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by

Johannes A. Skjeltorp

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The market impact and timing of open market share repurchases in Norway*

Johannes A. Skjeltorp†
Norges Bank, Bankplassen 2, 0107 Oslo, Norway and
Norwegian School of Management (BI)

April 16, 2004

Abstract

This paper examines a detailed dataset on open market repurchase announcements and actual repurchases conducted by Norwegian firms during the period 1998-2001. Firms that announce a repurchase plan experience a positive excess return around the announcement date. However, these firms also experience an abnormal performance after the announcement, suggesting that the market underreacts to the positive signal conveyed through the announcement. When examining the sample of actual repurchases, we find that there is a positive price impact around the execution dates, indicating that the market puts a positive value on the information conveyed through the actual repurchases. In the long run, only announcing firms that *do not* repurchase experience a significant positive abnormal performance, while a portfolio tracking the repurchasing firms perform according to expectations. In addition, announcing firms that do not repurchase are less liquid than repurchasing firms. One suggested explanation for the finding is that firms by executing repurchases mitigate the undervaluation by confirming their initial signal through actual transactions such that these firms perform as expected in the long run. Due to the lower liquidity of non-repurchasing firms, they are likely to be constrained from exploiting mispricing and unable to signal undervaluation to the market. If this is the case, the price remains too low, and information surprises in later periods contribute to the long term abnormal return drift for these companies.

Keywords: Open market share repurchases, asymmetric information
JEL Codes: G14, G32

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†E-mail: johannes-a.skjeltorp@norges-bank.no Phone: (+47) 22316740 Fax: (+47) 22424062

1 Introduction

Corporations distribute an increasingly larger amount of their cash to shareholders through repurchases relative to cash dividends. Grullon and Michaely (2002) show that, in the US, expenditures on share repurchase programs relative to total earnings increased from 4.8% in 1980 to 41.8% in 2000. Moreover, they also report that the number of firms repurchasing shares as a fraction of firms initiating a cash distribution increased from 26.6% in 1972 to 82% in 2000, and that US firms used as much money on repurchases as on cash dividends in 2000. This result suggests that share repurchases has become the preferred payout method for many firms in the US. Also outside the US, in e.g. Canada, France, Australia and the UK, there has been a growth in the repurchase activity. In recent years several countries where repurchases previously were prohibited now allow firms to repurchase their own shares. Among these countries is Norway, where share repurchases were allowed from 1999. The main objective of this paper is to provide a detailed examination of the open market repurchase activity among Norwegian firms from 1999 through 2001. Furthermore, we examine whether an announcement effect and support for the underreaction hypothesis in Ikenberry et al. (1995, 2000) is found in the Norwegian data. The underreaction hypothesis states that the market treats the announcement of an open market share repurchase program with scepticism, incompletely reacting to the information conveyed through the announcement such that prices adjust slowly over time. One reason for this slow adjustment may be that information is incorporated into prices at later points in time when the firm disclose new information to the market. In line with results for other countries, we find that announcing firms experience a positive announcement effect, and a long run drift in abnormal returns in the same direction as the announcement effect relative to several model specifications.

Due to the strict disclosure rules in Norway, we are also able to study the price effect of actual repurchases at a daily level. By combining the announcement and repurchase data, we investigate whether the abnormal performance after announcements of repurchase programs depend on the repurchase activity of announcing firms. The motivation for this is that if the market treats the initial announcement with skepticism, the actual repurchases may be a more credible signal about undervaluation since it involves real transactions by the firm. Thus, the actual repurchase may confirm the initial signal such that the market adjust prices closer to the true value in response to the actual repurchases.

Our results provide additional insight into the long term performance of announcing firms. The findings suggest that the abnormal performance of announcing firms as a group, to a large degree is related to firms that *do not* execute any repurchases after they have announced. In addition, the results suggest that liquidity constraints may restrict these firms from executing repurchases. One interpretation of this finding is that these firms experience excess returns when information is revealed to the market through public information surprises in later periods, and that they are unable to confirm their initial signal through actual repurchases. On the other hand, the firms that actually repurchase shares, may successfully confirm their initial signal of undervaluation through real transactions such that subsequent returns (after the first repurchase) fall to expected levels. If this is the case, requiring firms to report their repurchase activity in a timely fashion, as in Norway, may help improve price discovery and efficiency. An alternative interpretation of the result may also be that firms that actually repurchase shares are expected to do so. In other words, these companies may be those that successfully (and most credibly) are able to signal that they are undervalued through the announcement

such that they are no longer undervalued after the announcement. However, we would not expect these firms to repurchase shares for undervaluation reasons after the announcement. In addition, we do not find that there is a significant different announcement effect for announcements that result in subsequent repurchases and those that do not.

Overall, in addition to providing evidence on open market share repurchases in a market where repurchases has recently been allowed, we believe that repurchases in Norway are particularly interesting to study due to the legal requirement that firms report their repurchase activity on a daily basis. By exploiting these unique data, we provide new evidence with respect to open market repurchases, and how the market reacts to the actual repurchase executions.

Why firms choose to repurchase shares has gained a lot of attention, especially in the US which has the longest history of repurchases. At a general level, a repurchase is merely an alternative way of paying out cash to shareholders. Initially, whether a firm chooses one payout method over the other should not matter for firm value, and hence the shareholders of the firm. In a perfect world with no frictions or information asymmetries, whether the firm chooses to pay out some of its cash pro rata through dividends, or use the same cash to buy shares back from some shareholders should not affect the value of the firm because a buyback reduces assets in a way that offsets the reduced number of shares with cash flow rights, and should leave the price for the remaining stocks unaffected. In addition, since investors allocate their funds relative to their preferences and risk tolerances, any changes in the payout policy of the firm can be offset by portfolio rebalancing. However, several studies (e.g. Vermaelen (1981), Comment and Jarrell (1991), Ikenberry et al. (1995), Ikenberry et al. (2000)) find that firms announcing a repurchase plan experience an abnormal price increase around the announcement, indicating that the announcement must have some economical benefits to shareholders. This is not surprising in the sense that we know that information asymmetries are important with respect to the pricing of assets and that actions by the firm (e.g. payout announcements) may help the market extract enough information to move the price closer to the full information value (Miller and Rock, 1985).

The literature on repurchases provides a vast amount of suggestions for why one should expect a positive announcement effect. However, one of the most prevalent hypotheses, which is the main topic of this paper, is the signalling hypothesis discussed in e.g. Vermaelen (1981, 1984). The signalling hypothesis assumes that there is asymmetric information between the managers and the market, and that the initiation of a repurchase plan is a positive signal about the value of the firm that the market yet has failed to incorporate into prices. If the managers of a firm have better information about the current earnings and future prospects of the firm, and the firm is priced too low relative to their information set, they can convey this to the market by announcing a repurchase plan. In short, a repurchase announcement indicates that the firm's managers believe that the stock is trading below fair value, such that the stock price should rise as the market reacts to the new earnings information that it infers from the signal.[1] The motivation for managers to initiate a repurchase plan may be to increase the market value of the firm to avoid costs of undervaluation (such as e.g. reduce the probability of takeover which could replace the managers). If the signalling hypothesis is true, and markets are semistrong efficient, the announcement of a repurchase plan should induce the market to quickly correct the

[1] In the early literature there is also a negative signal interpretation of stock repurchases which argue that a repurchase is a signal that the firm does not have any profitable investment opportunities.

mispricing. To assess the market valuation of the repurchase signal, the price impact of repurchase announcements has been studied across several countries and time periods. The results in Vermaelen (1981), Dann (1981), Comment and Jarrell (1991), Stephens and Weisbach (1998), Ikenberry et al. (1995, 2000) among others, find support for the signalling hypothesis in that there is a significant positive abnormal return of about 2% around the announcement date.[2]

Although the signalling hypothesis is the most frequently mentioned explanation for why firms announce repurchase programs, and the observed announcement effect, there is also a vast amount of other explanations which will be discussed in more detail in section 2. Among these are capital structure adjustments (Vermaelen, 1981; Opler and Titman, 1996), disgorgement of excess cash (Jensen, 1986; Stephens and Weisbach, 1998; Jagannathan et al., 2000), substitution for cash dividends (Grullon and Michaely, 2002), takeover defense (Denis, 1990; Bagwell, 1991; Dittmar, 2000), shareholder expropriation (Brennan and Thakor, 1990), to counter the dilution effects of employee and management options (Fenn and Liang, 1997), personal taxes (Masulis, 1980; Lie and Lie, 1999; Grullon and Michaely, 2002) and manipulating EPS figures (Bens et al., 2002).

Although, support for the signalling hypothesis has been found for many markets and time periods, one puzzle is that the market seems to underreact to the announcement signal. This lines up with an emerging body of empirical literature suggesting that the market underreacts to new information about firms cash flows. Events that are likely to contain relevant information about current or future cash flow, such as earnings surprises, dividend initiations and omissions, as well as the announcements of repurchase plans, are followed by an abnormal stock-price drift in the same direction as the initial announcement return. For repurchase announcements, this is documented by Ikenberry et al. (1995) for the US, and for Canada by Ikenberry et al. (2000). Initially, if the market efficiently, and in an unbiased fashion, adjusts the price as a response to the announcement signal, these firms should *not* experience an abnormal performance following the announcement. However, both studies find that firms announcing an open market repurchase plan experience a positive drift in abnormal return in the long run (up to 4 years) after the announcement. This finding suggests that the market underreacts to the initial signal by ignoring a large part of the signal value. In other words, the observed positive price adjustment around the repurchase announcement is not sufficient to correct the mispricing. In Ikenberry et al. (1995) the market's valuation of the signal conveyed through the repurchase announcement is about 3.5% while a portfolio of the same firms experience a risk adjusted performance of 12.1% the years following the announcement.

However, one problem with the signalling hypothesis is that, in the case of open market repurchases, the announcement of a repurchase plan is not a commitment from the firm to repurchase shares. Furthermore, as argued in Comment and Jarrell (1991), the announcement of an open market repurchase plan is a weak signal since it does not impose any costs to the manager if it is false. Thus, the apparent underreaction observed for open market repurchases may be a rational reaction (as opposed to an irrational underreaction)

[2]Comment and Jarrell (1991) and Ikenberry et al. (1995) find an announcement effect in the US of 2.3% (for the period 1985-1988) and 3.5% (1980-1990) respectively. In addition Comment and Jarrell (1991) examine Dutch auction repurchases and tender offer repurchases, which have a 11% and 8% price impact respectively. They argue that tender offer repurchases have the strongest signalling ability of the three. For Canada, Li and McNally (2002) find a announcement effect of 0.9% (for the period 1995-1999). Lasfer (2000) find the effect to be 1.64% in the UK, 1% for continental Europe, 0.78% in France and 0.63% for Italy over the period 1985 to 1998.

since the signalling power of the announcement is weak. Moreover, the market is unable to distinguish truly undervalued firms from falsely signalling firms, and treat the signal with skepticism. On the other hand, if managers owns shares in the firm and commit themselves to retaining their shares during the repurchase period, the power of the signal would be stronger.[3] Such commitments are rarely observed for open market repurchases. However, as discussed by Comment and Jarrell (1991), one type of repurchase where managers often pre-commit to retaining their shares are tender offer repurchases. In these cases, a false signal would be more costly to the manager since it would reduce his wealth if the firm distributes cash to tendering shareholders above the true value. Their findings support this as tender offer repurchases experience a much stronger announcement effect than open market repurchases.

Further, tender offer repurchases are generally for larger volumes than open market repurchases, and the repurchases are executed very close in time to the announcement. Thus, there is no uncertainty with respect to whether the firm will repurchase or not. In the case of open market repurchases, on the other hand, the actual repurchases may occur a long time after the announcement, if at all. Since actual repurchase executions reflect real transactions, they potentially reduce the manager's wealth if he has a stake in the company, retains his shares and execute repurchases when the firm is overvalued. Thus, it is plausible that an actual repurchase may constitute a stronger signal (or a confirmation of the initial signal) of undervaluation than the initial announcement. This is one of the issues we will investigate in this paper. An additional motivation for studying the actual repurchases in detail is a survey in Institutional Investor (1998), which notes that less than one quarter of the companies that had announced a repurchase plan during a specific period in the US had actually completed the amount that they announced that they intended to repurchase. Furthermore, as discussed by Stephens and Weisbach (1998), an issue that has not been addressed in the academic literature, but has been a concern among practitioners and the popular press, is that the actual repurchase activity among firms that announce a repurchase plan is small relative to what the intention is at announcement.[4] A concern that has been raised in the popular press is that the announcement of a repurchase plan is a way for the management to raise the stock price at little or no cost in the short run. In fact, Kracher and Johnson (1997) argue that many firms in the US announce repurchase plans with no intention of repurchasing. One of their arguments is that since the reporting standards in the US, with respect to open market repurchases, are very loose, it is difficult for investors to actually know whether announcing firms under normal circumstances are actually going through with the repurchase plan. Their main suggestion is that US firms should be required to report the progress of the repurchase plan such that they are motivated to only announce a repurchase plan when their intentions are true. Interestingly, this is exactly the case for Norwegian firms, in that they are required by law to report their repurchases within the same trading day or before the trading session starts the next day.

This brings us back to the main topic of this paper. If the market is concerned with the announcements of repurchase plans being false signals due to the lack of commitment to actually repurchase, it is interesting to examine whether the actual repurchases are

[3]However, managers rarely commit to retaining their shares during the repurchase period such that they may also use the repurchases to sell their own shares at a high price (Fried, 2002).

[4]They refer to two articles in *The Wall Street Journal* (March 7, 1995) and *Fortune* (September 4, 1995). More recent articles expressing the same concern are articles in *Fortune* (September 8, 1997) and *Forbes* (June 21, 2001).

perceived by the market as valuable information, confirming the firms's initial intentions. It may be that requiring firms to report their repurchase activity help improve price discovery and price efficiency when there is asymmetric information between the managers of the firm and the market. Especially if the firm is unable to convey this information through explicit announcements.

The paper has three contributions to the existing literature. First, we examine the announcement effect and long-term performance of repurchasing firms in a market where repurchases recently have been allowed. The paper provides a descriptive examination of the growth of repurchases in Norway for the period 1999 through 2001, and examines whether an announcement effect and a long term abnormal performance (underreaction) is observed for Norwegian firms that announce a repurchase program.

The second contribution is that we are able to examine the actual repurchase activity of announcing firms. While the literature to a large extent has focused on the announcements of repurchase plans, we examine in more detail the market reaction to actual repurchases transactions on a daily frequency as well. Due to the difficulty in measuring actual repurchases in the US[5] only a few studies examine the actual repurchase activity of firms. Notable exceptions are Stephens and Weisbach (1998), Jagannathan et al. (2000), Dittmar (2000), Ikenberry et al. (2000) and Chan et al. (2003).[6] However, since these papers only have access to monthly, quarterly and annual data, and use noisy measures of the actual repurchase activity (for the US) they are unable to examine in detail any price effects and the timing of these repurchases in the short term. Thus, by exploiting detailed information on actual repurchases we are able study the timing of repurchase executions and the price effect around these repurchases on a daily frequency. Moreover, we are able to examine whether the repurchases represent trading opportunities/undervaluations exploited by the managers of these firms, and whether the market perceives the repurchase as a signal about firm value. In a related paper by Stephens and Weisbach (1998), they examine the determinants of actual repurchases during the repurchase period and find that managers repurchase more shares when the stock price falls and that firms adjust their repurchase activity to their cash position.

The third contribution of the paper is to combine the announcement and actual repurchase data to examine wether the long run performance of firms that actually repurchase shares is different from firms that do not repurchase any shares.

The empirical section of the paper consists of four main parts. The first part provides a description of the repurchase activity among Norwegian firms during the first three years that repurchases were allowed in Norway.[7] The second part examines whether the empirical regularities (announcement effect and long term positive excess performance) found in other studies (especially in the US and Canada) also are evident in the Norwegian data. The third part of the paper examines whether the performance of firms that actually repurchase are different from announcing firms that do not. The fourth part of the paper examines in more detail the price impact and timing of actual repurchases. Before we present the results we will in the next section go through the empirical and theoretical literature on repurchases in more detail to review the proposed reasons for why one should

[5]Due to the loose reporting requirements of repurchases in the US, previous studies have to rely on estimating the repurchase activity based on financial statements or other data sources.

[6]In a recent paper by Brockman and Chung (2004) they exploit a similar dataset as examined in this paper from Hong Kong where the disclosure requirements are similar as in Norway.

[7]Note that firms were allowed to announce repurchase programs before 1999, but were not allowed to execute any repurchases before 1999.

expect a positive price impact at the announcement. In section 3 we give an overview of the institutional and regulatory aspects of repurchases in Norway. In section 4 we discuss the dataset, and explain the empirical methodology in section 5 before the results from the various analyzes are presented in section 6 and a summary is provided in section 7.

2 Theoretical predictions

The decision taken by the firms to initiate a repurchase program is a strategic choice between debt and equity as well as a choice of how much dividend to pay out. In a Miller and Modigliani (1961) setting where capital markets are perfect, this choice does not matter for the value of the firm. However, as the perfect market assumption is relaxed, one gains the insight that capital market imperfections and taxes are important determinants of corporate financial policies. Although this study mainly focuses on the signalling hypothesis, we also review some of the most commonly proposed hypotheses aimed at explaining the price impact and its direction with respect to repurchase announcements. Many of the hypotheses are not mutually exclusive, and most of the hypotheses predict a positive price impact.

Asymmetric information explanations

The traditional signalling hypothesis is motivated by asymmetric information between the managers of a firm and the market place. Since managers through their positions in the firm are expected to have important private information, they, based on their information set, may assess the true value of the firm to be different than the current market valuation. It is important to note that this relates to information that is not easy or impossible to convey to the market through a public disclosure. For example, the company may not want to explicitly disclose the information for competitive reasons or because it is constrained by confidentiality agreements. This information may both indicate that the current market valuation is above or below what the manager perceives as the true value of the firm. The motivation for managers to initiate a repurchase plan may be to increase the market value of the firm to avoid costs of undervaluation (e.g. reduce the probability of takeover which could replace the management team). Vermaelen (1981), Dann (1981) and Comment and Jarrell (1991) among others, argue that the announcement of a repurchase plan is a valuable signal to the less informed marketplace about undervaluation because the managers of a firm potentially know more about the future prospects of the firm, current earnings and current investment opportunities. Thus, a repurchase is a vehicle for communicating valuable information to shareholders and the market, and is perceived by investors as a signal of management's assessment of company value. Furthermore, in Brav et al. (2003), managers often mention undervaluation as an important motive for why they repurchase shares. As a consequence, the observed stock-price increase around the announcement of a repurchase program is often interpreted as support for the signalling hypothesis. Alternatively, a repurchase announcement may also be interpreted by the market as if the firm does not have any profitable use of its internally generated funds. Thus, the direction of this signal may be ambiguous, but is most commonly hypothesized to be positive.

However, there are a few sensitive issues with respect to the signalling hypothesis, especially with respect to open market repurchase announcements. First, for a signal about undervaluation to be credible, it needs to impose substantial costs on the manager. If

managers could commit to retaining their shares through the repurchase period, as well as committing the firm to actually execute repurchases, the credibility of the signal would be stronger the greater the ownership of the manager or other primary insiders. Through such commitments, it would be costly to the manager if the firm initiates a repurchase program when the firm is overvalued since the repurchase would increase the managers ownership in the overvalued firm. However, since firms seldom commit to actually repurchasing any shares (unless in the case of tender offer repurchases), and managers rarely commit themselves to retaining their own shares through the repurchase period, the credibility of the open market repurchase announcement may be questionable.

As discussed in Fried (2002), there is a theoretical inconsistency with respect to the signalling hypothesis in the sense that it requires managers to sacrifice their own wealth to increase that of shareholders. If managers act opportunistically, Fried (2002) argues that they will use open market share repurchases in two situations. First, they do not use repurchases to signal undervaluation, but rather initiate repurchases when the firm is undervalued with the motivation of transferring wealth to themselves (and the remaining shareholders). This, however, is still consistent with the signalling hypothesis since the market will observe the repurchase announcement (and subsequent repurchases) and interpret this as the firm being undervalued. Moreover, while the signalling hypothesis predicts that managers attempt to credibly communicate that the stock is underpriced, the managerial opportunism theory predicts that managers try *not* to reveal that the stock is underpriced. However, this may be difficult or even impossible since repurchases, at least in Norway, are observable (the day after the repurchase) to the rest of the market.[8] In the US on the other had, the firm is not required to report their repurchase activity, such that it would be easier for the the manager to repurchase shares without revealing this to the market. Furthermore, Fried (2002) argues that the second situation in which opportunistic managers announce a repurchase plan is when they want to sell their own shares.

A model that directly addresses the credibility issue related to open market share repurchase announcements is Isagawa (2000). In that model, the credibility of the announcement is restored when the manager's monetary compensation depends on the future stock price (either through share-ownership or options). Whether the manager chooses to invest free cash in an unprofitable project or not depends on the private benefits to the manager. Moreover, if the private benefit of investing in the unprofitable project (and decreasing the firm value) is smaller than the monetary compensation from increased firm value, he will repurchase shares instead of investing in the unprofitable project. Thus, the announcement of the repurchase program conveys information about the managers private benefits and signals to the market that the manager is committed not to waste cash on unprofitable projects. Thus, in firms where the manager has a high ownership stake or options, the announcement of a repurchase plan may be a credible signal to the market. In this model, the manager does not signal undervaluation, but rather convey information that agency costs of free cash is less likely to occur.

Another theoretical contribution related to asymmetric information between the firm and the market is a paper by Barclay and Smith (1988) who argue that the implicit costs of trading the stock in the market increases after the firm has announced a repurchase plan. The main motivation of their model is to explain why firms in the US distribute

[8]Fried (2002) does not discuss another alternative in which an opportunistic manager instead buys undervalued shares on his own account without initiating a repurchase plan.

more cash through dividends relative to repurchases despite the tax benefit of repurchases relative to dividends. Their main argument is that the adverse selection component of the bid ask spread increases due to the increased probability of trading with an informed investor, the firm. The wider spread raises the required rate of return, reduces corporate investments and lowers firm value. Because of this they argue that firms prefer to use dividends to pay out cash. The early literature on repurchases in the US was puzzled by the fact that so few firms repurchased shares. However, later years there has been a large increase in cash distributed through share repurchases relative to dividends in the US (Grullon and Michaely, 2002).

In a model by Brennan and Thakor (1990), they argue that different incentives of becoming informed among shareholders, when information gathering is costly, is important when firms decide to repurchase shares. They argue that share repurchases causes a wealth redistribution from small, uninformed, shareholders to large, informed shareholders. The main assumption is that information gathering is costly, inducing only large shareholders to becoming informed. Thus, informed investors are able to bid for undervalued stocks and avoid over-valued ones. Since the small investors are unable to condition their trading on the trading of the better informed investors, they will be left with a higher stake in overvalued firms and a lower stake in undervalued firms. Since dividends do not have this problem because they are pro-rata, the Brennan and Thakor (1990) model predicts that large shareholders will prefer cash to be distributed through repurchases, while small investors prefer cash dividends. Thus, an implication of their model is that the choice of cash distribution method depends on the ownership composition in the firm, and that firms with high ownership concentration would be more likely to use repurchases.

Free cash-flow hypothesis

As discussed in Jensen (1986), repurchases is an alternative to increasing dividends, or issue new debt, to pay out excess cash to mitigate agency costs of free cash.[9] In line with the suggestions in Jensen (1986), both Stephens and Weisbach (1998), Dittmar (2000) and Jagannathan et al. (2000), among others, find that firms in fact use repurchases to pay out cash flows that have a low probability of being sustainable, while dividend increases reflect higher expected permanent cash flows. Moreover, since firms seem to smooth dividends, and are reluctant to reducing dividends (Lintner, 1956; Brav et al., 2003), a repurchase is a way for firms with volatile cash flows to distribute temporary cash without increasing dividends. Thus, since a repurchase may mitigate agency costs of free cash, one would expect a positive price impact from a repurchase announcement. In addition, as discussed earlier, in firms where the manager has an ownership in the firm, the announcement of a repurchase plan may be a credible signal that the manager does not want to waste free cash on unprofitable projects (Isagawa, 2000).

Personal taxes

The personal tax hypothesis argues that firms repurchase their own shares so that the

[9] As defined by Jensen (1986), free cash flow is the remaining cash within a firm after all projects with positive net present values have been funded. Alternative ways of reducing the agency cost of free cash flow is through e.g. new debt, dividends or repurchases. Debt is the most credible method to counter the free cash flow agency problems since it is a binding commitment whereas repurchase announcements and dividend increases are not.

shareholders can benefit from the tax advantage of a repurchase, which (in the US) is taxed at capital gains rates, relative to dividends, that are taxed at higher ordinary income tax rates. Thus, if the cash payout is kept fixed, personal taxes are reduced if the firm uses repurchases instead of dividends to distribute cash. This argument implies that the announcement should have a positive effect on the stock price due to the relative tax advantage to shareholders. However, there are several problems with this hypothesis. First, for the US, the tax differential is not necessarily the main explanation due to the US tax code which states that repurchases only qualify as capital gains if the distribution is essentially not equivalent to paying dividend. Thus, if the repurchase program is of the same magnitude and at the same frequency as dividend payments, the repurchase is not classified as capital gains, but instead taxed at ordinary income tax rates. On the other hand, as mentioned by Allen and Michaely (2003), they are not aware of any cases where the IRS has taxed a repurchase as ordinary income. Secondly, studies from countries where there is no tax advantage to repurchases, find a positive announcement effect of the same magnitude as in the US. Thirdly, Black and Scholes (1974) argue that in an equilibrium where companies have adjusted their payout policies to match the payout policies demanded by investors with different tax schedules, a further adjustment in payout policy should not affect the stock price. Finally, results in Brav et al. (2003) suggest that the relative taxation of capital gains and dividends is unimportant when mangers choose between dividends and repurchases. Thus, the predicted effect of the personal tax argument is not clear, and empirical results do not show strong support for it.[10]

Leverage hypothesis

Another explanation for the announcement effect is that the repurchase can be financed by an issue of debt. The leverage argument is that due to the tax subsidy from interest payments, and that a part of this subsidy is passed on to the shareholders, the price of the stock is expected to rise in connection to the repurchase. Thus, the firm will exploit the benefits of higher leverage by altering its capital structure and this will affect the value of the firm and the wealth of the remaining shareholders. Repurchases may also be used to obtain an optimal leverage ratio. As discussed in e.g. Vermaelen (1981) and Opler and Titman (1996), repurchases are used by firms to reduce their equity and increase the leverage ratio. When firms are below their target ratio, firms are more likely to repurchase stock. A related hypothesis is the bondholder expropriation hypothesis discussed in Dann (1981), where a repurchase reduces the assets of the company in such a way that the value of the claims of the bondholders is reduced. Thus, if this potential expropriation of the bondholders has not been taken into account in the pricing of the bond issues, there will be a wealth transfer from bondholders to the stockholders of the firm.

Takeover defense

A repurchase may also be used by a firm as a defensive payout in response to hostile takeover attempts. Denis (1990) examine defensive changes in corporate payout policy[11] for a sample of firms in the US. The main finding is that repurchases is an effective device for countering hostile takeovers, as there is a high probability of the target firm

[10] Much of the earlier literature on repurchases in the US were motivated by the puzzle that despite the relative tax advantage of repurchases to dividends, firms preferred dividends as the main payout method.

[11] Denis (1990) examine defensive share repurchases and special dividends.

maintaining independence.[12] The effect of a firm announcing a defensive repurchase is highly negative which suggests that defensive repurchases are associated with losses for the shareholders of the target firm. This in the sense that defensive repurchases reduce the probability that there will be a valuable restructuring within the firm that could lead to a more efficient use of firm resources. Bagwell (1991) proposes a model with heterogenous valuations among current shareholders and an upward sloping supply curve for for the company shares. A repurchase removes current shareholders with the lowest valuations such that a more expensive pool of shareholders are left. Also Bagnoli and Lipman (1989) propose a model where there is asymmetric information between the manager and the marketplace, and that repurchases convince current shareholders that the firm value is higher, revising their price upwards, such that a takeover attempt becomes more costly for the bidder.

Other hypotheses

There are also several other hypotheses that aim at explaining why firms repurchase shares as well as the positive price effect associated with (non defensive) repurchase announcements. Dittmar (2000) find evidence that repurchases are used to counter the dilution effect of management- and employee options, while Fenn and Liang (1997, 2001) find evidence that repurchases are used to increase the value of such stock options and that the increase in management stock options may explain the increased use of repurchases. Bens et al. (2002) argue that repurchases are used to increase earnings per share (EPS) figures and Grullon and Michaely (2002) find evidence that dividends are substituted for repurchases due to several of the issues discussed above.

3 Repurchases in Norway

3.1 Repurchase methods

There are mainly three methods for firms to repurchase their own shares; through tender offers (fixed price offers), open market transactions or via Dutch auction repurchases. The two first methods are used to a larger extent than the latter, and in the US, open market transactions are observed more frequently than tender offers. In fact, 90% of the cases between 1985 and 1993 were open market transactions as discussed in Ikenberry et al. (1995) and Stephens and Weisbach (1998). Open market repurchase programs, where there is an upper limit on how much shares the company can repurchase, are often referred to as "Normal Course Issuer Bids", whereas fixed price tender offers which do not have any limit to the amount of stock that can be repurchased is commonly called "Substantial Issuer Bids". In a tender offer, the reacquiring firm offers to repurchase a fraction of its shares at a specific price, usually at a premium to the market price. In an open market repurchase, on the other hand, the purchase is executed through brokers in the open market at normal commissions rates, and no premium is paid.[13] Thus, open

[12] Those firms that remain independent show a significantly lower abnormal returns after the takeover attempt than those that were successful takeovers.

[13] At least no direct premium is paid. As argued by Barclay and Smith (1988), the announcement of a repurchase plan may lead to increased implicit transaction costs in the market due to an increased adverse selection component in the spread. Thus, by announcing a repurchase plan, the firm itself may experience higher trading costs in the primary market.

market repurchases may be viewed as a sequence of tender offer repurchases, where the bid price of the order is the tender price. Since tender offers are generally larger in magnitude than open market repurchases, the alternative of trading the shares directly in the market may induce a price impact to the firm that would exceed the premium offered through the tender price. With respect to Dutch auction repurchases, the repurchasing firm set a range of prices at which it is willing to repurchase shares. Then, each shareholder informs the firm of their supply at these price levels. When all price schedules are collected, the firm has an aggregate supply curve, and chooses the lowest price that will fill their demand, and the transactions are executed at this clearing price.

The 1st of January, 1999, the Securities Act of June 13 1997 (Aksjeloven) went into effect, and Norwegian firms were allowed to repurchase their own shares. The Securities Act states that firms are not allowed to hold more than 10% of their issued shares at any point in time. In addition, the firm's total equity value in excess of the firm's own stockholdings must at all times be higher than NOK 1 mill. For a company to be able to initiate a repurchase plan, it requires 2/3 of the voting shares represented at the shareholder meeting to vote in favor of the repurchase plan.[14] In addition, the maximum length that a repurchase plan can be in effect before it requires a new vote is 18 months, and a shorter time if specified. After the Securities Act went into the effect, Norwegian firms were allowed to announce a repurchase plan, but not execute any repurchases before January 1999. When a firm has repurchased shares, the shares are first assigned as treasury stock with no voting or cash flow rights as long as the company owns them. Firms may then reduce the number of treasury stock by retiring these shares or as a payment in various transactions. What firms do with the shares after the repurchase varies, but commonly firms use them as payment in acquisitions, sell them in the market or distribute them to employees or managers as a part of a bonus plan etc. The dataset also contain data on the sale of treasury stock. However, the paper only consider the part of the sample related to the repurchases. Table 14 in appendix B show some aggregate statistics for the sale/reduction of treasury stock. There are about six times as many repurchase transactions as sales. However, the number of shares in the repurchases are only twice that of the sales, and the average repurchase is about 1/3 of the size of a reduction in treasury stock. This is probably because firms accumulate treasury stock through many smaller transactions, and use the repurchased shares as payment in relatively large transactions or retire relatively large amounts of shares in a single event.

The sample examined in this paper only includes announcements of open market share repurchase programs and actual repurchases related to these announcements. Other types of repurchases are rarely observed during the sample period.[15] Recall that open market share repurchase programs also are the most frequently observed repurchase method in the U.S. and Canada as well. Furthermore, Norwegian listed firms do not have to receive approval from the stock exchange before initiating a repurchase program. In the U.S. the same rule applies as in Norway. However, Canadian firms (see Ikenberry et al. (2000)), must receive approval from the exchange before they can initiate a repurchase program. When a firm actually execute an open market repurchase the law requires the firm to report this to the OSE on the same day or before the trading starts the following day. This is very different from the US, where firms are not required to report their actual

[14] It also requires 2/3 vote of all shares represented at the meeting (including non-voting shares).

[15] One example is Storebrand (STB) which at the beginning January 1999 gave an offer to shareholders that owned less than 8 shares to sell their shares back to the company. Of the total 74000 shareholders at the time, 39000 owned less than 8 shares.

repurchase activity. Moreover, several studies note that firms actual repurchase activity in the US is very hard to measure (see e.g. Jagannathan et al. (2000)). Canadian firms are required to report their aggregate repurchase activity every quarter.

3.2 The Norwegian tax system

Dividends distributed from a Norwegian tax resident public- or private limited company were taxed fully on the investor's hand until 1992. As a result of an extensive tax-reform in 1992, dividends became tax-exempt while the capital gains tax was set at a flat rate of 28%, both for individuals, companies and private pension funds.[16] However, shareholders in firms that retain a part of their after tax earnings, may experience that some of the capital gains when the shares are sold reflect a price increase due to the retained earnings. To eliminate the double taxation this would imply, an adjustment is made. The retained earnings per share is added to the cost basis (usually the purchase price) such that the capital gain/tax basis is reduced accordingly (RISK adjustment).[17] Thus, during the period 1992 until 2001, dividends were not taxed on the investor's hand at all, and tax on capital gains linked to retained earnings was eliminated. However, in 2001, personal tax on dividends was re-introduced, at a rate of 11%, while the capital gains tax and corporate tax remained at 28%. With respect to the dividend taxation, a basic deduction of NOK 10 000 was introduced. Thus, small investors in dividend paying firms were not directly affected by the tax increase. However, for larger investors the total taxation on dividends increased from 28% to 35.92%, due to the double taxation of parts of the earnings. In 2002 the personal taxation of dividends was removed. With respect to foreign shareholders, dividends distributed from a Norwegian tax resident public or private limited company to its non-resident shareholders are subject to 25% withholding tax. Tax treaties may make the withholding tax deductible in the shareholder's home country. Non-resident shareholders gain on a sale of shares in a Norwegian company is not subject to any Norwegian taxation, unless the shares form part of a permanent establishment in Norway or the seller is an individual who fulfill certain conditions that would make the gain taxable at a rate of 28%.

With respect to the relative tax treatment of dividends and repurchases in Norway, we see that there has been a change during our sample period from 1999 through 2001. However, in 1999 and 2001, dividend distributions were not taxed. On the other hand repurchases where the shareholder sell shares above the tax basis was taxed at 28%. Thus, in cases where the firm uses already taxed earnings for repurchasing shares at a price above the tax basis, the shareholder that sell shares back to the firm would experience a double taxation on the excess capital gains. In 2000, when a dividend tax of 11% was introduced, the tax differential between capital gains and dividends was reduced, favoring repurchases. With respect to foreign investors, they have been subject to 25% withholding tax on dividends through the entire sample period. However, since the capital gains for foreigners is subject to the tax in the home country, the preference between dividends and repurchases may vary between foreign investors depending on the tax treatment in their home country.

[16] labor unions, non-profit organizations and public pension funds are exempt from taxation.

[17] RISK is the acronym for "Regulering av Inngangsverdien med Skattlagt Kapital". Translated, it means that there is an adjustment of the cost basis by the retained earnings after corporate tax. To be eligible to the RISK adjustment within a given year, the shareholder must have owned the shares over the turn of the year.

4 Data description

4.1 Announcements of repurchase programs

In panel A of table 1, we report some general statistics for the announcement data. Over the entire period period from 1998 through 2001 there were 318 announcements of repurchase plans by 163 different firms. Of these firms, 70 announced one repurchase plan, 46 announced two plans, 32 announced 3 plans and 15 announced 4 repurchase plans during the sample period. Over the different sample years, the number of announcing firms increased from 30 to 109, while the maximum number of announcements by a single firm in one year was two. For the individual years, we also show statistics on the announcement frequencies in the middle section of panel A. In column n=1, the numbers represent the number of firms that announced for the first time in the respective year, column n=2 report the number of firms that announce for the second time in the respective year and so on. Thus, in 2001 32 firms announced for the first time, 30 for the second time, 35 for the third time and 12 for the fourth time. When looking at the distribution of authorized repurchase amounts across firms, we see that they are highly skewed with a maximum (and median) amount of 10% and a mean amount of 9.5% while the lowest repurchase amount announced by a firm was 1% of outstanding shares. Thus, the majority of the announcements was for the maximum legal limit of 10%.[18]

Panel B in table 1 report the completion rates across firms that announced a repurchase plan. For the whole sample about 60% (100 firms) of the announcing firms repurchased at least some shares following at least one of their announcements, while 63 of the firms that announced a repurchase program never repurchased any shares within the repurchase period.[19] With respect to the firms that actually executed repurchases, the mean fraction of outstanding shares that was repurchased was 2.9%, while the median firm repurchased 1.8%. The maximum accumulated fraction repurchased by any firm during a repurchase period was 22.1%. This is above the legal limit of 10%. And for some firms there is an apparent breach of the legal limit, but this is probably because these firms during the repurchase period used some of the repurchased shares as payment in transactions, wrote down some of the repurchased shares or distributed them to employees, managers as part of a bonus program or other events that is not captured in our data.[20] The median number of days between the announcement of a repurchase plan and the first repurchase was 169 days, while the mean number of days was 198. Thus, on average it seems like the repurchase plan is put in place not for immediate executions. However, the minimum number of days indicate that some firms also repurchase shares immediately after the announcement has been made. For announcements in 1998 these numbers are biased upwards because firms were not allowed to execute repurchases before 1999, but could announce a repurchase plan in 1998. Across months (not reported), there is some degree of clustering in May and June. The reason for this is that many repurchase plans are voted on at the annual shareholders meetings, which for many firms are conducted during spring.

[18] Since some firms do not explicitly report a maximum amount to be repurchased, we assume that these firms are subject to the maximum legal limit of 10%.

[19] The repurchase period is defined as the period in which the shareholders give the manager authorization to repurchase shares.

[20] The Securities Act (Aksjeloven) only require the holding of treasury shares to be no more than 10% of the firms outstanding shares.

Table 1: Descriptive statistics of announcements

Panel A shows descriptive statistics for the announcements of repurchase plans for the entire sample period from 1998 through 2001 as well as for separate years. The first column report the number of announcements, the second column report the number of different firms that announced at least one repurchase plan, and the third column report the maximum announcements by one firm within the specified period. The next four columns decompose the frequency of repurchase announcements. For the whole sample, n=1 counts the number of firms that announce once, and n=4 counts the number of firms that announce 4 times. For the separate years, n=1 counts the number of firms that announce for the first time in the respective year, while n=2 counts the number of firms announcing for the second time etc. For example, in 2001 there were 32 firms that announced for the first time, 30 firms that had announced once in one of the previous three years, 35 firms that had announced a repurchase plan in two of the previous three years and 12 firms that had announced four times during the previous four years. The last three columns of the table report the cross-sectional minimum, mean and maximum amount of shares that the firm was authorized to repurchase by the current owners. Panel B shows statistics with respect to the completion rates where "Repo" denotes the number of firms that actually repurchase after an announcement, and "Norepo" denote the number of firms that announce a repurchase plan but do not execute any repurchases. The median, mean and max completion rates are calculated relative to the number of shares repurchased divided by the total number of outstanding shares. The last four columns report distribution of days between announcement of a plan and the first repurchase.

Panel A: Announcement statistics

				Number of firms (i) announcing n times				Authorized repurchase amount		
Period	Announce-ments	Different firms (i)	Max ann.	n=1	n=2	n=3	n=4	Min.	Mean	Max.
Whole sample	318	163	4	70	46	32	15	1.0%	9.5%	10.0%
1998	28	28	1	28	-	-	-	2.5%	9.1%	10.0%
1999	85	85	1	70	15	-	-	1.0%	9.5%	10.0%
2000	93	90	2	33	47	10	-	1.0%	9.4%	10.0%
2001	112	109	2	32	30	35	12	3.3%	9.6%	10.0%

Panel B: Completion rates for announcing firms

	Repurchasing firms		Completion rates			Days until first repurchase			
Period	Repo	Norepo	Median	Mean	Max	Min	Median	Mean	Max
Whole sample	100	63	1.8%	2.9%	22.1%	1	169	198	502
1998	15	13	1.9%	2.9%	10.0%	20	364	326	469
1999	41	44	1.9%	3.2%	19.0%	9	203	216	502
2000	65	25	1.8%	2.9%	16.1%	2	217	206	498
2001	60	49	1.3%	2.7%	22.1%	1	123	138	459

4.2 Actual repurchases

The sample of actual repurchases reported to the OSE from January 1999 through December 2002 was obtained from the Oslo Stock Exchange. In addition, the dataset was updated and cross checked using detailed records from the equity feed database of Oslo Exchange Information (OBI).[21]

Panel A in table 2 show various statistics for the actual repurchase activity across firms for the whole sample as well as for separate years. The firms that repurchased shares executed a total of 1719 repurchases including all repurchases executed in 2002 (denoted as 2002^{a} in the table). When excluding repurchases in 2002 that were not related to repurchase plans initiated in 2001 or earlier[22] (denoted as 2002^{b} in the table), the total number of repurchases related to announcements in 1998-2001 was 1375. In the rest of the paper we will examine the repurchases related to these announcements and ignore the 344 repurchases that was executed due to repurchase plans announced in 2002 since we do not have this information yet. The median firm executed 7 repurchases for the entire sample period, while the maximum number of repurchases executed by a single firm was 197. The average size of the repurchases was 166 thousand shares or about NOK 7.8 mill. Overall, the repurchases related to plans announced in 1998-2001 resulted in Norwegian firms repurchasing 210 million shares worth more than NOK 15 bill. During the same period, the total market value of all firms on the OSE was about NOK 600 bill. on average. The total dividends paid out by all firms at the OSE (including firms that did not announce) during the same period amounted to about NOK 60 bill.[23] Since Norwegian firms were first allowed to repurchase shares in 1999, they have increased their spending on repurchases as a percentage of cash dividends to 25% in 1999 and to 44% in 2000 and 2001. However, for 2002 there was a drop in the repurchase activity, while dividend payments was high compared to the other years. Examining the other statistics across different years, the first thing to note is the increase in repurchasing firms and repurchases (N) from 1999 through 2001, and then a significant drop in repurchase activity in 2002. This trend is also evident when looking at the total number of shares and the NOK volume of all repurchases. One main reason for this drop in repurchases in 2002 may be related to the fact that the personal tax on dividends, which was introduced in 2001, was removed in 2002 which made it relatively more attractive for private investors to get cash paid out as dividends.[24] Another interesting observation is that, while the repurchase volume increased from 1999 through 2001, the average NOK size of each repurchase decreased while the average number of shares in each repurchase increased. Panel B in table 2 report monthly summary statistics of our repurchase sample. The table shows the number of different firms that executed repurchases, the number of repurchases conducted by these firms, as well as the aggregate share volume and NOK volume of these repurchases for each sample month. As can seen from the table there is an increasing trend until September 2001. In fact, for the entire sample, September 2001, was the month in the sample that most firms executed repurchases and the share volume of repurchases was the highest. This is probably related to the large drop in share-prices due to the terrorist attacks in the US

[21] More specifically, Record E 19, Trading in Company Shares, in the Equity Feed data from Oslo Exchange Information (OBI) was used to track companies repurchase activity.

[22] These repurchases are repurchases up until 18 months after the most recent announcement in 2000/2001, or until a new announcement in 2002.

[23] Note that these dividend numbers are aggregates for all companies listed on the OSE, not only for the firms executing repurchases. The dividend statistics are official numbers from the Oslo Stock Exchange.

[24] This reasoning require that firms take into account the tax schedule of their investors.

on September 11th. In fact, when looking more closely on the amount of repurchases that were executed within that specific month, there was a huge increase in repurchases just after the terror events. More than 75% of the repurchases and 65% of the share-volume that month occurred in the week after the attacks. This is similar to what was observed in the US when a large amount of US firms increased their repurchase activity to supply liquidity and support their share prices. In fact, on September 13th, the Securities and Exchange Commission (SEC) suspended regulations on repurchases allowing firms to repurchase shares without any volume limits. About 75 corporations responded during the first day of trading after the attacks by announcing the initiation or renewal of a repurchase plan, and the dollar value of their buybacks on the opening day was estimated at more than USD 45 billion.[25]

5 Estimation methodology

5.1 Measuring abnormal announcement returns

In the paper we investigate the short term price impact related both to the announcement of repurchase plans as well as when the market learns that the firm actually has repurchased shares. For these purposes, we apply a standard event study methodology. To investigate the short term effect around an event, we examine various event windows surrounding the event. We use daily returns which are indexed relative to an event, and define τ as the event time, with the event date at τ=0. The event date is the date at which the event (the repurchase plan or actual repurchase) is announced to the market. For the various event windows we denote the beginning of the event window as τ_1 and the end of the event window as τ_2. We apply three model specifications to characterize normal returns; the market model, the Fama and French (1993) three factor model and the Carhart (1997) four factor model. All benchmarks models are calibrated during the estimation period running from two years prior (τ=-571) to the event until the start of the event period at τ_1 for each firm, i.[26] Since many of the companies at the OSE, and hence in our sample, are not traded every day, our OLS beta estimates may be biased due to the intervaling effect. To reduce the potential bias, we also estimate adjusted betas for the market model as suggested by Scholes and Williams (1977) and Dimson (1979). In the regular market model, normal returns are expressed as,

$$\widehat{E[R_{i\tau}]} = \alpha_i + \beta_i R^m_\tau \tag{1}$$

where $R_{i\tau}$ is the return on security i on event date τ, R^m_τ is the value weighted total return on the OSE all share index, and $E[\varepsilon_{i,\tau}] = 0$ and $Var[\varepsilon_{i,\tau}] = \sigma^2_{\varepsilon_i}$. In the Dimson (1979) specification, we run an multivariate version of eq.(1) of securities returns against lagged ($R^m_{\tau-1}$), contemporaneous (R^m_τ) and leading ($R^m_{\tau+1}$) market returns. As proposed in Dimson (1979), we obtain a consistent estimate of beta by summing the slope coefficients from this regression. The Scholes and Williams (1977) procedure is similar, but instead of estimating the β's simultaneously, the three betas are estimated separately and the aggregated beta

[25] Also during the market crash in 1987 there was a surge in repurchase activity after the market collapse. During the fourth quarter of 1987 Stephens and Weisbach (1998) report that 995 firms announced a repurchase plan.

[26] Some firms have a shorter price history. However, since none of these firms have less than half a year of price observations, we do not exclude them from the analysis.

Table 2: Descriptive statistics of actual repurchases

Panel A reports the actual repurchase activity across firms for the whole sample as well as for separate years. The columns in panel A report the number of different firms that executed repurchases (Firms), the cross sectional distribution of repurchases (minimum, median, mean and max repurchases across firms), the average size of repurchases in thousand shares and Norwegian kroner (NOK) and the total share-volume and NOK volume in all repurchases. The last column of the table report the aggregate NOK value of dividend payments for all firms at the OSE. Panel B shows the repurchase activity for each month within each year. For each month, the reported statistics is the number of different firms that executed repurchases in the respective month (Firms), the number of repurchases executed by these firms (N), the total number of shares (in thousands) in these repurchases and the total volume in million Norwegian kroner (NOK).

Panel A: Cross sectional repurchase statistics

		Number of repurchases					Repurchase size		Repurchase volume		Dividends[c]
	Firms	N	min	median	mean	max	shares (1000)	NOK (1000)	Mill. shares	Mill. NOK	Mill. NOK
Whole sample[a]	100	1719	1	10	16.7	197	159	7223	247	16505	59760
Whole sample[b]	100	1375	1	7	13.3	195	166	7861	210	15219	-
1999	41	205	1	3	5.0	17	168	13259	35	3679	14444
2000	60	463	1	5	7.7	64	186	12770	65	5320	12194
2001	69	659	1	4	9.6	120	281	7480	107	5947	13767
2002[a]	39	392	1	5	10.1	50	122	3780	41	1560	19356
2002[b]	11	48	1	3	4.4	10	89	5420	4	273	-

[a] Includes all repurchases conducted in the period 1999 through 2002. [b] Includes only repurchases in 2002 that was related to announcements in 2000/2001 which had not yet expired. These repurchases are repurchases conducted up to 18 months after the most recent announcement (in 2001 or 2000) or until a new announcement in 2002. [c] The dividend statistics are official aggregates from the Oslo Stock Exchange (www.ose.no).

Panel B: Repurchase activity by month

	1999				**2000**				**2001**				**2002**			
	Firms	N	Shares (1000)	Mill. NOK	Firms	N	Shares (1000)	Mill. NOK	Firms	N	Shares (1000)	Mill. NOK	Firms	N	Shares (1000)	Mill. NOK
January	5	7	1787	64	6	13	624	40	15	51	7130	315	10	34	11942	97
February	3	3	499	52	9	21	1987	153	7	17	2790	170	10	14	1471	78
March	3	6	3581	57	11	34	6493	531	18	43	7482	567	11	16	2387	91
April	5	10	780	16	7	18	2799	142	10	40	1914	133	9	12	1163	63
May	3	6	307	20	12	22	2827	159	19	80	11537	1097	8	19	1826	106
June	5	14	975	35	14	39	4095	251	20	86	11077	789	14	37	2705	267
July	5	11	2629	213	11	23	4499	426	21	69	5732	255	9	32	2251	229
August	14	35	7118	1118	14	35	5873	478	20	72	14001	712	15	35	5206	235
September	12	29	6463	816	17	56	5894	313	34	125	26003	1274	18	77	4125	203
October	11	18	1967	234	8	17	3270	232	14	29	11880	287	12	50	4693	80
November	15	47	6387	864	20	62	7072	935	11	24	3445	155	12	36	1596	57
December	12	19	2064	189	26	123	19693	1661	13	23	3932	194	12	30	1206	55

estimate is adjusted for the autocorrelation in the market return to obtain a consistent estimate of β. Thus, by denoting the lagged-, matching- and leading beta estimates as β_i^+, β_i and β_i^- respectively, the consistent beta estimate, relative to the Scholes/Williams approach, is calculated as,

$$\hat{\beta}_i^{SW} = \frac{\hat{\beta}_i^+ + \hat{\beta}_i + \hat{\beta}_i^-}{1 + 2\hat{\rho}_M} \tag{2}$$

where $\hat{\rho}_M$ is the autocorrelation coefficient of the market index, and $\hat{\beta}_i^{SW}$ denotes the Scholes/Williams estimate. In addition to applying the market model, we use the Fama and French (1993) three factor model as well as the four factor model suggested by Carhart (1997) adding momentum to the Fama/French factors.[27] With respect to the four factor model, expected returns are described as,

$$\widehat{E[R_{i\tau}]} = \alpha_i + \beta_i^m R_\tau^m + \beta_i^h R_\tau^{hml} + \beta_i^s R_\tau^{smb} + \beta_i^{mom} R_\tau^{mom} \tag{3}$$

where R_τ^m, R_τ^{hml}, R_τ^{smb} and R_τ^{mom} are the returns on the market-, the book to market-, the size- and the momentum factors respectively, and the β's are the factor exposures. The book-to-market and size factor returns are calculated as the difference between two value weighted portfolios containing firms with a book to market value (or size) above the median and below the median. All firms at the OSE are assigned to one of the two portfolios at the beginning of each year. With respect to the momentum portfolios, firms are assigned to one of two portfolios based on the return over the previous year.[28] The exposures are estimated over the same post-event period as the market model in eq.1.

Having estimated the parameters in the various model specifications described above, we measure the daily abnormal returns as the daily prediction errors relative to the expected return, $\widehat{E[R_{i\tau}]}$ as,

$$\widehat{AR}_{i\tau} = R_{i\tau} - \widehat{E[R_{i\tau}]} \tag{4}$$

where $\widehat{E[R_{i\tau}]}$ is the expected return of security i, defined by either the market model, the Fama and French (1993) model or the Carhart (1997) model, on date τ given the return on the market and the contemporaneous factor returns. For each firm in the sample, we calculate cumulative abnormal returns (CAR) across the event window from τ_1 to τ_2. By cumulating the $\widehat{AR}_{i\tau}$ from τ_1 up to, and including, τ_2 for the different time windows, for each firm, we can calculate the the estimated average $\widehat{CAR}$ across all firms as,

$$\widehat{CAR}(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^{N} \sum_{\tau=\tau_1}^{\tau_2} \widehat{AR}_{i\tau} \tag{5}$$

where N is the total number of firms/events.

The main null hypothesis to be tested is that the cumulative abnormal return during the main event-window across firms is equal to zero. We use the standard test statistic proposed in Brown and Warner (1985) who argue that standard procedures are typically

[27] However, Brown and Weinstein (1985) and Campbell et al. (1997) argue that the use of more sophisticated models has little practical advantages relative to an unrestricted market model when we examine the short term market impact. The main reason is that the marginal explanatory power of additional factors to the market factor is usually relatively small, and therefore there is little reduction in the variance of abnormal returns.

[28] A number of filters are applied before a stock can enter the portfolios. Minimum number of trading days of 20, minimum price of 10 and minimum firm value of 1 mill NOK.

well-specified even when special daily data characteristics are ignored. The test statistic we apply is the ratio of the average cumulative abnormal return, across firms, to its estimated standard error, which can be expressed as,

$$t = \frac{\widehat{CAR}(\tau_1, \tau_2)}{[\overline{\sigma}^2_{\varepsilon}(\tau_1, \tau_2)]^{1/2}} \tag{6}$$

where $\overline{\sigma}^2_{\varepsilon}(\tau_1, \tau_2)$ is the average estimated variance for the abnormal returns across firms. Two estimators of the variance is commonly used in event studies. The most frequently applied estimator uses the standard deviation of abnormal returns from the expected return model estimated in the estimation period prior to the event. The second estimator uses the standard deviation of the cross-sectional CARs from the event window. The latter estimator is generally used when the event is expected to change the risk of the firm, and the pre-event estimator for the variance may be biased. In our case, we use the first estimator for variance when examining the announcement effect, since the announcement itself is not expected to affect the risk of the firm. When we later in the paper (section 6.4) examine the abnormal returns around the actual repurchases, on the other hand, we provide results using the second approach, since the transactions potentially change the riskiness of the firm.[29]

5.2 Measuring long run performance

Portfolio creation

We also examine the long run performance of portfolios of announcing firms and for portfolios conditional on whether the firm actually execute repurchases or not. To facilitate this we apply a calendar time approach used in e.g. Ikenberry et al. (1995), Womack (1996) and Ikenberry et al. (2000) among others. To explain how this applied in this paper, we will use the case when we construct a portfolio of firms conditional on that they have announced a repurchase plan.[30]

More specifically, we create a portfolio of firms given that they have announced a repurchase plan and calculate the daily returns of this portfolio through calendar time, t. We rebalance the portfolio the first day of every month. Moreover, all firms that have announced a repurchase plan in the previous month are added to the portfolio, and all firms are rebalanced to equal weights. We write the return on the equally weighted portfolio, $R_{p,t}$ on date t as,

$$R_{pt} = \sum_i w_{it} R_{it} \tag{7}$$

where $w_{i,t}$ denotes the weight of each firm in the portfolio which in our case is just $1/N_{i,t}$ where $N_{i,t}$ is the number of securities in the portfolio at date t. To minimize the idiosyncratic risk in our portfolio, we do not start our portfolio construction before 10 companies have announced a repurchase plan. We also examine several holding periods, where firms are kept in the portfolio for one year, two years and three years as well as for the remaining sample period (buy and hold). For e.g. the yearly holding period, a firm

[29] If the AR_τ are independent identically distributed and normal, the test statistic is distributed Student-t under the null hypothesis.

[30] However, later in the paper we will also use the same methodology when measuring the performance of portfolios conditional on the actual repurchase activity of the announcing firms.

is removed from the portfolio after one year. These portfolio strategies represents simple and realistic trading strategies, where the inclusion of stocks depends on whether they have announced a repurchase period in the previous month. It should be noted that we do not take into account transaction costs, but since we rebalance the portfolio on a monthly basis, these costs would not be very large.[31]

Benchmark models

The long term abnormal performance may to a large degree depend on the benchmark model against which we compare our portfolio returns. In addition, several papers note that long-term abnormal performance tests may be due to misspecification rather than mispricing. Thus, as argued by Kothari and Warner (1997) among others, caution should be used when interpreting the results.[32] We try to reduce this problem by measuring our sample portfolio returns generated from the trading strategy relative to several models. We evaluate the performance of our repurchase portfolio by estimating Jensen's alpha relative to a one factor CAPM model as well as the Fama and French (1993) model and the Carhart (1997) model, E.g. for the Carhart model we run the following regression,

$$R_{pt} - R_t^f = \alpha + \beta^m(R_t^m - R_t^f) + \beta^h R_t^{hml} + \beta^s R_t^{smb} + \beta^{mom} R_t^{mom} + \varepsilon_t \tag{8}$$

where $R_{p,t}$ is the return on the equally weighted portfolio of announcing firms created through calendar time, R_t^f is our proxy for the risk free rate,[33] R_τ^m, R_τ^{hml}, R_τ^{smb} and R_τ^{mom} are the returns on the market-, the book to market-, the size- and the momentum factors respectively, and the β's are the factor exposures. The factor returns are calculated similarly as in eq. 3 and α measures the average daily excess performance of the portfolio.

6 Results

Our empirical analysis consists of four parts. The first part in section 6.1 evaluate the short term market reaction around the announcement of repurchase plans. The second part, in section 6.2, tests the underreaction hypothesis in Norway by examining the long term performance of a portfolio of firms that have announced a repurchase plan. The third part, in section 6.3, combines the announcement data with the actual repurchase data and examine whether the long-run performance depend on whether firms repurchase or not. The fourth part, in section 6.4, examines the short term market impact of the actual repurchases.

[31] The transaction costs would in reality depend on the size of the portfolio. For a small portfolio, the total commissions related to the rebalancing could constitute a large fraction of invested wealth. For a large portfolio, on the other hand, the commissions would be a smaller part of invested amount, while the implicit costs related to price impact and delay when the portfolio is rebalanced is likely to constitute a larger fraction of total costs.

[32] Kothari and Warner (1997) argue that bootstrapping procedures may help mitigating the potential biases in long-term performance measurement. With respect to bootstrapping, it is important to have a large number of firms to match against. One problem in Norway is that there are very few similar companies, in addition to that we want to match against non-announcing firms, which makes this approach difficult to implement in a satisfactory way in this study.

[33] As the risk free rate we use the 3 month Norwegian interbank offered rate (NIBOR).

6.1 The short term effect of announcing a repurchase plan

In table 3 we report the average cumulative abnormal returns surrounding the announcement of repurchase plans. For all announcements, the table shows the average excess return relative to the market model (unadjusted and adjusted as proposed in Dimson (1979) and Scholes and Williams (1977)), the Fama and French (1993) three-factor model and the Carhart (1997) four-factor model. In the table we also show the average announcement effect for separate years and when split the sample into announcements that specify that the firm will repurchase more or less than 5% of their outstanding shares. In these cases we report results only from a Carhart (1997) specification for normal returns. In the table we use an event window staring two days before the announcement and ending two days after the event. The main reasons for why we use a relative large event window is that the announcements of the outcome of the vote on the repurchase plans are in some cases on the same day as the shareholder meeting, while it in other cases is announced up to a few days after the shareholder meeting. Thus, for those announcements that are delayed, the outcome of the vote is likely to be known to the market before the announcement. In fact, when looking at the cumulative abnormal return from 60 days prior to the announcement of the repurchase plan through 60 days after the announcement in figure 1, there is some indication that there is a positive impact starting before the announcement. Thus, the relatively large window reduces the power of the tests, but since we want to capture the entire market reaction we use a relatively large window. In addition, the table report the average cumulative abnormal return from 60 days prior to the announcement and until 60 days after the announcement.

The first thing to note from the table is that the announcement effect is positive and significant for the whole sample, with an average significant announcement effect of about 2.5%. This is very similar to what is found for other markets and time periods in e.g. Comment and Jarrell (1991) and Ikenberry et al. (1995, 2000). With respect to the different model specifications, the results are quantitatively similar. We do not, however, find a significantly negative CAR for the 60 day period prior to the announcement for all announcements of for announcements within separate years. This is in contrast to other studies that find a significant negative abnormal return prior to the announcement. Thus, in the Norwegian market, it does not seem that firms decision to announce a repurchase plan is influenced by the (risk adjusted) prior performance of the firm at least relative to the three months prior to the announcement. This may be explained by the findings in panel B in table 1, where we found that the number of days between the announcement of the plan and the first repurchase execution was almost 200 days. Thus, the announcement does not, on average, seem to be triggered by a negative drift prior to the announcement.

When examining the announcement effect for different years, we find a positive effect for all years, but the announcement effect is only significantly different from zero for announcements in 1999 and 2001. In addition, only firms that announce that they are planning on repurchasing more than 5% of their outstanding shares experience a significant abnormal price impact, while the excess return for firms that announce a lower repurchase fraction is positive but insignificant. Table 13 in appendix A shows the results from a robustness check where all firms with an announcement CAR below the 5th and above the 95th percentile are removed from the sample. The announcement effect falls to about 1.9%, but is still significant at the 1% level.

To examine in more detail what factors are important with respect to the size of the announcement effect, we run the following regression with the cumulative abnormal return

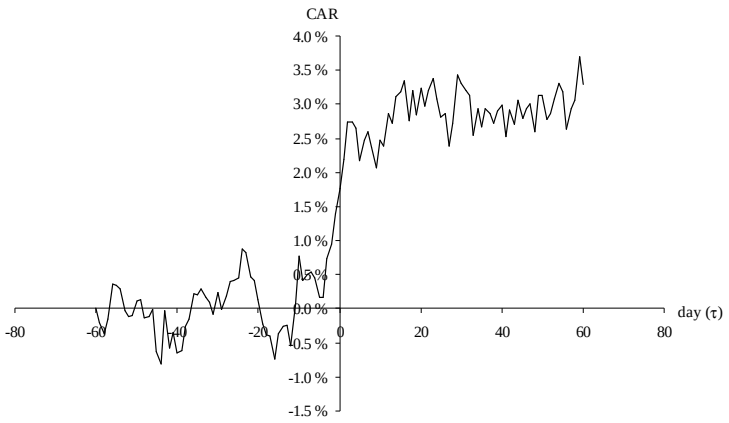
Table 3: Abnormal returns around announcements of repurchase plans

The table shows the abnormal return (in percent) around announcements of repurchase plans. The abnormal return is measured relative to a one factor market model (unadjusted and adjusted for biases induced by infrequent trading as proposed in Dimson (1979) and Scholes and Williams (1977)), Fama and French (1993) three factor model and the Carhart (1997) four factor model, with the value weighted OSE general index as the market portfolio. The sub-sample regressions and the repurchase% regressions are cumulative excess returns relative to the Carhart four factor model. Numbers in bold represent numbers significantly different from zero at the 1% level, and numbers in parenthesis are the associated t-values.

		Days relative to announcement date τ_1 to τ_2					
	n	-60 to -3		-2 to +2		+3 to +60	
		Whole sample (1998-2001)					
Unadjusted market model	318	-0.23	(-0.29)	**2.52**	(3.72)	0.51	(0.62)
Dimson (1979)	318	-0.06	(-0.07)	**2.43**	(3.53)	0.24	(0.29)
Scholes and Williams (1977)	318	-0.25	(-0.32)	**2.44**	(3.58)	0.20	(0.24)
Fama and French (1993)	318	-0.31	(-0.41)	**2.52**	(3.72)	0.63	(0.77)
Carhart (1997)	318	-0.25	(-0.34)	**2.62**	(3.86)	0.62	(0.75)
		Subsamples (year)					
1998	28	1.59	(0.85)	1.25	(0.57)	1.47	(0.89)
1999	85	-0.68	(-0.56)	**2.79**	(2.66)	2.35	(1.53)
2000	93	-1.97	(-1.63)	1.36	(1.30)	0.42	(0.25)
2001	112	1.03	(0.66)	**3.86**	(2.72)	-0.80	(-0.56)
		Announced repurchase limit (%)					
<0%- 5%]	42	-2.93	(-1.85)	3.37	(1.30)	-0.81	(-0.46)
<5%-10%]	276	0.16	(0.19)	**2.50**	(3.70)	0.84	(0.92)

Figure 1: Cumulative average abnormal return

The figure shows the CAR relative to a Carhart (1997) model across all 318 announcements that occurred in the period 1999 through 2001. The CAR is the accumulated average abnormal returns starting 60 days prior to the announcement of the repurchase plan and ending 60 days after the announcement.



across the event window for each announcement, $\widehat{CAR}_i(\tau_1, \tau_2)$, as the dependent variable,

$$\begin{aligned}\widehat{CAR}_i(\tau_1, \tau_2) = \alpha &+ \beta_1 \widehat{CAR}_{i,\tau_1-k} + \beta_2 \overline{SPR}_{i,\tau_1-k} + \beta_3 MCAP_{i,\tau_1-1} \\ &+ \beta_4 BM_{i,\tau_1-1} + \beta_5 PERC_{i,\tau} + DIV_{i,\tau_1-360} + QuickRatio_{i,\tau} + \epsilon_i\end{aligned} \tag{9}$$

where α is the intercept term, CAR_{i,τ_1-k} is the cumulative abnormal return over the k days prior to the event window, $\overline{SPR}_{i,\tau_1-k}$ is the average relative spread[34] across the k days prior to the event window, $MCAP_{i,\tau_1-1}$ is the natural log of the firms market capitalization on the last date before the event window, BM_{i,τ_1-1} is the book to market value on the last date before the event window, $PERC_{i,\tau}$ is the size of the repurchase plan, DIV_{τ_1-360} is a dummy variable indicating whether a firm has paid any cash dividends during the previous year and $QuickRatio_{i,\tau}$ is the most recently reported quick ratio[35] before the firm announces a repurchase plan.

Panel A in table 4 shows the results from the cross sectional regression when τ_1=-2, τ_2=2 and k=20, and panel B shows the correlations between the variables. As can be seen from panel B, the average pre-event spread ($\overline{SPR}_{i,\tau_1-k}$) is strongly negatively correlated with market capitalization ($MCAP_{i,\tau_1-1}$). This is because large firms generally are more liquid and has lower spreads. In addition, as noted by Vermaelen (1981), small firms may have a greater degree of asymmetric information since they are less closely followed by analysts and the popular press. Thus, both the spread and market capitalization variables capture to a large degree these same characteristics. The second highest correlation is between the book to market (BM_{i,τ_1}) variable and the pre-event (20 days) cumulative abnormal return, which has a significant positive correlation of 0.26. To reduce the multicolinearity problem when including all these variables in the regression, we orthogonalize both the market capitalization against the relative spread measure as well as the book to market variable against the pre announcement CAR (CAR_{i,τ_1-k}).[36] Panel C in the table shows some descriptive statistics for the independent variables. Note that the $MCAP_{i,\tau_1-1}$ is in natural logs and that the $\widehat{CAR}_{i,\tau_1-k}$ is not in percentage terms.

We estimate two models. Model 1 include all variables, and in model 2 the variables related to firm liquidity are omitted. The first thing to note is that the greater (lower) the cumulative excess performance ($\widehat{CAR}_{i,\tau_1-k}$) during the 20 days prior to the announcement, the lower (greater) is the price impact at the announcement date. Although we did not find support for a negative drift in cumulative abnormal returns before the announcement on average in table 3, this indicates that some firms may announce a repurchase plan as a response to a price decline. From an undervaluation viewpoint, this suggests that the market perceives it as more likely that the firm is undervalued the worse the pre-event performance has been, and put more weight on the signal the worse the prior performance of the stock. This finding is similar to what is found in Comment and Jarrell (1991) and Chan et al. (2003) who argue that the credibility of the signal (proxied by the announcement effect) increases with the underperformance of the firm relative to the general market in the period prior to the announcement of the repurchase program. Furthermore, firms with larger spreads (SPR_{i,τ_1-k}) experience a greater price impact at the announcement

[34]The relative spread for a security for a day, τ, is calculated as $SPR_\tau = (ask_\tau - bid_\tau)/[(ask_\tau + bid_\tau)/2]$, where ask_τ and bid_τ is the best ask and bid quotes at the close of day τ.

[35]The quick ratio is calculated as the sum of cash and deposits, total short-term financial investments and total short-term receivables divided by total short-term debt

[36]When estimating the regressions with the original (nonorthogonalized) variables the results are quantitatively similar.

date than firms with smaller spreads. If the spread proxy for market liquidity, this result is expected in the sense that the market price moves more for a less liquid stock. If the announcement results in an excess demand for the stock, at the announcement, the supply side of the order book will be exhausted more easily for a less liquid stock than a more liquid stock. In addition, since the spread may also proxy for asymmetric information, the announcement of a repurchase plan may have a stronger signalling value for a security where there is a higher uncertainty about firm value and potentially more private information is revealed through the announcement. With respect to the market capitalization variable (MCAP) we find that larger firms experience a lower abnormal price impact than smaller firms. As mentioned earlier, the reason for this may be that smaller firms are generally less liquid and that an announcement is more valuable to the market for small firms if there is larger information asymmetries in smaller firms.

Further, we also find that value stocks, with a high book-to-market value, experience a stronger price impact than growth stocks. One interpretation for this is that value firms are more likely to be undervalued relative to growth firms, and that the announcement of a repurchase plan may confirm the markets perception of undervaluation. With respect to the size of the repurchase plan, it does not explain any variation in the announcement effect. Initially, one would expect that a larger repurchase plan would be a stronger signal about undervaluation. However, as discussed earlier, a large fraction of the announcements are for the maximum allowed size of 10%. Thus, there may be too little variation in this variable to account for any variation in the CAR. Wether the firm has paid any dividend the previous year is not related to the announcement effect. With respect to the dividend variable, one could initially expect this to be negative if firms that has paid dividends the previous year is expected to continue paying dividends in the future (dividend smoothing). If firms are expected to continue using excess cash to pay dividends, this lowers the probability that they will repurchase, and the potential positive effects related to repurchases discussed in section 2 are less likely to occur. Finally, the most recent quick ratio before the announcement, is negatively related to the announcement effect. Initially, one would expect this variable to be positive in the sense that liquid firms may be expected to actually execute repurchases such that the signal is more credible when firms are liquid. On the other hand, the announcement may to a greater extent be expected by the market in these cases.

6.2 Long-term performance of firms announcing a repurchase plan

In this section we examine the long term performance of firms announcing a repurchase plan. The main hypothesis to be investigated is the underreaction hypothesis of Ikenberry et al. (1995) who argue that, if a repurchase announcement is a positive signal, this signal should be, in an efficient market, incorporated into prices completely and in an unbiased fashion when the firm announces the repurchase plan. In the previous section we found a significant positive announcement effect of about 2.5%. In panel A of table 5 we report the results from evaluating the long term abnormal performance of a calendar time portfolio of announcing firms. The portfolio is rebalanced every month. All stocks that announce a repurchase plan during a month are added to the portfolio the first day of the following month. At the beginning of each month, all firms receive equal weights in the portfolio. We also examine in panel B of table 5 the performance of our portfolio with respect to various fixed holding periods from 1 to 4 years in addition to a buy-and-hold strategy ("whole sample") where the stock remains in the portfolio for the rest of the period.

Table 4: Cross-sectional CAR regression

Panel A in shows the results from the cross sectional regression of $CAR_i(\tau_1, \tau_2)$ on various variables. Model 1 is estimated as,

$$\begin{aligned}\widehat{CAR}_i(\tau_1, \tau_2) = \alpha + \beta_1 \widehat{CAR}_{i,\tau_1-k} + \beta_2 \overline{SPR}_{i,\tau_1-k} + \beta_3 MCAP_{i,\tau_1-1} \\ + \beta_4 BM_{i,\tau_1-1} + \beta_5 PERC_{i,\tau} + \beta_6 DIV_{i,\tau_1-360} + \beta_7 QuickRatio_{i,\tau} + \epsilon_i\end{aligned} \tag{10}$$

where i denotes the announcements, α is the intercept, $\widehat{CAR}_{i,\tau_1-k}$ is the cumulative abnormal return over the k days prior to the event window, $\overline{SPR}_{i,\tau_1-k}$ is the average spread across the k days prior to the event window, $MCAP_{i,\tau_1-1}$ is the natural log market capitalization on the last date before the event window, BM_{i,τ_1-1} is the book to market value on the last date before the event window, $PERC_{i,\tau}$ is the size of the repurchase plan and DIV_{τ_1-360} is a dummy indicating whether a firm has paid any dividends during the last year and $QuickRatio_{i,\tau}$ is the most recent quick ratio before the announcement. In the regression τ_1=-2, τ_2=2 and k=20. Note that the market capitalization is orthogonalized against the spread measure, and the book-to-market variable is orthogonalized against the $\widehat{CAR}_{i,\tau_1-k}$ variable. Panel B shows the Pearson's correlations coefficients between the variables used in the regressions in panel A. The correlations for MCAP and SPR are before they are orthogonalized. Numbers in bold refer to correlations significantly different from zero at the 5% level. Panel C shows some descriptive statistics for the variables.

Panel A: Cross sectional CAR regression

	Model 1				Model 2			
Variable	Est.	std.err.	p-val.	Part.R^2	Est.	std.err.	p-val.	Part.R^2
Constant	0.041	0.034	0.228	-	0.026	0.036	0.463	-
$\widehat{CAR}_{\tau_1-k}$	-0.165	0.046	<0.001	0.027	-0.151	0.049	0.002	0.027
$\overline{SPR}_{\tau_1-k}$	0.338	0.067	<0.001	0.060	-	-	-	-
$MCAP_{\tau_1-1}$	-0.013	0.005	0.008	0.016	-	-	-	-
BM_{τ_1-1}	0.023	0.006	<0.001	0.051	0.028	0.006	<0.001	0.051
$PERC_i$	-0.179	0.350	0.609	0.000	0.054	0.364	0.882	0.000
DIV_{i,τ_1-360}	-0.031	0.017	0.067	0.008	-0.035	0.018	0.045	0.012
Quick $ratio_\tau$	-0.007	0.002	0.002	0.026	-	-	-	-
adj.R^2	0.171				0.078			
N	318				318			

Panel B: Variable correlations

	$\widehat{CAR}_{\tau_1-k}$	$\overline{SPR}_{\tau_1-k}$	$MCAP_{\tau_1-1}$	BM_{τ_1-1}	$PERC_{i,\tau}$	DIV_{τ_1-240}
$\overline{SPR}_{\tau_1-k}$	0.06					
$MCAP_{\tau_1-1}$	-0.05	**-0.52**				
BM_{τ_1-1}	**0.26**	**0.13**	-0.07			
$PERC-i,\tau$	0.07	**0.12**	**-0.15**	-0.08		
DIV_{τ_1-360}	0.00	-0.01	0.08	**0.12**	-0.07	
Quick $ratio_{i,\tau}$	0.01	0.08	-0.13	-0.03	0.08	-0.02

Panel C: Variable statistics

Variable	Mean	std.dev	min	max
$\widehat{CAR}_{\tau_1-k}$	-0.003	0.132	-0.43	0.33
$MCAP_{\tau_1-1}$ (log)	20.602	1.512	16.13	25.12
BM_{τ_1-1}	1.328	1.111	0.24	8.54
$PERC_i$	0.095	0.018	0.01	0.10
$\overline{SPR}_{\tau_1-k}$	0.064	0.093	0.01	0.81
DIV_{i,τ_1-360}	0.164	0.370	0	1
Quick $ratio_\tau$	2.078	2.668	0.26	31.79

When a stock has been in the portfolio for the duration of the respective holding period, it is removed from the portfolio until it announces a new repurchase plan. To reduce the idiosyncratic risk of the portfolio, we require there to be at least 10 firms that has announced a repurchase plan before we start the portfolio.[37]

Panel A in table 5 shows that for a buy-and-hold portfolio, with no limit on the holding period, the portfolio significantly outperforms the market by about 0.9% per month, or 11% per year, when we adjust for the Fama and French (1993) and Carhart (1997) risk factors. This is in line with results in Ikenberry et al. (1995, 2000) who finds an abnormal performance of 12.1% in the US and 7% per year in Canada respectively. Relative to the CAPM, the excess performance is almost 2% per month, or almost 27% per year, illustrating the importance of adjusting the portfolio performance for additional risk factors in addition to the market risk. When restricting the holding period in panel B, we find, for the Fama/French and Carhart models, that there is a significant excess performance when the holding period is longer than 1 year. With respect to a CAPM specification, the portfolio outperforms regardless of the chosen holding period.

One important point with respect to evaluating the long term abnormal performance in this type of study is that the expected return model may be misspecified. As shown by Kothari and Warner (1997), in a random sample of 200 firms, about 35% of the firms, independent of the benchmark model used, show an abnormal positive and negative abnormal performance over a 36 month period. Although they do not examine these issues in the context of calendar time portfolios (only with respect to the long run performance through event time), they argue that a calendar time approach may involve similar issues. In this study we do not attempt to adjust for such biases, but instead examine several model specifications for expected returns. An alternative approach could be to create a matching portfolio of non announcing firms. However, since there are relatively few listed companies at the OSE,[38] implementing a matching procedure in a satisfactory way may be difficult. As noted by Kothari and Warner (1997), it is not necessarily enough to match on size and book to market, but also other firm characteristics as well.

To examine the robustness of the results in table 5 we also estimate the excess returns when we start the portfolio construction in different years throughout the sample period (1999, 2000 and 2001) and vary the holding period from 1 to 4 years. The results from this analysis, relative to a Carhart (1997) specification is reported in table 5. We also note that the results when we start the portfolio construction in 1999 are very similar to the results in table 5. The reason for this that we do not start the portfolio construction in 1998 before at least 10 firms have announced a repurchase plan, which is in October 1998. Thus, the portfolio construction only starts 3 months later for the portfolio starting in 1999. In addition, since the time series becomes longer the earlier we start our portfolio, the data used in later years are subsets of the data we use when starting the portfolio in earlier years. However, the main point of the analysis is to check to what degree the results change when we change the starting point of the sample. The results are similar to those in panel B in table 5. There is no significant excess performance for the announcement portfolio for holding periods of one year. However, for holding periods of two years or longer, there is a significant abnormal performance regardless of the year when we start the portfolio construction.

To summarize the analysis so far, both the results in table 5 and 6 support the under-

[37] When we use the entire sample period, this result in our portfolio starting in October 1998, when 10 firms had announced a repurchase plan.

[38] In the end of 1999, 2000 and 2001 there were respectively 215, 214 and 212 listed firms at the OSE.

Table 5: Long term performance of the announcement portfolio

The table shows the excess performance of a calendar time portfolio of firms announcing a repurchase plan. The excess return on the portfolio is both measured relative to a one-factor CAPM model (*i*), a three factor Fama and French (1993) model (*ii*) and a four factor Carhart (1997) model (*iii*),

$$
\begin{aligned}
(i) \quad & R_{p,t} - R_{f,t} = \alpha + \beta_m (R_{m,t} - R_{f,t}) + \varepsilon_t \\
(ii) \quad & R_{p,t} - R_{f,t} = \alpha + \beta_m (R_{m,t} - R_{f,t}) + \beta_{hml} R_{hml,t} + \beta_{smb} R_{smb,t} + \varepsilon_t \\
(iii) \quad & R_{p,t} - R_{f,t} = \alpha + \beta_m (R_{m,t} - R_{f,t}) + \beta_{hml} R_{hml,t} + \beta_{smb} R_{smb,t} + \beta_{mom} R_{mom,t} + \varepsilon_t
\end{aligned}
$$

where $R_{p,t}$ is the return on the equally weighted portfolio of announcing firms, R_t^f is our proxy for the risk free rate, R_τ^m, R_τ^{hml}, R_τ^{smb} and R_τ^{mom} are the returns on the market-, the book to market-, the size- and the momentum factors respectively, and the β's are the factor exposures. The factor returns are calculated similarly as in eq. 3 and α measures the average daily abnormal performance of the portfolio relative to the excess return on the factor portfolios. The portfolio is rebalanced at the beginning of every month, and firms that announced a repurchase plan during the previous month is included in the portfolio. Panel A shows the results for our buy-and-hold portfolio when stocks are not sold (the stocks in the portfolio are hold through the entire sample from when they enter), and Panel B shows the results when we vary the holding period from 1 months to the entire sample period. In both panel A and panel B the average daily excess return, α, is reported in percent.

Panel A: Buy-hold portfolio performance (no limit on holding period)

	CAPM	t-value	Fama/ French	t-value	Carhart	t-value
α (%)	0.10	4.71	0.04	2.29	0.04	2.30
β_m	0.58	33.79	0.72	38.88	0.72	37.94
β_{smb}	-	-	0.27	13.51	0.27	13.38
β_{hml}	-	-	0.06	3.74	0.05	2.90
β_{mom}	-	-	-	-	-0.02	-0.98
adj.R^2	0.523		0.602		0.602	
N	1041		1041		1041	

Panel B: Various holding periods

Holding period	CAPM		Fama/French		Carhart	
	α(%)	t-value	α(%)	t-value	α(%)	t-value
1 year	0.064	2.18	0.008	0.28	0.008	0.27
2 years	0.087	4.49	0.036	1.98	0.036	1.99
3 years	0.100	4.61	0.046	2.28	0.047	2.29
4 years	0.099	4.73	0.045	2.31	0.045	2.32
Whole sample	0.098	4.71	0.044	2.29	0.045	2.30

reaction hypothesis of Ikenberry et al. (1995, 2000). The reaction to the announcement of repurchase plans found in table 3 seem to be incomplete relative to the true value of the signal conveyed through the announcement proxied by the long term excess performance following the announcement. The subsequent abnormal performance for announcing firms may be related to information surprises through e.g. public announcements or unexpected earnings reports that occur after the announcement of the repurchase plan. However, we cannot exclude the possibility that the excess performance may be due to miss-specification of the expected returns model as discussed in Kothari and Warner (1997) among others. We try to reduce the misspecification by using several model specifications for expected returns. Including the size, book to market and momentum factors, reduces the excess performance estimate relative to a CAPM specification. However, for horizons longer than one year, there is still evidence that the portfolio of announcing firms experience an excess performance after having accounted for the portfolios exposure to these risk factors.

Table 6: Long term performance of announcement portfolio - varying starting year
The table shows the excess performance of a calendar time portfolio of firms announcing a repurchase plan for various starting years and holding periods. The excess return on the portfolio is measured relative to a four factor Carhart (1997) model,

$$R_{pt} - R_t^f = \alpha + \beta_m (R_t^m - R_t^f) + \beta^h R_t^{hml} + \beta^s R_t^{smb} + \beta^{mom} R_t^{mom} + \varepsilon_t$$

where R_{pt} is the return on the equally weighted portfolio of announcing firms, R_t^f is our proxy for the risk free rate, R_τ^m, R_τ^{hml}, R_τ^{smb} and R_τ^{mom} are the returns on the market-, the book to market-, the size- and the momentum factors respectively, and the β's are the factor exposures. The factor returns are calculated similarly as in eq. 3 and α measures the average daily abnormal performance of the portfolio after having adjusted for the Carhart risk factors. The portfolio is rebalanced at the beginning of every month, and firms that announced a repurchase plan during the previous month is included in the portfolio. The results when starting the portfolio construction in 1998 and 1999 are quite similar. This is mainly because we do not start the portfolio in 1998 before enough firms (10 firms) have announced a repurchase plan which is in October 1998.

	Year when starting portfolio construction					
	1999		2000		2001	
Holding period	α(%)	t-value	α(%)	t-value	α(%)	t-value
1 year	0.009	0.31	0.008	0.23	0.02	0.46
2 years	**0.038**	2.11	**0.044**	2.09	**0.07**	2.59
3 years	**0.049**	2.40	**0.059**	2.38	-	-
4 years	**0.048**	2.44	-	-	-	-

6.3 Long term performance conditional on repurchase activity

In the previous section we found support for the underreaction hypothesis in the Norwegian market. In this section we examine more closely the nature of the excess performance. Moreover, we study whether the fact that a firm actually execute a repurchase or not is important for the subsequent performance.

This is motivated by the fact that a repurchase announcement itself is not a commitment to actually repurchase shares. Furthermore, the announcement does not impose any costs on the managers in the announcing firms if the announcement is false.[39] Thus, as

[39] As proposed by Fried (2002), if managers act opportunistically they may also announce a repurchase

Table 7: Announcement CAR given subsequent repurchase activity

The table shows the abnormal returns (in percent) for different periods around the announcement of repurchase programs that resulted in actual repurchases versus announcements that did not result in subsequent repurchases. The table also show the p-value from a test that the means between the two groups are equal.

		Days relative to announcement date (τ_1 to τ_2)		
	n	-60 to -3	-2 to +2	+3 to +60
Announcement, no repurchase	133	-0.05%	2.39%	0.89%
Announcement, repurchase	185	-0.40%	2.78%	0.43%
Test for difference in means (p-value)		0.54	0.75	0.62

discussed in Fried (2002) and Comment and Jarrell (1991), the credibility of the signal may be questionable. On the other hand, when a firm actually executes a repurchase, this may be perceived as a stronger signal about undervaluation since it involves real transactions. Especially, if the manager or other insiders owns a stake in the company, since if they repurchase when the firm is overvalued, the managers will increase their ownership in an overvalued firm (assuming that they retain their shares). Thus, when the market observes that the firm executes a repurchase it may be interpreted as a signal (or confirmation of the initial signal) that the the firm is actually undervalued.

Given that undervaluation is the main motivation for why firms repurchase shares, the actual repurchase executions should be a positive signal to the market about firm value. Moreover, one would expect the firm to execute repurchases until the firm is no longer undervalued. If this is the case we expect the market to react positively to the actual repurchases, and increase prices closer to the true value. Furthermore, if the firms repurchase activity increases the price closer to the true value, reducing the mispricing, this should also reduce the subsequent long run excess performance for these firms.[40]

Announcements that do not result in subsequent repurchases, may be because of several reasons. First of all, the firm may simply not be mispriced after the announcement. If these firms are more able to credibly signal that they are undervalued through the announcement of a repurchase plan, and the market fully reacts to the information conveyed by the announcement, one would *not* expect these firms to repurchase any shares after the announcement (at least not for undervaluation reasons). If this is the case, we would expect announcements that do not result in subsequent repurchases to experience a greater announcement effect than announcements that result in subsequent repurchases. To check this, we examine, in table 7, whether announcements that do not result in subsequent repurchases experience a stronger announcement effect than announcements that result in repurchases. The results suggest that the announcement effect (as well as the pre- and post-announcement CAR) is similar for the two groups. Thus, there is no evidence that announcements which result in subsequent repurchases experience a greater underreaction than announcements that do not result in repurchases. Rather, the market reaction in the two cases are remarkably similar.

plan when the firm is not undervalued to boost the stock price when selling.

[40] As discussed in section 2, firms also repurchase shares for many other reasons than undervaluation. However, our main discussion will be centered around the undervaluation hypothesis.

Another reason for why firms do not execute any repurchases may be because of liquidity reasons. This can be due to low profitability or that they do not have any excess cash available for repurchasing shares. Thus, from an undervaluation perspective, the managers may want to repurchase shares due to undervaluation, but are unable to do so.[41] An additional reason for why firms do not repurchase shares during the course of a repurchase program is discussed in Ikenberry et al. (2000). Findings in Ikenberry et al. (2000) indicates that managers are sensitive to price movements. Thus, if the price increases, such that the stock potentially becomes overvalued, the manager may choose not to execute repurchases.

Our main hypothesis is that if managers execute repurchases to exploit undervaluation, and the market efficiently reacts to the signal conveyed through the actual repurchases, the repurchase activity should mitigate the mispricing. Moreover, the price should increase towards the "true" value if the actual repurchases signal undervaluation. This should further reduce the subsequent excess returns closer to expected levels for a portfolio of these firms. In other words, we should observe a lower subsequent abnormal performance for repurchasing firms if the initial repurchases are successful in reducing the mispricing. In addition, we should also see a positive, and permanent price impact from the actual repurchases if the market respond favorably to the information that the firm has executed repurchases (this will be examined more closely in section 6.4).

Relative to what we expect to see for the group of non-repurchasing firms, this is not clear. As discussed earlier, these firms may both choose to repurchase because they are not mispriced which imply that these firms should perform as expected. Alternatively, these firms may experience a price increase after the announcement such that the managers choose not to repurchase any shares (Ikenberry et al., 2000), in which case we expect these firms to show an abnormal performance if the price increase is related to new information. Also, if these firms are undervalued after the announcement, but are unable to execute repurchases due to e.g. liquidity constraints, we would also expect these firms to show an long run abnormal performance if prices are adjusted in response to favorable information arrivals in later periods. On the other hand, if these firms choose not to repurchase because they are overvalued, we would expect these firms to underperform in the long run.

To examine these questions in more detail, we construct a portfolio through calendar time in the similar fashion as we did when we examined the long term performance of announcing firms in the previous section. However, instead of only selecting our portfolio stocks conditional on whether the firm has announced a repurchase plan, we now also condition our stock selection on whether a firm has executed its first repurchase as well. More specifically, we create two portfolios, assigning firms based on whether they have repurchased shares in the previous period or not. In the first portfolio (P1) we include a firm the first day of the month following the month when it announced a repurchase plan (similar to the portfolio created in the previous section). Next, if a firm in P1 executes a repurchase, we remove the firm from P1 the following day and include it in a second portfolio (P2) the first day of the following month after it for the first time has executed a repurchase.[42] Thus, P1 will at any point in time only contain firms that have announced a repurchase plan, but not yet repurchased, while P2 contains firms that have

[41] The managers could also issue debt to finance the repurchases, but this may be costly if the firm already have a high leverage ratio or that the undervaluation is to small to justify an issue of debt.

[42] Firms may execute several repurchases before it is included in P2. However, the potential price effect of these repurchases will not be included in either P1 or P2. Only the effect of the first repurchase will be included in the return of P1.

Table 8: Long term performance conditional on repurchase activity

The table shows the excess performance of two calendar time portfolios. P1 is the portfolio with announcing firms that do not execute any repurchases, only announces. P2 is a portfolio of repurchasing firms where a firm is included in the portfolio the month after it has executed its first repurchase. The firm is excluded from P1 one day after it has repurchased for the first time. Thus, at any point in time, P1 consists of firms that has announced a repurchase plan, but has not executed any repurchases, while P2 consists of firms that has executed at least one repurchase. The excess returns on the two portfolios are estimated relative to a one-factor CAPM model (i), a three factor Fama and French (1993) (ii) and a four factor Carhart (1997) model (iii),

$$
\begin{aligned}
(i) \quad & R_{p,t} - R_{f,t} = \alpha + \beta_m (R_{m,t} - R_{f,t}) + \varepsilon_t \\
(ii) \quad & R_{p,t} - R_{f,t} = \alpha + \beta_m (R_{m,t} - R_{f,t}) + \beta_{hml} R_{hml,t} + \beta_{smb} R_{smb,t} + \varepsilon_t \\
(iii) \quad & R_{p,t} - R_{f,t} = \alpha + \beta_m (R_{m,t} - R_{f,t}) + \beta_{hml} R_{hml,t} + \beta_{smb} R_{smb,t} + \beta_{mom} R_{mom,t} + \varepsilon_t
\end{aligned}
$$

where $R_{p,t}$ is the return on the equally weighted portfolio of announcing firms, R_t^f is our proxy for the risk free rate, R_τ^m, R_τ^{hml}, R_τ^{smb} and R_τ^{mom} are the returns on the market-, the book to market-, the size- and the momentum factors respectively, and the β's are the factor exposures. The factor returns are calculated similarly as in eq. 3 and α measures the average daily abnormal performance of the portfolio relative to the excess return on the factor portfolios. The table shows the results for buy-and-hold portfolios for which stocks are not sold (the stocks in the portfolio are held through the entire sample from when they enter the portfolio). The estimated average daily excess return, α, is reported in percent, and numbers in bold denote an α estimate significant at the 5% level.

	CAPM		**Fama/French**		**Carhart**	
	P1 (norep)	P2 (rep)	P1 (norep)	P2 (rep)	P1 (norep)	P2 (rep)
α (%)	**0.10**	**0.10**	**0.06**	0.03	**0.06**	0.03
p-value	0.00	0.00	0.03	0.20	0.03	0.20
β_m	0.58	0.56	0.68	0.72	0.67	0.73
β_{smb}			0.20	0.31	0.20	0.32
β_{hml}			0.05	0.04	0.01	0.06
β_{mom}					-0.08	0.03
adj.R^2	0.39	0.37	0.42	0.45	0.43	0.45
Avg. firms	45	69	45	69	45	69

executed at least one repurchase following an announcement. The combined portfolio of the firms in P1 and P2, is the portfolio that was analyzed in section 6.2, such that P1 and P2 represent a decomposition of the announcement portfolio.[43] The fraction of firms actually repurchasing and the fraction of outstanding shares actually repurchased among Norwegian firms is reported in table 1. Thus, at the end of the sample period in the scenario with no limit on the holding period, and we start the portfolio construction at the beginning of the sample, we will be left with 63 firms in P1 and 100 firms in P2 at the end of the sample period.

In table 8 we estimate the performance of the two portfolios relative to the CAPM, Fama and French (1993) three factor model and the Carhart (1997) four factor model. On average the portfolio of firms that has not repurchased, P1, consists of 45 firms while the portfolio firms that execute at least one repurchase, P2, contains on average 69 firms. For diversification reasons, we do not start our portfolio construction before both portfolios each contain at least 10 firms, which is in May 1999. Estimating Jensen's alpha with

[43] One difference however, is that since firms are removed the day after they repurchase and not included in P2 before the first day of the next month, there is a window where a repurchasing firm is excluded from both portfolios.

respect to the CAPM, both portfolios show a significant abnormal performance of 2% (P1) and 1.6% (P2) per month. However, relative to the Fama/French and Carhart specifications, the results indicate that P2 does not experience an abnormal performance while P1 experience a significant abnormal performance of about 1.2% per month. In other words, the portfolio tracking the portfolio of repurchasing firms (after they have executed their first repurchases) perform as expected while the portfolio of firms that announces, but do not repurchase, experience an excess performance.

This result may indicate that actual repurchases provide useful information to the market which may be related to the confirmation of the initial announcement signal, permanently increasing the price such that mispricing is mitigated, and subsequent returns are reduced to expected levels. However, we cannot exclude the possibility that these firms do not repurchase shares for undervaluation reasons. In addition, the result may also indicate that managers repurchase shares when their underperforms, such that the average performance of this portfolio is lower than the portfolio where managers do not execute any repurchases. We will examine the abnormal price impact of the actual repurchases in the next section to investigate whether it is likely that the actual repurchases mitigate mispricing.

Our results are also consistent with earlier findings. Stephens and Weisbach (1998) find, using quarterly repurchase data for Canada, that repurchases during one quarter appear to be negatively related to unadjusted returns in the previous (and contemporaneous) quarter. This suggests that managers respond to previous price changes when determining whether to repurchase or not. In addition, they find that subsequent returns is lower in the quarters after the firm has repurchased. This finding is also confirmed in, Ikenberry et al. (2000), using monthly repurchase data from Canada. In addition, Ikenberry et al. (2000) find that stock performance in the year following the announcement of a repurchase plan decreases with the repurchase activity. They argue that this is because managers time their repurchases to times when the firm is perceived by the manager of the firm as being undervalued, such that these firms experience a lower excess performance on average.

This points to an issue that is not examined in the paper. The decision to repurchase is likely to be related to events occurring after the announcement of the repurchase program, such that the repurchases (or non repurchases) observed ex post were not necessarily intended ex ante. This is an important and interesting issue since announcing firms are likely to "self select" into being repurchasers or non-repurchasers. Furthermore, this may explain the finding that repurchasing firms has a lower abnormal performance than non repurchasing firms. It may be that firms choose not to repurchase because the price of their stock has increased reflected by the abnormal performance of P1, while non-repurchasers choose to repurchase because their stock has performed poorly. An interesting extension would be to examine this self selection in more detail to study what are the important decision variables that induce announcing firms to execute repurchases or not.

Since the results in table 8 are for the whole sample period for a buy-an-hold strategy, we also check the robustness of our results by creating portfolios starting in different years as well as with various holding periods. The results from this analysis is reported in table 9. With respect to the different starting years, the results are qualitatively the same as in table 8, but quantitatively stronger in the later part of the sample. When we also vary the holding period, we find that the abnormal performance for P1 is significant for holding periods longer than one year. This is similar to the results when we examined the performance for all firms in table 5.

So far we have not discussed in detail what may contribute to the abnormal perfor-

Table 9: Long term performance conditional on repurchase activity - varying starting year and holding period

The table shows the excess performance of two calendar time portfolios for varying starting years and holding periods. P1 is the portfolio with announcing firms that do not execute any repurchases, only announces. P2 is a portfolio of repurchasing firms where a firm is included in the portfolio the month after it has executed its first repurchase. Thus, at any point in time, P1 consists of firms that has announced a repurchase plan, but has not executed any repurchases, while P2 consists of firms that has executed at least one repurchase. The excess returns on the two portfolios are both measured relative to a four factor Carhart (1997) model,

$$R_{pt} - R_t^f = \alpha + \beta_m (R_{m,t} - R_t^f) + \beta_{hml} R_{hml,t} + \beta_{smb} R_{smb,t} + \beta_{mom} R_{mom,t} + \varepsilon_t$$

where R_{pt} is the return on the equally weighted portfolio of announcing firms, R_t^f is our proxy for the risk free rate, R_τ^m, R_τ^{hml}, R_τ^{smb} and R_τ^{mom} are the returns on the market-, the book to market-, the size- and the momentum factors respectively, and the β's are the factor exposures. The factor returns are calculated similarly as in eq. 3 and α measures the average daily abnormal performance of the portfolio relative to the excess return on the factor portfolios. The average daily excess return, α, is reported in percent, numbers in parentheses are p-values for the α estimates, and numbers in bold represent a significance at the 5% level.

Year when starting portfolio construction

Max. holding period	1999		2000		2001	
	α(P1)	α(P2)	α(P1)	α(P2)	α(P1)	α(P2)
1 year	0.045	0.013	0.069	-0.007	**0.134**	0.028
	(0.191)	(0.727)	(0.128)	(0.86)	(0.039)	(0.655)
2 years	**0.066**	0.012	**0.089**	-0.006	**0.121**	0.017
	(0.046)	(0.658)	(0.033)	(0.832)	(0.034)	(0.665)
3 years	**0.063**	0.028	**0.083**	0.016	·	·
	(0.036)	(0.231)	(0.027)	(0.533)	·	·
4 years	**0.061**	0.029	·	·	·	·
	(0.025)	(0.308)	·	·	·	·

Table 10: Long term performance conditional on repurchase activity - removing initial repurchase in P1

The table shows the excess performance of two calendar time portfolios. P1 is the portfolio with announcing firms that do not execute any repurchases, only announces. To examine whether the the effect of the initial repurchase contribute to the excess performance of P1, we exclude a firm five days before it executes its first repurchase. P2 remains identical as in the previous analysis where firms are included in the first day of the month after it has executed its first repurchase. Thus, at any point in time, P1 consists of firms that has announced a repurchase plan, but has not executed any repurchases, while P2 consists of firms that has executed at least one repurchase. The excess returns on the two portfolios are both measured relative to a one-factor CAPM model (i), a three factor Fama and French (1993) (ii) and a four factor Carhart (1997) model (iii),

$$
\begin{aligned}
(i) \quad & R_{p,t} - R_{f,t} = \alpha + \beta_m (R_{m,t} - R_{f,t}) + \varepsilon_t \\
(ii) \quad & R_{p,t} - R_{f,t} = \alpha + \beta_m (R_{m,t} - R_{f,t}) + \beta_{hml} R_{hml,t} + \beta_{smb} R_{smb,t} + \varepsilon_t \\
(iii) \quad & R_{p,t} - R_{f,t} = \alpha + \beta_m (R_{m,t} - R_{f,t}) + \beta_{hml} R_{hml,t} + \beta_{smb} R_{smb,t} + \beta_{mom} R_{mom,t} + \varepsilon_t
\end{aligned}
$$

where $R_{p,t}$ is the return on the equally weighted portfolio of announcing firms, R_t^f is our proxy for the risk free rate, R_τ^m, R_τ^{hml}, R_τ^{smb} and R_τ^{mom} are the returns on the market-, the book to market-, the size- and the momentum factors respectively, and the β's are the factor exposures. The factor returns are calculated similarly as in eq. 3 and α measures the average daily abnormal performance of the portfolio relative to the excess return on the factor portfolios. The table shows the results for buy-and-hold portfolios for which stocks are not sold (the stocks in the portfolio are held through the entire sample from when they enter the portfolio). The estimated average daily excess return, α, is reported in percent, and numbers in bold denote an α estimate significant at the 5% level.

	CAPM		**Fama/French**		**Carhart**	
	P1 (norepo)	P2 (repo)	P1 (norepo)	P2 (repo)	P1 (norepo)	P2 (repo)
α (%)	**0.09**	**0.10**	**0.06**	0.03	**0.06**	0.03
p-value	0.00	0.00	0.04	0.24	0.04	0.20
β_m	0.58	0.56	0.68	0.72	0.66	0.73
β_{smb}			0.20	0.31	0.19	0.32
β_{hml}			0.05	0.04	0.01	0.06
β_{mom}					-0.08	0.03
adj.R^2	0.39	0.37	0.42	0.45	0.42	0.45
Avg. firms	45	69	45	69	45	69

mance of P1. As discussed in the beginning of this section, the abnormal performance of this portfolio may be due to several reasons. However, one issue that may affect the excess performance of P1 is that a stock is removed after it has repurchased shares for the first time after the announcement. If there is an strong abnormal price impact related to the first repurchase execution, this may affect the performance of P1.

To examine to what degree this contributes to the abnormal performance of P1, we re-estimate the models in table 8, but exclude each firm from P1 five days before it execute its first repurchase. Thus, the excess returns related to the initial repurchases should then not be included in the performance of P1. The results from this analysis is reported in table 10, and it does not change the results greatly relative to the results in table 8. However, the estimated alpha for P1 decreases slightly, as well as its p-value, but the alpha is still significant at the 5% level for P1. Thus, the initial repurchase seem to have an impact on the performance of P1, but it does not explain the overall abnormal performance of P1.

An alternative reason for why firms choose not to repurchase shares may be that the stock price increases such that the manager choose not to repurchase any shares (Ikenberry

et al., 2000). This may clearly be a potential reason for why P1 experience a long term abnormal performance. However, another explanation for why these firms do not execute any repurchases may be that the firms do not have any cash available to repurchase shares. Thus, if these firms experience an underreaction when they announce the repurchase plan, such that they are undervalued after the announcement, it may be that they are unable to signal to the market that they are mispriced through actual repurchases due to liquidity constraints. Moreover, given that the market underreacts to the signal conveyed through the initial announcement, and the firm is undervalued after the announcement, the lack of repurchase activity keeps the price at a low level, resulting in abnormal returns when the market is faced with positive information surprises in later periods.

To examine more closely whether low liquidity is a likely reason for why firms do not repurchase, we examine measures of liquidity from accounting data. The liquidity measures we use are the most recently reported quick ratios and current ratios prior to the announcements of the repurchase plans. The current ratio is calculated as the total short-term assets divided by total short-term debt, and the quick ratio is calculated as the sum of cash and deposits, total short-term financial investments and total short-term receivables divided by total short-term debt. In table 11 we examine the difference in liquidity between the firms in the two groups. The "no repurchase" group contains firms that do not repurchase shares during the sample (the firms in portfolio P1 in the above analysis). The first column of the table also contain the average liquidity measure for all firms listed at the OSE.[44] The results suggests that non-repurchasing firms are on average significantly less liquid than repurchasing firms. Although this varies somewhat across the years, the overall difference in liquidity between non-repurchasing and repurchasing firms support a hypothesis that at least some announcing firms do not execute repurchases due to lack of liquidity. Furthermore, it also substantiates our story that since these firms are constrained from repurchasing, and more credibly signal undervaluation, they experience a long-term abnormal drift due to e.g. information surprises in later periods.

To summarize, the results in this section indicates that the long term abnormal performance experienced by firms that announce a repurchase plan, mainly is due to firms that do not repurchase shares (P1). These results does not provide an explanation for the underreaction hypothesis proposed by Ikenberry et al. (1995). However, it offers an alternative interpretation in that the market rationally underreacts at the announcement date due to the low credibility of the signal. If a firm actually executes a repurchase, this may be a stronger signal of undervaluation, such that the market price is increased and the subsequent performance is reduced to expected levels. With respect to why the firms that do not repurchase experience a long term abnormal performance, we propose several explanations. This may be because these firms experience a price increase after the announcement reflected in the excess performance for this group, such that the manger chooses not to execute any repurchases. An additional interpretation, may be that these firms are unable to signal undervaluation, such that they on average experience a positive drift when positive information about the firms are announced in later periods.

[44]Before averaging across all the firms, we filter away the extreme observations in the upper 99% percentile. This removes 6 observations (within different years) with the largest having a quick ratio of more than 1000.

Table 11: Liquidity difference

The table shows the average liquidity of firms announcing a repurchase plan conditional on whether they execute repurchases for the duration of the repurchase plan or not. Results are supplied for the whole sample (All years) as well as for announcements occurring within separate years. The first column report the average across all firms at the OSE. The proxies used to measure liquidity are the "current ratio" calculated as total short-term assets divided by total short-term debt, and the "quick ratio" calculated as the sum of cash and deposits, total short-term financial investments and total short-term receivables divided by total short-term debt. The liquidity measure is the most recently reported by the firm before it announces the repurchase plan. We perform t-tests for differences in means between firms that announce a repurchase plan but do not repurchase (1) and firms that execute repurchases (2). The first test is a one sided test with the null that non-repurchasing firms has a higher or equal liquidity to firms that repurchase. The second test is a two sided test with the null hypothesis that the two means are equal. The p-values are adjusted conditional on whether the variance of the two distributions are significantly different at the 5% level or not.

	All OSE firms	No repurchase (1)			Repurchase (2)			Test for difference in means	
	Mean	Mean	Std.err	N	Mean	Std.err	N	(2) <= (1) p-value	(1) = (2) p-value
Quick ratio									
All years	2.32	1.66	0.14	63	2.47	0.24	100	<0.01	<0.01
1998	2.48	1.97	0.38	13	1.91	0.31	15	0.54	0.91
1999	2.31	1.55	0.22	44	2.23	0.31	41	0.04	0.08
2000	2.36	1.41	0.18	25	2.88	0.43	65	<0.01	<0.01
2001	2.14	1.84	0.31	49	2.37	0.49	60	0.18	0.37
Current ratio									
All years	2.65	1.98	0.14	63	2.72	0.23	100	<0.01	0.01
1998	2.96	2.31	0.35	13	2.10	0.29	15	0.68	0.63
1999	2.62	1.86	0.21	44	2.56	0.21	41	0.03	0.05
2000	2.63	1.74	0.22	25	3.13	0.42	65	<0.01	<0.01
2001	2.36	2.16	0.33	49	2.58	0.49	60	0.24	0.47

6.4 The timing and price impact of the actual repurchases

In the previous sections we found evidence that the market on average underreacted to the announcement of a repurchase plan, suggesting that the information in the initial signal was slowly incorporated into prices over time. In addition, we found that the apparent underreaction seemed to be mainly related to firms that announced a repurchase plan, but did not execute any repurchases during the course of the plan.

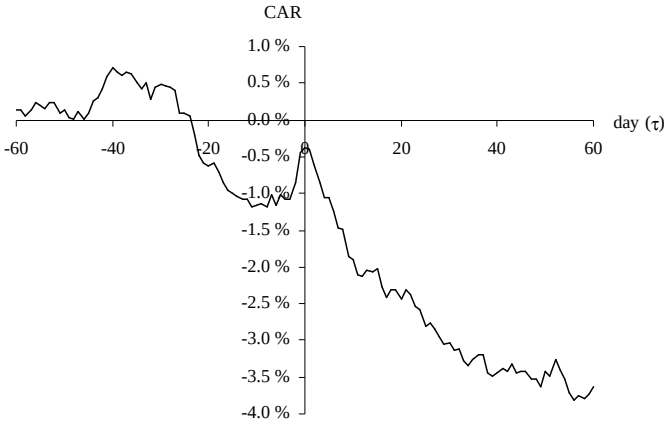
In this section we look closer at the short term effect in the days surrounding the actual repurchases. Moreover, we examine whether and to what degree the actual repurchases are interpreted by the market as informative to the value of the firm. If the repurchase is interpreted as a valuable positive signal, we should observe on average a positive abnormal return on the repurchase date, and that there is no reversal in the CAR after the repurchase. This would be in line with our interpretation of the results in the previous section that the repurchases mitigate mispricing. Alternatively, an effect from the repurchase may also be related to trading activity of the firm, in which case we would expect to see only a temporary effect.

Initially, in the extreme case where undervaluation is the only motive for why a firm announces a repurchase plan, undervaluation should also be the main motivation for why firms actually execute repurchases. However, as discussed in Ikenberry et al. (2000), the manager may also repurchase because he perceives the firm to be undervalued after large price declines. Relative to the initial announcement, the actual repurchases reflect real transactions and may be more credible signals to the market than the announcement of the plan when there is no commitment to repurchase. Furthermore, when a firm announces a repurchase plan, this may not be related to the firm being undervalued at the time, but rather to give the managers the flexibility to exploit windows of opportunity some point in the future. Thus, examining the price impact of the actual repurchases may give us more information about whether undervaluation is a potential explanation for why firms repurchase shares and how the market react to the actual repurchase. If managers successfully identify when the firm is undervalued, one would expect their timing to coincide with a preceding negative drift in abnormal returns. Results in Ikenberry et al. (2000) suggest that this is the case, but are unable to examine the pattern in excess return around the repurchase date since they only have monthly repurchase aggregates. However, their results indicate that firms repurchase more in periods when the stock price falls.

To examine the effect of actual share repurchases, we apply a similar event study methodology to the one used in section 6.1, and use the actual repurchase announcement date as the event. This date is either the same day as the repurchase or before the trading session starts the next day. One main problem with analyzing the actual repurchases is that there are about 1375 repurchase events over a 4 year period. Since firms often repurchase shares on several days in a row, this clustering of events is problematic in several respects. First of all, if a firm execute several repurchases in sequence, the event dates will be overlapping and dependent. This results in the post and pre-event excess returns being averaged across overlapping periods. Thus, if firms repurchase when there is a negative drift in excess returns, the average negative excess return will be exaggerated. Figure 2 shows the average cumulative abnormal returns from 50 days before to 50 days after the repurchase when we ignore these problems and use all 1375 repurchase events. Although the numbers used in the figure are subject to several problems related to the clustering of events, and that firms that repurchase more gain a larger weight, it illustrates that repurchases are executed in periods when the stock experience a downward drift

Figure 2: CAR around actual repurchases - unfiltered

The figure shows the CAR from 50 days before the actual repurchase until 50 days after the repurchase. In the figure we average across all 1375 event dates.



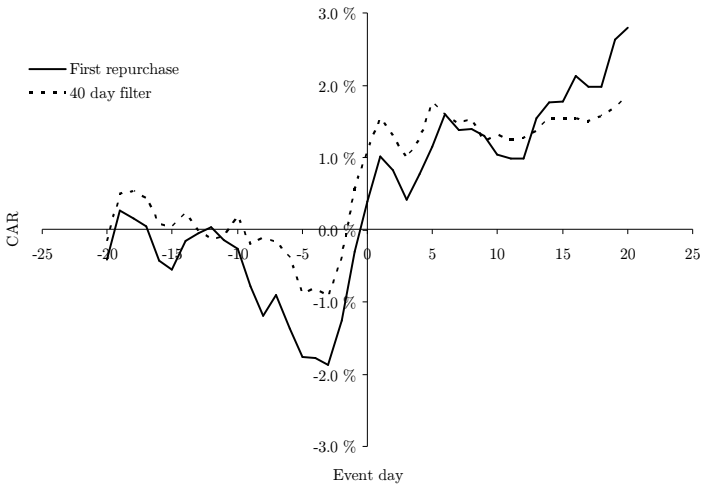
in abnormal performance. In addition, there seem to be a temporary increase in the stock price around the repurchases date. Thus, the normal performance of the repurchase portfolio (P2) in the previous section, may be because these firms perform worse on average than non-repurchasing firms in (P1).

To reduce the bias related to the clustering of repurchases discussed above, we calculate short term excess returns for two main cases. First, for each firm, we restrict repurchases to be 40 days apart to be included in the sample. Although this reduces the bias related to overlapping, the excess returns both before and after the repurchase contain potential abnormal price movements related to repurchases that are not included in the sample, but are still reflected in the returns. We also examine excess returns surrounding only the first repurchase executed by a firm, leaving us with 100 repurchase events. The results from this analysis is illustrated in figure 3. In both cases, there seem to be a negative drift in CAR prior to the repurchase and a price impact on the event date. However, pre event CAR is not significant at any conventional levels. The most important thing to note is that the price impact is permanent, in the sense that there is no reversal in CAR at least 20 days after the repurchase. If the impact was mainly a liquidity effect, we would expect to see a reversal in the day after the actual repurchase. Thus, the abnormal permanent price impact is in line with the market interpreting the repurchase as a positive signal and/or a confirmation of the initial announcement of the repurchase plan. This support our interpretation of the results in the section 6.3, in the sense that repurchases permanently increase prices, and mitigate the undervaluation.

One concern with the argument in section 6.3 is that many of the firms that have executed their first repurchase, execute several repurchases. In fact 81% of the firms execute two repurchases, and 26% of the firms execute 10 repurchases. Thus, if each repurchase has an impact on excess returns, we would expect to see an abnormal performance related to these subsequent repurchases which should create a positive drift in the repurchase portfolio (P2). On the other hand, it may be that most of the signalling value of the

Figure 3: CAR around actual repurchases - filtered

The figure shows the CAR from 20 days before the firm announces that it has repurchased until 20 days after the announcement, when we restrict repurchases not to be within 40 trading days of each other (40 day filter) and when we only look at the first repurchase executed by a firm (first repurchase).



repurchase activity is related to the first repurchase conducted by a firm, since it conveys to the market that the firm is committed to actually repurchasing shares. If so, most of the price correction occurs before the stock is included in the second portfolio (P2), such that the subsequent performance is not affected by the continuing repurchase activity. To examine this in more detail we estimate the CAR for the three day period surrounding the actual repurchase, from τ_1=-1 (when the firm actually execute the repurchase), through τ_2=1 (one day after the firm has announced that it has repurchased). We do this for each n'th repurchase event. In table 12 "Repurchase number" denotes the sequence number of the repurchase. Thus, 100 firms executed one repurchase, 81 firms execute a second repurchase etc. For each subsequent repurchase event we report the percentage CAR for the event window, the standard deviation of the CARs related to the event and the associated t-value. As opposed to the event study in section 6.1 where we estimated the variance for the excess returns prior to the event, we use the event window standard deviation when we examine the abnormal returns related to actual repurchases. This estimator of the variance takes into account the possibility that the event itself increases the risk of the firm, as suggested in Campbell et al. (1997). In addition, the two last columns of the table shows the average fraction that firms repurchase during the n'th repurchase, both with respect to the total number of shares they repurchase in the program as well as as a percentage of outstanding shares. The results in the table indicate that the first repurchase executed by firms has the greatest price impact of about 0.88% which is highly significant. This may suggests that the first repurchase contains the most value to the market. After the first repurchase there seem to be a decrease in the effect from the subsequent repurchases.

It is also interesting to note that firms on average repurchase about 38% of their total repurchase amount during their first repurchase. This is also evident when looking at the repurchase volume as a fraction of outstanding shares, with about 1.1% of the firm

Table 12: CAR for subsequent repurchase events

The table shows the average cumulative abnormal return from τ_1=-1 to τ_2=1 for the 15 first repurchases executed by firms. The first column ("Repurchase number") denotes whether it is the first, second, third etc. repurchase executed by the sample firms. Thus, we see from the table that 100 firms executed one repurchase, 81 firms executed a second repurchase, 66 firms executed a third repurchase and so on. $\%CAR(\tau_1, \tau_2)$, is the average CAR around the n'th repurchase executed by firms. The table also report the t-value from a test that the CAR is equal to zero, the average fraction of the total volume repurchased by firms in the n'th repurchase and the average% of outstanding shares repurchase by firms in the n'th repurchase.

Repurchase		%CAR			avg.fraction	
number	Firms	(τ_1, τ_2)	std.dev	t-value	of rep.vol	of outs. shares
1	100	0.877	0.023	3.83	38.1%	1.1%
2	81	0.388	0.021	1.69	16.1%	0.6%
3	66	0.398	0.018	1.77	13.1%	0.7%
4	65	0.045	0.017	0.22	11.6%	0.5%
5	54	0.012	0.015	0.06	8.7%	0.6%
6	51	0.449	0.021	1.55	8.0%	0.6%
7	41	0.298	0.019	1.00	6.6%	0.6%
8	38	0.599	0.020	1.84	6.9%	0.7%
9	33	0.218	0.018	0.68	3.1%	0.2%
10	26	-0.051	0.017	-0.16	3.9%	0.3%
11	22	0.365	0.023	0.75	2.8%	0.3%
12	22	0.186	0.021	0.42	3.8%	0.4%
13	18	0.154	0.043	0.15	3.8%	0.8%
14	16	-0.116	0.014	-0.33	6.0%	0.7%
15	15	-0.129	0.019	-0.26	4.4%	0.4%

shares bought back during the initial repurchase. Thus, the largest impact from the initial repurchase may be due to a liquidity effect. On the other hand, a larger average volume may also be perceived as a stronger signal in the market. From figure 3 there is no evidence of reversal, but rather that the CAR is relatively stable in the 20 days following the repurchase.

Overall it seems like the actual repurchases are greeted by the market as a positive signal, and that the first repurchase executed by firms is perceived as the most valuable signal.

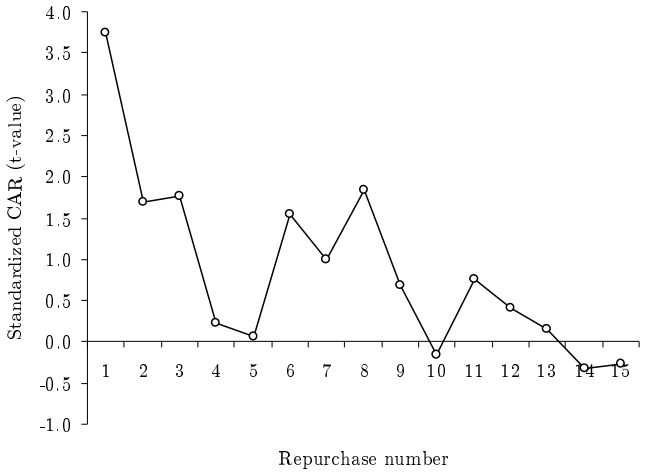
7 Conclusion

This paper examines a sample of announcements of repurchase plans and actual repurchases by Norwegian firms in the period 1998 through 2001. In addition to providing evidence on open market share repurchases in a market where repurchases recently has been allowed, we believe that repurchases in Norway are particularly interesting to study because of the legal requirement that firms report their repurchase activity on a daily basis. By exploiting these unique data, we improve the understanding of repurchases, and how the market reacts to the actual repurchase executions.

Even during this short period, repurchases has become an important tool for Norwegian firms. With respect to the actual repurchase activity of Norwegian firms, we find that about 60% of the firms that announces a repurchase plan execute at least one repurchase during the repurchase period authorized by the shareholders. In addition, the cash distributed through repurchases as a fraction of dividends was 25% in 1999 and 44% in 2000 and 2001. Furthermore, these firms repurchased on average 2.9% of their outstanding

Figure 4: CAR for subsequent repurchase events

The figures plots the standardized CAR (t-values) calculated in table 12 for the 15 first repurchases by firms.



shares during the repurchase period.

We find support for the underreaction hypothesis investigated in Ikenberry et al. (1995) also in Norwegian data. The excess performance around the announcement of a repurchase plan is on average about 2.5%, while a calender time portfolio of the same firms experience a significant long term excess performance of about 0.9% per month, or about 11% a year, relative to a Fama and French (1993) three factor model specification. Thus, although the market puts a positive value on the signal conveyed through the announcement, this indicate that it is not completely and immediately incorporated into prices.

In the long run, when creating two portfolios of firms that have announced a repurchase plan and condition the portfolio construction on whether the firm actually execute any repurchases, we find that the portfolio consisting only of announcing firms that has not yet repurchased show a significant excess performance of about 1.2% per month. The portfolio of firms that actually execute repurchases does not experience a significant abnormal performance. We interpret this as the market assessing the actual repurchases as a valuable signal, increasing the stock price and aligning the subsequent long term returns to expected levels.

For the firms that do not repurchase, we argue that their excess performance may be related to several issues. First, it may be that these firms do not repurchase simply because their stock price increases after the announcement such that the manager no longer assess the firm as being undervalued. However, an additional explanation may be that these firms are restricted from repurchasing due to liquidity reasons. And by being unable to signal undervaluation to the market through real transactions, their stock price experience excess performance as the information is conveyed through positive information surprises in later periods. Consistent with this interpretation we find that firms that do not execute any repurchases are less liquid than firms that actually execute repurchases.

When examining in more detail the timing and price impact around the actual repurchase executions, we find that there is a negative drift in excess returns during the 20

days prior to the actual repurchase. This suggests that managers execute repurchases in periods when the stock underperforms relative to several model specifications for expected returns. When examining the market impact of the repurchases itself, we find that there is a significant excess return on the day when the firm execute the repurchase. In the period after the repurchase, there is no reversal in excess returns suggesting that market puts a positive value on the signal that the firm has actually repurchased shares.

Overall, our findings offer additional evidence for the underreaction hypothesis. Overall, the market seem to underreact to the initial announcement. However, the abnormal performance of announcing firms is to a large degree driven by firms that are unable to execute repurchases. If these firms are still undervalued after the announcement, and unable to signal undervaluation due to liquidity constraints, the price remains too. This result indicate that requiring repurchasing firms to announce their repurchases immediately may help improve price discovery.

A Robustness check for announcement effect

To check that the results in table 3 in section 6.1 are affected by extreme observations, firms with CARs below the 5th percentile and above the 95th percentile are removed from the sample. Table 13 shows the results from this analysis. Truncating the sample reduces the average announcement CAR to about 1.9% for the Carhart specification.

Table 13: Abnormal returns around announcements of repurchase plans - a robustness check

The table shows the abnormal return (in percent) around announcements of repurchase plans when the 5% lowest and 5% highest CARs are removed from the sample. The abnormal return is measured relative to a one factor market model (unadjusted and adjusted for biases induced by infrequent trading as proposed in Dimson (1979) and Scholes and Williams (1977)), Fama and French (1993) three factor model and the Carhart (1997) four factor model, with the value weighted OSE general index as the market portfolio. The sub-sample regressions and the repurchase% regressions are cumulative excess returns relative to the Carhart four factor model. Numbers in bold represent numbers significantly different from zero at the 1% level, and numbers in parenthesis are the associated t-values.

		Days relative to announcement date					
	n	-20 to -3		-2 to +2		+3 to +20	
				Whole sample regressions			
Unadjusted market model	286	-0.56	(-1.20)	**1.845**	(4.39)	0.51	(0.62)
Dimson(1979)	286	-0.32	(-0.67)	**1.806**	(4.21)	0.00	(0.01)
Scholes/Williams(1977)	286	-0.51	(-1.08)	**1.807**	(4.23)	-0.12	(-0.21)
Fama/French 3 factor model	286	-0.74	(-1.54)	**1.814**	(4.28)	0.16	(0.29)
Carhart 4 factor model	286	-0.60	(-1.27)	**1.901**	(4.44)	0.14	(0.26)
				Subsample regression (year)			
1998	25	1.61	(1.18)	1.360	(0.74)	1.12	(0.86)
1999	77	-0.59	(-0.69)	**2.198**	(2.82)	1.46	(1.19)
2000	83	-1.55	(-1.62)	1.042	(1.30)	-0.17	(-0.17)
2001	101	-0.37	(-0.47)	**2.515**	(3.62)	-0.87	(-0.96)
				Max.repudchase %			
<0%-5%]	23	**-4.27**	(-2.08)	4.235	(1.00)	-1.80	(-0.67)
<5%-10%]	263	-0.33	(-0.69)	**1.893**	(4.48)	0.24	(0.41)

B Additional data for the sale of treasury stock

The paper only examines the gross repurchase activity by firms. However, the dataset also contains the sale of repurchased shares (treasury stock). Table 14 shows aggregate statistics for both repurchases as well as for the sale of treasury stock ("reverse repurchases"). The reduction in treasury stock may be due to e.g. sales of shares in the open market, as payment in various transactions, management/employee option exercises, stock bonuses, stock dividends or that the treasury stock is retired. As can be seen from the table, there are almost six times as many repurchase executions as sales, and the number of repurchased shares are more than twice of what was sold. However, the size of the repurchases are on average about 1/3 of the amount that was sold. This indicate that firms aggregate treasury stock through many smaller repurchases, and reduce treasury stock in much larger volumes.

Table 14: Aggregate statistics for repurchases and sale of treasury stock

The table shows aggregate statistics for both stock repurchases as well as for "reverse" repurchases (sale of treasury stock). The table shows the number of transactions, the total number of shares traded and the average size of the transactions for repurchases and sales during the period from 1999 to 2002. The last part of the table shows the fraction of buys to sales.

	Number of transactions	Shares (mill.)	Size of transactions (1000 shares)
Repurchases			
Whole period	1719	247.2	143.8
1999	205	35.3	172.2
2000	463	64.6	139.5
2001	659	107.4	163.0
2002	392	40.6	103.5
Sales			
Whole period	293	109.4	373.5
1999	19	2.8	145.0
2000	68	26.2	385.0
2001	105	40.6	386.9
2002	101	39.9	394.9
Fraction of buys/sales			
Whole period	5.87	2.26	0.38
1999	10.79	12.82	1.19
2000	6.81	2.47	0.36
2001	6.28	2.64	0.42
2002	3.88	1.02	0.26

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