief description of relevant changes in the Norwegian tax system during our sample period is presented.

2.1 SHARE REPURCHASE METHODS

Below, we examine four ways to execute a share repurchase; these are through an open market transaction, a tender offer, a Dutch auction or a targeted repurchase. Globally, 91 % of all share repurchases were conducted as open market repurchases in the period from January 2004 to October 2013, with the remaining being conducted as tender offers, Dutch auctions or other variations. Similar proportions

seem to be likely among firms listed on the main list of the OSE as well⁷. In total, 48 120 share repurchases were executed globally in the period (S&P Capital IQ, 2014).

Open market transactions, also known as normal course issuer bids, are carried out by brokers at current market prices, without any direct price premium (Skjeltop 2004). As Barclay and Smith (1988) argue, there might be, however, an indirect premium resulting from increased bid-ask spreads after the share repurchase announcement. Miller and McConnell (1995) find no empirical support for this hypothesis, though.

Another form of share repurchase is a tender offer, also known as a substantial issuer bid. In this case, the firm offers to purchase a number of shares at a fixed and given price, often at a premium to the current market price. Firms often use tender offers when they intend to repurchase a substantial amount of shares. This is to avoid the price hike an open market repurchases would most likely cause (Skjeltop 2004). The presumption is that the indirect cost of such a price hike is larger than the premium paid in the tender offer.

A third way to execute a repurchase is through a Dutch auction process, also referred to as a privately negotiated transaction. In a Dutch auction, the firm sets a price range at which it is willing to repurchase shares. Investors then inform the firm of their willingness to sell within the price interval, creating a supply curve of shares for the firm. Based on the supply curve the firm sets a clearing price that satisfies their demand for shares, paying the same price to all investors willing to sell at this price level or below (Skjeltop 2004).

Last, a firm can target certain shareholder groups based on some common defining factor. The targeted repurchase serves the function of creating a shareholder base with desired characteristics. For example, the repurchase could target smaller shareholders in order to concentrate the shareholder base and thus improve corporate governance through increased monitoring (Shleifer and Vishny 1986).

2.2 REGULATION RELATED TO SHARE REPURCHASES

In the following section we will explore regulations related to share repurchases in Norway and in other countries.

⁷ Based on conversations with Magnus Tornling, head of ECM at ABG Sundal Collier.

2.2.1 The repurchase process in Norway

Norwegian firms were allowed to repurchase shares from January 1. 1999, when the Norwegian Public Limited Liability Firms Act⁸ (NPLLCA) of June 13. 1997 came into effect (Magma 1998). However, firms were allowed to authorise a share repurchase program as early as in 1998, although the share repurchases could first be executed in 1999.

In order to initiate a repurchase program the general meeting must approve the program with a 2/3 majority of all voting shares represented at the meeting. In addition, it is required that 2/3 of all shares represented at the meeting, including non-voting shares, are in favour of the program (NPLLCA).

The size of the repurchase program is restricted in that the parent firm or any subsidiaries can never hold more than 10 % of the shares outstanding. Further, the firm's total equity value in excess of own shareholdings must at all times be higher than NOK 1 million (NPLLCA).

Initially the Securities Act stated that a repurchase program could last for a maximum of 18 months (Magma 1998), unless otherwise specified. This period was extended with an additional six months in 2013, thus allowing for a total repurchase period of 24 months (NPLLCA).

When the shares are repurchased they are first assigned as treasury shares, that is shares without any voting or cash flow rights. The treasury shares are typically either retired, used as a means of payment in various transactions, sold in the market or distributed to employees and management as part of an incentive scheme (Skjeltop 2004). This means that firms can acquire a substantial amount of shares as long as they retire or in another way remove the shares from their books. However, it has to be done in steps, and at all times total shareholdings cannot exceed 10 %. In addition, in our data the repurchased amount may exceed 10 % since we have not accounted for share repurchase programs being renewed within the same year.

2.2.2 Reporting repurchases in Norway

Norway provides an excellent framework for studying repurchases due to strict reporting requirements. First, the protocol from the general meeting must state whether any share repurchase program was authorised. The protocol from the general meeting will be issued by the firm and should also appear on the NewsWeb

⁸ "Allmennaksjeloven" in Norwegian

service provided by the OSE. A protocol reporting an approved share repurchase is what we will refer to as an announcement⁹. Second, firms must report any executed repurchase to the OSE on the same day as the repurchase, or before trading starts the following day (OSE 2013).

2.2.3 Regulation in other countries

As Kim et al. (2004) uncovers, regulation related to share repurchases varies considerably between the largest share markets in the world. Share repurchases have to be authorised at general meetings, like in Norway, in: the U.K., France, Germany, Italy, Netherlands, Switzerland, and Hong Kong. In the U.S., Japan, as well as in Canada, an approval from the board is sufficient. Restrictions in timing also vary¹⁰: the U.K., France, Germany, Italy, and Netherlands all have an 18 month authorisation period; Hong Kong has 12 months; Switzerland, Japan, and the U.S. have only tiny restrictions related to the repurchase period. Most countries do not allow firms to repurchase more than 10 % of outstanding shares. The U.S. and Japan do however not have any restrictions on the amount of outstanding shares repurchased. The U.K. allows repurchases up to 15 % of outstanding shares, while Canada allows repurchases up to 5 %.

When it comes to disclosure, the differences are also substantial. Japan, the U.K., Netherlands, and Hong Kong require disclosure of repurchases before the next trading day at the latest. Switzerland in many cases requires continuous disclosure of all single trades. France and Canada require a monthly disclosure, while the U.S. and Germany mostly do not require regular disclosure apart from in financial reports.

2.3 THE NORWEGIAN TAX SYSTEM

Taxes have generally been a popular factor when attempting to explain the choice between paying dividends and repurchasing shares. However, previous studies have found results pointing in both directions, as we will see in section 3.1.2. Below, is a short account on how changes in tax policy has affected our sample.

⁹ In some cases, however, a message on NewsWeb confirming that a share repurchase has been authorised is made prior to the protocol being published. Naturally, the date of such a message becomes the announcement in these cases.

¹⁰ Some of the countries have further restrictions in certain hours of the day or days in a year, see Kim et al. (2004) for a closer examination.

2.3.1 Changes in the Norwegian tax system during the sample period

Our sample runs for the full year 1998 through the full year 2013, thus covering 16 full years. This means that our sample is subject to the change in dividend tax in 2001 and the general tax reform of 2004-2006. For a brief account on the Norwegian tax system before 1998 and after 2013, we refer to appendix A1 and A2 respectively.

Until the introduction of dividend taxes in 2001, dividends represented the most tax-efficient way to disburse cash. After the corporate tax of 28 %, capital gains were taxed an additional 28 %, whereas dividends were exempted. Note that labour unions, non-profit organisations and public pension funds were exempted from taxation (Christensen 2014).

In 2001, a dividend tax of 11 % was introduced with deduction up until NOK 10 000, thus saving the smaller investors from the tax. Although dividends were now less favourable, it remained the most tax-efficient choice of disbursement. For larger investors the tax increased from 28 %, the corporate tax, to 35.92 % as a result of double taxation¹¹. The dividend tax was cancelled in 2002 to avoid double taxation, and dividends regained their full previous favourability (Magma 2002; Finansdepartementet 2002).

The tax reform of 2004-2006 introduced the shareholder model¹². The model made dividends taxable at 28 %, after the deduction of a risk-free return, on the private taxpayer's hand to correct for income shifting incentives arising from low taxes on dividends relative to personal income¹³. Capital gains were also taxable at 28 % for private individuals, with losses being deductible against ordinary income (Skatteetaten). In addition, the reform reduced the maximum private tax from 64.7 % to 54.3 % (Finansdepartementet 2011).

Non-resident private individuals are liable to pay tax on dividend received from Norwegian firms at the regular rate or at a reduced rate determined in an applicable tax treaty. Such shareholders may apply to the tax authorities for a deduction of the risk-free return pursuant to the rules applying to Norwegian shareholders. Capital gains are not subject to taxation in Norway unless the personal shareholder holds

¹¹ Total dividend tax with 11 % dividend taxation: $1 - (1 - 0.28) * (1 - 0.11) = 0.3592$

¹² "Aksjonærmodellen" in Norwegian

¹³ Total dividend tax with 28 % dividend taxation: $1 - (1 - 0.28) * (1 - 0.28) = 0.4816$

the shares in connection with the conduct business activities in Norway (Skjeltnor 2004).

Further, for corporate shareholders, the exemption model¹⁴ was introduced to avoid double taxation by making share income tax-exemptible. This includes both dividends and capital gains. Share income would now only be taxed once paid to private individuals (Finansdepartementet 2014).

The Exemption model applies to foreign firms located within the EEA in the same manner as for Norwegian firms (Regnskap Norge 2005). If located outside the EEA, or for any other reason the Exemption model is not found applicable to the firm, The withholding tax is set at 25 % unless tax treaties between Norway and the shareholder's home country specify otherwise. If there is a tax treaty, the dividend tax is usually set at 15 % (Skatteetaten 2012). Capital gains are not subject to taxes in Norway.

The effect on our sample is that dividends would be tax preferential from 1998 until the tax reform from 2004 to 2006, with only a slight reduction in favourability from 2001 to 2002.

The Norwegian state does not pay taxes on capital gains or dividends from its shareholdings. Further, the Norwegian state supports share repurchases as part of the firm's payout policy if it can generate competitive returns. In addition, with regards to share repurchases, the Norwegian state should maintain its ownership ratio after the repurchase (Nærings- og fiskeridepartementet 2014).

3 THEORY AND LITERATURE REVIEW

In this section, we present theories and hypotheses that are relevant for the following econometrical analysis. Although we are not able to test all the hypotheses mentioned here econometrically, we wish to provide the reader a full and thorough account of the research related to share repurchases. Note that the hypotheses presented are not necessarily mutually exclusive. This implies that the hypotheses and subhypotheses presented are difficult to test econometrically, even with access to perfect data. A thorough discussion of these issues will be provided in section 8.1. However, the results might still give some interesting suggestions related to what motivates a share repurchase.

¹⁴ "Fritaksmodellen" in Norwegian

3.1 LITERATURE REVIEW ON SHARE REPURCHASES

A share repurchase represents a distribution of capital from the firm to its shareholders, a change in the capital structure and a choice to forego investment in operating or financial assets.

As presented by Modigliani and Miller (1961)¹⁵, investors should view dividends and share repurchases as perfect substitutes given perfect financial markets (Skjeltop 2004). Further, given an investment policy, arbitrage arguments renders the choice of payout policy irrelevant to firm value, and thus shareholders should not have any payout preferences. Modigliani and Miller defined perfect financial markets by the assumptions:

1. *Equal and costless access to all information*
2. *No fees, taxes or other transaction costs*
3. *No differential between distributed and undistributed profits and dividends and capital gains*
4. *Rational behaviour*
5. *Perfect certainty, complete assurance of future investment and profits*

Studies have found that these assumptions do not always hold. The majority of previous research on share repurchases has empirically documented and attempted to explain the abnormal positive share price reactions that follow the announcement of share repurchase programs. Other studies have attempted to define what characterises firms that repurchase shares, in order to understand their motivation for repurchasing. This paper belongs in the latter category. Below, we will detail some of the hypotheses that these studies have presented. Note that we will only test for the optimal capital structure hypothesis, the payout preference hypotheses, the excess cash hypothesis and the undervaluation signalling hypothesis.

3.1.1 Optimal capital structure hypothesis

Firms can use share repurchases to attain an optimal capital structure, assuming its existence, by increasing leverage. This could increase the value of the firm through the tax subsidy of debt (Kraus and Litzenberger 1973) and reduced agency costs (Jensen 1986). However, increases in bankruptcy penalties will partly offset the effect

¹⁵ See appendix B1 for a brief review of Modigliani and Miller's firm value propositions.

(Kraus and Litzenberger 1973). See appendix B2 for more information on optimal capital structure.

Feldstein and Green (1983) show that share repurchases are better than dividends to increase the leverage ratio, since the market imposes a penalty on a firm that later cuts their dividend. Thus, firms with a leverage ratio below what constitutes an optimal capital structure are more likely to repurchase shares.

If management pursues its own interest, leverage would presumably be lower than optimal (Harris and Raviv 1991). However, external and internal control mechanisms constrain managerial discretion (Walsh and Seward 1990). External constraints are related to the market, like the market for corporate control and hostile take-overs (Gedajlovic and Shapiro 1998; Jensen 1986), the supply of skilled managers in the managerial labour market (Fama 1980), or manager salary contingent on share performance (Lazonick 2007). Internal constraints relates to the organisation and includes monitoring by the board (Fama and Jensen 1983) or promotions (Fama 1980). In the U.S. and the U.K., corporate governance is assumed to depend more on external constraints, while in Europe governance is more reliant on internal constraints (Gedajlovic and Shapiro 1998).

Bagwell and Shoven (1988), and Lee et al. (2010) do not find support for the optimal capital structure hypothesis. However, employing a slightly different variable, Dittmar (2000), and Mitchell and Dharmawan (2007) find support for the hypothesis.

Another theory related to the capital structure is the pecking order theory developed by Donaldson (1961) and extended by Myers and Majluf (1984), it is based on observed financing practices by firms. The theory states that firms prefer internal financing and applies a dividend policy that matches the expected financing requirements, see appendix B3 for more on the pecking order theory. This could potentially interfere with the optimal capital structure hypothesis, since profitable firms with few positive net-present-value (NPV) project will have low leverage and engage in share repurchases. Thus, firms with leverage below the optimal level do not repurchase to increase leverage, but because they are profitable and need to distribute cash.

3.1.2 Payout preference hypotheses

For clarity we have decided to split hypotheses related to payout preference into two subhypotheses; the dividend substitution hypothesis and the dividend complement

hypothesis. Note that when conducting regression analysis it could be difficult to separate the effects from the two hypothesis from each other.

Dividend substitution hypothesis

The dividend substitution hypothesis states that firms substitute share repurchases for dividends based on differences in tax, flexibility and shareholder preferences.

Grullon and Michaely (2002) found that firms paying less dividends than predicted tended to repurchase more shares. Further, they found that differential taxes between dividends and capital gains had an effect on the market reaction related to a dividend or repurchase announcement, implying value to the investor. Studies by Kulchania (2013) and Jiang et al. (2013) employing catering theory¹⁶, find that the share repurchase premiums that investors place on firms that repurchase shares are positively correlated with the decision to repurchase and negatively correlated with the decision to pay dividends. Thus, firms engage in either share repurchases or dividend payments, treating the two as substitutes.

On the other hand, a firm would wish to smooth dividends with a minimal amount of increases and no reductions, since dividend reductions are punished severely in the market and it becomes harder to maintain a dividend that is regularly increased (Lintner 1956). Thus, it is not a payout channel with much flexibility in relation to substitution with share repurchases depending on changes in tax preferences. The dividend substitution incentive does not have strong support empirically (Dittmar 2000; Mitchell and Dharmawan 2007; Lee et al. 2010). Further, differences in tax treatments have an unclear predicted effect on whether firms choose to engage in dividend payments or repurchase shares, other empirical results do not provide strong support either (Lie and Lie 1999; Brav et al. 2005; Skjeltorp 2004).

In addition, as discussed above, Norwegian tax rules has treated dividends and capital gains equally in terms of tax since the reform of 2004-2006. Thus, the only positive tax effect of share repurchases instead of dividends is the ability to delay tax payments, although this could vary between different type of investors depending on their tax treatment.

Dividend complement hypothesis

According to the dividend complement hypothesis firms employ both dividends and share repurchases to disburse capital to shareholders. A dividend represents a more

¹⁶ A proposal that managers cater to investors by paying dividends or repurchase shares depending on the price premium placed on firms engaging in one or the other (Baker and Wurgler, 2004).

fixed commitment to disburse capital to shareholders, and is expected to mainly rely on permanent cash flows. A share repurchase, on the other hand, does not represent a fixed commitment and can be used to distribute temporary increases in the cash flow (Jagannathan et al. 2000).

DeAngelo et al. (2000) suggest a complementary relationship between dividends and share repurchases. They find that the reduced frequency of special dividends over time was not caused by the increase in share repurchases. Further, Jagannathan et al. (2000) find that dividends were used to disburse permanent cash flows, whereas repurchases were used to distribute temporary cash flows. Thus, a firm that wishes to smooth dividends (Lintner 1956) and pay out temporary cash flows should have no correlation or positive correlation between dividends and share repurchases.

3.1.3 Excess cash hypothesis

Share repurchases is one way of reducing free cash flow¹⁷ agency costs (Jensen 1986; Bagwell and Shoven 1988; Nohel and Tarhan 1998; Easterbrook 1984). A firm with a positive free cash flow can either retain the cash or distribute it to shareholders through dividends or share repurchases. Managers will have incentives to retain free cash flow and invest it in negative NPV projects to build empires for themselves and/or enjoy excessive perquisites (Jensen and Meckling 1976; Jensen 1986). These free cash flow agency costs, or excess cash agency costs as we might call them, are larger the more free cash flow a firm produces (Jensen 1986). A share repurchase will reduce the excess cash, and it can thus be a way to prevent managers from investing in negative NPV projects and spending excessively.

Results from several previous studies support the excess cash hypothesis as an explanation for share repurchases (Stephens and Weissbach 1998; Dittmar 2000; Mitchell and Dharmawan 2007; Bagwell and Shoven 1988). However, the results are not always clear-cut. Mitchell and Dharmawan (2007) finds that excess cash only explains share repurchase announcements for the smallest half of their sample of Australian firms in terms of market capitalisation. In surveys, the reduction of free cash flow agency cost is not stated as a strong motive to announce a share repurchase (Mitchell et al. 2001; Brav et al. 2005).

On a side note, insiders with large share holdings will have larger costs related to high agency costs, as agency costs reduce the value of their shareholdings. Because

¹⁷ Jensen (1986) defines free cash flow as “cash flow in excess of that required to fund all projects that have positive net present values when discounted at the relevant cost of capital”.

of this, insiders with large holdings might be keen to reduce free cash flow agency costs by repurchasing, even if it means reducing their perquisites (Li and McNally 2002)

3.1.4 Information signalling hypotheses

We can separate the information signalling hypothesis into two subhypotheses, the undervaluation signalling hypothesis and the earnings signalling hypothesis (Jagannathan and Stephens 2003). We remind the reader that when two hypotheses are so closely related it is difficult to separate the effects of the respective hypotheses.

Undervaluation signalling hypothesis

A share repurchase could send a signal to the market that insiders, with presumably superior information, believe the marketplace undervalues the firm's shares. If the share repurchase is interpreted as such a signal, the share price would likely increase. This would benefit non-selling shareholders, including insiders with a stake in the firm. This relation could be a strong incentive for repurchasing shares (Guthart 1967; Stewart 1976).

Several studies have found positive abnormal returns following share repurchase announcements, indicating that the market believes in the undervaluation signal (Dann 1981; Vermaelen 1981; Asquith and Mullins 1986; Comment and Jarrell 1991; Cudd et al. 1996; Stephens and Weisbach 1998; Ikenberry et al. 1995, Ikenberry et al. 2000)¹⁸. Additionally, firms that are about to announce a share repurchase have been found to deliver negative abnormal returns in the period leading up to the repurchase announcement (Vermaelen 1981; Comment and Jarrell 1991). Indicating that firms that announce a share repurchase may be undervalued at the time of the announcement.

Earnings signalling hypothesis

A firm could also engage in share repurchases to signal unexpected future improvements in the firm's earnings performance. If market participants interpret the share repurchase as such a signal, the share price would increase, and non-selling shareholders would benefit. This is a variation of Miller and Rock's (1985) dividend signaling argument, supported by Jagannathan and Stephens (2003). The advantage of signalling through a share repurchase is that it does not require the firm to disclose specific information related to future positive NPV projects in order to achieve the price increase. It may not be easy to signal unexpected improvements in this way, as

¹⁸ For more on abnormal returns following share repurchase announcements, see appendix B4.

a cash disbursement might indicate that the firm lacks profitable growth opportunities (Stewart 1976). However, the marketplace considers the promise to disburse cash flows as a positive signal of the firm's future earnings potential (Bartov 1991; Mitchell and Robinson 1999; Mitchell et al. 2001).

3.1.5 Earnings per share management hypothesis

Empirically, investors have been found to consider earnings-per-share (EPS) when they evaluate firm performance (Patell 1976; Penman 1980; Ajinkya and Gift 1984; Waymire 1984; Jennings 1987; Das et al. 2007). This should incentivise firms to manage their EPS through share repurchases (Bens et al. 2003; Hribar et al. 2006).

Firms tend to increase share repurchases when the dilutive effect of outstanding employee stock options on diluted EPS increases, and when earnings are below the level required to reach desired EPS growth (Bens et al. 2003; Hribar et al. 2006) also found a large number of EPS accretive repurchases among firms that would have missed EPS forecasts and that it mitigated some of the negative share price reaction. In a survey of CFOs, Brav et al. (2005) found that EPS management was among the most important motives behind a share repurchase. On the other hand, Bens et al. (2005) find that firms only manage diluted EPS as a result of employee stock options and not basic EPS.

3.1.6 Ownership concentration hypothesis

Shareholders in firms with poor corporate governance and management monitoring would want to increase ownership concentration to improve corporate governance. By repurchasing shares, a firm can reduce the shareholder base and increase ownership concentration. However, in practice one might observe that firms with dispersed shareholder concentration could have difficulties initiating a share repurchase in the first place, and firms with high ownership concentration might be able to use share repurchases more actively.

Firms with high ownership concentration are more likely to have boards that monitor management closely. Large shareholders have a large claim on residual cash flows and can exert significant influence through their voting rights (Shleifer and Vishny 1986). Thus, they have both a strong incentive and an opportunity to influence the firm in the direction they feel will maximise shareholder value.

Skjeltop and Ødegaard (2004) observed that firms announcing a share repurchase have lower ownership concentration and about twice as many owners as firms that do not announce a share repurchase, when firm size is similar. This implies that

firms with dispersed ownership have stronger incentives to announce share repurchases to mitigate agency costs.

On the other hand, Brennan and Thakor (1990) argue that firms with high ownership concentration will engage in share repurchases, while firms with dispersed ownership will use dividends. They reason that shareholders must incur information collection costs or risk expropriation by better-informed investors in a non-proportionate share repurchase¹⁹. Given a fixed cost of information collection, larger shareholders will have a greater incentive to be informed than smaller shareholders, leading to a redistribution of wealth from small shareholders to large shareholders. Thus, larger shareholders prefer share repurchases, whereas small shareholders will prefer dividends.

3.1.7 Management ownership hypotheses

There are several possible incentives that relate management ownership to likelihood of repurchasing shares. Some hypotheses emphasise that firms with low management ownership repurchase shares to increase management's relative ownership. Another hypothesis suggest that management in firms, where management already has large ownership, will repurchase shares to increase the value of their own holdings. Again, when hypotheses are closely related it is challenging to separate their effects.

Increased management ownership hypotheses

Firms may use repurchases as a tool to increase management's ownership. A potential motive for aiming to increase management's ownership could be to reduce agency costs of equity, as interests of managements and the firm are more aligned when management has a larger ownership stake (Jensen and Meckling 1976). Management could also actively encourage share repurchases to become entrenched²⁰ (Mitchell and Dharmawan 2007). This could be to secure their position in the firm (Jensen 1983; Demsetz 1983) and introduce their own ideas and policies without having to worry about other shareholders.

¹⁹ A share repurchase where different portions of investors' shareholdings are acquired by the firm.

²⁰ Entrenchment is defined by Berger et al. (1997) as "the extent to which managers fail to experience discipline from the full range of corporate governance and control mechanisms, including monitoring by the board, the threat of dismissal or takeover, and stock- or compensation-based performance incentives".

Some studies have found a negative relation between management ownership and repurchases (Mitchell and Dharmawan 2007, Cudd et al. 1996), indicating that firms with low management ownership are more likely to repurchase. Cudd et al. found evidence of a deliberate and long-term increase in insider ownership through repurchases.

Increased value of own shares hypothesis

Management might also encourage a repurchase if they have large ownership, since it might increase the value of their own shares (Mitchell and Dharmawan 2007). However, it requires that management have a substantial portion of their wealth in the firm and that they own a considerable portion of the firm, if not they would rather prefer to have excess cash. Isagawa (2000) constructed a model predicting that managers with an ownership stake in the firm use repurchases to increase future payoff from their own shares. The share price could increase through several mechanisms after a share repurchase.

One possible mechanism is that repurchases remove shareholders with the lowest valuations (Bagwell 1991). Thus, the total value of shares owned by management also increases. Empirical research suggests that the underlying premises for such a mechanism, the existence of heterogeneous shareholders and an upward-sloping supply curve, hold (Brown and Ryngaert 1991; Bagwell 1992; Hodrick 1996). The belief that repurchases increase share value could also stem from managers believing that shares are undervalued, and that a repurchase will remove this undervaluation (Barclay and Smith 1988). An additional note, as touched upon in the section 3.1.3, is that managers might be keener to reduce free cash flow agency costs by repurchasing when their shareholdings are higher. If any of the above mechanisms increase the share price after a share repurchase, managers should be increasingly interested in repurchasing shares when their ownership stake increase.

Some studies have found that firms with higher management ownership are more likely to repurchase shares (Li and McNally 2002; Skjeltop and Ødegaard 2004).

3.1.8 Management option hypothesis

Lambert et al. (1989) were the first to suggest the management option hypothesis. They note that as very few share options are adjusted for the negative value impact of future dividends on call options²¹, management has an incentive to avoid

²¹ Murphy (1998) finds that only 7 out of 618 large firms with share option plans use dividend protection for their management share options.

dividends. It should also be noted that the effect of this incentive on likelihood of repurchasing is expected to be larger the more options management has. Lambert et al. also find empirical support for their hypothesis; they find that dividends decreased following the initial adoption of a share option plan. In addition, they find that greater decreases in dividends occur when the impact on share option value increases.

Other papers also find support for the management option hypothesis. Fenn and Liang (2001) finds a negative impact of share option plans on dividends, as well as a positive relation between share option plans and repurchases. There also seem to be a greater likelihood for repurchases when managers have more share options (Jolls 1998).

It is also reasonable to assume that managers with extensive share option plans would be incentivised to encourage share repurchases based the belief that the share price would increase, as described in section 3.1.7.

3.1.9 Takeover deterrence hypothesis

Yet another motive for repurchasing shares could be to reduce the chance of potential or expected takeovers succeeding. Bagwell (1991) describes in his model that a repurchase could increase the cost of a takeover by removing shareholders with the lowest valuations, and thus reduce the attractiveness of a takeover. Another angle, suggested by Stultz (1988), is that a repurchase could increase manager and manager-friendly ownership, making a takeover more difficult. This is a hypothesis closely relates to the entrenchment hypothesis described under the increased management ownership section. A repurchase could also increase ownership concentration, which according to Skjeltorp (2004) makes a takeover less likely. Reducing the potential takeover gains like agency costs (Billett and Hui 2007) or undervaluation (Bagnoli et al. 1989) might also deter a takeover.

Empirical studies have found support for takeover deterrence as a motivation for share repurchases. Dann and DeAngelo (1988) find evidence of repurchases during takeover contests. They also find a negative announcement effect for these repurchases, which could imply that the market believes the firm is trying to deter a value-creating takeover. In addition, managers, in some cases, seem to be strongly motivated to increase their own and manager-friendly voting rights. Dittmar (2000) identifies significant repurchase activity for firms rumoured as potential takeover targets, while Billett and Hui (2007) find a strong relation between modelled probability of takeover and repurchase activity.

3.2 PRICING MODELS FOR FINANCIAL ASSETS

Pricing models are frequently used to determine the theoretical price of financial assets by matching the expected return with the required return based on exposure to one or more risk factors. The models assume that all information about the firm is correctly reflected in the share price. In the following econometrical analysis in section 8, we will employ the Fama and French Three-factor model presented in this section to calculate a firm's abnormal return.

3.2.1 Capital Asset Pricing Model

One of the most widely employed pricing models is the capital asset pricing model developed by Sharpe (1964), Lintner (1965), Mossin (1966), as well as Fischer and Black (1972). The model is based on modern portfolio theory developed by Harry Markowitz (1952) and relies on several assumptions, see appendix B5.

Sharpe (1964) proves that when the borrowing rate equals the lending rate, the capital market line (CML) runs through the optimal combination of risky assets with respect to risk-reward, tangent with the efficient frontier on the investment opportunity curve²². The CML is defined by:

$$(1) \quad CML: E(r) = r_f + \sigma \left(\frac{E(r_m) - r_f}{\sigma_m} \right)$$

where $E(r)$ is the expected return of a portfolio consisting of the risk-free asset and the market portfolio, $E(r_m)$ is the expected return of the market portfolio, r_f is the return of the risk-free asset, σ is the volatility of the portfolio, and σ_m is the volatility of the market portfolio.

As prices adjust based on demand, several portfolios will lie on the capital market line, implying that not all investors will hold the same portfolio. An investor can choose preferred risk exposure by deciding on an allocation between the riskless asset and an optimal risky portfolio, in line with conclusions drawn by Tobin (1958) and Hicks (1962).

Sharpe (1964) further shows that the security market line (SML), and the asset's correlation with the market portfolio determines the expected return of a single asset.

²² The different combination of two or more assets provide an investment opportunity curve. The efficient part of this curve is when no other combination of the assets can give a higher expected return with the same standard deviation.

Thus, the expected return of an asset will rely on its exposure to systematic risk and not idiosyncratic risk. The SML is defined by:

$$(2) \quad SML: E(r_i) = r_f + \beta_i[E(r_m) - r_f]$$

where $E(r_i)$ is the expected return of the asset, $E(r_m)$ is the expected return of the market portfolio, r_f is the return of the risk-free asset, and $\beta_i = \frac{Cov(E(r_i), E(r_m))}{Var(E(r_i))}$.

The capital asset pricing model can be modified to explain observed returns. This model is referred to as the single-index model:

$$(3) \quad r_{it} - r_f = \alpha_i + \beta_i[r_{mt} - r_f] + \epsilon_{it}$$

The dependent variable $r_{it} - r_f$ is the risk premium of security i in period t . The market premium or market factor is estimated as $r_{mt} - r_f$, where r_{mt} is the return of a chosen market index and r_f is the return of an asset that is close to risk-free. α_i is the active return of the security, otherwise known as the alpha, and it provides the expected abnormal return of the security after controlling for the market factor. The residuals, denoted by ϵ_{it} , express the unexpected idiosyncratic return.

3.2.2 Fama and French Three factor-model

The three factor-model developed by Fama and French (1992; 1993) aims to explain empirical stock market deviations from the capital asset pricing model and other pricing models.

Fama and French (1992; 1993) find that the size factor and value factor explain returns of single assets better than the market factor, and that including the market factor as well delivers alpha values close to zero when explaining returns.

$$(4) \quad r_{it} - r_f = \alpha_i + \beta_{1i} [r_{mt} - r_f] + \beta_{2i} SMB_t + \beta_{3i} HML_t + \epsilon_{it}$$

In the equation, β_1 , β_2 and β_3 are the coefficients for the market factor, size factor and value factor respectively. Further, α and ϵ are the constant and residuals respectively, with the same interpretation as in section 3.2.1. The market risk factor, explained in section 3.2.1, is included in the same form as in the single index model. Further, the size factor, small-minus-big (SMB) portfolio, is included to control for smaller firms realising higher returns than larger firms. Last, the value factor, high-minus-low

(HML) portfolio, is included to control for the effect that firms with high book-to-market achieve better returns than firms with low book-to-market. For more information on the Three-factor model and how Fama and French construct the portfolios see appendix B6.

4 ECONOMETRICAL METHOD

To test our hypotheses econometrically, we run several binary variable logit regressions, with the results presented in section 8. The foundation of the logit is presented in this section. In addition, an explanation for why the logit model is suitable for econometrical problems with binary dependent variables as well as a description of how it can be used in practise is given. This part is based on Liao (1994), Menard (1995), Pampel (2000), and Kutner (2005).

4.1 LOGIT AS A GENERALISED LINEAR MODEL

A logit model is a type of generalised linear model. The starting point for generalised linear models is the assumption that the i th observation y_i is a realisation of a random variable Y_i with expected values $E(Y_i) = \mu_i$. We will only be dealing with binary dependent variables in our econometrical analysis. That means y either takes on the value one if a specific event happens and zero otherwise. μ is thus the expected probability of the event occurring, i.e. $\mu_i = P(y_i = 1)$. The specific event will equal a share repurchase announcement or a share repurchase execution in the econometrical analysis. From now on, we will drop the subscript i for the sake of simplicity. We refer to appendix C1 for a closer examination on the generalised linear model.

Further, we let η be a linear predictor produced by the independent variables x_1, x_2, \dots, x_K . η is related to the x variables through the function:

$$(5) \quad \eta \equiv \sum_{k=1}^K \beta_k x_k$$

In a simple linear model the link function, the model that links η with μ is $\eta = \mu$. The link function for the logit model is non-linear in its nature, specified as $\eta = \log\left(\frac{\mu}{1-\mu}\right)$. In other words, we assume a relationship between the x variables and the logarithm of the odds, or the logged odds, of the event.

4.2 FORMS OF THE LOGIT

The logit model comes in two forms; the logit form and the event probability. In logit form, the model is simply:

$$(6) \quad \log\left(\frac{P(y=1)}{1-P(y=1)}\right) = \sum_{k=1}^K \beta_k x_k$$

When L represents the cumulative distribution function (CDF) of the logistic distribution, the event probability form is:

$$(7) \quad P(y=1) = L\left(\sum_{k=1}^K \beta_k x_k\right) = \frac{e^{\sum_{k=1}^K \beta_k x_k}}{1 + e^{\sum_{k=1}^K \beta_k x_k}}$$

4.3 WHY THE LOGIT MODEL IS SUITABLE FOR BINARY DEPENDENT VARIABLES

Several properties make the logit model well suited for modelling binary variables, especially compared to a linear model estimated through ordinary least squares regression, where linear model is defined as a model with $\eta = \mu$.

First, a logit model ensures that no predicted probabilities exceed one or are below zero. This can be seen in equation 7. With a linear model, we would risk getting predicted probabilities that are negative or larger than one, which is not meaningful.

Second, the logit model allows for each independent variable's effect on predicted probabilities to vary. In many cases, an independent variable should have little impact on predicted probability for small and large values, and a larger impact for mid-level values of the independent variable. This is exactly how it is in the logit model. In a linear model, still defined as $\eta = \mu$, the effect on the predicted probability of increasing an independent variable is constant irrespective of the level of the independent variable²³.

Third, independent variables have a non-additive effect on predicted probabilities in logit models. This means that the effect of an independent variable on predicted probabilities is dependent on the level of the other independent variables. It is often more natural that the effect of independent variables is non-additive. As an example, the gender effect on predicted probability of defaulting on a car loan would

²³ Example; the effect on the probability of buying a car for a wage increase from 5 000 000 USD to 5 010 000 USD is the same as a wage increase from 20 000 USD to 30 000 USD in a linear model.

presumably be very small for very rich individuals²⁴. Therefore, if one independent variable has a very high value, increasing another independent variable by a little would have a very small effect on predicted probability. In contrast, independent variables are additive in a linear model. Note that independent variables in a logit have an additive effect on the logged odds.

Fourth, residuals resulting from an ordinary least squares (OLS) estimation of a linear model with a binary dependent variable necessarily must violate the assumptions of normality²⁵ and homoscedasticity²⁶. For large samples, non-normality is not a big issue, while heteroscedasticity creates inefficient estimates of the coefficients. Estimated logit models are based on maximum likelihood estimation rather than minimization of residuals. Hence, non-normality and heteroscedasticity is not a problem for logit models.

4.4 MAXIMUM LIKELIHOOD ESTIMATION

To estimate the coefficients of a logit model, a maximum likelihood estimation method is employed. Maximum likelihood estimation is basically done by finding the parameters $\beta_1, \beta_2, \dots, \beta_K$ that maximize the probability of observing the sample in question. This probability is called the likelihood value²⁷.

4.5 INTERPRETING LOGIT

By exponentiating the logit form, we get:

$$(8) \quad \frac{P(y = 1)}{1 - P(y = 1)} = e^{\sum_{k=1}^K \beta_k x_k} = \prod_{k=1}^K e^{\beta_k x_k}$$

The left hand side is now the odds of $y = 1$ occurring. Further, the effect on the odds of increasing independent variable k with one unit, all else equal, is approximated by multiplying the odds without changing variable k by e^{β_k} . Hence, if we assume x_k is a binary variable, changing it from zero to one will, all else equal, make the $y = 1$ event e^{β_k} times more likely. That is, the odds of the $y = 1$ event happening with $x_k = 1$ is e^{β_k}

²⁴ One may ask why such individuals should take up a car loan in the first place. Luckily, this is only a simple illustration.

²⁵ Residuals in OLS are required to be normally distributed.

²⁶ The opposite of homoscedasticity is heteroscedasticity, which arises when residuals are correlated with independent variables, resulting in non-constant variance in the population.

²⁷ For reasons explained in appendix C2, the actual procedure tries to maximise the log of the likelihood function.

times the odds of the $y = 1$ event happening with $x_k = 0$. When one odds is divided by another, it is called the odds ratio. This is a meaningful interpretation measure of coefficients for our logit analysis in section 8. It is worth to note that a negative log odds corresponds to an odds between zero and one, and a positive log odds corresponds to an odds larger than one.

4.6 TESTS OF MODEL ADEQUACY

A number of measures can be used to evaluate an estimated logit model. For testing whether the whole model is better than a model without independent variables, it is normal to perform a chi-square test of the likelihood ratio (LR). The LR compares the likelihood values²⁸ of the estimated logit model to a model with all parameters equal to zero. LR should be the starting point for assessing model fit. If used with caution, one can also look at McFadden R^2 . This measure aims to estimate how much of the error in a model without independent variables can be explained by the fitted model, where error again is based on likelihood values. It ranges from zero to about one, analogous to R^2 in OLS, but not comparable to R^2 , closer review is provided in appendix C4. The Akaike information criterion (AIC) and Bayesian information criterion (BIC) can be used to compare models. Both are based on the likelihood value of the estimated model. Contrary to LR and McFadden R^2 , however, AIC and BIC adjust for the number of independent variables. BIC adjusts for sample size as well. For more on AIC and BIC, see appendix C5 and C6.

The standard normally distributed Wald statistic, which is coefficient values over asymptotic standard errors, can be used to assess coefficient values. This is analogous to t-values in OLS. See appendix C7 for more on the Wald statistic.

A logit model should satisfy a number of assumptions. First, it should have the correct specification. This means having a logit model with the correct functional form, as well as a model which includes all relevant variables and no irrelevant variables. Second, the independent variables should not be considerably correlated with each other. Third, residuals should be symmetrical around zero, and residuals should not be correlated with each other over time. A more thorough account of model adequacy is presented in appendix C8.

²⁸ Described briefly in section 4.4, and thoroughly in appendix C2 and C3.

5 DEFINING THE DEPENDENT AND INDEPENDENT VARIABLES

Below, we will explain how we have constructed relevant variables to test and control for some of the hypotheses presented in section 3 for what motivates share repurchase announcements and executions. We also provide an explanation for the decision on variable design and discuss potential weaknesses. The hypotheses we have constructed variables for are the undervaluation signalling hypothesis, the excess cash hypothesis, the optimal capital structure hypothesis and the payout preference hypotheses. For an even more thorough description of how the variables were constructed, and our reasoning, see appendix D.

5.1 DEPENDENT VARIABLE

The dependent variable used in the econometrical analysis later, is a binary variable that takes on the value one if the firm acts according to a defined criterion. Depending on whether we wish to observe motives for share repurchase announcements or executions, we have defined two binary variables that account for the two events²⁹.

$$(9) \quad \textit{Announced}_{it} \equiv \begin{cases} 1, & \text{if a repurchase is announced for firm } i \text{ in year } t \\ 0 & \text{otherwise} \end{cases}$$

$$(10) \quad \textit{Executed}_{it} \equiv \begin{cases} 1, & \text{if a repurchase is announced for firm } i \text{ in year } t, \text{ and any} \\ & \text{repurchases is executed within the authorisation period} \\ 0 & \text{otherwise} \end{cases}$$

The reader should note that the authorisation period is defined as 18 months from the announcement date³⁰, or the time until the next announcement if it occurs sooner than 18 months.

²⁹ In addition, we defined binary variables that would take on the value one if (i) more than 0.5 % of outstanding shares was repurchased, (ii) more than 2 % of shares outstanding was repurchased, and (iii) more than 25 % of shares the firm was authorised to repurchase was repurchased. Using these dependent variables in similar logit regression as executed in section 8 yielded no additional insight.

³⁰ In 2013, firms listed on the OSE were allowed to authorise repurchase programs lasting for up to 24 months. Since we have not controlled for this in our analysis, the authorisation period will be too short for some firms announcing in 2013, potentially missing some repurchase executions in 2014. Further, since we do not have announcement data for 2014 we might erroneously connect repurchases made in 2014 to repurchase announcements in 2013.

5.2 INDEPENDENT VARIABLES

Below we define the independent variables that we will use in the regression analysis. We will not construct variables for all the hypotheses, since we were not able to attain good data for all of them. We will comment on this in section 5.3.

5.2.1 Optimal capital structure hypothesis variable

To determine whether a firm is close to their optimal capital structure, if existent, we use leverage ratio as a starting point. Leverage ratio is defined as the market value of financial net debt relative to the market value of equity. We estimate net debt by adding the value of long-term debt to short-term debt less cash. Further, the mean leverage ratio for the industry is subtracted from the firm leverage ratio, see appendix D1 for a closer description of industry adjustments. The mean leverage ratio of the industry is supposed to be an estimate for the optimal capital structure in the industry. It is reasonable to believe that agency costs, tax advantages of debt and bankruptcy costs differ between industries. Last, this difference is divided by the leverage ratio's standard deviation within the industry. Part of the rationale behind the division is that the mean leverage ratio might be a poorer estimate for an optimal capital structure if the standard deviation of leverage ratios is large.

If the optimal capital structure hypothesis holds, firms with negative variable values should be more likely to repurchase, since they have less debt relative to the proxy optimal capital structure. In addition, for industries with large variations in the leverage ratio, the difference between leverage ratio and the mean leverage ratio has to be larger to make the same impact.

$$(11) \quad \text{Industry – standardised leverage ratio} = \frac{\left(\frac{\text{NetDebt}}{\text{Equity}} - \frac{\text{NetDebt}_{\text{industry}}}{\text{Equity}_{\text{industry}}} \right)}{\sigma_{\text{industry}}}$$

Bagwell and Shoven (1988) employ the leverage ratio, while Lee et al. (2010) use the change in leverage ratio before and after the repurchase. None of these studies find evidence for the optimal capital structure hypothesis.

The variable defined by Dittmar (2000) is similar to the one we employ. It takes the difference between the firm's net debt-to-asset ratio and the median net debt-to-assets ratio for firms in the same sector as defined by the Global Industry

Classification Standard (GICS)³¹. Mitchell and Dharmawan (2007) use a comparable measure, the difference between firm leverage ratio and average industry debt-to-equity. Both of these variables significantly explain repurchases in the respective studies.

5.2.2 Payout preference hypotheses variable

To assess whether firms substitute repurchases for dividends or not, an estimate of dividend levels is needed. Dividend yield is our estimate for the dividend level. Theoretically, the dividend yield should be the expected paid out dividends one year ahead to the current market value of equity. We used the actual dividend yield for the coming year as an approximation of expected dividends. The reason for this choice is primarily that we distrust dividend data for expected dividends from Datastream. The dividend yield is made relative to the industry dividend yield, in order to remove any differences in practice between industries.

If the variable is to support the dividend substitution hypothesis it must significantly, and negatively correlate with share repurchases. In order to support the dividend complement hypothesis we should observe no correlation or positive correlation with share repurchases.

$$(12) \quad \text{Expected DY to industry} = \frac{\left(\frac{\text{DividendPaid}}{\text{Price}}\right)}{\frac{\text{DividendPaid}_{\text{industry}}}{\text{Price}_{\text{industry}}}}$$

The variable is similar to the one employed by Mitchell and Dharmawan (2007). They employ the three-year average dividend yield relative to the industry average. Dittmar (2000) employed the ratio of cash dividends paid to net income in the year prior to the repurchase. Using this ratio, however, would have presented several problems when adjusting for industry-related effects as some firms and some industries have negative earnings in certain years.

Our dividend yield variable carries some weaknesses. First, the price could be incorrectly valued. Second, the measure will incorporate risk related to the ability to maintain the dividend. Third, since we use actual dividends paid as an estimate for expected dividends paid, we have a forward-looking bias. A firm with a high dividend

³¹ GICS is an 8-digit code where the first two digits identifies sector, the first four identifies industry group, the first six identifies industry and all digits identify sub-industry (MSCI)

yield according to our variable is not only expected to be in a position where they can pay dividend, but is actually certain to be in such a position. Or, a firm that normally pays much dividends, but bad market conditions makes it unable to pay out expected dividends, will look like it does not prefer to pay out dividends. The forward-looking bias should not be too problematic, though, since dividends are often declared at the end of the year and great efforts are made to pay declared dividends. Fourth, the dividend yield might also carry some correlation with share returns, potentially causing multicollinearity in our regressions (Fama and French, 1988).

5.2.3 Excess cash hypothesis variable

A variable that is to provide a good estimate for the excess cash hypothesis, should take into consideration both the amount of positive NPV investment opportunities faced by the firm and their cash holdings. Further, the variable must influence the variable value in a manner consistent with the excess cash hypothesis³².

We have accounted for positive NPV investment opportunities by defining *BP* as a binary variable that equals one if the book-to-price³³ is above one, and zero otherwise. An important reason for using *BP* is that a book-to-price larger than one should correspond to the expected future average return on equity being less than the expected cost of equity, which means some future investments have a negative NPV³⁴. In such a situation, firms aiming to maximize shareholder value should distribute cash to shareholders, rather than investing it in these negative NPV projects.

Instead of using *BP*, we could simply have used book-to-price. The reason we choose to use *BP* instead is because it assigns too much weight to the wrong values. The book-to-price measure is non-linear in its nature. In a logit regression, this will more specifically result in firms with an extremely low price-to-book receiving more weight. If we trust market values and book values to be correctly valued, then a firm with extremely value-destructing future projects would get more weight than a firm with only a slight overweight of value-destructing future projects. This does not make sense, as both funding for projects with a very negative NPV and funding for projects with NPV slightly below zero should be distributed to shareholders. Further, a substantially high *BP* should not be a normal situation for a firm. Often, it does not

³² Example; positive NPV investment opportunities and a decreasing cash position should both reduce the value of the variable. In this case, a lower variable value would be associated with an increased likelihood of a share repurchase according to the hypothesis.

³³ Book-to-price is defined as the book value of equity divided by the market value of equity.

³⁴ That is, if both market values and book values are correctly valued

mean that a firm's investment opportunities are poor; it rather means the firm is in distress. It might have good investment opportunities that it simply cannot pursue.

BP is interacted with cash-to-total assets for the firm relative to the industry to form the full estimate for excess cash. The rationale for using this estimate for available cash is twofold. First, using cash relative to total assets allows us to compare firms of different sizes. Second, comparing the relative cash position to the industry group would remove biases related to different practices in cash holdings between different industries.

The final variable will be determined by the cash position relative to the industry if book-to-price is lower than one, while it is zero otherwise.

$$(13) \quad BP \times \frac{Cash}{TA} \text{ to industry} = BP * \frac{\frac{Cash}{TA}}{\frac{Cash_{industry}}{TA_{industry}}}$$

Mitchell and Dharmawan (2007) employs an interaction term to properly account for the excess cash hypothesis, although their definition differed slightly from ours. Bagwell and Shoven (1988), and Nohel and Tarhan (1998) also support the notion that an interaction variable provides the most appropriate representation.

There are some potential issues with the interaction variable. Regarding *BP*, it is very sensitive to incorrect market values and book values. Market participants and accountants may value equity and book values incorrectly. In practice, the accounting rules for assets across industries vary significantly, and very few book values reflect replacement cost of net assets. Regarding cash to total assets relative to the industry, it does not incorporate how much cash is set aside to cover short-term commitments and obligations of the firm. It may also not account for differences within industries in how much cash a firm needs to operate on a day-to-day basis.

5.2.4 Undervaluation signalling hypothesis variable

We have chosen to use the cumulative abnormal return, calculated as the share return less the expected return determined by the Fama and French Three-factor model. For a closer review of how the abnormal return was calculated, see appendix D2. To determine whether or not a share is under-priced at the time of announcement we look at the cumulative abnormal return for the 60 days leading up to the

announcement³⁵. Valuation at the time of execution is determined by using the return for the 30 days prior to the first executed repurchase³⁶.

$$(14) \quad CAR_{60_{1Q}} = \prod_{i=-60}^0 (DailyReturn_i - ExpectedReturn_i + 1)$$

$$(15) \quad CAR_{30_{2Q}} = \prod_{i=-30}^0 (DailyReturn_i - ExpectedReturn_i + 1)$$

Dittmar (2000) use the value-weighted, market-adjusted return in the calendar year prior to the repurchase. Mitchell and Dharmawan (2007) employ a very similar measure, the abnormal return one year prior to the share repurchase, with the average return on the industry as the expected return.

One issue with observing price movements leading up to the announcement date is that in most cases the general meeting approves everything. Thus, the notice of a future general meeting with a proposal of a share repurchase program could provide a stronger signal than the actual approval from the general meeting. A more general issue is that returns adjusted with the Fama and French Three-factor model might not be what management or the board look at when considering the relative valuation of the firm, although it is the most common adjustment in academics. They might be more likely to compare the share performance relative to the industry and its closest peers. Last, the number of days we measure abnormal returns for might be too short or too long relative to the period firms use to assess whether their stock is undervalued.

5.3 HYPOTHESES THAT ARE NOT ACCOUNTED FOR

There are several hypotheses we have not been able to test due to either unavailability of data, significant monetary costs of receiving data or simply that no good measures exist. We stress that our variable for the undervaluation signalling hypothesis is not meant to control for the earnings signalling hypothesis.

³⁵ For firms that have not announced, we use the return for the 60 days leading up to the last trading day of the first quarter. This is the time when most share repurchases are announced, see appendix D3.

³⁶ For firms that did not execute, we use the return for the 30 days leading up to the last trading day of the second quarter. Share repurchase execution are more evenly spread through the year so the second quarter is not necessarily the best assumption, see appendix D3.

As a result of not being able to control and test for everything, we might experience endogeneity issues due to omitted variables. This will be commented on in section 8.1.

6 DATASET GATHERING AND DATA CLEANING

This section reviews the process of gathering data and evaluation of data quality. We review each of our data sources, the data gathered from these sources and potential weaknesses with the data. In addition, we provide a description of the observation identification measures we employed to connect and structure the data from all the different sources.

6.1 LIST OVER FIRMS ON THE MAIN LIST OF OSLO STOCK EXCHANGE

Firms listed on the main list of the OSE in the period from 1997 to 2014 forms the basis of our sample. The list was supplied by the OSE itself and is thus likely to be complete and exhaustive. We remind the reader that our later analysis only will cover the years from 1998 to 2013, a total of 16 years. The list includes for each year the securities listed on the main list over the year. Hence, it includes both firms that are still listed and firms that have been delisted. The dataset serves many purposes. It includes for each security: International Securities Identification Numbers (ISIN)³⁷, Oslo Stock Exchange Security IDs (SID)³⁸, GICS codes, stock tickers and firm names. Having both SID and ISIN is necessary to match repurchase data with financial data, for more on this process see appendix E1. The GICS codes give us the opportunity to control for sector effects in the analysis.

If a security was listed during the year and then delisted before the year ended, it would not appear in the list. We assume this is a very rare event on the OSE, if it has happened at all. Accordingly, it should not affect our analysis significantly.

6.2 FINANCIAL DATA FROM DATASTREAM AND EXCHANGE RATES FROM BLOOMBERG

To collect financial data related to each observation we used the Datastream database. The data necessary for calculating variables defined in section 5 was

³⁷ An International Securities Identification Number (ISIN) is a unique code assigned to most listed securities in the world. If a firm has several securities listed, it would have one ISIN for each. If an ISIN ceases to exist, it does not necessarily mean that the firm. An ISIN could also cease to exist without the firm being delisted; this could for instance be the case if a new security is issued in connection with a merger (ISINO)

³⁸ Security ID is a unique code which works in the same way as ISIN, only that it is specific for Norwegian Securities.

obtained by matching ISIN numbers in the list described in section 6.1 for each year, with ISIN numbers in Datastream. All firms were located for each relevant year except from Actinor, Polar Holding, Troms Fylkes Dampskibsselskap and PA Resources which were not available in Datastream.

We collected information on the following data points; cash and cash equivalents, long-term debt, short-term debt and current portion, market value of equity, cash dividends paid, book value per share, total assets and adjusted price. A closer examination of these and some additional data points is provided in appendix E2³⁹. To correct for differences in currency denomination in some of the observations, we obtained exchange rates from Bloomberg. A complete overview of the changes made is included in appendix E3. Finally, we gathered daily-adjusted prices for all firms over the entire period, in order to calculate the cumulative abnormal return.

We chose Datastream for a number of reasons. First, Datastream is known to have high data collection standards. The data is updated regularly, and data should mostly be correct. Second, it contained data for almost all of the firms in the main list. That also goes for delisted companies. Third, it provides access to a wide range of variables that are computed in a standardised way, as well as exist for all the firms we looked for. There are other sources that possibly could have provided us with more granular data for some firms, but these data often do not exist for all firms and/or is not standardised across companies. However, as with any database it contains errors and some observations had to be dropped to correct for apparent mistakes in Datastream, see appendix E4 for a full overview of observations that were dropped. In appendix E5 and E6 we provide plots of relevant financial values and variables before and after dropping observations.

One weakness with the data is the granularity, the data is annual and represent end of fiscal year values, and thus may not be representative for the firm's decision to announce or execute a share repurchase in for example May. Last, one weakness not directly related to the financial values from Datastream, is that we were not able to attain relevant variables to test all the hypotheses, elaborated on in section 5.3.

³⁹ A note should be made on how Datastream treats per share values. In Datastream most per share values are adjusted for splits and dividends, leading to potential errors if not taken into consideration when constructing the variables. As we have taken this into consideration, there should be no errors.

6.3 SHARE REPURCHASE ANNOUNCEMENT DATA FROM THE OSE NEWSWEB

Announcement data for all share repurchase announcements made in the period 1998 to 2013 is gathered from the NewsWeb service offered by the OSE. Johannes Skjeltnor provided us with data from 1998 to 2004, while we gathered for 2005 to 2013. For every share repurchase announcement, it includes the date of the announcement, the authorised repurchase amount, as well as firm name and stock ticker at the time of announcement. The list also includes announcements made for securities that are now delisted. The announcement date is the date when a NewsWeb message reveals that a repurchase has been authorised. This represents the announcement date, since the Norwegian Securities Trading Act prevents investors to trade on information that is not yet public. The announcement is most often revealed through an attached general meeting protocol. For our analysis we have only been able to use the first share repurchase announcement of a firm in a given year. Thus, for the 31 instances where a firm announced a share repurchase more than once during a year the data is lost. A closer review of how this data was gathered can be found in appendix E7.

6.4 SHARE REPURCHASE EXECUTIONS DATA FROM THE OSE

A list of repurchase executions from 1999 to July 2015 was provided by the OSE. The list includes all share repurchase executions made by all firms listed at the OSE in the period on a daily basis. Relevant data points included are SID, repurchase date, payment date, number of shares repurchased, number of shares held by the firm at the time of the repurchase, number of shares outstanding for the firm at the time of repurchase, and the average price paid.

6.5 THE OBX INDEX AND FACTOR PORTFOLIOS FROM BERNT ARNE ØDEGAARD

In order to compute the cumulative abnormal return we need to compute the expected return. Since we employ the Fama and French Three-factor model we needed data on the market portfolio, as well as the two factor portfolios HML and SMB, in addition to the risk-free rate.

We obtained the necessary data from Bernt Arne Ødegaard's website. Here we collected daily returns of the OBX-index, which lists the 25 most liquid firms on the OSE. Further, we collected daily returns for the HML and SMB factor portfolios at the OSE, as calculated by Fama and French (1993). We were also able to obtain the monthly risk-free rate.

Using factor data for the OSE instead of relying on for instance U.S. data reduces the risk of calculating abnormal returns that do not reflect expected returns for OSE-listed firms. The risk, however, is that the small sample that the OSE represents might create random fluctuation in factor returns, that do not reflect actual risk premia. This adds to the notion that undervaluation is not something which is easy to estimate in the real world.

7 DESCRIPTIVE ANALYSIS

This section provides an overview of relevant share repurchase statistics for firms listed on the main list of the OSE from 1998 until 2013.

Considering U.S. data, share repurchases seem to play an increasingly greater role in a firm's payout policy. The value of shares repurchased have exceeded that of dividends paid in most years since 2004, see appendix F1. A similar development has not been experienced by firms listed on the main list of the OSE. Here, repurchases still constitute a relatively small part of total cash distributions, see figure 2.

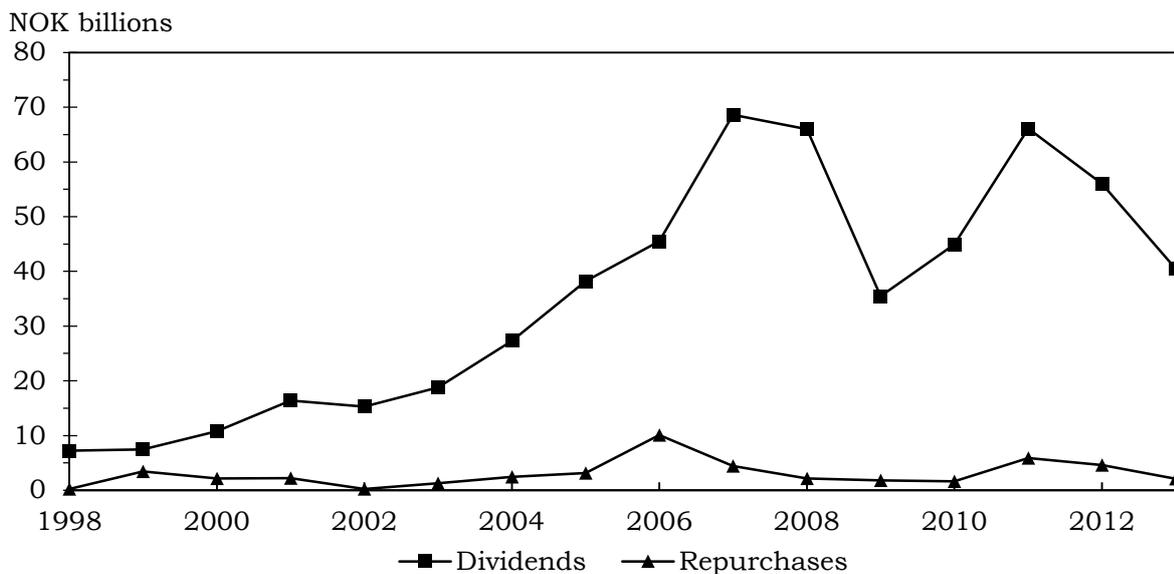


Figure 2. Annual dividend value and repurchase value in NOK billions.

The annual value of dividends and share repurchases made by firms listed on the main list of the OSE for each year from 1998 to 2013. We see that share repurchases constitute a small portion of a firm's total payout, which is very different from the U.S.

7.1 FREQUENCY OF SHARE REPURCHASE ANNOUNCEMENTS AND EXECUTIONS

Table I displays some general statistics on share repurchase announcements and executions. First, we remind the reader that our data only contain observations from

the main list of the OSE and that only the first announcement for each firm every year is included⁴⁰. Second, it is important to remember that the statistics for each year corresponds to data for repurchase programs authorised in that specific year. We can for instance have cases where a share repurchase program is authorised in 2000 and shares are repurchased as late as 2002, but still connected to 2000.

Table I

Cross-sectional repurchase announcement and execution statistics

The table provides information on the number of share repurchase announcements and executions, as well as the number of unique firms that made a share repurchase announcement or execution in the period from 1998 to 2013. The statistics are given for the entire sample and the different sample years.

Period	Share repurchase announcements			Share repurchase executions		
	Number	Unique firms	Share of all firms	Number	Unique firms	Share of all announcing firms
Whole sample	1371	271	96 %	7457	188	69 %
1998	23	23	16 %	70	12	52 %
1999	70	70	49 %	224	36	51 %
2000	74	74	50 %	555	58	78 %
2001	90	90	59 %	552	55	61 %
2002	65	65	43 %	220	31	48 %
2003	72	72	53 %	159	25	35 %
2004	69	69	48 %	473	27	39 %
2005	87	87	52 %	353	42	48 %
2006	116	116	67 %	907	57	49 %
2007	114	114	65 %	520	55	48 %
2008	105	105	63 %	550	41	39 %
2009	114	114	73 %	550	32	28 %
2010	95	95	62 %	477	36	38 %
2011	100	100	67 %	668	41	41 %
2012	94	94	65 %	764	34	36 %
2013	83	83	63 %	416	34	41 %

Over the entire period from 1998 to 2013 there were 1371 first-of-the-year repurchase announcements made by 271 different firms. The number of announcing firms increased from 23 to 83, with the maximum number of announcing firms being 116

⁴⁰ Previous research by Skjeltorp has included both the main list and Oslo Axess. In addition, Skjeltorp includes all announcements a firm makes during a year (Skjeltorp 2004).

in 2006. In addition, the share of firms on the main list of the OSE that announced a share repurchase has increased from 16 % in 1998 to 63 % in 2013. Although most of the increase came in 1999, there is still some evidence of increased popularity during the following years.

It is interesting to note that 52 % of announcements made in 1998 ended in executions, whereas only 41 % ended in executions in 2013. Of the 271 unique firms that announced a share repurchase, only 188 actually executed one or multiple share repurchases. This corresponds to just below 70 % of all firms on the main list of the OSE. The remaining 83 firms never executed on any of their repurchase announcements⁴¹.

The 188 firms that repurchased shares in our sample executed a total of 7457 individual share repurchase transactions. Keep in mind that the statistics include share repurchase executions in 2014 that were related to share repurchase programs announced during the end of 2012 or in 2013.

As can be seen in appendix F2, most announcements are made in April, May and June. The reason is that most general meetings take place in these months. Further, we find that the first share repurchase execution related to a share repurchase programs are more evenly spread out over the different months.

7.2 GENERAL STATISTICS RELATED TO SHARE REPURCHASES

In table II below, we provide statistics on the authorised share repurchase amount, the number of days from announcement until the first repurchase, and the amount of outstanding shares repurchased.

⁴¹ A share repurchase execution is assigned to the year of the announcement, not necessarily the year of the execution. This explains why 12 firms are considered to be executing a share repurchase in 1998, even though repurchases was not allowed.

Table II
Cross-sectional share repurchase execution statistics

The table provides information on the authorised share repurchase amount, the days from the announcement until the first share repurchase execution, and the amount of outstanding shares that were repurchased within a single share repurchase program. The statistics are given for the entire sample and the different sample years.

Period	Authorised repurchase amount			Days until first repurchase			Amount of outstanding shares repurchased		
	Min	Mean	Max	Min	Mean	Max	Median	Mean	Max
Whole sample	0.0 %	9.3 %	10.0 %	0	119.4	527	0.0 %	1.0 %	45.7 %
1998	5.0 %	9.3 %	10.0 %	18	250	431	0.0 %	2.0 %	10.0 %
1999	2.2 %	9.3 %	10.0 %	0	148	422	0.0 %	2.4 %	19.4 %
2000	1.9 %	9.6 %	10.0 %	2	127	510	1.3 %	2.8 %	23.9 %
2001	1.0 %	9.3 %	10.0 %	0	86	510	0.4 %	2.1 %	34.5 %
2002	3.0 %	9.6 %	10.0 %	0	128	484	0.0 %	1.0 %	21.6 %
2003	1.0 %	9.7 %	10.0 %	3	121	417	0.0 %	0.8 %	26.1 %
2004	5.0 %	9.7 %	10.0 %	0	65	323	0.0 %	1.6 %	45.7 %
2005	1.0 %	9.2 %	10.0 %	1	123	367	0.0 %	0.8 %	7.5 %
2006	0.1 %	9.1 %	10.0 %	1	86	357	0.0 %	1.2 %	15.2 %
2007	2.0 %	9.8 %	10.0 %	1	109	527	0.0 %	0.5 %	6.2 %
2008	0.0 %	9.4 %	10.0 %	55	157	389	0.0 %	0.5 %	6.2 %
2009	0.1 %	9.3 %	10.0 %	3	121	500	0.0 %	0.4 %	8.8 %
2010	0.1 %	8.8 %	10.0 %	0	127	449	0.0 %	0.2 %	4.4 %
2011	0.1 %	9.0 %	10.0 %	1	105	301	0.0 %	0.5 %	8.4 %
2012	0.3 %	8.8 %	10.0 %	0	110	510	0.0 %	0.4 %	10.0 %
2013	0.4 %	8.7 %	10.0 %	1	161	516	0.0 %	0.4 %	5.8 %

Looking at the distribution of the authorised repurchase amount we see that it is highly skewed towards 10 % for most years with a mean slightly above 9 % and a minimum close to zero. This points towards most firms announcing the maximum allowed amount. A possible implication is that there is no special purpose for announcing the share repurchase. The authorised repurchase amount could simply be set at the maximum limit to keep the door open for a repurchase, instead of setting a clear repurchase target to achieve an objective. Adding to this impression is that very few firms provide a specific reason for repurchasing in their general meeting protocols.

Most of the first executions within a repurchase program happens a while after the announcement date. The average number of days between the announcement date and the date of the first share repurchase execution was 119. The repurchase plan

does not seem to be put in place for immediate execution. Note that 1998 numbers are biased upwards since it was not allowed to repurchase until 1999⁴².

The extent to which firms execute on their share repurchase program is skewed towards zero. For some years, more than 10 % of the shares outstanding are repurchased. This is in most cases the result of treasury shares that are used in transactions, retired or distributed to employees or managers as part of a bonus program, or any other event that is not captured in our data. Hence, companies can fill up their allowed amount of treasury shareholdings again. It is also possible that repurchase amounts exceed 10 % due to renewed share repurchase programs not being reflected in our dataset. As mentioned earlier, we only have the first announcement within a single year for the small sample of firms announcing more than once during a year. For the whole sample the median repurchase value was 0 %, implying that at least half of all share repurchase announcements in our sample did not lead to executions. On average firms that announced a share repurchase ended up repurchasing 1 % of the outstanding shares. There might be a downwards trend in the amount of outstanding shares repurchased across firms, as averages decrease over the years. This strengthens our suspicion that announcements are made to have the opportunity to repurchase, rather than carrying a direct intention to repurchase. We show the five largest repurchases in amount of shares outstanding in table III below.

Table III

Five largest share repurchases in amount of outstanding shares

The table provides information on the five firms that repurchased the largest amount of their outstanding shares within a single share repurchase program. Included in the table is information on the year the share repurchase program was announced, market capitalisation, repurchased amount, authorised repurchase amount, cash, net debt and the leverage ratio. All monetary values are in NOK millions.

Firm	Year	M. Cap.	Repurchased amount	Authorised amount	Cash	Net debt	D/E
DNO	2004	1 463	45.7 %	10 %	138	689	0.47
Odfjell	2001	1 026	34.5 %	10 %	2 031	6 338	6.18
DNO	2003	791	26.1 %	10 %	84	477	0.60
Marine H.	2000	1 803	23.9 %	10 %	559	1 398	0.78
DNO	2002	691	21.6 %	10 %	164	487	0.70

⁴² The number of days have been calculated as the difference between the announcement date and payment date, and not the date the share repurchase execution was announced as used by Skjeltorp.

The largest five repurchases in the period, measured in amount of outstanding shares repurchased, is displayed in table III. In the case of DNO, we have not been able to confirm any repurchase motive. However, based on news articles and press releases it might seem that DNO repurchased shares to increase shareholder concentration (DNO 2001). Further, shares issued to preferred shareholders through private placements possibly financed this under the management of Berge Gerdt Larsen (DN 2003; DNO 2003).

The repurchases by Odfjell in 2001 are related to repurchase of series B shares. Thus, the amount repurchased is not 34.5% of all shares outstanding, but only to series B shares. As of end 2003 the series B shares constituted approximately 24.3 % of all shares outstanding, thus the repurchase represents only 8.4 % of all outstanding shares⁴³ (Odfjell 2004).

Marine Harvest, then called Pan Fish, repurchased substantial amounts of their own share in 2000 on speculation. The transactions resulted in financial revenues of NOK 180 million for the firm, although similar trades in succeeding years were not as successful. The case is widely believed to be the result of market manipulation, orchestrated by manager Arne Nore. The repurchased shares either were retired or, even more frequently, were used in transactions (BT 2001; Stavanger Aftenblad 2001)

7.3 STATISTICS RELATED TO SHARE REPURCHASE EXECUTIONS

Table IV provides an overview of the number of share repurchase executions within a share repurchase program and the size of all share repurchase executions within share repurchase program. First, note that an execution in this section means a day where a firm has repurchased own shares, even though it executed multiple repurchases that day. Second, it is important to note that repurchase values lacked for 945 out of 10166 executions. This impacts the extent to which we can trust our data on the value of each execution⁴⁴. Still, the missing values seem to be randomly distributed between firms and years, so there should be no large biases in the data.

⁴³ We were not able to locate information on shares outstanding for 2001, but the numbers for 2003 should be fairly representative.

⁴⁴ We only lack the value of single executions; there are no missing values for other execution statistics.

Table IV
Cross-sectional share repurchase execution statistics

The table provides information on the number of share repurchases executed within a single share repurchase program, and the market value of repurchased shares in NOK millions. The statistics are given for the entire sample and the different sample years.

Period	Number of repurchases				Repurchase value			
	Min	Median	Mean	Max	Median	Mean	Max.	Total
Whole sample	1	5	12.1	193	0.0	41.2	2 928	47 952
1998	1	5	6	21	0.0	0.0	108	218
1999	1	5	6	25	0.0	70.6	1 601	3 460
2000	1	5	10	114	8.6	44.3	595	2 172
2001	1	4	10	67	0.0	41.3	771	2 229
2002	1	4	7	59	0.0	6.0	52	247
2003	1	2	7	45	0.0	29.4	621	1 293
2004	1	7	18	87	0.0	61.3	1 176	2 450
2005	1	4	8	54	0.0	39.2	887	3 134
2006	1	7	16	123	0.0	93.0	2 928	10 131
2007	1	5	10	139	0.0	40.1	689	4 447
2008	1	7	13	73	0.0	20.5	637	2 134
2009	1	3	17	193	0.0	16.0	770	1 790
2010	1	3	13	106	0.0	18.8	1 046	1 634
2011	1	3	16	98	0.0	61.6	2 008	5 912
2012	1	12	23	162	0.0	51.5	2 220	4 585
2013	1	4	12	118	0.0	26.7	915	2 109

The median firm had five share repurchase executions within each repurchase program, while the maximum number of repurchase executions was 197 for a single share repurchase program. The average value of all repurchases related to a single share repurchase program was NOK 41 million, with the largest share repurchase for a single program being NOK 2 928 million. Over the sample period, shares were repurchased for a total value of NOK 48 billion. We show the five largest repurchases in terms of market value repurchased in table V below.

Table V**Five largest share repurchases in terms of market value repurchased**

The table provides information on the five firms that repurchased the most in terms of market value within a repurchase program. Included in the table is information on the year the share repurchase program was announced, market capitalisation, market value of the repurchase program, market value of repurchases by all firms announcing in that specific year, the firm's relative share of total repurchase value that year, value of dividends paid, value of all dividends paid by all firms in that specific year, the firm's relative share of the paid dividends, cash, net debt and the leverage ratio. All monetary values are in NOK billions.

Firm	Year	M.Cap.	Repo value	Total repo	Share	Div.	Total div.	Share	Cash	Net debt	D/E
Hydro	2006	179.5	2.9	10.1	29 %	5.0	68.6	7 %	14.3	12.1	7 %
Telenor	2012	157.8	2.2	4.6	48 %	6.2	40.5	15 %	15.5	11.9	8 %
Telenor	2011	157.2	2.0	5.9	34 %	4.1	56.0	7 %	14.6	11.5	7 %
Hydro	1999	58.9	1.6	3.5	46 %	1.7	10.8	16 %	4.4	26.4	45 %
Statoil	2012	468.7	1.6	4.6	34 %	19.9	40.5	49 %	127.4	55.2	12 %

In relation to the merger of Statoil and Hydro in December 2006, Hydro repurchased shares in the market for several billion NOK. The repurchased shares and a proportionate portion of the shares owned by the Norwegian state were retired to facilitate for the merger (Nettavisen 2006).

In 2010, 2011, and 2012 Telenor executed multiple large share repurchases in order to pay out excess cash. The background for increasing their payout policy was general critique towards Telenor for not being as shareholder-friendly as comparable telecom firms, and Telenor wanted to increase the direct return to shareholders. In addition, analysts believed the repurchases would give the company a capital structure suitable for a mature company, and perhaps signal the latent undervaluation of the share (e24.no 2011; hegnar.no 2013).

The period leading up to year 2000 was characterised by mergers and acquisitions by all firms in all sectors. Hydro was no exception with the acquisition of Saga Petroleum in 1999 from Statoil. Due to the booming economy most firms produced significant amounts of excess cash. With a mergers and acquisition wave, investors may have been especially sceptic to the way this excess cash would be employed. A repurchase might comfort investors, reducing excess cash agency costs. The rationale for Hydro might also be related to such a motive (Magma 2002).

Before the oil price drop in 2014, firms operating in the oil industry experienced situations of excess cash. Statoil used the opportunity to increase their payout to shareholders and adjust their capital structure appropriately (DN 2012).

7.4 FINANCIAL DATA SORTED ON ANNOUNCEMENT AND EXECUTION STATUS

Table VI contains some of the key financial values and ratios related to the hypotheses we are looking to examine.

Table VI

Financial values and ratios for firms depending on repurchase status

The table provides several financial values and ratios for firms depending on whether they are non-announcing, announcing, non-executing or executing. Financial values and ratios are grouped to reflect information relevant to the hypotheses that will be examined using regression analysis. The financial variables are: firm market capitalisation in a certain year; the firm leverage ratio in a certain year; the firm leverage ratio less the average industry leverage ratio in a certain year divided by the standard deviation in leverage ratio for the industry in the same year; cash holdings in the firm; cash to total assets in the firm in a certain year; price to-book value of the firm in a certain year; firm return on equity in a certain year; binary variable equal to one if book-to-price is below one; binary variable equal to one if book-to-price is below one interacted with cash to total assets relative to the industry; the 60-day cumulative abnormal return leading up to announcement or the 30-day cumulative abnormal return leading up to the date of the first repurchase; total cash dividends paid by a firm in a certain year; the expected dividend yield divided by the average expected dividend yield for the industry in a certain year All monetary values are in NOK millions.

		Non-announcing	Announcing	Non-executing	Executing
M. Cap.	Mean	4 783	9 380	4 550	14 600
	Median	693	1 243	1 137	1 487
Leverage ratio	Mean	104 %	77 %	100 %	51 %
	Median	27 %	26 %	39 %	12 %
Industry-std. leverage ratio	Mean	1 %	-6 %	7 %	-19 %
	Median	-23 %	-33 %	-21 %	-44 %
Cash	Mean	961	1 918	1 878	1 961
	Median	121	207	197	225
Cash/TA	Mean	19 %	17 %	15 %	19 %
	Median	12 %	11 %	11 %	12 %
PB	Mean	3.71	2.69	2.92	2.45
	Median	1.48	1.57	1.48	1.67
ROE	Mean	-23 %	0 %	-9 %	9 %
	Median	6 %	9 %	6 %	12 %
BP Dummy	Mean	32 %	26 %	29 %	23 %
	Median	0 %	0 %	0 %	0 %
BPxCash_TA to industry	Mean	25 %	24 %	26 %	21 %
	Median	0 %	0 %	0 %	0 %
CAR	Mean	-4 %	-6 %	-5 %	-6 %
	Median	-7 %	-7 %	-5 %	-6 %
Dividend paid	Mean	154.0	308.6	165.4	462.8
	Median	0.0	8.3	0.0	13.4
Expected DY to industry	Mean	95 %	92 %	84 %	100 %
	Median	0 %	19 %	0 %	42 %
Observations		707	984	510	474

The data appears to provide support for the optimal capital structure hypothesis, especially when it comes to execution. One should be very cautious with such an interpretation, however, as there could be other explanations. Announcing and executing firms are larger and more profitable in terms of beginning-of-year return on equity (ROE) than their non-acting counterparts are. According to the pecking order theory presented in section 3.1.1, it is expected that profitable firms have lower leverage. Their lower price to book value indicates that their expected future profitability may be lower than non-announcing and non-executing firms⁴⁵. Still, they are currently substantially more profitable. Profitable firms have a higher ability to distribute cash to shareholders, as they simply produce more cash. It is true that the relative cash levels does not seem to reflect this ability to produce cash in a clear-cut way. However, the cash levels fluctuate throughout a year, and the beginning-of-year values is consequently not a perfect measure.

The conclusions are fairly similar when segmenting on market capitalisation, as can be seen in appendix F3. The data indicates that smaller firms have somewhat lower leverage when announcing a share repurchase, whereas the leverage is lower for larger firms that announce. Further, smaller firms that execute a share repurchase have pointedly lower leverage than firms that do not execute, and the difference is greater than for larger firms. Yet, ROE is higher for the announcing and executing firms for all the different sizes. The relation between profitability and repurchases presented in the previous paragraph may still hold.

The numbers neither confirms nor denies the excess cash hypothesis. Simply looking at the amount of cash, we see that announcing firms have more cash than non-announcing firms have, and firms that execute have a little more cash than those that do not. The cash to total assets gives a more unclear picture. This could mean that the absolute value of cash holdings is more relevant than the value relative to total assets when contemplating a repurchase. Considering ROE as a measure of profitability, we find a clear positive relation between being a profitable firms and to announce or to execute. ROE is however not a direct measure of the cash available for distribution. It might be related to non-cash earnings, and earnings may be used for investments. Price to book is meant to be a starting point for measuring whether the firm has profitable growth opportunities. Averages seem to confirm that announcing and executing firms have lower growth opportunities. However, this

⁴⁵ The median announcing and executing firms do not have lower price to book values, though.

relation is not evident when looking at medians. The variable that will be used in the econometrical analysis in section 8, $BP \times Cash/TA$ to industry is flat across the different groups, providing no support for the excess cash hypothesis. As elaborated on in section 5.2.3, the variable is complex and especially provides a rough measure of future profitability. This may cloud the results.

Conclusions are similar when segmenting on market capitalisation, except for cash to total assets being higher for small firms that execute a share repurchase than those that do not. Since we do not observe the same characteristic for larger firms, it might again indicate that the absolute value of cash is more predictive than the relative amount.

There is weak evidence in favour of the undervaluation hypothesis, since firms that announced or executed a share repurchase have experienced relatively lower cumulative abnormal return. Results are somewhat clearer for announcement when observations are segmented on market capitalisation, but weaker for executions. However, it is hard to state that the differences are large enough to provide any indication on the undervaluation hypothesis being correct.

The data find no support for the dividend substitution hypothesis. Rather, it appears that firms treat dividends and share repurchases as complements, in line with the dividend complement hypothesis. We see that firms executing a share repurchase even pay higher dividends both in terms of dividends paid and expected DY relative to the industry than those who do not.

8 ECONOMETRICAL ANALYSIS OF SHARE REPURCHASES

In this section, we present an econometrical analysis of what motivates share repurchase announcements and executions among firms listed on the main list of the OSE. First, we examine share repurchase announcement motives by comparing announcing firms with non-announcing firms in logit regressions. Second, we perform similar logit regressions on executing firms compared with firms that announced a share repurchase without executing.

The share repurchase hypotheses that will be analysed, presented in section 3.1, are the undervaluation hypothesis, the excess cash hypothesis, the optimal capital structure hypothesis and the payout preference hypotheses. Concerning the payout preference hypotheses, both the dividend substitution hypothesis and the dividend complement hypothesis will be considered. A short review of the variable specifications is provided in the table text of table VII. We remind the reader that the

hypotheses are not mutually exclusive and therefore subject to collinearity. Further, the results are likely to be affected by endogeneity issues. These issues are discussed in section 8.1. We advise the reader to read this material carefully and consider the analysis in light of these issues.

Note that the following logit regression tables report coefficients in odds ratio form. Assuming a coefficient value of 1.2, the interpretation would be that an increase in the independent variable of one unit makes it 1.2 times more likely that the event will occur. A coefficient value of 0.8 would have made it 0.8 times more likely that the event would occur, in other words the likelihood is decreased. Thus, odds ratios below one indicate a reduced likelihood for the event occurring given an increase in the variable. Similarly, a coefficient value above one indicates increased likelihood of the event occurring for an increase in the variable.

8.1 MOTIVES FOR ANNOUNCING A SHARE REPURCHASE

In the following section, we analyse what motivates a firm to announce a share repurchase. In addition, we attempt to uncover whether motives are the same for subsamples based on market capitalisation and different periods.

Our findings support the optimal capital structure hypothesis, although this finding could be related to profitability not being properly controlled for. This is discussed further below. The data also point in favour of the dividend complement hypothesis. In other words, we find no relation between dividends paid and share repurchase announcements. Further, we find no evidence for the undervaluation hypothesis or the excess cash hypothesis. Segmenting the data on market capitalisation or different periods yield few additional insights, perhaps except for the lack of significant variables in the subsamples. The lack of significant results supports the notion that a share repurchase announcement has become a routine procedure at general meetings, as discussed in section 7. For smaller firms the undervaluation hypothesis appears to have some validity when announcing a share repurchase. This could be related to smaller firms receiving less analyst coverage than larger firms do, making repurchases a stronger signal. However, the coefficients do not seem to be economically significant.

Table VII

Announcement logit regression on full sample for various specifications

Logit regressions for the full sample where the dependent variable is a binary variable equal to one if the firm announces a share repurchase in a given year and zero otherwise. There are four independent variables. The firm leverage ratio less the average industry leverage ratio in the relevant year divided by the leverage ratio's standard deviation within the industry in the same year. The expected dividend yield divided by the average expected dividend yield for the industry. A binary variable equal to one if book-to-price is below one interacted with cash to total assets relative to the industry. Last, the cumulative abnormal return for the 60 days preceding to the announcement. Model I contains only the above variables. Model II includes binary variables for each year. Model III includes binary variables for each sector as defined by GICS. Model IV includes both year and sector binary variables, whereas Model V also includes the interaction between these binary variables.

	Model I	Model II	Model III	Model IV	Model V
Industry-standardised leverage ratio	0.866** (-2.39)	0.871** (-2.21)	0.844*** (-2.76)	0.843*** (-2.66)	0.822*** (-2.93)
Expected DY to industry	1.000 (1.21)	1.000 (0.88)	1.000 (1.06)	1.000 (0.70)	1.000 (0.45)
BP x Cash/TA to industry	0.999 (-0.69)	0.999 (-1.19)	0.999 (-0.73)	0.998 (-1.43)	0.998 (-1.44)
60-day CAR	0.998 (-0.97)	0.997 (-1.23)	0.997 (-1.14)	0.997 (-1.07)	0.996 (-1.44)
McFadden R^2	0.004	0.062	0.014	0.072	0.083
AIC	1883.8	1805.7	1870.8	1793.5	1877.5
BIC	1910.1	1910.8	1939.0	1940.4	2515.7
LR	7.714	115.8	27.11	134.5	147.0
P	0.103	6.71e-16	0.00744	3.18e-16	0.0609
Observations*	1417	1417	1407	1407	1325

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

* Some binary variables predict success perfectly and the observations are dropped

Choice of model specification

Among the competing model specifications outlined in table VII, we find that Model IV achieves the best results on most model fit estimates, satisfies all econometrical assumptions reasonably well and is the easiest model to justify logically. Including year and sector binary variables is sensible, since the likelihood of a share repurchase announcement is likely to vary across years and sectors.

All model specifications included in table VII, except Model I and Model V, has an LR⁴⁶ that is significant at the 5 % level. The McFadden R²,⁴⁷ indicates that the models are not considerably better than a baseline model without independent variables.

When controlling for year-specific effects in Model II, the model fit in terms of LR increases significantly. Controlling for sector-specific effects as well in Model IV further improves the model fit, although not to the same extent as the year-specific effects. Model IV also has an AIC⁴⁸ estimate that is superior to the other models⁴⁹. Last, we note that the BIC⁵⁰ estimate is worse than for the other models, but given our sample size, this estimate may place too much weight on the addition of more variables. Thus, Model IV is our preferred model in terms of model fit estimates and economic reasoning.

Interpretation of the coefficients

The industry-standardised leverage ratio is the only independent variable that significantly explains a share repurchase announcement for the full sample⁵¹. The coefficient suggests that firms with low leverage ratios are more likely to announce a share repurchase, in line with the optimal capital structure hypothesis. Reducing the leverage ratio relative to the industry mean by one standard deviation makes a share repurchase announcement 1.2 times⁵² more likely. These results support previous studies by Dittmar (2000), and Mitchell and Dharmawan (2007). Yet, it goes against the findings of Lee et al. (2010). However, keep in mind that the results might be driven by profitable firms with low leverage ratio that want to pay out some of their excess cash flows through share repurchases. The interpretation would be that low leverage ratio in itself does not increase the probability of a repurchase, but that low

⁴⁶ Likelihood ratio: A ratio based on comparing the probability of observing the sample for estimated parameter values with the probability of observing the sample when all parameters are zero. The ratio is chi-squared distributed with degrees of freedom equal to the number of independent variables.

⁴⁷ Estimate of error-explanation that ranges from zero to one. It is analogous to OLS R², but not directly comparable.

⁴⁸ Akaike information criterion: Compares different models' goodness of fit adjusted for number of independent variables, lower values signifies a better model.

⁴⁹ AIC and BIC estimates can only be used for comparison between models based on the same sample and we notice that the sample size changes slightly between each regression model. However, the sample observations should be almost exactly the same, and thus we disregard the small error.

⁵⁰ Bayesian information criterion: Similar as AIC, but penalises number of observations.

⁵¹ Note that the large amount of observations could potentially inflate z-values, leading to significant results for even very small changes.

⁵² Model IV, industry-standardised leverage ratio: $1/0.843 = 1.1862$

leverage ratio is the result of high profitability which leads to increased likelihood of a repurchase. When including ROE as a measure of profitability in the regression we find that the industry-standardised leverage ratio coefficient gets closer to one and becomes less significant, see table XX in appendix G1. This type of reasoning is in line with the pecking order theory and was mentioned in section 3.1.1, and further indicated in section 7.1. Thus, the evidence in favour of the optimal capital structure hypothesis might be the result of an endogeneity bias.

Looking at the expected DY to industry, we notice that a firm's dividend payments are unrelated to share repurchase announcements. This might indicate support for the dividend complement hypothesis and not the dividend substitution hypothesis, in line with studies by Dittmar (2000).

Several studies (Dittmar 2000; Mitchell and Dharmawan 2007; Bagwell and Shoven 1988) have found support for the excess cash hypothesis. However, our regression analysis has not found a similar support using our variable $BP \times \text{Cash}/TA$ to industry. If we include ROE as a measure of profitability in the regression, we find that ROE significantly explains share repurchases, see table XX in appendix G1. An explanation as to why the $BP \times \text{CASH}/TA$ does not find similar support could be the result of poor variable definition. The variable is a complex measure, and as we elaborate on in section 5.2.3, there are potential problems with it.

Last, the regression analysis does not back the undervaluation hypothesis, which also has received significant support from previous studies (Dittmar 2000; Mitchell and Dharmawan 2007; Lee et al. 2010). Our lack of findings could be due to neither board nor management wishing to exploit uninformed shareholders by transferring wealth to the more informed shareholders. Another possible explanation is that the board and management do not have the skills or knowledge to identify undervaluation, or simply that the repurchases represent unsuccessful routine speculation in their own share. Finally, our 60-day CAR may not measure undervaluation in a good way. Perhaps it covers too short a period to identify undervaluation properly, or that the factor portfolios employed do not identify undervaluation appropriately.

Another, more deep-seated explanation of our results might be that no particular motives underlie a share repurchase announcement. As can be seen in table 1 in section 7.1, most firms announce at least one share repurchase per year. This is possibly the result of better corporate governance and aligned management

incentives over the years, resulting in the board and shareholders trusting management to repurchase shares in the best interest of the firm. Therefore, it might be best to provide managers the freedom to execute a share repurchase when the time is right, without having to wait for shareholder approval. The result would be that all firms, with or without the existence of a motive, announce share repurchases⁵³ to expand their available financial toolbox.

Regression diagnostics

In appendix G2 we provide a detailed account of whether the various assumptions related to regression analysis and the logit model hold. In conclusion, we find that the assumptions are likely to hold, although collinearity and endogeneity could cause issues as elaborated on below.

Table VIII shows the correlation between all the variables, and although some variables have correlation that is significant at the 5 % level, this might be the result of a large sample and we see that the correlation coefficients are low.

Table VIII
Correlation table for variables used in the announcement model

Values in parentheses are the p-values, indicating a correlation significant at the 5 % level if below 0.05.

	60-day CAR	BP x Cash/TA	Industry- standardised leverage ratio	Expected DY to industry
60-day CAR	1			
BP x Cash/TA	0.0526 (0.0473)	1		
Industry-standardised leverage ratio	-0.0708 (0.0076)	-0.0599 (0.0139)	1	
Expected DY to industry	0.0091 (0.7324)	0.0051 (0.8332)	0.0704 (0.0038)	1

⁵³ The reason that the industry-standardised leverage ratio is significant could be that firms in danger of bankruptcy, that is high leverage ratio, are the only ones that do not announce share repurchases. Again, we also mention that very profitable firms are the firms most likely to announce, and due to their profitability there are more likely to have low leverage.

Another issue is related to endogeneity due to omitted variables. Although we have been able to identify several motives for share repurchase announcements and executions, we have not been able to test and control for all of these. If there is reason to believe that any of the included motives will correlate with an excluded motive, and that this in turn will correlate with the dependent variable, there is reason to be concerned with endogeneity issues.

In our case this situation is highly likely to be present since the hypotheses are not mutually exclusive and the variables are not necessarily constructed to avoid this issue.

There are several possible correlations between the motives included and those not included. Below, we briefly comment on some of the potential relationships. Note that this overview is not complete, that the relations may be vague, and the direction of causality is not always clear. Also note that we do not consider how the independent variables included in our regression would correlate with proxies for the different hypotheses. We rather try to consider the economic relations that are likely to create endogeneity.

Information signalling hypothesis

First, firms that are undervalued are also more likely to be subject of a takeover. Consequently, undervalued firms may not only repurchase to remove the undervaluation itself, but also to reduce the likelihood of a takeover. Second, firms with dispersed ownership could be more likely to be undervalued, as owners might be less informed. Thus the variable would incorporate some of the effect of firms wishing to increase ownership concentration. Third, a firm that is undervalued is more likely to not engage in EPS management, since they would probably not be undervalued if they managed EPS. Consequently, if firm is undervalued the likelihood of a repurchase is perhaps reduced since it would not use EPS management.

Excess cash hypothesis

Firms with excess cash make attractive takeover targets since performance can be improved by reducing agency costs and disburse excess cash. Also, firms with excess cash are more likely to have dispersed ownership since shareholders often have less interest and ability to exert corporate governance. Both of these correlations should increase the likelihood that firms with excess cash repurchase shares, although the entire effect is no longer attributable to only excess cash. It could also be that firms where managers have a large stake in the firm is less likely to have much excess cash,

since an aligned manager would be more likely to maximise firm and share performance.

Payout preference hypotheses

Firms can manage EPS through share repurchases and not dividend payments. Therefore, firms that prefer repurchases because they want to manage EPS, are less likely to consider repurchases and dividends to be substitutes. Thus, firms that are expected to pay dividends based on taxes and shareholder preferences, are less likely to do so if they also engage in EPS management, leading to biased results. Another possible relation is that firms that want to increase manager ownership is likely to prefer repurchases, as dividends cannot alter the ownership structure. This yields a similar bias in the results.

Optimal capital structure hypothesis

There are several possible relations between the optimal capital structure hypothesis and the hypotheses which are not included. First, firms with a concentrated ownership is less likely to have a leverage ratio below the optimal level, as concentrated owners would be able and incentivised to enforce an optimal capital structure. Second, in a similar way, firms with a large manager stake in the firm might be more likely to optimise the capital structure. Third, firms with leverage below the optimal capital structure might be more likely to become a takeover target. Thus, if the leverage ratio is below the optimal level the firm is more likely to repurchase in order to not only increase leverage ratio, but to increase ownership concentration, increase manager ownership and reduce the probability of a takeover.

8.1.1 Announcement segmented on market capitalisation

In order to see if share repurchase announcement motives differ between firms of different sizes we segment our sample into four groups based on market capitalisation. We employ the same model specification as Model IV from table VII.

Table IX**Announcement logit regression segmented on market capitalisation**

We split the sample into four different segments based on market capitalisation, where the groups consist of the 25 % smallest firms, 50 % smallest firms, 50 % largest firms and 25 % largest firms at the beginning of each year. In addition to the variables displayed, the model includes both year and sector binary variables, in line with Model IV.

	25 % small	50 % small	50 % large	25 % large
Industry-standardised leverage ratio	0.870 (-1.08)	0.864 (-1.64)	0.815** (-2.01)	0.964 (-0.21)
Expected DY to industry	1.001 (1.58)	1.001 (1.64)	1.000 (-0.83)	1.000 (-0.00)
BP x Cash/TA to industry	1.001 (0.33)	1.000 (-0.12)	0.997 (-1.51)	0.992** (-2.49)
60-day CAR	0.991** (-2.14)	0.994* (-1.82)	1.000 (-0.00)	0.983* (-1.95)
McFadden R^2	0.105	0.092	0.092	0.142
LR	45.44	83.92	85.73	65.43
p	0.00744	5.14e-08	4.98e-08	3.00e-5
Observations*	313	666	740	375

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

* Number of observations differ due to observations with missing CAR values being dropped

Table IX above shows that all models achieve an LR that is significant at the 5 % significance level. Further, we note that McFadden R^2 is higher than for the Model IV on the full sample.

An interesting result is that the industry-standardised leverage ratio only achieves a significance at the 5 % level for the segment containing 50 % largest observations. This might only be a result of more observations. If that is the case, Model IV may only be significant due to many observations too. We see, however, that the coefficients carry a direction in support of the optimal capital structure hypothesis. If we include ROE in the regression, see table XX in appendix G1, coefficients move closer to one and the significance is reduced.

Concerning the expected DY to industry and BP x Cash/TA to industry, there are no apparent differences when compared to the results in table VII for the full sample. However, BP x Cash/TA to industry is significant at the 5 % level for the 25 % largest observations, but carries a direction in disfavour of the excess cash hypothesis and does not seem to be economically significant. This could indicate problems with the

variable definition, as elaborated on in section 5.2.3. Including ROE yields no additional insights, see table XX in appendix G1.

Last, the 60-day CAR is significant at the 5 % level for the 25 % smallest observations and at the 10 % level for the 50 % largest and 25 % largest observations. However, it does not seem to be economically significant. We refer to the potential explanations provided in section 8.1.

8.1.2 Announcement segmented on periods

Over time, the motives for announcing a repurchase might have changed because of better familiarity with the practice, increased focus on corporate governance, better aligned incentives for management or other reasons. In an attempt to uncover any of these changes, we segment the sample into four distinct periods.

Table X
Announcement logit regression segmented on periods

The periods consist of four years each and span from 1998 to 2001, 2002 to 2005, 2006 to 2009 and 2010 to 2013. In total, they span 16 full years. The model specification employs the four variables displayed in the table and binary variables to control for year and sector specific effect, this is consistent with Model IV used previously.

	1998-2001	2002-2005	2006-2009	2010-2013
Industry-standardised leverage ratio	0.886 (-0.76)	0.763** (-2.36)	0.810 (-1.56)	0.919 (-0.67)
Expected DY to industry	1.001 (1.25)	1.000 (0.50)	1.001 (0.93)	0.999 (-1.51)
BP x Cash/TA to industry	1.001 (0.51)	0.995** (-2.12)	0.997 (-1.09)	0.999 (-0.49)
60-day CAR	0.995 (-0.81)	0.996 (-0.96)	1.008 (1.36)	0.993 (-1.26)
McFadden R^2	0.131	0.034	0.044	0.046
LR	50.39	18.58	18.20	21.53
p	5.24e-6	0.234	0.252	0.121
Observations	279	394	374	359

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

From table X we find that the model only explains the period from 1998 to 2001 at a 5 % significance level. However, none of the coefficients provided are significant. The outcome could be related to small sample sizes for each segment, yielding a higher standard deviation. Solely considering the coefficient values, we see that it is fairly

close to what was found in the full sample regression, without any clear trends or changes over time. Again, this might suggest that industry-standardised leverage ratio is significant in the full-sample model due to many observations.

If we split the sample into two periods, from 1998 to 2005 and from 2006 to 2013, the model explains both periods. We find that the industry-standardised leverage ratio is supported at the 1 % level for the first period. In the second period, expected DY to industry is supported at the 5 % level. See table XXIV in appendix G3 for the regression table.

8.2 EXECUTION MOTIVATION

Having considered the motives underlying a repurchase announcement, a closer examination of what motivates a share repurchase execution is in order. The findings seemingly support the optimal capital structure hypothesis. Further, smaller firms appear more motivated by the optimal capital structure incentive than larger firms are. These results might be driven, again, by factors not controlled for. Although some of the other coefficients are significant when segmented on either market capitalization or periods, they do not appear to have any economic significance.

Table XI**Execution logit regression on full sample for various specifications**

Logit regressions for the full sample with the same variables that were employed in the announcement logit regression. The only exception is the variable covering the undervaluation hypothesis, which now is the cumulative abnormal return for the 30 days preceding the execution. Model VI contains only the above variables. Model VII also includes binary variables for each year, and Model VIII includes binary variables for each sector as defined by GICS. Model IX includes both year and sector binary variables, whereas Model X also includes the interaction between these binary variables.

	Model VI	Model VII	Model VIII	Model IX	Model X
Industry-standardised leverage ratio	0.683*** (-4.57)	0.673*** (-4.62)	0.673*** (-4.57)	0.666*** (-4.55)	0.632*** (-4.57)
Expected DY to industry	1.000 (0.18)	1.000 (0.13)	1.000 (0.20)	1.000 (0.17)	1.000 (0.71)
BP x Cash/TA to industry	0.997** (-2.44)	0.998* (-1.74)	0.997** (-2.07)	0.998 (-1.24)	0.998 (-1.18)
30-day CAR	0.993 (-1.50)	0.996 (-0.82)	0.993 (-1.49)	0.996 (-0.88)	0.995 (-0.92)
McFadden R^2	0.024	0.054	0.034	0.066	0.103
AIC	1217.4	1211.1	1206.8	1198.0	1187.0
BIC	1241.4	1307.0	1269.0	1332.0	1659.5
LR	30.30	66.68	42.03	80.87	112.7
p	4.26e-06	3.25e-07	3.29e-5	2.79e-7	0.181
Observations*	894	894	884	884	795

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

* Some binary variables predict success perfectly and the observations are dropped

Choice of model specification

Employing the same model selection approach as in section 8.1, we find that Model IX performs best on most model fit estimates. It also appears to satisfy all econometrical assumptions reasonably well, and it has a logical economic interpretation.

Considering the model fit estimates we see that controlling for year and sector specific effects improves the model. One could argue that the improvement in model fit is so small from Model VII to Model IX that it does not justify the increased number of variables. However, applying economic reason it seems natural that year and sector specific effects will be present, and that not controlling for them could introduce biases. We note that Model X scores better on both the AIC and LR estimate, but that the LR is not significant at the 5 % level.

Interpretation of the coefficients

The results from table XI support the optimal capital structure hypothesis at the 1 % level. The estimated effect of reducing leverage relative to the industry mean by one standard deviation increases likelihood of a repurchase 1.5 times⁵⁴. Note that the likelihood for execution increases more for a reduction in leverage, than what we found for announcement. We remind the reader of our argument in section 8.1, that this finding might be related to an endogeneity bias caused by profitability. In table XXII in appendix G1 we include ROE in the regression, and find similar conclusions as in section 8.1, although to a lesser degree.

The expected DY to industry provides the same result as we found for share repurchase announcements. Thus, the execution of a repurchase does not relate to the dividend policy of the firm. This might point in favour of the dividend complement hypothesis.

We find that BP x Cash/TA to industry is not significant and we find no support for the excess cash hypothesis. Further, we find no support for the undervaluation hypothesis in the full sample, and refer to the same reasons specified in section 8.1.

Regression diagnostics

Again, we refer to appendix G2 for a thorough review of whether the logit regression assumptions hold. Further, we will supply an account of collinearity below and note that the same endogeneity problems that were identified in section 8.1 still apply for these logit regressions.

The correlation table XII show correlation between the variables employed in the execution logit regression model. Although some are significant at the 5 % level, this might be the result of a large sample and we see that the correlation coefficients are low.

⁵⁴ Model IV, industry-standardised leverage ratio: $1/0.666 = 1.5015$

Table XII
Correlation table for variables used in the execution model

Values in parentheses are the p-values, indicating a correlation significant at the 5 % level if below 0.05.

	30-day CAR	BP x Cash/TA	Industry- standardised leverage ratio	Expected DY to industry
30-day CAR	1			
BP x Cash/TA	0.0918 (0.0061)	1		
Industry-standardised leverage ratio	-0.0338 (0.3128)	-0.0599 (0.0139)	1	
Expected DY to industry	0.0101 (0.7626)	0.0051 (0.8332)	0.0704 (0.0038)	1

8.2.1 Execution segmented on market capitalisation

Motives for share repurchase executions may change between different-sized firms, making it relevant to segment observations as we did for share repurchase announcements. However, the sample now only consists of firms that have announced a share repurchase.

Table XIII

Execution logit regression segmented on market capitalisation

We split the sample into four different segments based on market capitalisation, where the groups consist of the 25 % smallest firms, 50 % smallest firms, 50 % largest firms and 25 % largest firms at the beginning of each year. In addition to the variables displayed, the model includes both year and sector binary variables, in line with Model IX.

	25 % small	50 % small	50 % large	25 % large
Industry-standardised leverage ratio	0.576*** (-2.75)	0.722** (-2.52)	0.742** (-2.08)	0.685 (-1.50)
Expected DY to industry	1.002** (1.98)	1.001* (1.81)	0.999** (-2.02)	0.999 (-1.41)
BP x Cash/TA to industry	1.000 (0.15)	1.002 (0.95)	0.992** (-2.48)	0.987 (-1.57)
30-day CAR	0.999 (-0.08)	0.996 (-0.66)	0.989 (-1.37)	0.979 (-1.43)
McFadden R ²	0.148	0.125	0.075	0.150
LR	41.73	73.25	46.27	45.37
P	0.0138	1.25e-6	0.00852	0.00758
Observations	208	430	447	218

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

* Number of observations differ due to observations with missing CAR values being dropped

From table XIII we see that all models have an LR estimate significant at the 5 % level. Considering the McFadden R² we see that it is higher for the segmented sample than for the full sample, but that it drops for the 50 % largest observations. Yet, we stress that the McFadden R² is not a perfect model fit estimate.

We find that the industry-standardised leverage ratio is significant at the 1 % level for the smallest segment, and at the 5 % level for the 50 % smallest and 50 % largest observations. This could indicate that the optimal capital structure incentive is stronger among smaller firms and a clear motive for executing share repurchases. However, the motive also has strong support for the 50 % largest observations and it is only for the 25 % largest observations that it does not appear to have any significant effect. The reason could be that the largest firms find it as easy to increase leverage through the debt capital markets, and therefore does not need to repurchase shares to increase leverage. This would be in line with findings by Mitchell and Dharmawan (2007). Again, when we control for ROE, see table XXV in appendix G1, the significance falls to the 10 % level or lower and coefficients move closer to one.

Further, although the expected DY to industry is significant for some segments, it does not appear to be economically significant. This indicates that firm size does not affect the relation between dividends and share repurchases.

The BP x Cash/TA to industry is significant at the 5 % level for the 50 % largest observations. The direction of the coefficient indicates that excess cash reduces the likelihood of a share repurchase, but the coefficient is not economically significant. Controlling for ROE yields no additional insight, see table XXV in appendix G1. Last, the 30-day CAR does not display significance for any segment. We refer to section 8.1 for potential explanations.

8.2.2 Execution segmented on periods

Over time the motives for executing a share repurchase may have changed. To see if we can uncover any differences we have divided the sample into four periods analogous to what we did for share repurchase announcements. Again, the sample now only includes firms that have announced a share repurchase in any given year.

Table XIV

Execution logit regression segmented on periods

The periods consist of four years each and span from 1998 to 2001, 2002 to 2005, 2006 to 2009 and 2010 to 2013. In total, they span 16 full years. The model specification employs the four variables displayed in the table and binary variables to control for year and sector specific effects, this is consistent with Model IV used previously.

	1998-2001	2002-2005	2006-2009	2010-2013
Industry-standardised leverage ratio	0.497** (-2.21)	0.787 (-1.38)	0.685** (-2.44)	0.582*** (-2.65)
Expected DY to industry	1.002* (1.81)	1.000 (-0.12)	1.000 (0.40)	0.998* (-1.92)
BP x Cash/TA to industry	1.018** (2.44)	0.997 (-0.76)	1.001 (0.41)	0.992*** (-2.73)
30-day CAR	1.025 (1.55)	0.988 (-1.22)	0.976** (-2.26)	1.001 (0.09)
McFadden R^2	0.203	0.041	0.109	0.120
LR	36.63	12.80	43.24	37.82
p	0.000838	0.618	0.000145	0.000961
Observations	138	226	286	234

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In table XIV we see that all models have LR significant at the 5 % level except the period from 2002 to 2005. Not considering the period from 2002 to 2005, we find that the industry-standardised leverage ratio is significant and supports the optimal capital structure hypothesis. Including ROE reduces the significance and the coefficients move closer to one, see table XXIII in appendix G1.

The expected DY to industry displays significance in some periods, but the coefficient does not seem to be economically significant. Thus, our findings indicate that dividends and share repurchases have been treated as complements for all periods, even when dividends were tax favourable.

The BP x Cash/TA to industry is significant at the 5 % level for the first period in favour of the excess cash hypothesis. However, it is also significant in the last period in disfavour of the excess cash hypothesis. This might indicate that the coefficient value is not economically significant and the fluctuations, although significant, are a result of noise. Last, the 30-day CAR is significant in some periods, but it is difficult to determine if the findings have any economic impact.

If we split the sample into two periods, from 1998 to 2005 and 2006 to 2013, we find support for the optimal capital structure hypothesis for both periods. None of the other coefficients are significant or appear to have any economic significance. We refer to table XXV appendix G3 for the regression table.

9 CONCLUSION

Our thesis provides updated statistics of share repurchase announcements and open market share repurchase executions in the Norwegian market, and explores what motivates them. We base our thesis on a detailed dataset of share repurchases announcements and open market share repurchase executions for firms of the main list of Oslo Stock Exchange (OSE) in the period 1998 to 2013.

The trend appears to be that more and more firms announce share repurchases in the Norwegian market, but it does not seem like it results in more open market share repurchase executions in number or value. Dividends still constitute the majority of cash distributed by Norwegian firms. From 1998 until 2013, 271 unique firms announce 1371 first-of-the-year share repurchase announcements. The number of announcing firms by year goes from 23 in 1998 to 83 in 2013. In other terms, 16 % of firms announced in 1998, while 63 % of firms announced in 2013. 52 % of

announcements made in 1998 ended in open market executions, whereas only 41 % ended in open market executions in 2013. Most firms authorise a share repurchase amount close to the maximum of 10%, while completion rates are only about 1% for the whole sample – although the median completion rate is heavily skewed towards zero. This leaves the impression that firms authorise share repurchases just to keep the door open. It might seem like completion rates were higher in the first years, before coming closer to zero in the latter years. This adds to the impression that share repurchase announcements merely are routine procedures at general meetings.

In our econometrical analysis, we employ logit regressions to test (i) the optimal capital structure hypothesis, (ii) the excess capital hypothesis, (iii) the payout preference hypotheses, and (iv) the undervaluation signalling hypothesis for why firms repurchase shares.

Our variable for the optimal capital structure hypothesis appears to explain share repurchase announcements and supports the hypothesis, using the whole sample. Yet, it might be a consequence of not accounting for the current profitability of a firm in our analysis. The relationship may be that low leverage is the result of profitability, which increases the likelihood of a repurchase, and not that low leverage in itself increases the likelihood of a repurchase. This is in line with the pecking order theory. We find descriptively that the ROE is higher for announcing firms. Further, it seems that the dividend complement hypothesis receives some support, as dividends have no clear correlation with share repurchases. Few additional insights are provided when segmenting on market capitalisation or period, apart from the fact that not even the optimal capital structure proxy variable is statistically significant in some of the subsamples. This further reinforces the notion that share repurchase announcements are mainly done to expand the financial toolbox of a firm. We did not find any evidence for any of the other hypotheses.

Our findings for open market share repurchase executions again seem to reinforce the optimal capital structure hypothesis. Analogously to the case of share repurchase announcements, this might be due to profitability not being properly accounted for in the regression. However, the statistical significance of the variable for the optimal capital structure hypothesis is stronger in this case. The statistical significance is also less sensitive when segmenting into different subsamples, although the variable lacks statistical significance for the period 2002-2005 and for the 25 % largest firms. These facts could indicate that optimal capital structure is a motive for firms that execute open market share repurchases. Still, it might simply be a consequence of

the profitability difference being large between executing and non-executing firms. Further, the dividend complement hypothesis is supported in the same way as for share repurchase announcements. Again, we found no evidence of the other hypotheses that we tested.

9.1 FURTHER RESEARCH

The most obvious way to provide additional insights into repurchase motivation for firms listed on the main list of the OSE, is to get access to data that can provide reliable estimates of the hypotheses we did not test for. This would also improve the validity of our findings for the hypotheses we tried to test for in this thesis.

Further, the hypotheses could be tested against quarterly instead of annual data. This would have provided an opportunity to find variable values that are closer to the announcement or execution event. The data quality of quarterly data might be poorer, however.

Future research could also survey boards and managers to identify their motives directly, and compare against motives apparent from financial data. In addition, these motives could be compared to motives communicated in the protocol from the general meeting. The qualitative data could then be gathered in groups referring to hypotheses for repurchase motivation, and tested econometrically in logit regressions.

Last, it would be interesting to study the motivation not only related to share repurchase announcements and open market share repurchase executions, but also consider motivation for adding share repurchases to the agenda for the general meeting. The board proposes the agenda, and it is often released one or two months before the general meeting. Their motives might differ from other shareholders.

10 BIBLIOGRAPHY

- Aarbakke, M. 2014. "RISK." *Store Norske Leksikon*. Accessed October 17, 2015. <https://snl.no/RISK>.
- Ajinkya, B B, and M J Gift. 1984. "Corporate Managers' Earnings Forecasts and Symmetrical Adjustments of Market Expectations." *Journal of Accounting Research* (Wiley on behalf of Accounting Research Center, Booth School of Business, University of Chicago) 22 (2).
- Allen, F, and R Michaely. 2003. "Payout Policy." In *Handbook of the Economics of Finance*. Philadelphia: Elsevier
- Asquith, P, and D W Jr. Mullins. 1986. "Signalling with dividends, stock repurchases, and equity issues." *Financial Management* (Wiley for Financial Management Association International).
- Bagnolli, M, R Gordon, and B L Lipman. 1989. "Stock Repurchase as a Takeover Defense." *The Review of Financial Studies* (Oxford University Press) 2 (3).
- Bagwell, L S. 1992. "Dutch Auction Repurchases: An Analysis of Shareholder Heterogeneity." *The Journal of Finance* (Wiley for the American Finance Association) 47 (1).
- Bagwell, L S. 1991. "Share Repurchase and Takeover Deterrence." *The RAND Journal of Economics* (Wiley on behalf of RAND Corporation) 22 (1).
- Bagwell, L S, and J B Shoven. 1988. "Share Repurchases and Acquisitions: An Analysis of Which Firms Participate." In *Corporate Takeovers: Causes and consequences*. Chicago: University of Chicago Press.
- Baker, M, and J Wurgler. 2004. "A Catering Theory of Dividends." *Journal of Finance* (Wiley for the American Finance Association) 59 (3).
- Barclay, M J, and C W Smith. 1988. "Cash Dividends versus Open-Market Repurchases." *Journal of Financial Economics* (Elsevier) 22.
- Bartov, E. 1991. "Open-market stock repurchases as signals for earnings and risk changes." *Journal of Accounting and Economics* (Elsevier) 14.
- Bens, D A, V Nagar, D J Skinner, and M H F Wong. 2003. "Employee stock options, EPS dilution, and stock repurchases." *Journal of Accounting and Economics* (Elsevier) 36.
- Billett, M T, and X Hui. 2007. "The Takeover Deterrent Effect of Open Market Share Repurchases." *The Journal of Finance* (Wiley for the American Finance Association) 62 (4).
- Black, F, M C Jensen, and M Scholes. 1972. "The Capital Asset Pricing Model: Some Empirical Tests." In *Studies in the Theory of Capital Markets*, by M Jensen. Praeger Publishers Inc. .
- Bråthen, T. 1998. "Aksjeselskaper og allmennaksjeselskapers erverv av egne aksjer." *Magma - Econas tidsskrift for økonomi og ledelse*. Magma - Econas tidsskrift for økonomi og ledelse. Accessed 11 26, 2015.

- <http://www.magma.no/aksjeselskaper-og-allmennaksjeselskapers-erverv-av-egne-aksjer>.
- Brav, A, J R Graham, C R Harvey, and R Michaely. 2003. "Payout Policy in the 21st century." *NBER Working paper series* (National Bureau of Economic Research).
- Brav, A, J R Graham, C R Harvey, and R Michaely. 2005. "Payout Policy in the 21st century." *Journal of Financial Economics* (Elsevier) 77 (3).
- Brennan, M J, and A V Thakor. 1990. "Shareholder Preferences and Dividend Policy." *The Journal of Finance* (Wiley for the American Finance Association) 45 (4).
- Brown, D T, and M D Ryngaert. 1991. "The Mode of Acquisition in Takeovers: Taxes and Asymmetric Information." *The Journal of Finance* (Wiley for the American Finance Association) 46 (2).
- Christensen, I S. 2011. "Telenor satser 4.32 milliarder på seg selv." *e24.no*. Accessed November 30, 2015. <http://e24.no/boers-og-finans/telenor-satser-4-32-milliarder-paa-seg-selv/20083876>.
- Christensen, J. 2014. "Skattereformene i 1987 og 1992." *Store Norske Leksikon*. Accessed 12 16, 2015. https://snl.no/Skattereformene_i_1987_og_1992#menuitem2.
- Comment, R, and G A Jarrell. 1991. "The Relative Signalling Power of Dutch-Auction and Fixed-Price Self-Tender Offers and Open-Market Share Repurchases." *The Journal of Finance* (Wiley for the American Finance Association) 46 (4).
- Cudd, M, R Duggal, and S Sarkar. 1996. "Share Repurchase Motives and Stock Market Reaction." *Quarterly Journal of Business and Economics* (University of Nebraska-Lincoln College of Business Administration) 35 (2).
- Dagens Næringsliv. 2003. *Gransking i DNO*. Accessed December 10, 2015. <http://www.dn.no/nyheter/2003/06/21/gransking-i-dno>.
- Dann, L Y. 1981. "Common stock repurchases: An analysis of returns to bondholders and stockholders." *Journal of Financial Economics* (Elsevier) 9.
- Dann, L Y, and H DeAngelo. 1988. "Corporate Financial Policy and Corporate Control: A Study of Defensive Adjustments in Assets and Ownership Structure." *Journal of Financial Economics* (Elsevier) 20.
- Das, S R, D Duffie, N Kapadia, and L Saita. 2007. "Common failings: How corporate defaults are correlated." *The Journal of Finance* (Wiley for the American Finance Association) 62 (1).
- DeAngelo, H, L DeAngelo, and D J Skinner. 2003. "Are dividends disappearing? Dividend concentration and the consolidation of earnings." *Journal of Financial Economics* (Elsevier) 72.
- Demsetz, H. 1983. "The Structure of Ownership and the Theory of the Firm." *The Journal of Law & Economics* (University of Chicago Press for Booth School of Business, University of Chicago) 26 (2).

- Dittmar, A K. 2000. "Why Do Firms Repurchase Stock." *The Journal of Business* (The University of Chicago Press) 73 (3).
- DNO. 2001. *DNO ASA - Fisjon av Offshore & Services*. Accessed December 5, 2015. <http://www.dno.no/en/investor-relations/announcements/2001/dno-asa---fisjon-av-offshore--services/>.
- DNO. 2003. *Re-finansiering / Rettet emisjon*. Accessed December 10, 2015. <https://www.dno.no/en/investor-relations/announcements/2003/re-finansiering--rettet-emisjon/>.
- Donaldson, G. 1961. *Corporate debt capacity: A study of corporate debt policy and the determination of corporate debt capacity*. Boston, Division of Research, Graduate School of Business Administration, Harvard University.
- Easterbrook, F H. 1984. "Two Agency-Cost Explanations of Dividends." *The American Economic Review* (American Economic Association) 74 (4).
- Fama, E F, and K R French. 1993. "Common risk factors in the returns on stocks and bonds." *Journal of Financial Economics* (Elsevier) 33 (1).
- Fama, E F, and K R French. 1992. "The cross-section of expected stock returns." *The Journal of Finance* (Wiley for the American Finance Association) 47 (2).
- Fama, E F. 1980. "Agency problems and the theory of the firm." *Journal of Political Economy* (University of Chicago Press) 26.
- Fama, E F, and M C Jensen. 1983. "Separation of Ownership and Control." *The Journal of Law & Economics* (University of Chicago Press for Booth School of Business, University of Chicago) 26 (2).
- Feldstein, M, and J Green. 1983. "Why do companies pay dividends?" *American Economic Review* (American Economic Association) 73 (1).
- Fenn, G W, and N Liang. 2001. "Corporate payout policy and managerial stock incentives." *Journal of Financial Economics* (Elsevier) 60 (1).
- Finansdepartementet. 2011. "§ 2-38: Utenlandsk skattesubjekt - fritaksmetodens anvendelse på aksjeinntekt oppebåret gjennom filial/deltakerlignet selskap med virksomhet i Norge." *Skatteloven*. Accessed August 31, 2015. <https://www.regjeringen.no/no/dokumenter/utenlandsk-skattesubjekt---fritaksmetode/id633449/>.
- Finansdepartementet. 2014. "Direkte skatter." *Skatter og avgifter*. Accessed October 11, 2015. <https://www.regjeringen.no/no/tema/okonomi-og-budsjett/skatter-og-avgifter/direkte-skatter/id2353512/>.
- Finansdepartementet. 2011. "Evaluering av skattereformen 2006." *Regjeringen Stoltenberg II*. Accessed November 28, 2015. <https://www.regjeringen.no/no/aktuelt/evaluering-av-skattereformen-2006/id637651/>.
- Finansdepartementet. 2014. "Skattereform for omstilling og vekst." *regjeringen.no*. Accessed November 14, 2015. <https://www.regjeringen.no/no/aktuelt/skattereform-for-omstilling-og-vekst/id2457106/>.

- Finansdepartementet. 2013. "Skattesatser 2014." *Statsbudsjettet 2014*. Accessed November 13, 2015. <http://www.statsbudsjettet.no/Statsbudsjettet-2014/Artikler/Skattesatser-2014/>.
- Finansdepartementet. 2002. *Statsbudsjettet - Tilleggsproposisjon 2002. Regjeringen Bondevik II*. Accessed November 5, 2015. <http://www.statsbudsjettet.no/Tilleggsproposisjon-2002/Artikler/Otprp-nr-21/6-Endring-av-utbytteskatten/>.
- Fruin, P, and L Ma. 2014. "Buying Outperformance: Do Share Repurchase Announcements Lead to Higher Returns?" *S&P Capital IQ*. Accessed 12 10, 2015. https://www.spcapitaliq.com/our-thinking/resources-ideas/Buying_Outperformance_Do_Share_Repurchase_Announcements_Lead_to_Higher_Returns.pdf.
- Gedajlovic, E R, and D M Shapiro. 1998. "Management and ownership effects; Evidence from five countries." *Strategic Management Journal* (Strategic Management Society) 19.
- Gould, W. 2011. "Precision (yet again), Part I." *The Stata Blog - Not Elsewhere Classified*. Accessed November 29, 2015. <http://blog.stata.com/2011/06/17/precision-yet-again-part-i/>.
- Grullon, G, and R Michaely. 2002. "Dividends, Share Repurchases, and the Substitution Hypothesis." *The Journal of Finance* (Wiley for the American Finance Association) 57 (4).
- Guthart, L A. 1967. "Why companies are buying back their own stock." *Financial Analyst Journal* (CFA Institute) 23 (2).
- Hackethal, A, and A Zdantchouk. 2006. "Signaling Power of Open Market Share Repurchases in Germany." *Financial Markets and Portfolio Management* (Swiss Society for Financial Market Research) 20 (2).
- Harris, M, and A Raviv. 1991. "The theory of capital structure." *Journal of Finance* (Wiley for the American Finance Association) 46.
- Herskedal, K. 2001. "Høster millioner av laksen." *Stavanger Aftenblad*. Accessed December 01, 2015. <http://www.aftenbladet.no/nyheter/okonomi/Hoster-millioner-av-laksen-2684862.html>.
- Hicks, J R. 1962. "Liquidity." *The Economic Journal* (Wiley on behalf of the Royal Economic Society) 72 (288).
- Hribar, P, N T Jenkins, and W Bruce Johnson. 2006. "Stock repurchases as an earnings management device." *Journal of Accounting and Economics* (Elsevier) 41.
- Ikenberry, D, J Lakonishok, and T Vermaelen. 1995. "Market underreaction to open market." *Journal of Financial Economics* (Elsevier) 39.
- Ikenberry, D, J Lakonishok, and T Vermaelen. 2000. "Stock Repurchases in Canada: Performance and Strategic Trading." *Journal of Finance* (Wiley for American Finance Association) 55 (5).

- International Securities Identification Number Association. n.d. *About International Securities Identification Number (ISIN)*. Accessed September 15, 2015. <http://www.isin.org/isin/>.
- Isagawa, N. 2000. "Open-Market Stock Repurchase and Stock Price Behaviour When Management Values Real Investment." *The Financial Review* (Eastern Finance Association) 35.
- Jacobsen, S. 2013. "Telenor sletter 43.32 millioner aksjer ." *Hegnar.no*. Accessed December 11, 2015. <http://www.hegnar.no/bors/artikkel322904.ece>.
- Jagannathan, M, and C Stephens. 2003. "Motives for Multiple Open-Market Repurchase Programs." *Financial Management* (Wiley on behalf of the Financial Management Association International) 32 (2).
- Jagannathan, M, C P Stephens, and M S Weisbach. 2000. "Financial flexibility and the choice between dividends and stock repurchases." *Journal of Financial Economics* (Elsevier) 57.
- Jennings, R. 1987. "Unsystematic Security Price Movements, Management Earnings Forecasts, and Revisions in Consensus Analyst Earnings Forecasts." *Journal of Accounting Research* (Wiley on behalf of Accounting Research Center, Booth School of Business, University of Chicago) 25 (1).
- Jensen, M C. 1986. "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers." *The American Economic Review* (American Economic Association) 76 (2).
- Jensen, M C, and W H Meckling. 1976. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure." *Journal of Financial Economics* (Elsevier) 3 (4).
- Jiang, Z, K A Kim, E Lie, and S Yang. 2013. "Share repurchases, catering, and dividend substitution." *Journal of Corporate Finance* (Elsevier) 21.
- Jolls, C. 1998. "Stock repurchases and incentive compensation." *NBER Working Paper Series* (National Bureau of Economic Research).
- Kim, E H. 1978. "A Mean-Variance Theory of Optimal Capital Structure and Corporate Debt Capacity." *The Journal of Finance* (Wiley for the American Finance Association) 33 (1).
- Kim, J, R Schremper, and N Varaiya. 2004. "Survey on open market repurchase regulations: Cross-country examination of the ten largest stock markets." *Unpublished working paper* (University of San Diego).
- Koller, T. 2015. "Are share buybacks jeopardizing future growth?" *McKinsey & Company - Insights & Publications*. Accessed 11 26, 2015. http://www.mckinsey.com/insights/corporate_finance/are_share_buybacks_jeopardizing_future_growth.
- Kraus, A, and R H Litzenberger. 1973. "A State-Preference Model of Optimal Financial Leverage." *The Journal of Finance* (Wiley for the American Finance Association) 28 (4).

- Kulchania, M. 2013. "Catering driven substitution in corporate payouts." *Journal of Corporate Finance* (Elsevier) 21.
- Kutner, M H. 2005. *Applied Linear Statistical Models*. 5. McGraw-Hill Irwin.
- Lambert, R A, W N Lanen, and D F Larcker. 1989. "Executive Stock Option Plans and Corporate Dividend Policy." *Journal of Financial and Quantitative Analysis* (Michael G. Foster School of Business, University of Washington) 24 (4).
- Landre, E, and A C Utvik. 2006. "Statoil og Hydro slår seg sammen." *Nettavisen*. Accessed November 15, 2015. <http://www.nettavisen.no/na24/837964.html>.
- Lazonick, W. 2007. "The US stock market and the governance of innovative enterprise." *Industrial & Corporate Change* (Oxford University Press) 16.
- Lee, C I, D D Ejara, and K C Gleason. 2010. "An empirical analysis of European stock repurchases." *Journal of Multinational Financial Management* (Elsevier) 20.
- Li, K, and W McNally. 2003. "The Decision to Repurchase, Announcement Returns and Insider Holdings: A Conditional Event Study." *The ICFAI Journal of Applied Finance* (The ICFAI University Press) 9 (6).
- Liao, T F. 1994. *Interpreting Probability Models: Logit, Probit, and Other Generalized Linear Models (Quantitative Applications in the Social Sciences)*. 1st. Sage Publications.
- Lie, E, and H J Lie. 1999. "The Role of Personal Taxes in Corporate Decisions: An Empirical Analysis of Share Repurchases." *The Journal of Financial and Quantitative Analysis* (Cambridge University Press on behalf of the University of Washington School of) 34 (4).
- Lintner, J. 1965. "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets." *The Review of Economics and Statistics* (MIT Press) 47 (1).
- Lintner, J. 1956. "Distribution of Incomes of Corporations Among Dividends, Retained Earnings, and Taxes." *The American Economic Review* (The American Economic Association) 46 (2).
- n.d. "Lov om allmennaksjeselskaper (allmennaksjeloven). Kapittel 3. Selskapskapitalen." *Lovdata*. Accessed September 30, 2015. https://lovdata.no/dokument/NL/lov/1997-06-13-45/KAPITTEL_3#KAPITTEL_3.
- n.d. "Lov om allmennaksjeselskaper (allmennaksjeloven). Kapittel 9. Egne Aksjer." *Lovdata*. Accessed October 12, 2015. https://lovdata.no/dokument/NL/lov/1997-06-13-45/KAPITTEL_9#KAPITTEL_9.
- Majluf, N S., and S C. Myers. 1984. "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have." *Journal of Financial Economics* (Elsevier) 13 (2).

- Markowitz, H. 1952. "Portfolio Selection." *The Journal of Finance* (Wiley for the American Finance Association) 7 (1).
- Menard, S. 1995. *Applied Logistic Regression Analysis*. 1st. Sage Publications.
- Miller, J M, and J J McConnell. 1995. "Open Market Share Repurchase Programs and Bid-Ask Spreads on the NYSE: Implications for Corporate Payout Policy." *Journal of Financial and Quantitative Analysis* (Cambridge University Press) 30 (3).
- Miller, M H, and K Rock. 1985. "Dividend policy under assymmetric information." *The Journal of Finance* (Wiley for the American Finance Association) 40 (4).
- Miller, M H, and F Modigliani. 1961. "Dividend Policy, Growth, and the Valuation of Shares." *The Journal of Business* (University of Chicago Press) 34 (4).
- Mitchell, J David, and G V Dharmawan. 2007. "Incentives for on-market buy-backs: Evidence from a transparent buy-back regime." *Journal of Corporate Finance* (Elsevier) 13.
- Mitchell, J D, and P Robinson. 1999. "Motivations of Australian Listed Companies Effecting Share Buy-Backs." *Abacus* (Wiley on behalf of the Accounting Foundation) 35 (1).
- Mitchell, J David, G V Dharmawan, and A W Clarke. 2001. "Managements' views on share buy-backs: an Australian survey." *Accounting & Finance* (Wiley on behalf of the Accounting and Finance Association of Australia and New Zealand) 41.
- Modigliani, F, and M H Miller. 1958. "The Cost of Capital, Corporation Finance and the Theory of Investment." *The American Economic Review* (American Economic Association) 48 (3).
- Mohn, K, M Emhjellen, F Helgeland, and P Osmundsen. 2002. "Fusjoner og oppkjøp i olje- og gassindustrien." *Magma - Econas tidsskrift for økonomi og ledelse*. Accessed December 10, 2015. <http://www.magma.no/fusjoner-og-oppkjoep-i-olje-og-gassindustrien>.
- Mossin, J. 1966. "Equilibrium in a Capital Asset Market." *Econometrica* (Econometric Society) 34 (4).
- MSCI. n.d. *GICS*. Accessed September 18, 2015. <https://www.msci.com/gics>.
- Nærings- og fiskeridepartementet. 2014. "Meld. St. 27 (2013–2014)." *Meldinger til Stortinget*. Accessed September 15, 2015. <https://www.regjeringen.no/no/dokumenter/Meld-St-27-20132014/id763968/?ch=1&q>.
- Nohel, T, and V Tarhan. 1998. "Share repurchases and firm performance: new evidence on the agency costs of free cash flow." *Journal of Financial Economics* (Elsevier) 49.
- Nygaard-Sture, T. 2001. "Stor lyst på seg selv." *Bergens Tidende*. Accessed December 07, 2015. <http://www.bt.no/na24/Stor-lyst-pa-seg-selv-2378592.html>.

- Ødegaard, B A. n.d. *Asset Pricing Data at OSE*. Accessed October 23, 2015.
http://finance.bi.no/~bernt/financial_data/ose_asset_pricing_data/index.html.
- Odfjell. 2004. "Annual Report 2003." Annual Report.
- Opler, T C, and S D Titman. 1996. "Financial distress and capital structure choice." *Research in Finance* (Emerald) 14.
- Oslo Stock Exchange. 2013. "Løpende forpliktelser for børsnoterte selskaper." Oslo.
<http://www.oslobors.no/Oslo-Boers/Regelverk/Regler-for-utstedere>.
- Pampel, F C. 2000. *Logistic Regression: A primer*. Sage Publications.
- Patell, J M. 1976. "Corporate forecasts of earnings per share and stock price behavior: Empirical test." *Journal of Accounting Research* (Wiley on behalf of Accounting Research Center, Booth School of Business, University of Chicago) 14 (2).
- Penman, S H. 1980. "An Empirical Investigation of the Voluntary Disclosure of Corporate Earnings Forecasts." *Journal of Accounting Research* (Wiley on behalf of Accounting Research Center, Booth School of Business, University of Chicago) 18 (1).
- Regnskap Norge. 2005. "Kildeskatt på aksjeutbytte til utenlandske aksjonærer - fritaksmetoden." *Skatt*. Accessed October 30, 2015.
<https://www.regnskapnorge.no/Fagstoff/Skatt/Skatt/Kildeskatt-pa-aksjeutbytte-til-utenlandske-aksjonarer---fritaksmetoden/>.
- Schwarz, G. 1978. "Estimating the Dimension of a Model." *The Annals of Statistics* (Institute of Mathematical Statistics) 6 (2).
- Scott, J H. 1976. "A Theory of Optimal Capital Structure." *The Bell Journal of Economics* (RAND Corporation) 7 (1).
- Sharpe, W F. 1964. "Capital asset prices: A theory of market equilibrium under conditions of risk." *The Journal of Finance* (Wiley for the American Financial Association) 19 (3).
- Shleifer, A, and R W Vishny. 1986. "Large Shareholders and Corporate Control." *Journal of Political Economy* (University of Chicago Press) 94 (3).
- Skatteetaten. n.d. "Aksjonærmodellen." *Skatteregler for gevinst/tap ved realisasjoner og aksjeutbytte*. Accessed December 3, 2015.
<http://www.skatteetaten.no/no/Person/Aksjer-og-verdipapirer/Skatteregler-for-gevinst-tap-ved-realisasjoner-og-aksjeutbytte/Aksjonarmodellen/>.
- Skatteetaten. 2012. "Kildeskatt på utbytte fra norske selskap til utenlandske aksjonærer." *Prinsipputtalelser*. Accessed September 24, 2015.
<http://www.skatteetaten.no/no/Radgiver/Rettskilder/Uttalelser/Prinsipputtalelser/Kildeskatt-pa-utbytte-fra-norske-selskap-til-utenlandske-aksjonarer/>.
- Skjeltnor, J A, and B A Ødegaard. 2004. "The ownership structure of repurchasing firms." *Norges Bank Working Papers* (Norges Bank).

- Skjeltnor, J. 2004. "Trading in Equity Markets: A study of Individual, Institutional and Corporate Trading Decisions." PhD Thesis, Department of Financial Economics, BI Norwegian School of Management, Oslo.
- Stephens, C P, and M S Weisbach. 1998. "Actual Share Reacquisitions in Open-Market Repurchase Programs." *The Journal of Finance* (Wiley for the American Finance Association) 53 (1).
- Stewart, Samuel S, Jr. 1976. "Should a Corporation Repurchase its own stock." *The Journal of Finance* (Wiley for the American Finance Association) 31 (3).
- Stoveland, P H. 2002. "Ny skattereform." *Magma - Ecnas tidsskrift for økonomi og ledelse*. Accessed 12 10, 2015. <http://www.magma.no/ny-skattereform>.
- Stulz, R. 1988. "Managerial Control of Voting Rights: Financing Policies and the Market for Corporate Control." *Journal of Financial Economics* (Elsevier) 20.
- TDN Finans. 2014. "Statoil ber om fullmakt til storstilt kjøp av egne aksjer." *Dagens Næringsliv*. Accessed October 15, 2015. <http://www.dn.no/nyheter/energi/2012/04/20/statoil-ber-om-fullmakt-til-storstilt-kjop-av-egne-aksjer>.
- Titman, S, and R Wessels. 1988. "The Determinants of Capital Structure Choice." *The Journal of Finance* (Wiley for the American Finance Association) 43 (1).
- Tobin, J. 1958. "Liquidity Preference as Behaviour Towards Risk." *The Review of Economic Studies* (Oxford University Press) 25 (2).
- Vermaelen, T. 1981. "Common Stock Repurchases and Market Signaling: An Empirical Study." *Journal of Financial Economics* (Elsevier) 9.
- Walsh, J P, and J K Seward. 1990. "On the efficiency of internal and external corporate control mechanisms." *Academy of Management Review* (Academy of Management) 20.
- Waymire, G. n.d. "Additional Evidence on the Information Content of Management Earnings Forecasts." *Journal of Accounting Research* (Wiley on behalf of Accounting Research Center, Booth School of Business, University of Chicago) 22 (2).

11 APPENDIX

A APPENDIX TO THE NORWEGIAN TAX SYSTEM

A1 Historical rules

Up until the tax reform of 1992, dividends paid by public or private limited liability firms with Norwegian tax residence were fully taxed by the investor. However, with the enactment of the 1992 reform dividends were exempted from any tax. Further, the capital gains tax rate was set flat at 28 % for individuals, firms and private pension funds. Labour unions, non-profit organisations and public pension funds were exempted from taxation (Christensen 2014). Since retained earnings increase the share price, and thus the capital gains, retained earnings per share were added to the cost base of the share to avoid double taxation⁵⁵ (Aarbakke 2014). The RISK-adjustment was discontinued as of first January 2006 (Skatteetaten).

A2 Rules in 2014 and suggestions for 2016 and 2018

In 2014 the corporate tax rate, capital gains tax rate and the dividend tax rate was reduced from 28 % to 27 %. Thus, the total tax on dividends decreased from 28.16 % to 46.71 % (Finansdepartementet 2013).

For 2016 the government has suggested further reducing the corporate tax rate, capital gains tax rate and dividend tax rate from 27 % to 25 %. However, since the resulting total dividend taxation will be significantly lower than the personal income tax rate it might stimulate income-shifting behaviour. Thus, all dividends are multiplied with 1.15 before the dividend tax is calculated, thus the real tax on dividends is 28.75 % (Finansdepartementet 2014).

The government aims at a corporate tax rate and capital gains tax rate of 22 % in 2018. However, this reduction will not be followed by a similar reduction in the dividend tax, which will be increased from 25 % to 31.68 % to keep the total taxation level at 46.71 % (Finansdepartementet 2014).

⁵⁵RISK adjustment: Regulering av Inngangsverdien med Skattlagt Kapital.

B APPENDIX TO THEORY AND LITERATURE REVIEW

B1 Modigliani and Miller

Modigliani and Miller (1958) presented a model where investment decisions formed the basis of value and not financing decisions.

Proposition 1: The market value of any firm is independent of its capital structure and is given by capitalising its expected return at the rate ρ_k appropriate to its class. The average cost of capital to any firm is completely independent of its capital structure and is equal to the capitalisation rate of a pure equity stream of its class.

Proposition 2: The expected yield of the share of a stock is equal to the appropriate capitalisation rate ρ_k for a pure equity stream in the class, plus a premium related to the financial risk equal to the debt-to-equity ratio times the spread between ρ_k and r .

$$(16) \quad i_j = \rho_k + (\rho_k - r) * \frac{D_j}{S_j}$$

In equation 16 above i_j is the expected yield of a stock, ρ_k is the capitalisation rate, r is the risk-free rate and $\frac{D_j}{S_j}$ represents the leverage ratio of the firm.

B2 Optimal capital structure hypothesis

There are several theories related to the capital structure. Two of the most well known theories are the static trade-off theory (Kraus and Litzenberger 1973; Scott 1976; (Kim) (Titman) and the pecking order theory (Donaldson 1961; Myers and Majluf 1984).

Kraus and Litzenberger (1973) show that the existence of market imperfections like taxation of corporate profits and the existence of bankruptcy penalties affects the firm valuation through the capital structure. See figure 3 for an illustration. Other studies have found that effects such as the agency cost of debt (Jensen and Meckling) (Myers), and the loss of non-debt tax shields in non-default states also impact the value of the firm (DeAngelo and Masulis).

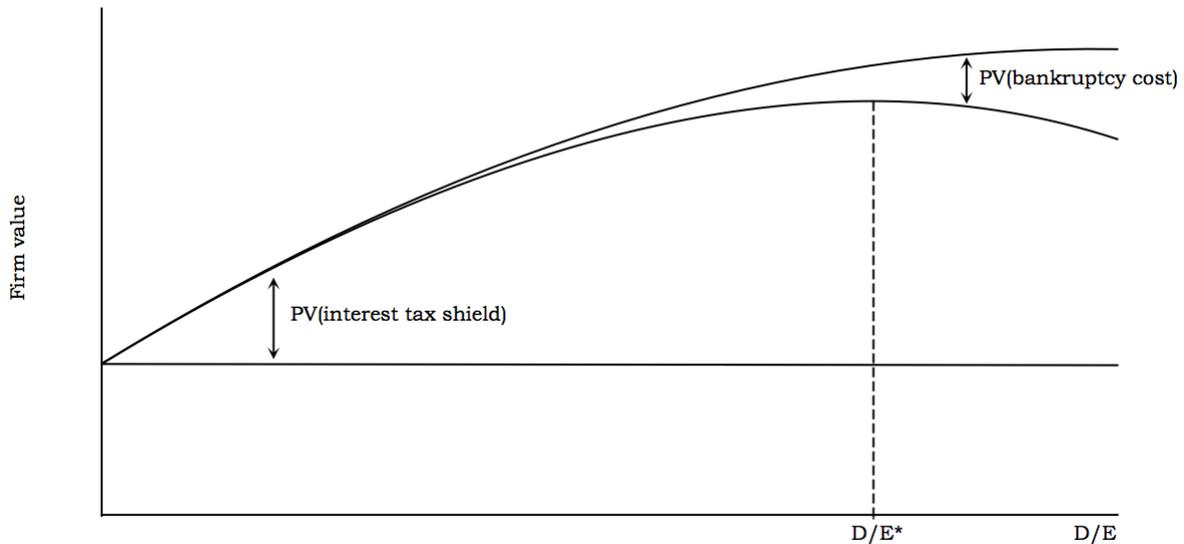


Figure 3. Illustration of the static trade-off theory.

We see that the firm value increases as the leverage ratio (D/E) increases. In the model developed by Kraus and Litzenberger (1973), this was due to the present value of interest tax shields. However, as the leverage ratio increases the firm will experience bankruptcy penalties. The present value of bankruptcy penalties reduces firm value, thus there exists an optimal leverage ratio that maximises the firm value.

B3 Pecking order theory of capital structure

According to the pecking order theory capital structure is the result of cash flow generation, investment opportunities and cash distribution to shareholders. Firms prefer to use internal financing, but this is not always possible since dividends tend to be sticky (Lintner 1956) and profits suffer from unpredictable fluctuations. Thus, when the firm cannot cover investments or cash distributions with generated cash flow it might have to draw on its cash balance or marketable securities portfolio to cover investments. If external financing is required, firms prefer to issue the safest security first. That is, they start with debt, then possibly hybrid securities such as convertible bonds, and as a last resort, they use equity. There is no well-defined capital structure, because there are two kinds of equity, one at the top of the pecking order and one at the bottom. The leverage ratio reflects each firm's cumulative requirement for external finance (Donaldson (1961); and, Myers and Majluf (1984)), and not an optimal level that maximises firm value.

B4 Abnormal returns after share repurchase announcement

Ikenberry, Lakonishok, and Vermaelen (1995) finds that the positive stock price reaction is not sufficient to correct the misevaluation, since firms that announced a share repurchase earn a positive abnormal return in the four years following the

announcement. Using Norwegian share repurchase announcement and execution data Skjeltorp (2004) discovers that the positive abnormal return following a share repurchase announcement is related to the firms that do not execute the share repurchase, whereas firms that execute the share repurchase achieve returns in line with what is expected or slightly below.

B5 Capital asset pricing model

Assumptions underlying the capital asset pricing model (BODIE INVESTMENTS P 304):

1. Individual behaviour
 - a. Investors are rational, mean variance optimisers.
 - b. Their planning period is a single period.
 - c. Investors have homogenous expectations (identical input lists).
2. Market structure
 - a. All assets are publicly held and trade on public exchanges, short positions are allowed, and investors can borrow and lend at a common risk-free rate.
 - b. All information is publicly available.
 - c. No taxes.
 - d. No transactions costs.

B6 Fama and French Three-factor model

Banz (1981) first reported the risk factor related to firm size, having found that smaller firms delivered abnormal returns. Several other studies have documented the abnormal returns related to value shares, as defined by a low book-to-price (Stattman, 1980; Rosenberg, Reid and Lainein, 1985; and Chan, Hamao and Lakonishok, 1991)

Fama and French construct their factor portfolios by sorting shares into two groups based on market capitalisation with one group consisting of the 10 % smallest shares and the other consisting of the 10 % largest shares. Further, they construct three groups based on book-to-price with the groups consisting of firms below the 30th percentile, between the 30th and 70th percentiles and above the 70th percentile. This should produce six portfolios; small-growth (SG), small-neutral (SN), small-value(SV), big-growth (BG), big-neutral (BN), and big-value (BV). Growth shares are considered to those with low book-to-market and value shares are those with high book-to-market. To calculate the return of the SMB and HML portfolios the following formulas are employed respectively:

$$(17) \quad SMB = \frac{1}{3}(SV + SN + SG) - \frac{1}{3}(BV + BN + BG)$$

$$(18) \quad HML = \frac{1}{2}(SV + BV) - \frac{1}{2}(SG + BG)$$

C APPENDIX TO ECONOMETRICAL METHOD

In this part, material related to the logit model is expanded on. As in section 4, this section is based on Liao (1994), Menard (1995), Pampel (2000) and Kutner et al. (2005).

C1 From a response variable approach to the generalised linear model

The generalised linear model approach is consistent with an econometric approach assuming an underlying response variable y^* . The underlying response variable is defined by the relationship:

$$(19) \quad y^* = \sum_{k=1}^K \beta_k x_k + \epsilon$$

We do not observe y^* and ϵ is symmetrically distributed with zero mean and has a cumulative distribution function (CDF) defined as $F(\epsilon)$. We do however observe y , defined by:

$$(20) \quad y = \begin{cases} 1 & \text{if } y^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

It should be noted that $\sum_{k=1}^K \beta_k x_k$ is $E(y^* | x_1, \dots, x_k)$, and not $E(y | x_1, \dots, x_k)$. We get:

$$(21) \quad \begin{aligned} P(y = 1) &= P\left(\sum_{k=1}^K \beta_k x_k + \epsilon > 0\right) = P\left(\epsilon > -\sum_{k=1}^K \beta_k x_k\right) \\ &= 1 - F\left(-\sum_{k=1}^K \beta_k x_k\right) = F\left(\sum_{k=1}^K \beta_k x_k\right) \end{aligned}$$

The generalised linear predictor η may be seen as the systematic component in y^* , while ϵ may be seen as the random component in y^* . The distribution of ϵ determines the link function of a generalized linear model. If the random component of the response in the data follows a binomial distribution, we can assume that ϵ is

logistically distributed. Consequently, a logit model applies to the data, and the link function becomes the logit:

$$(22) \quad \eta = \log\left(\frac{P(y=1)}{1-P(y=1)}\right) = \log\left(\frac{\mu}{1-\mu}\right)$$

We end up having a logit model which takes a binary outcome variable.

C2 Maximum likelihood estimation

As explained in section 4.4, the nature of the residuals in a model with a binary dependent variable makes OLS estimation inappropriate. Instead, the parameters are estimated through maximum likelihood estimation. For logistic regression, the starting point is an expression for the likelihood of observing the exact observed values $y = 1$ and values $y = 0$ in a sample of N observations.

$$(23) \quad LF = \prod_{i=1}^N \{P(y_i = 1)^{y_i} (1 - P(y_i = 1))^{1-y_i}\}$$

Here, $P(y_i = 1)$ is the same as in equation 7 in section 4.2. Given a set of parameters β_1, \dots, β_k , then, different likelihoods can be estimated.

To avoid multiplication of probabilities and to avoid working with very small values, it is standard procedure to work with the logged likelihood function instead:

$$(24) \quad \ln LF = \sum_{i=1}^N \{[y_i \log P(y_i = 1)] + [(1 - y_i) \log(1 - P(y_i = 1))]\}$$

In the actual maximum likelihood estimation, statistical software comes close to finding the parameters that minimize the logged likelihood.

C3 Likelihood ratio

The starting point is what is commonly referred to as the likelihood ratio (LR). The LR is -2 times the difference between the logged likelihood values of the fitted model and a baseline model. The baseline model is a result of letting all parameters equal zero. LR is chi-square distributed with k degrees of freedom. This is the equivalent of an F test in an OLS regression, testing the null hypothesis $\beta_1 = \beta_2 = \dots = \beta_k = 0$.

C4 McFadden R²

An analogy to the R² measure in OLS is:

$$(25) \quad McFadden R^2 = \frac{[(-2 \ln L_0) - (-2 \ln L_1)]}{-2 \ln L_0}$$

Here, L_0 is the log likelihood for the baseline model while L_1 is the log likelihood for the fitted model. The rationale for the McFadden R² is that it shows the ratio of the reduction in “error” by using the model to the total “error” of not using the independent variables. The McFadden R² can go from zero to almost one.

There are two aspects that one should be especially aware of when using McFadden R² measures. First, it is not based on variance defined as the sum of squared errors. Hence, it does not compare directly to R² measures used in OLS regression. Second, the value of McFadden R² measures will increase when increasing sample size. It should as a result be used with caution for large samples.

C5 Akaike information criterion

Akaike proposed in 1974 an information criterion that could identify which model displayed the smallest information loss when attempting to explain data generated by an unknown process. The Akaike information criterion (AIC) is meant for comparison between models. It is computed as:

$$(26) \quad AIC = 2k - 2 \ln L_1$$

Here, k is the number of independent variables, and L_1 is the likelihood of the fitted model. Thus, AIC both rewards the model’s goodness of fit and penalises excessive use of independent variables. The validity of the estimate depends on the number of observations, making it less useful for smaller samples.

C6 Bayesian information criterion

Schwarz introduced a closely related estimate to AIC in 1978, namely the Bayesian information criterion (BIC). As with the AIC, the estimate is meant to determine the best model among a set of models based on their goodness of fit and number of independent variables. It is calculated as:

$$(27) \quad BIC = \ln(n) * k - 2\ln(L_1)$$

Here, n is the sample size. We see that BIC also adjusts for the sample size, in contrast to AIC. For samples with more than e^2 observations, BIC will place a higher penalty on the addition of one more parameter than the AIC.

C7 Tests of significance for each coefficient

Like in linear models, the coefficient value divided by its standard error provides the basis for testing whether coefficients are statistically significant. The standard normally distributed Wald statistic is a popular test statistic:

$$(28) \quad W = \frac{\hat{\beta}_k}{\hat{\sigma}_k}$$

Here, $\hat{\beta}_k$ is the estimated coefficient and $\hat{\sigma}_k$ is its asymptotic standard error.

For large samples, Wald values can be statistically significant for what would otherwise be small and unimportant effects. Hence, it should be used with caution.

C8 Assumptions of logit regressions

If the assumptions of logit regressions do not hold, a calculated logit regression model might result in one or more of three problems: biased coefficients, inefficient estimates, or invalid statistical inferences. Bias refers to wrong values for coefficients, inefficiency relates to large standard errors, while invalid statistical inference refers to inaccuracy in computed statistical significance. As in OLS, a number of assumptions should hold to be able to trust results from logit regressions.

Correct model specification

Correct specification of the logit model includes having the correct functional form, including all relevant variables and no irrelevant variables. Relevant variables are independent variables that explain the dependent variable in the true model.

Regarding correct functional form, it could be that a model where the independent variables linearly relate to the logit of the binary variable is wrong. The relation could be partly nonlinear, or partly multiplicative or interactive. In addition, the independent variables must be nonadditive. This means that the effect of an independent variable on the logit must not be dependent on the value of other independent variables. As this is hard to test formally, trusting one's logical sense is the best thing to do.

Including irrelevant variables has the effect of increasing parameter standard errors. The increase in standard error is larger the more correlated the irrelevant variables are to the other variables. Omitting relevant variables creates biased coefficients of

the included variables, to the extent that the omitted variables correlate with included variables. The size and direction of the bias depends, as in OLS regression, on the size and direction of the omitted variable coefficient and the size and direction of the correlation with included variables.

Collinearity

Collinearity problems arise when independent variables correlate with each other. As collinearity increases, variable coefficients remain unbiased. However, standard errors can increase considerably, making the model inefficient. In addition, collinearity tends to produce coefficients that appear too high.

Residual assumptions

With binary dependent variables, ordinary residuals will neither be normally distributed nor homoscedastic when defined as:

$$(29) \quad e_i = \begin{cases} 1 - \hat{P}(y_i = 1) & \text{if } y_i = 1 \\ -\hat{P}(y_i = 1) & \text{if } y_i = 0 \end{cases}$$

They will actually be unknown under the assumption that the fitted model is correct. Residuals can become more comparable by adjusting for standard errors. A common measure is the Pearson residual:

$$(30) \quad r_i = \frac{y_i - \hat{P}(y_i = 1)}{\sqrt{\hat{P}(y_i = 1)(1 - \hat{P}(y_i = 1))}}$$

Here, y_i is the observed binary variable for observation i and $\hat{P}(y_i)$ is the estimated probability of a binary value of one for observation i . For large samples, r_i should be standard normally distributed. Thus, values larger (smaller) than 1.96 (-1.96) should only occur in 95 % of the observations. For smaller samples, residuals are expected to follow a binomial distribution.

If the estimated logit model is correct, we should have $E(y_i - \hat{P}(y_i = 1)) = 0$. To test for this assumption, a smoothed plot of Pearson residuals r_i against estimated probabilities $\hat{P}(y_i = 1)$ can be used. The smoothed line should be approximately horizontal.

In addition, since we have panel data, residuals should not be autocorrelated. That is, residuals should not be correlated with residuals based on observations on earlier dates. However, it is worth to note that the time factor is not an important part of our

dataset since we do not attempt to model a phenomenon over time, but rather use time to separate observations in our dataset.

D APPENDIX TO DEFINING VARIABLES

D1 Industry adjustments

To make the variables reflect differences in what is common practice for different industries, we constructed mean⁵⁶ values for the various industry groups as defined by the GICS on an annual basis. However, for some of the industry groups there were too few observations for some or all years to construct good mean values. For the industry groups 2020, 4010, 4030, 4040 and 4530 we experienced this issue for all years. In these cases, we used the mean for the entire sector for each given year, instead of the industry group. In a few instances we also experienced that some sectors contained too few observation within a given year, this problem existed for sector 35, 50 and 55. Here we decided to use the mean value for the entire sample for the given year, instead of the sector. Since our adjustment is not entirely based on either sector or industry group, we have chosen to refer to it as an industry adjustment.

D2 Calculation of expected returns

The expected returns are calculated using the Fama and French Three-factor model with relevant market and portfolio returns from the Norwegian market. We use the previous 700 trading days as a relevant period to estimate the beta-values. Then we calculate the expected daily return for each trading day and compound these daily returns for the relevant period.

Since we use 700 trading days as our beta-estimation period, we have to drop all observations with less than 700 trading days leading up to the estimation time. Further, we use 60 and 30 days to calculate the return leading up the announcement and execution date, respectively. Thus, in the cases where there is not enough share price data at the date when share returns should be calculated, we have to drop the observation. The result is that firms that were listed during our sample period, or some time before the beginning of our sample period, are not included in our sample for their first couple of years of listing.

⁵⁶ Whenever we have made any adjustments, these have been made employing the mean instead of the median. The reason is that sometimes the median value can become arbitrary due to few observations.

D3 Undervaluation signalling hypothesis

When determining the correct return period for a non-announcing firm, we simply use the return for the last 60 days of the first quarter of the year since this will be fairly close to most ordinary general meetings that occur in April and May. The return-relevant return period for non-announcing firms could have been found if the date of the general meeting had been gathered. Similarly, we set the return period for non-executing firms to the last 30 days of the second quarter. This assumption is less founded on what we observe for when repurchases are executed. The choice is based on having a date that is some months after most announcement dates. See appendix F2 for tables on monthly distribution of share repurchase announcements and executions.

E APPENDIX TO DATA GATHERING AND DATA CLEANING

E1 Merging the data

The list of firms provided by the OSE formed the basis of our data gathering process. Utilising the year and ISIN for each observation we could form a unique identifier. Using the ISIN we could locate the firms in Datastream and collect the data for each relevant year. Only four firms were not located in Datastream; these were Actinor, Polar Holding, Troms Fylkes Dampskibsselskap and PA Resources.

Then, the observations were linked with actual repurchases by matching on SID and an estimated authorisation period. The estimated authorisation period is the minimum of 18 months and the time to the next general meeting including a repurchase announcement. All variables relating to execution are tied to an announcement observation by only including execution data within the estimated authorisation period. Although it would be more precise to find the actual authorisation period, it is in our experience a small problem, as most firms authorise the maximum period of 18 months or until next general meeting.

Finally, we tied the relevant return data obtained from Datastream to the share repurchase announcement date and execution date using ISIN. For firms that did not announce, we used the last trading day of the first quarter, and for firms that did not execute we used the last trading day of the second quarter.

E2 Datastream data points

Description of every data point obtained from Datastream. Note that the market value originally was denominated in millions, but was adjusted to thousands. Further, some currency adjustment have been made, we refer to appendix E3 for more

information. In table XV below, we report some general information on the data points.

Table XV
Description of data points collected from Datastream

The table provides information on the name of variables used in the construction of variables, and other variables downloaded from Datastream. In addition, it reports the Datastream code used to identify the variable and the unit it is reported in.

Name of used variables	Code	Unit
Cash and cash equivalents	WC02005	Thousand NOK
Long-term debt	WC03251	Thousand NOK
Short-term debt and current portion	WC03051	Thousand NOK
Market value	MV	Thousand NOK
Book value per share	WC05476	NOK
Total assets	WC02999	Thousand NOK
Adjusted price	P	NOK
Unadjusted price	UP	NOK
Cash dividends paid - total	WC04551	Thousand NOK
Net sales or revenues	WC01001	Thousand NOK
Shares outstanding	WC05301	Number
EBIT	WC18191	Thousand NOK

E3 Bloomberg currency adjustments

Datastream reported some values in other currencies than the Norwegian krone, these currencies were adjusted using the relevant exchange rate for each year.

Table XVI
Overview of firms where values were reported in foreign currencies

The table provides the firm names and the currency that their financial information was reported in on the Datastream database.

Firm name	Currency in Datastream
Frontline	Bermudian Dollar
Jinhui Shipping and Transportation	Hong Kong Dollar
Stolt-Nielsen	Euro
Subsea 7	Euro
Fairstar Heavy Transport	Euro
Funcom	Euro
Bakkafrost	Danish Krone
Avocet Mining	Great British Pound
ContextVision	Swedish Krona
Maritime Industrial Services	Emirati Dirham
Siem Offshore	Caymanian Dollar

E4 Overview of observations dropped in data cleaning and treatment

We used the statistical software, Stata, to perform data treatment and analysis. Due to the way that computers store and operate with binary numbers, Stata will lose some precision in its calculations (The Stata Blog 2011). This will most clearly be

noticeable in the number of observations, since the number will sometimes vary for no apparent reason. However, below we provide a short review of how many observations have been dropped during data cleaning and treatment.

Table XVII
Overview of dropped observations

The table provides the variable name and the requirement set for dropping observations related to the variable value. It also supplies the number of observations dropped and the rationale for dropping these observations.

Variable	Drop if...	# dropped	Rationale
Net sales or revenues	<i>less than 0</i>	1	<i>Negative revenues could indicate something wrong</i>
EBIT	<i>equal to 0</i>	311	<i>Unlikely to observe EBIT equal to zero</i>
Shares outstanding	<i>less or equal to 0</i>	63	<i>A firm with zero shares outstanding is not listed</i>
Unadjusted price	<i>equal to 0</i>	35	<i>A price of zero is unlikely</i>
Adjusted price	<i>blank value</i>	203	<i>A price of zero is unlikely</i>
BPS	<i>equal to 0</i>	8	<i>The book value of equity can be zero, but unlikely</i>
Firm name	<i>Imarex</i>	4	<i>Very strange values attached to this firm</i>
Cash dividend paid next	<i>blank value</i>	230	<i>Had to be dropped as a result of variable creation</i>
Leverage ratio	<i>larger than 15, or lower than -1.5</i>	17	<i>Unlikely with values at the indicated levels</i>
Book-to-price	<i>larger than 10, or less than 0</i>	24	<i>Unlikely with values at the indicated levels</i>
Dividend yield	<i>larger than 100 %</i>	10	<i>Unlikely with values at the indicated level</i>

E5 Consideration of variables

Below we provide histograms of relevant financial values, both before and after dropping observations. The scale of the density measure should in some cases be ignored since it has included observations with lacking values in the calculations. These will not be displayed as bars, but still affects the total number of observations.

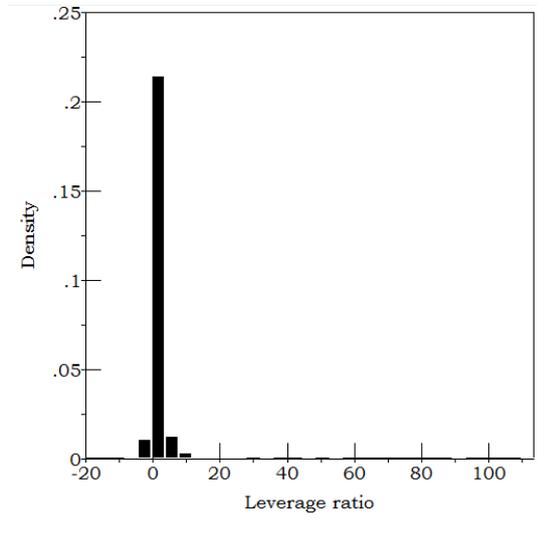


Figure 4. Histogram for leverage ratio before dropping observations.

A few firms have more than 100 times more debt than equity this seems unlikely.

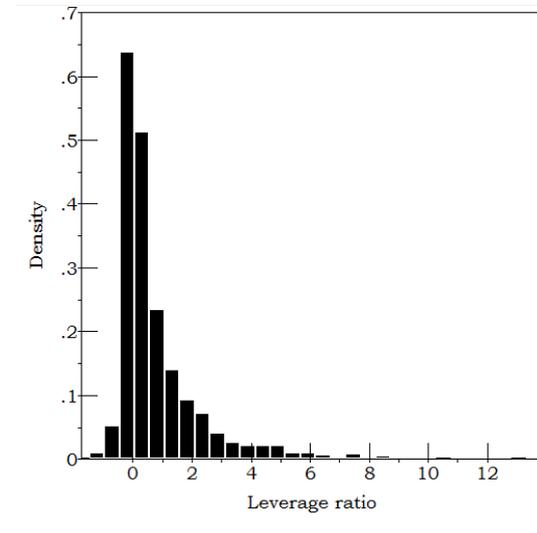


Figure 6. Histogram for leverage ratio after dropping observations.

The distribution more natural, although some firms have a very high leverage ratio.

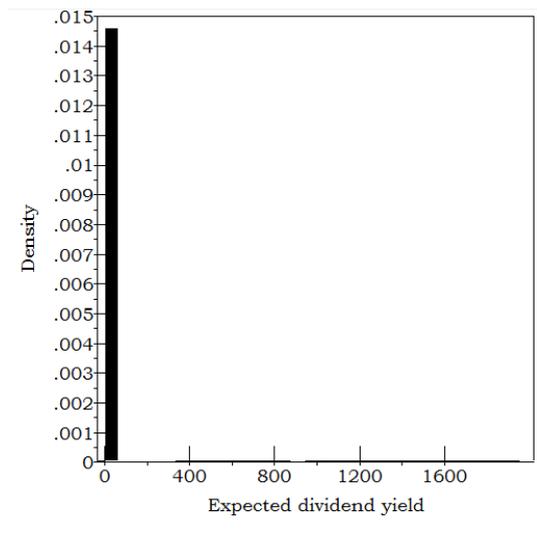


Figure 5. Histogram for dividend yield before dropping observations.

Some firms have a dividend yield that does not represent believable levels.

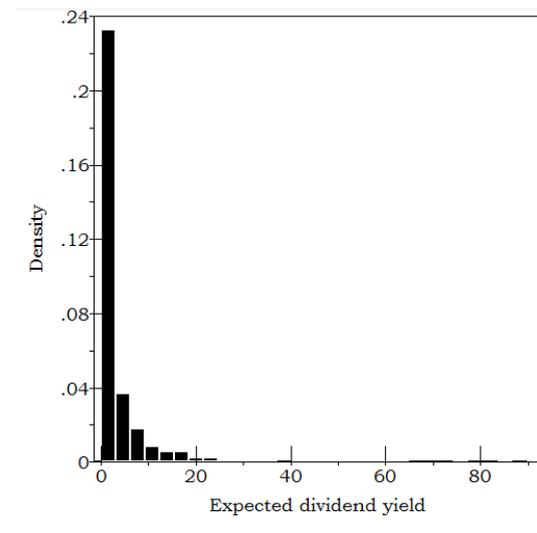


Figure 7. Histogram for dividend yield after dropping observations.

The range is more natural, although 100 % dividend yield is inexplicably high.

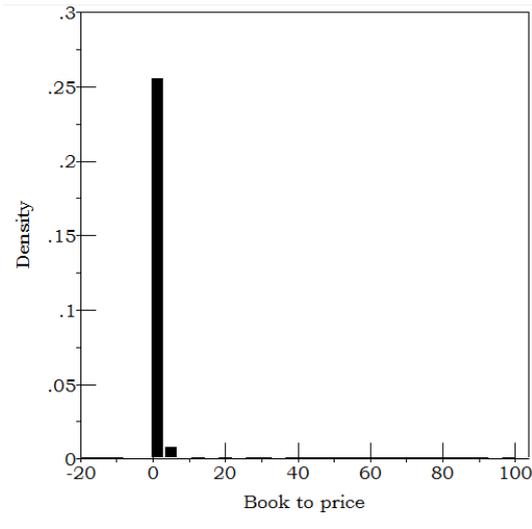


Figure 8. Histogram for book-to-price before dropping observations.

We see that the book-to-price interval is peculiarly wide, chiefly in the positive end.

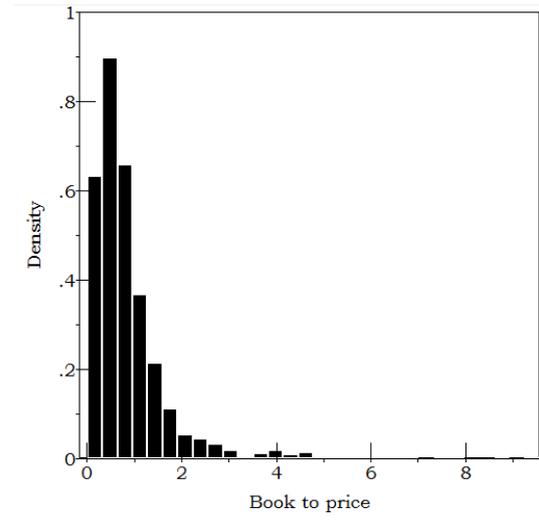


Figure 10. Histogram for book-to-price after dropping observations.

The interval now covers a more ordinary range, although still wide.

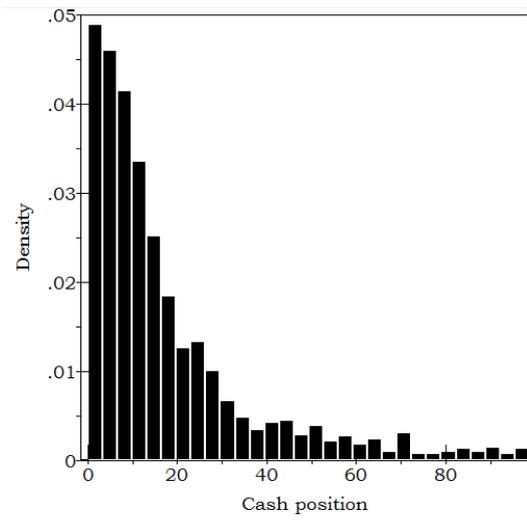


Figure 9. Histogram for cash position before dropping observations.

First, note that cash position is cash to total assets. Second, the distribution looks reasonable.

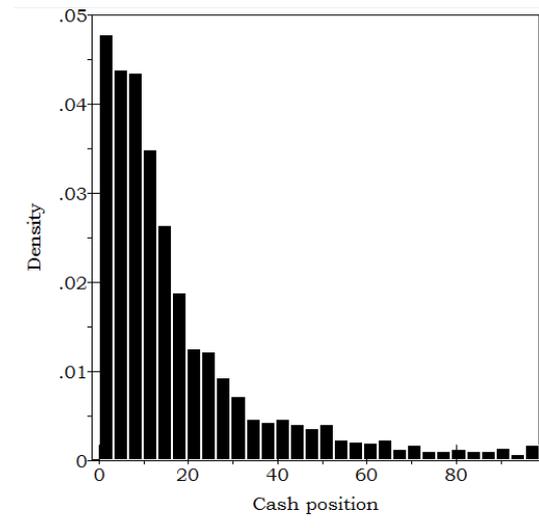


Figure 11. Histogram for cash position after dropping observations.

Cash position is cash to total assets. No observations were dropped on basis of the cash position. Changes are related to observations being dropped based on other variables.

E6 Plots of relevant variables after observations are dropped

Below we provide plots of the relevant variables after having dropped observations. Again, note that the scale of the density measure should in some cases be ignored since it has included observations with lacking values in the calculations.

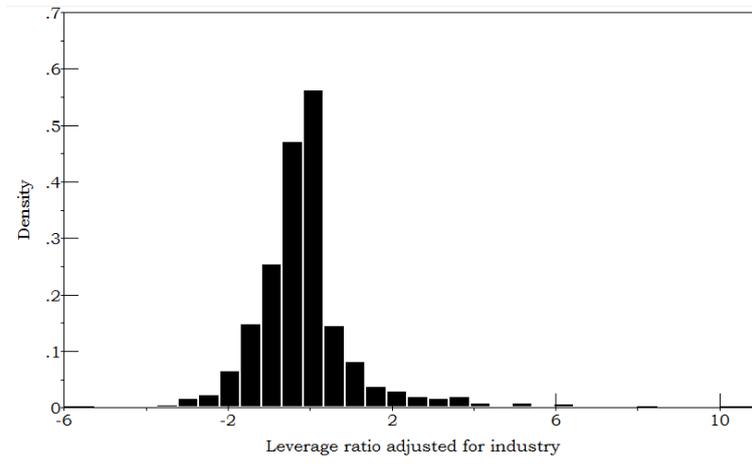


Figure 12. Histogram for leverage ratio relative to industry after dropping observations.

We see that most firms have a leverage ratio around the industry mean, but that the tails of the distribution remain quite fat to the plus and minus two level. Thus, it is not unlikely to observe firm significantly higher or lower leverage than the industry mean.

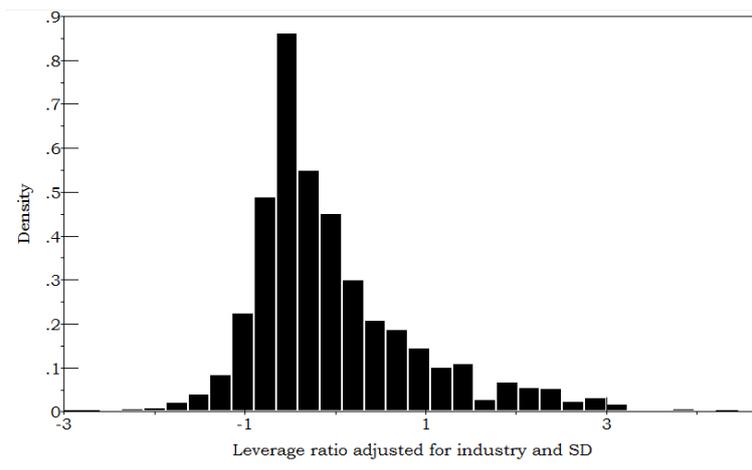


Figure 13. Histogram for industry-standardised leverage ratio after dropping observations.

When the industry adjusted leverage ratio is divided by the standard deviation (SD), we see that most firms have a leverage of plus or minus one standard deviation to the industry mean.

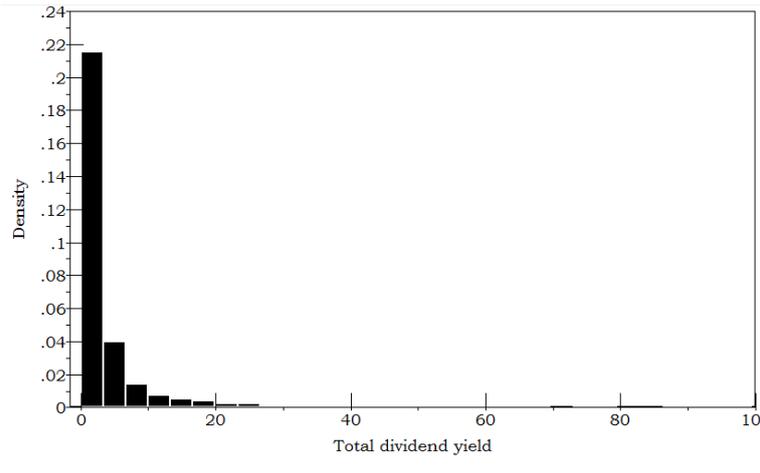


Figure 14. Histogram for expected after dropping observations

Keep in mind that the x-axis is in percentages. We see that most firms have a dividend yield below 10 % and the distribution falls quickly.

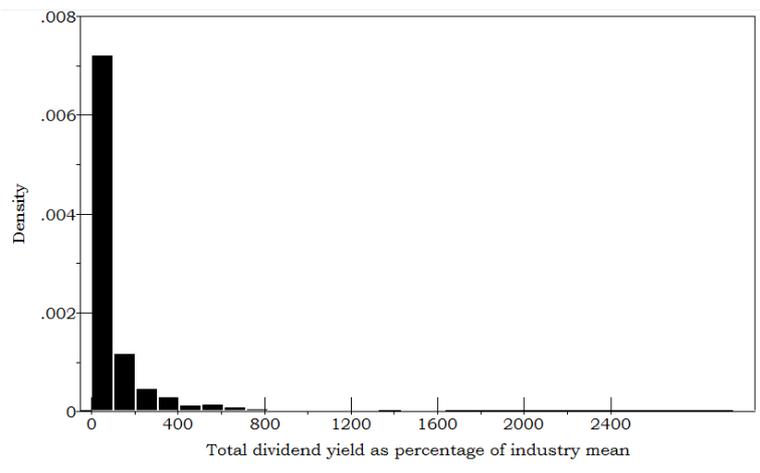


Figure 15. Histogram for expected DY to industry after dropping observations

Keep in mind that the x-axis is in percentages. Thus, we see some firms having a dividend yield that is 24 times higher than the industry average. This may sound too high, but it is the result of some industries having a very low mean dividend yield. Most observations are below four times the dividend yield.

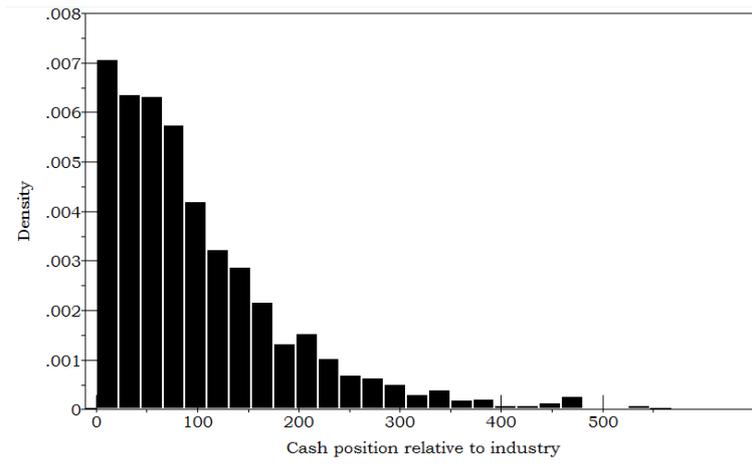


Figure 16. Histogram for cash position relative to industry after dropping observations. Note that the x-axis is in percentages, and cash position is cash to total assets. We see that almost all observations have less than five times the cash position of the industry. And about half of the observations have a cash position below the industry average.

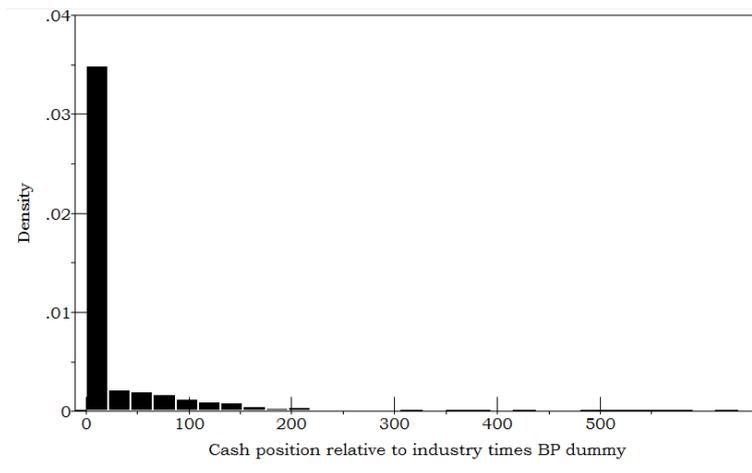


Figure 17. Histogram for cash position relative to industry times BP binary variable after dropping observations. Note that the x-axis is in percentages, and cash position is cash to total assets. We see that most observations are considered to have investment opportunities according to the BP binary variable, and thus get the value zero. We still see some firms with large cash positions that do not have growth opportunities according to the book-to-price, these firms should be likely to repurchase.

Share repurchases in Norway

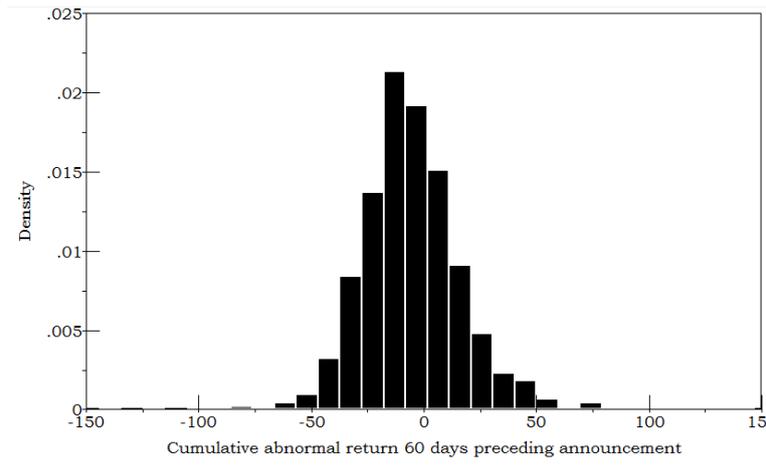


Figure 18. Histogram for cumulative abnormal return for the 60 days preceding the share repurchase announcement.

The x-axis is in percentages. We see that most shares return between -25 % and 25 % in the 60 days preceding the announcement or non-announcement.

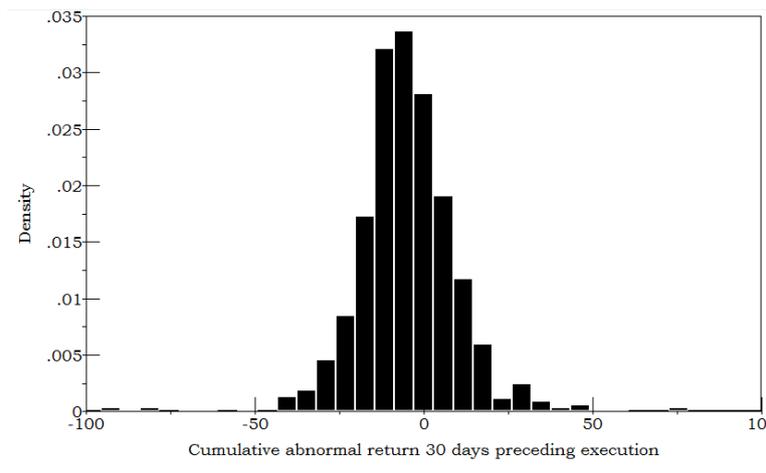


Figure 19. Histogram for cumulative abnormal return for the 30 days preceding the share repurchase execution.

The x-axis is in percentages. We see that most shares return between -15 % and 15 % in the 30 days preceding the announcement or non-announcement.

E7 Announcement data from OSE NewsWeb

For the period from 1998 to 2004, we were handed the data from Johannes Skjeltnor, while we collected the data ourselves for the rest of the period. The collection process involved looking through all messages labelled “General Meeting Information” that might relate to a repurchase authorisation. The general meeting protocols often specify the authorised repurchase amount. Sometimes, however, authorised repurchase amounts had to be calculated manually, based on par value of shares

repurchased or number of shares repurchased versus those outstanding at the time. For a small number of observations the authorised amount was not located, in those cases the authorised repurchase amount was either set to 10 % or a best estimate.

As a share repurchase has to be authorised in an ordinary or extraordinary general meeting, and since all firms listed on the OSE are required to post correct information from general meetings on NewsWeb, NewsWeb is a reliable source with respect to data quality and exhaustiveness.

That being said, there are some challenges related to the dataset. First, there is no standard format for how a firm announces repurchases in NewsWeb, increasing the likelihood of measuring errors. For instance, authorisation repurchase percentages calculated manually are more prone to mistakes. Second, the considerable amount of NewsWeb messages that had to be reviewed can lead to some announcements being overlooked or included multiple times. Third, there is a possibility that the data gathered for 1998 to 2004 used a different approach, although we have attempted to make the processes as similar as possible.

F APPENDIX TO DESCRIPTIVE ANALYSIS

F1 Value of share repurchases and dividends paid in the U.S.

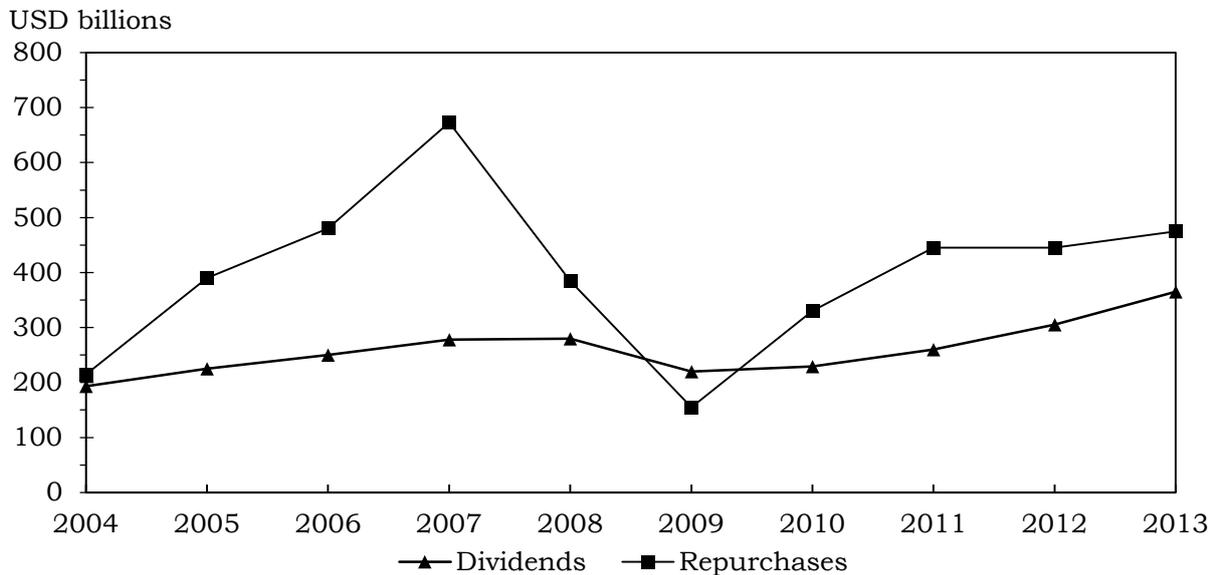


Figure 20. Annual dividend value and repurchase value in USD billions.

The annual value of dividends and share repurchases made by S&P 500 firms for each year from 2004 to 2013. We see that the value of share repurchases exceed the value of dividends paid for most years. Source: Factset.

F2 Share repurchase announcements and first executions by month

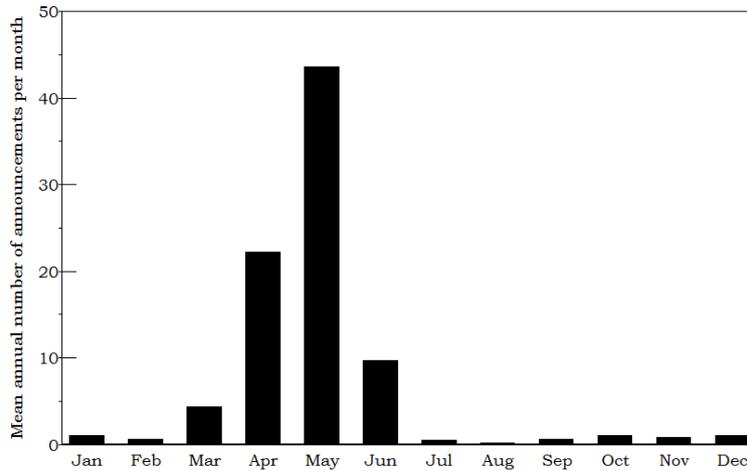


Figure 21. The mean number of announcements by month from 1998 to 2013.

The figure shows that the majority of share repurchase announcements occur in the months April, May and June, with the remaining announcements being spread relatively evenly over the rest of the year. Since most ordinary general meetings take place in April, May and June, the results are expected. Other announcements are in many cases related to extraordinary general meetings.

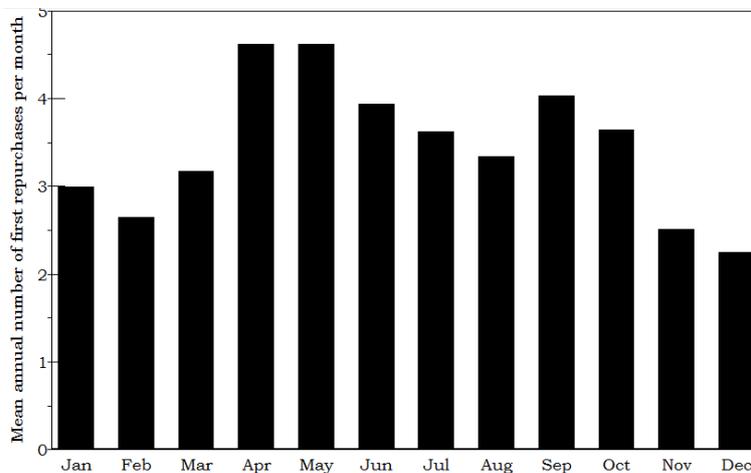


Figure 22. The mean number of first executions by month from 1998 to 2013.

The figure shows that the first execution related to a share repurchase program is spread fairly evenly between the different months of the year.

F3 Financial values and ratios**Table XVIII****Financial values and ratios for firms depending on announcement status, segmented on market capitalisation**

The table provides several financial values and ratios for firms depending on whether they are non-announcing or announcing. Financial values and ratios are grouped so that they should reflect information relevant to the hypotheses. All monetary values are in NOK millions.

		Non- announcing 25 % small	Announcing 25 % small	Non- announcing 50 % small	Announcing 50 % small	Non- announcing 50 % large	Announcing 50 % large	Non- announcing 25 % large	Announcing 25 % large
Leverage ratio	Mean	1.1	1.2	1.0	0.9	1.1	0.7	0.9	0.6
	Median	0.2	0.4	0.2	0.2	0.3	0.3	0.3	0.2
Cash	Mean	49	66	125	149	2 089	2 953	3 794	5 019
	Median	27	32	59	63	499	590	991	921
Cash to TA	Mean	19.1 %	16.9 %	20.7 %	19.6 %	17.0 %	15.5 %	13.4 %	12.7 %
	Median	10.2 %	10.5 %	12.9 %	12.2 %	11.5 %	10.0 %	9.8 %	8.6 %
PB	Mean	2.3	2.1	3.2	2.2	3.8	3.1	2.5	3.1
	Median	1.3	1.2	1.4	1.4	1.6	1.7	1.5	1.8
ROE	Mean	-70.1 %	-12.2 %	-55.1 %	-10.2 %	4.4 %	9.8 %	7.1 %	13.4 %
	Median	-1.1 %	2.4 %	1.6 %	4.5 %	10.3 %	12.5 %	10.4 %	14.4 %
CAR	Mean	-1.3 %	-6.7 %	-5.3 %	-7.3 %	-3.0 %	-3.8 %	-1.5 %	-3.3 %
	Median	-9.7 %	-10.5 %	-10.8 %	-10.4 %	-3.0 %	-4.3 %	-0.3 %	-3.8 %
Dividends	Mean	3.1	4.2	12.6	11.3	353.8	571.1	711.1	1 029.7
	Median	0.0	0.0	0.0	0.0	23.1	68.8	109.6	151.9
DY	Mean	4.1 %	3.1 %	4.2 %	3.4 %	4.6 %	4.4 %	3.5 %	2.9 %
	Median	0.0 %	0.0 %	0.0 %	0.0 %	1.1 %	1.4 %	1.1 %	1.3 %
Observations		218	639	203	624	118	539	85	506

Table XIX

Financial values and ratios for firms depending on execution status, segmented on market capitalisation

The table provides several financial values and ratios for firms depending on whether they are non-executing or executing. Financial values and ratios are grouped to reflect information relevant to the hypotheses examined using regression analysis. All monetary values are in NOK millions.

		Non- executing 25 % small	Executing 25 % small	Non- executing 50 % small	Executing 50 % small	Non- executing 50 % large	Executing 50 % large	Non- executing 25 % large	Executing 25 % large
Leverage ratio	Mean	1.5	0.7	1.1	0.6	0.9	0.5	0.8	0.4
	Median	0.6	0.2	0.4	0.0	0.4	0.2	0.3	0.1
Cash	Mean	57.9	78.0	108.9	200.6	2 564.0	3 340.6	4 532.3	5 451.8
	Median	26.1	43.4	50.0	72.9	565.6	621.5	867.3	1 073.7
Cash to TA	Mean	13.6 %	21.4 %	16.1 %	24.0 %	14.8 %	16.1 %	13.4 %	12.1 %
	Median	7.8 %	13.6 %	9.9 %	17.9 %	10.0 %	10.0 %	9.3 %	8.2 %
PB	Mean	2.4	1.8	2.3	2.0	3.4	2.7	3.7	2.5
	Median	1.1	1.3	1.4	1.4	1.6	1.9	1.7	2.0
ROE	Mean	-17.2 %	-5.9 %	-19.3 %	1.4 %	5.3 %	14.2 %	11.0 %	15.7 %
	Median	-5.4 %	6.0 %	5.7 %	8.4 %	10.3 %	14.2 %	13.5 %	15.0 %
CAR	Mean	-5.8 %	-4.0 %	-4.9 %	-5.7 %	-3.9 %	-5.5 %	-3.9 %	-4.2 %
	Median	-6.6 %	-5.9 %	-5.7 %	-6.7 %	-4.1 %	-5.0 %	-3.9 %	-2.8 %
Dividends	Mean	3.4	5.2	12.1	10.3	276.3	864.9	503.9	1 497.1
	Median	0.0	0.0	0.0	0.0	52.8	92.1	105.2	213.2
DY	Mean	2.8 %	3.4 %	2.5 %	4.7 %	4.0 %	4.7 %	2.4 %	3.3 %
	Median	0.0 %	0.0 %	0.0 %	0.0 %	1.0 %	2.0 %	1.0 %	1.7 %
Observations		580	132	683	289	560	136	544	153

G APPENDIX TO ECONOMETRICAL ANALYSIS OF SHARE REPURCHASES

G1 Logit regressions controlling for ROE

Table XX

Announcement logit regression segmented on market capitalisation

We split the sample into four segments based on market capitalisation. In addition the model includes year and sector binary variables, and a model estimated from the full sample.

	Full sample	25 % smallest	50 % smallest	50 % largest	25 % largest
Industry-standardised leverage ratio	0.896* (-1.73)	0.911 (-0.73)	0.927 (-0.85)	0.844* (-1.66)	0.890 (-0.68)
Expected DY to industry	1.000 (-0.18)	1.001 (1.01)	1.000 (-0.08)	1.000 (0.34)	1.001 (0.92)
BP x Cash/TA to industry	0.999 (-1.03)	1.003 (1.24)	1.001 (0.78)	0.996** (-2.16)	0.993** (-2.22)
60-day CAR	0.997 (-1.07)	0.990** (-2.45)	0.994* (-1.82)	0.999 (-0.23)	0.992 (-1.01)
ROE	1.233** (2.20)	1.706*** (2.88)	1.195* (1.83)	1.162 (0.66)	1.114 (0.30)
McFadden R^2	0.069	0.122	0.085	0.090	0.144
LR	130.3	53.86	79.56	85.35	67.84
p	3.93e-15	0.00106	4.41e-7	1.04e-7	2.27e-5
Observations	1419	318	678	740	379

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table XXI**Announcement logit regression segmented on periods**

The sample is split into four periods. The model specification employs the four variables displayed in the table and binary variables to control for year and sector specific effects.

	1998-2001	2002-2005	2006-2009	2010-2013
Industry-standardised leverage ratio	0.872 (-0.86)	0.799* (-1.94)	0.936 (-0.49)	1.012 (0.08)
Expected DY to industry	1.001 (0.88)	1.000 (0.55)	0.999 (-0.91)	1.000 (-0.53)
BP x Cash/TA to industry	1.003 (1.23)	0.992*** (-2.99)	0.999 (-0.51)	1.000 (-0.12)
60-day CAR	0.994 (-0.97)	0.994 (-1.44)	1.011* (1.77)	0.995 (-0.99)
ROE	1.951** (2.08)	1.403* (1.88)	1.012 (0.15)	1.671** (1.99)
McFadden R^2	0.133	0.054	0.037	0.057
LR	53.61	29.76	15.48	26.11
p	6.01e-6	0.0193	0.490	0.0525
Observations	292	402	368	357

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table XXII**Execution logit regression segmented on market capitalisation**

We split the sample into four different segments based on market capitalisation, where the groups consist of the 25 % smallest firms, 50 % smallest firms, 50 % largest firms and 25 % largest firms at the beginning of each year. In addition to the variables displayed, the model includes both year and sector binary variables, in line with Model IV. The table also includes a model estimated from the full sample.

	Full sample	25 % smallest	50 % smallest	50 % largest	25 % largest
Industry-standardised leverage ratio	0.731*** (-3.52)	0.747 (-1.50)	0.794* (-1.80)	0.780* (-1.71)	0.853 (-0.62)
Expected DY to industry	1.000 (0.94)	0.999 (-0.60)	1.001 (1.21)	1.000 (-0.13)	0.998 (-1.56)
BP x Cash/TA to industry	0.999 (-1.03)	1.001 (0.30)	1.001 (0.51)	0.993** (-2.28)	0.992 (-1.25)
30-day CAR	1.002 (0.36)	1.005 (0.58)	1.002 (0.33)	1.000 (-0.05)	1.000 (0.01)
ROE	2.562*** (3.72)	1.397 (0.91)	1.896** (2.01)	2.915** (2.39)	1.767 (0.86)
McFadden R^2	0.080	0.170	0.136	0.089	0.159
LR	97.21	49.93	80.67	55.43	48.10
p	1.43e-09	0.00320	2.99e-7	0.00101	0.00526
Observations	883	214	432	448	218

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table XXIII

Execution logit regression segmented on periods

The periods consist of four years each and span from 1998 to 2001, 2002 to 2005, 2006 to 2009 and 2010 to 2013. In total, they span 16 full years. The model specification employs the four variables displayed in the table and binary variables to control for year and sector specific effects, this is consistent with Model IV used previously.

	1998-2001	2002-2005	2006-2009	2010-2013
Industry-standardised leverage ratio	0.798 (-0.67)	0.824 (-1.10)	0.760* (-1.73)	0.617** (-2.33)
Expected DY to industry	1.000 (0.29)	0.999 (-0.98)	1.001 (0.78)	1.001 (0.87)
BP x Cash/TA to industry	1.019*** (2.64)	0.999 (-0.28)	1.000 (0.03)	0.991*** (-2.71)
30-day CAR	1.034** (2.21)	0.995 (-0.53)	0.983 (-1.48)	1.006 (0.69)
ROE	3.692* (1.89)	3.985*** (2.64)	5.782*** (2.98)	0.941 (-0.13)
McFadden R^2	0.194	0.072	0.144	0.090
LR	35.57	22.36	55.19	28.23
p	0.00204	0.132	3.31e-6	0.0297
Observations	142	227	276	237

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

G2 Review of logit regression assumptions***Heterogeneity***

The distribution and location of parameters varies between panels and/or over time. This is most likely the case in our data and thus we control for unobserved effects by including binary variables for the different sectors and years.

Causality discussion

The explanatory variables are measured before the announcement or execution. Thus, we would expect that the explanatory variables would cause the announcement or execution, and not vice versa. However, there could be causalities working in the other direction. E.g. the firm wishes to repurchase share to increase ownership concentration, but has to raise cash before they are able to do execute. Thus, the high cash holdings of the firm does not cause the repurchase, but is rather caused by the repurchase. Similar stories can be constructed for the other variables as well, although with less clear underlying logic. One variable with causality issues is the expected DY to industry, since it employs the future dividend paid as an

approximation of the expected dividend. However, since the dividend is often declared ahead of time, and firms are highly motivated to provide this dividend, we can assume the issue is not too problematic.

Unit root issues

There would be unit root issues if the share repurchase announcement or execution event does not move around a constant mean with the same variance over time. There is a time aspect in our data, but it is not relevant for the analysis. We do not attempt to explain how repurchases would move over time; we rather use time as a way to separate one firm into several observations.

Collinearity

Below we provide

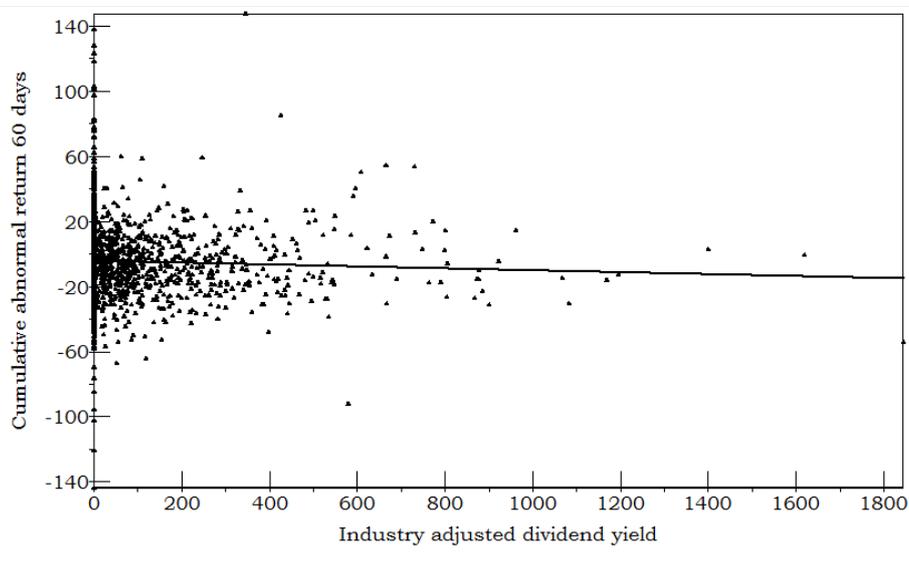


Figure 23. Scatterplot with 60 days CAR preceding announcement and industry adjusted dividend yield.

Both axes are in percentages. We see that there is a weakly negative relationship between the cumulative abnormal return and dividend yield. A higher dividend yield is association with lower share returns.

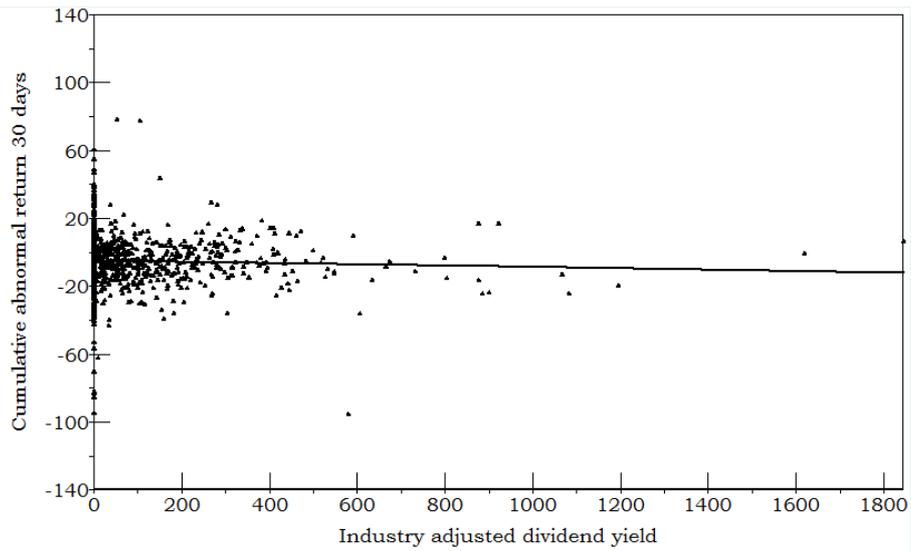


Figure 24. Scatterplot with 30 days CAR preceding execution and industry adjusted dividend yield.

Both axes are in percentages. We see that there is a weakly negative relationship between the cumulative abnormal return and dividend yield. A higher dividend yield is association with lower share returns.

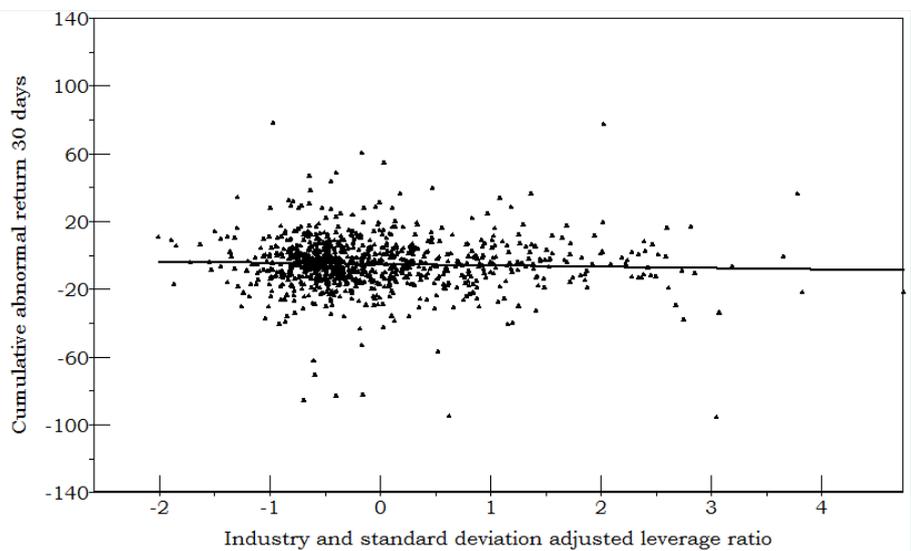


Figure 25. Scatterplot with 30 days CAR preceding execution, and industry-standardised leverage ratio.

The y-axis is in percentages. We see that there is a slightly negative relationship between the cumulative abnormal return and leverage ratio. Higher leverage is associated with lower returns.

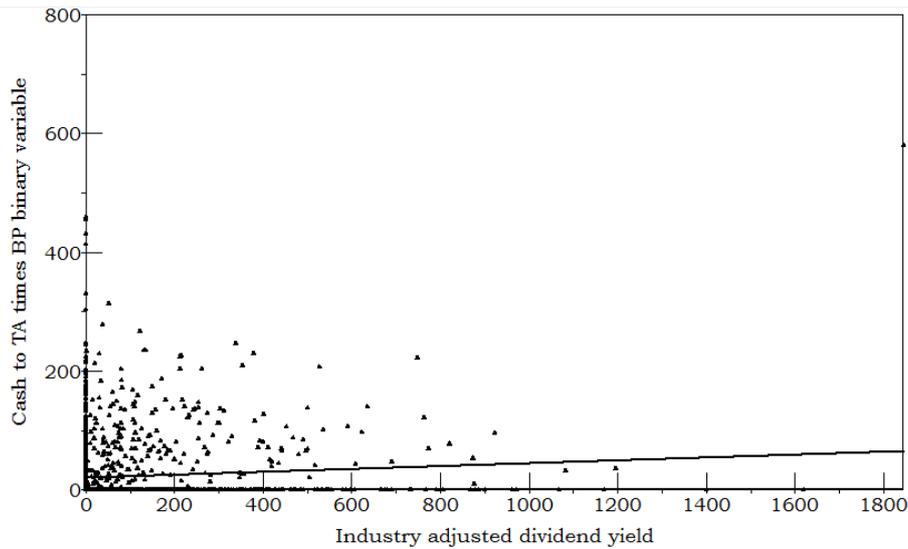


Figure 26. Scatterplot with excess cash and industry adjusted dividend yield.

Both-axes are in percentages. We see that there is a positive relationship between dividend yield and excess cash. Thus, firms with higher dividend yields are also expected to have more excess cash.

Residual analysis

Looking at the Pearson residuals for Model IV and Model IX in figure 27 and 28, we see that most of the residuals fall between plus or minus two Pearson residuals. This indicates a correctly specified model, which is further encouraged by relatively horizontal lowess smoothed lines with intercept at zero. Further, the model is good if the expected residual is zero.

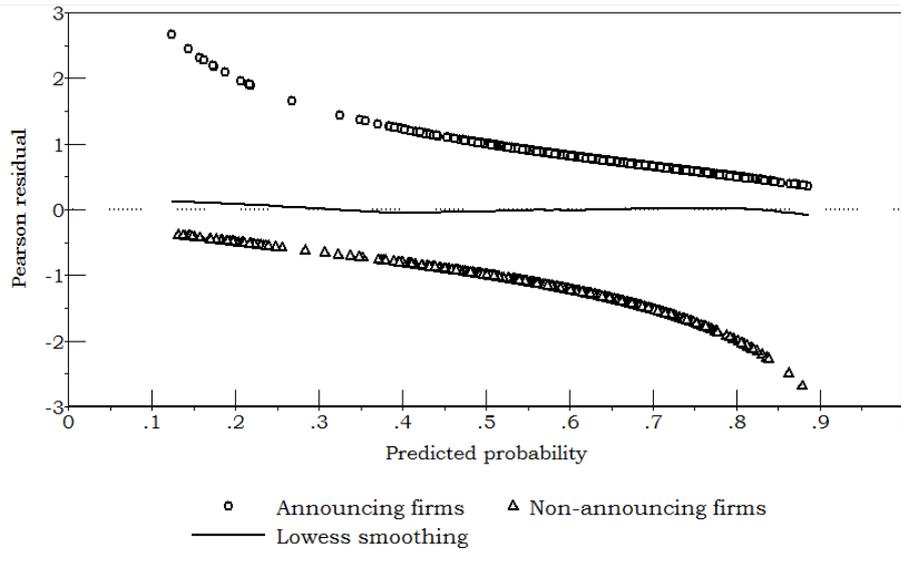


Figure 27. Pearson residuals plotted against the predicted probability of a share repurchase announcement.

The Pearson residuals predicted from the regression equation of Model IV, plotted against the predicted probability of a share repurchase announcement. As expected the residuals form two non-linear lines, one above zero for observations with an observed announcement and one below zero for those without an observed announcement. The lowess smoothing provides the best fitting model from the plot. We see that the lowess smoothing is fairly close to zero for the entire range, indicating a good model.

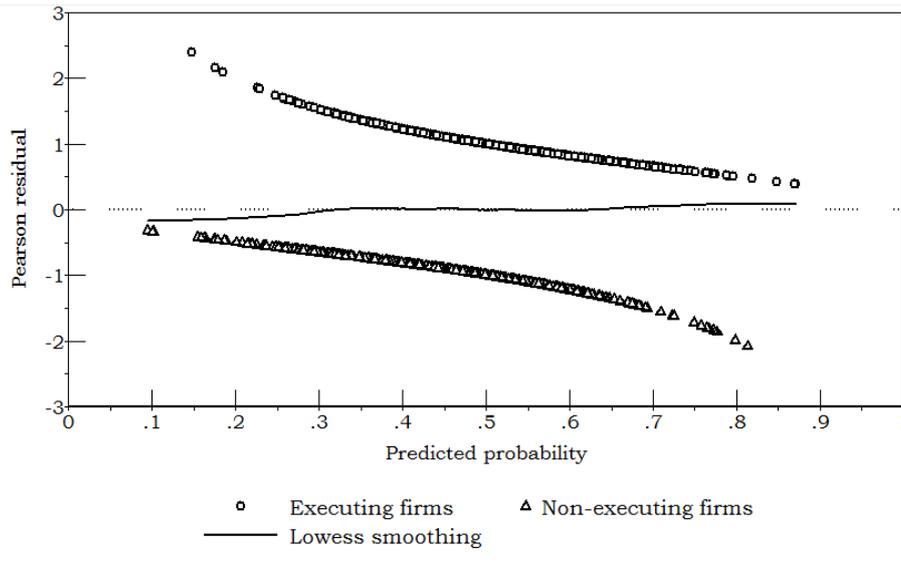


Figure 28. Pearson residuals plotted against the predicted probability of a share repurchase announcement.

The Pearson residuals predicted from the regression equation of Model IX, plotted against the predicted probability of a share repurchase execution. As expected the residuals form two non-linear lines, one above zero for observations with an observed execution and one below zero for those without an observed execution. The lowess smoothing provides the best fitting model from the plot. Again, we see that the lowess smoothing is fairly close to zero for the entire range.

G3 Logit regressions segmented on two periods**Table XXIV****Announcement logit regression segmented on two periods**

The periods consist of eight years each and span from 1998 to 2005 and 2006 to 2013. In total, they span 16 full years. The model specification employs the four variables displayed in the table and binary variables to control for year and sector specific effects.

	1998-2005	2006-2013
Industry-standardised leverage ratio	0.756*** (-3.06)	0.899 (-1.18)
Expected DY to industry	1.000 (0.87)	0.999** (-2.55)
BP x Cash/TA to industry	0.998 (-0.99)	0.999 (-0.59)
60-day CAR	0.995 (-1.43)	0.999 (-0.31)
McFadden R^2	0.065	0.035
LR	61.53	31.18
p	2.21e-6	0.0385
Observations	685	724

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table XXV**Execution logit regression segmented on two periods**

The periods consist of eight years each and span from 1998 to 2005 and 2006 to 2013. In total, they span 16 full years. The model specification employs the four variables displayed in the table and binary variables to control for year and sector specific effects.

	1998-2005	2006-2013
Industry-standardised leverage ratio	0.739** (-2.07)	0.667*** (-3.40)
Expected DY to industry	1.001 (0.98)	1.000 (0.65)
BP x Cash/TA to industry	1.004 (1.45)	0.995** (-2.29)
30-day CAR	1.011 (1.44)	0.997 (-0.39)
McFadden R^2	0.096	0.088
LR	49.45	61.58
p	0.000158	2.17e-6
Observations	371	508

Exponentiated coefficients; z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$