Implementation of Buy-Back Programs*

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Abstract

This paper documents how Swedish firms implemented and executed open-market share repurchases over the period 2000 to 2007 by using a unique hand-collected data set with detailed information of each repurchase transaction. I find that my sample firms have a higher repurchase fraction in the first half of the repurchase year. Analysis of liquidity of stocks offers mixed results as the first proxy, turnover, improves in the second half of the program, whereas the Amihud measure of illiquidity indicates lower liquidity. Positive abnormal returns following approval of the repurchase program is documented and large repurchase programs are associated with higher abnormal returns. My multivariate analysis indicates a positive correlation between abnormal return and repurchase size. Finally, I also find that managers in repurchasing firms exhibit market timing skill, a skill which is more pronounced for firms with multiple programs.

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This paper documents how Swedish firms implemented and executed open-market share repurchases over the period 2000 to 2007 by using a unique hand-collected data set with detailed information of each repurchase transaction. I find that my sample firms have a higher repurchase fraction in the first half of the repurchase year. Analysis of liquidity of stocks offers mixed results as the first proxy, turnover, improves in the second half of the program, whereas the Amihud measure of illiquidity indicates lower liquidity. Positive abnormal returns following approval of the repurchase program is documented and large repurchase programs are associated with higher abnormal returns. My multivariate analysis indicates a positive correlation between abnormal return and repurchase size. Finally, I also find that managers in repurchasing firms exhibit market timing skill, a skill which is more pronounced for firms with multiple programs.

1. Introduction

Following approval at the Annual General Meeting (AGM) in April 2000, *Trelleborg* activated its first share repurchase program (authorized to repurchase a maximum of 10% of outstanding shares) on May 8 by an open market repurchase. The trade represented 0.99% of outstanding shares and constituted 44.05% of shares traded during the day on the Stockholm Stock Exchange (SSE) in Sweden. The program was fully completed, representing a total repurchase fraction of 10% and 16 repurchase days, on June 7. The price paid for the shares varied between SEK 59 and SEK 64.61. From the approval date until the last repurchase date the abnormal return on the stock, adjusted for a non-repurchasing firm matched by firm size and book-to-market ratio, was 7.9%. A second repurchase program, approved at an Extraordinary General Meeting in June 2000, was activated in November 2000 and completed in March 2001. Clearly, when we examine open market share repurchase program, it is crucial that we monitor repurchase activities in detail as some firms "wash off" their program early during the repurchase year, activate after almost six months as in the second Trelleborg program, or never activate their approved programs at all.

Although numerous studies have examined open market share repurchases, our insights into of how firms implement a program and the relationship between repurchase size and market impact remains unsettled mainly due to data limitations. Also, the evidence of long-run abnormal performance following share repurchases raises the question whether the firm gives priorities to long-term over short-term shareholders. In short, not much is known about how firms implement repurchase programs.

In this paper, I analyze a new and superior data set of share repurchases in Sweden between March 2000 and up to 2007. Using detailed information of each repurchase I contribute to the extensive literature on share repurchases by providing new insights into how firms implement repurchase programs. In particular, I address the following research

questions: Do firms repurchase evenly over the program length? Will share repurchases affect liquidity in the firm's stock? Do large share repurchases have a valuation impact? Finally, do managers in repurchasing firms exploit the information asymmetry and repurchase stocks at a lower price than an average investor can, and can we model this behaviour?

The motive for repurchase programs among firms varies. The most important one is perhaps to view it as a signal from the managers within the firm that the stock is undervalued (see Dann 1981; Vermaelen, 1981; Comment and Jarrell, 1991; Ikenberry, Lakonishok and Vermaelen, 1995). Another aspect is to view a repurchase program as a substitute for cash dividends (see Fama and French, 2001; Grullon and Michaley, 2002). In addition, insider interest and agency costs can imply that management will act in their own interests rather than in the interest of all shareholders (see Jolls, 1998; Dittmar, 2000; and Fenn and Liang, 2001). Nevertheless, the knowledge of how firms actually implement share repurchase programs and the impact such activities have on the market has received little attention in previous research and has not yet been fully explored due to data constraints.[1]

Since findings and interpretations of share repurchases are based on studies performed in the U.S. they may not be appropriate or applicable to other countries. For instance, repurchase programs in the U.S. can take several years to complete (see Cook, Krigman and Leach, 2004), whereas in Korea the repurchase program must be completed within three months (Lee, Jung and Thornton, 2005). In addition, in most countries within the European Union, (EU), and in many other countries, repurchase programs are generally valid for one year and restricted to a maximum of 10% of outstanding shares (Lasfer, 2002). Furthermore, as there is a difference between the announcement date of a repurchase program (most

[1] The bulk of repurchase studies are related to the U.S. market where the disclosure systems, compared to other corporate events and other markets, "might characterize open market repurchase programs as obscure" [Grullon and Ikenberry (2000, p. 50)]. In December 2003, the U.S. regulations changed towards more disclosures related to share repurchases, see Banyi, Dyl and Kahle (2008).

frequently used in previous studies) and actual repurchase date, and implementation of a program, the interpretation of results varies.

As previously mentioned, share repurchases have been analyzed in many different contexts. In the 1990s, as documented by Fama and French (2001), U.S. corporations started to disburse cash to their shareholders through stock repurchases rather than cash dividends and consequently the proportion of dividend-paying firms dropped significantly.[2] With the increased use of share repurchases as a way to distribute profits to shareholders, we also changed and substituted "dividend policy" with "payout policy" as in the latest edition of the classic textbook in corporate finance by Brealey, Myers and Allen (2008).

Most of our insights into repurchase programs can be attributed to studies in North America with classic studies by Dann (1981) and Vermaelen (1981), to more recent studies by Ikenberry, Lakonishok and Vermaelen (1995, 2000), Dittmar (2000), Mitchell and Stafford (2000), Chan, Ikenberry and Lee (2004), Grullon and Michaely (2002, 2004) and Peyer and Vermaelen (2005). To overcome constraints in data, several earlier U.S. studies have used changes in treasury stocks and number of outstanding shares for each repurchasing firm as reported in the quarterly financial report and then calculated the number of shares repurchased. Banyi, Dyl and Kahle (2008) examine in detail the precision of this methodology and conclude that previous studies of open market share repurchases have used inappropriate data. In addition, and following regulatory changes of the Securities Exchange Act of 1934 (effective December 2003) which require that firms quarterly disclose share repurchases and average prices paid, the authors claim "... the need to re-examine the results of earlier studies of share repurchases in light of the accurate repurchase data now available in SEC Forms 10-Q and 10-K."

[2] Julio and Ikenberry (2004) document that the proportion of U.S. industrial firms that pay cash dividends has increased from 15% in the first quarter of 2000 to 20% in the first quarter of 2004.

To the best of my knowledge, detailed studies of how firms implement and execute repurchase programs are rare even if some of the issues have been examined in Canada, the U.S., Hong Kong, and France. Sample periods, sample size, markets, regulations, and methodology vary, and additional study of actual repurchase and firm behaviour seems therefore to be appropriate. Given this gap in our knowledge, fresh studies should be added to the existing literature.

It is important to shed some light on share repurchases from a microstructure perspective since in Sweden, and also in other countries, repurchasing firms are classified as insiders and thus possess unique firm-specific information which can influence the repurchase behaviour among firms. Adverse selection costs between short and long term investors, together with insider regulations can also affect the economic consequences of a repurchase program (see Buffa and Nicodano, 2006). In addition, as new legislation within the EU and also in other parts of the world has been introduced, several countries have removed restrictions on share repurchases in the 1990s.[3] Furthermore, in contrast to the disclosure environment in the U.S., most of the countries have a reporting system in which information of actual repurchase activity is disclosed in detail.

I find that firms with open market share repurchases in Sweden during the period 2000 to 2007, on average repurchase 4.39% of outstanding shares over the first repurchase year. A more detailed inspection of my data also shows that share repurchases are concentrated to the first half of the repurchase year. As hypothesized, I find that repurchase activities are lower for consecutive repurchase programs. Recent previous papers have looked at the liquidity effects of share repurchases, including Ginglinger and Hamon (2007) and Cook et al. (2004), and reporting conflicting results. Using several proxies for liquidity, I find that turnover on average is higher for the first compared to the four consecutive repurchase years and also that

[3] Example of countries (year) which have removed restrictions on share repurchases are Australia (1989), Hong Kong (1991), Korea (1994), Denmark (1995), Japan (1995), Finland (1997), Poland (1997), France, Germany and India (1998) and Norway (1999).

turnover is higher in the second half. Using the Amihud (2002) illiquidity measure as a proxy for liquidity, I document a lower liquidity in the second half of the repurchase year for all my repurchase years. In my analysis of abnormal returns following open market share repurchases, using multivariate analyses (Ibbotson, 1975) and the Fama-French three factors model augmented by Carhart's (1997) momentum factor, I find an average abnormal return of 1% a month, or equivalently 12% a year for the first repurchase year. Furthermore, the abnormal return is located in the second half of the repurchase year. Moreover, for all eight repurchase years in my sample, the abnormal performance appear to be positively related to the difference between value and growth stocks and repurchase size but negatively related to the difference between small and large firms. Also, the results do not appear to be related to momentum. Finally, evidence is provided showing that managers in repurchasing firms exhibit managerial timing skills – a skill which is more obvious in firms with multiple repurchase programs.

The outline of the paper is as follows. Section 2 outlines the framework for open market share repurchases in Sweden and the data used. Section 3 describes the methodology. Section 4 reports and discusses the empirical findings related to repurchase fractions and liquidity. Section 5 reports abnormal return for the repurchase year and also the relationship to repurchase fractions. Section 6 extends my analysis of share repurchase to the managerial timing hypothesis. Section 7 concludes.

2. Share repurchases in Sweden and data

In this section I describe and discuss share repurchases in Sweden and the data sets used in my study.

2.1. An overview of share repurchases in Sweden

Changes in the Companies Act, effective 10 March 2000, enable Swedish firms for the first time to repurchase their own stock to a maximum of 10% of the number of outstanding

shares.[4] Each program must be approved at the AGM and is valid for a year (until the next ordinary or extraordinary AGM) and repurchases can only be made out of distributable profits. The repurchase can take two forms: (a) an open market repurchase or (b) a public offer (tender) – or a combination of the methods. The framework for repurchases, in contrast to regulations in the United States and many other countries, is characterized by full disclosure of details of the repurchase program as well as details of every transaction (i.e., repurchase date, number of shares repurchased, and average price paid). In addition, companies must also comply with listing agreements with the SSE which have implications for the repurchase activities. For instance, the firm can use only one stockbroker and it must also inform the broker that the trade shall be classified as a share repurchase. The firm can also repurchase shares through a block trade from specific shareholders. The number of shares that can be repurchased during a specific day is limited to 25% of the daily average number of shares traded in the four weeks prior to the transaction (including block trades). Furthermore, all trades, with information on the number of shares repurchased and average price paid, must be reported to the SSE immediately and no repurchase can take place in the last 30 minutes of the trading day. In addition, as the repurchasing firm is classified as an insider, a repurchase cannot take place during the 30-day period immediately prior to the release of the firm's interim or annual reports.[5]

When a firm repurchases shares, and the stockbroker receives the order from the repurchasing firm, the order is placed in the limit order book and it is labeled as a share repurchase ("issuer"). As soon as the share repurchase is completed, the stockbroker issues a press-release or a memo to the SSE with details of volume and price (volume weighted) paid. The SSE then discloses this information as soon as possible; normally it is released on its

[4] Following approval of the Bill 1999/2000:34 by Parliament on 23 February 2000 and changes in the Company Act (SFS 2000:66).
[5] For a comparison with guidelines for open market repurchases in the U.S., see Cook, Krigman and Leach (2004) and Banyi, Dyl and Kahle (2008).

homepage on the same day or the following morning before trading takes place. Thus, information about share repurchases is released to the public fairly quickly.

2.2 Repurchase data

I obtain my initial sample of firms with activated open market share repurchase programs from the market surveillance department at the SSE. It covers the period from March 12, 2000 to December 2007. Two data sets reflecting trades are used. For the first period, March 12 to December 18, 2000, I use data from the Swedish Financial Supervisory Authority (Finansinspektionen).[6] From December 19, 2000 through December 2007, I use data from the SSE. Four firms were eliminated from the sample as they are classified as overseas firms (dual-listed) and do not have to comply with disclosure rules. Also, three firms with open market share repurchase programs combined with a public offer were eliminated from the sample. The remaining sample consists of 107 firms with 228 open market share repurchase programs with a total of 8,369 daily repurchase trades over the sample period.

Shares outstanding, stock returns, total number of shares traded, and prices for all stocks come from the SSE. Firm specific variables are obtained from Datastream. Information of the approval date (ordinary and extra-ordinary AGMs) of a repurchase program is obtained from the Swedish Central Security Registrar *Euroclear Sweden.*

3. Methodology

In this section, I first describe how repurchase fraction is computed for my sample firms. This is followed by a description of how the risk-adjusted returns are calculated using the widely used Carhart's (1997) four-factor model and Ibbotson's (1975) event time methodology Return Across Time and Securities (RATS).

3.1. Repurchase fraction and abnormal return

[6] The first dataset does not report the average price paid for the repurchased shares. To overcome this problem I compute and use the daily volume weighted price for the stock on the SSE which then enables me to quantify the repurchase cost for each repurchase date until December 18, 2000.

Throughout my analysis I follow the length of each program in detail beginning from the approval date until the next ordinary AGM or an Extraordinary General Meeting. In most firms the program length, or the repurchase year, is twelve months. In my analysis, the first 21 trading days from the approval date constitute month 1 and trading days 22 to 42 is month 2, etc. As the maximum number of months for each repurchase year is 12, my analysis stops after this month. For a small number of firms (3), the first repurchase program was terminated early within the repurchase year, after completing the program, and an Extraordinary General Meeting was called. In my analysis, the program for these firms is truncated from this completion date. If a new program is approved at the meeting, this program is classified as program 2 and analyzed in the same way as the first program.

I begin my empirical analysis by computing the repurchase fraction for each firm and defined as number of shares repurchased (Q) in firm i on day t ($Q_{i,t}$) divided by total outstanding shares as of the end of December the year prior to the repurchase year ($Total_i$) in firm i as described in equation (1).

$$Repurchase\ fraction = \frac{Q_{i,t}}{Total_i}. \tag{1}$$

Barclay and Smith (1988) argue that a share repurchase can affect the liquidity in the firm's stock in two different ways. Their competing market-maker hypothesis predicts that the bid/ask spread will narrow (hence higher liquidity) as the firm submit buy limit orders which establish a lower bound on the bid price whereas their information-asymmetry hypothesis imply higher bid/ask spreads (hence lower liquidity) because the possibility of trading by an informed trader (i.e., the repurchasing firm). To examine possible market liquidity effects of the firm's stock, I use three proxies. The first is number of shares repurchased divided by number of shares traded on the SSE. The second is the turnover rate, defined as number of shares traded on the SSE divided by total outstanding shares as of December the year prior to the repurchase year. The third is the illiquidity measure proposed by Amihud (2002).

Monthly abnormal return for all months within the repurchase year for my sample is calculated using the Fama and French (1993) three-factor model augmented by a momentum factor, Carhart (1997). This justifies results from prior studies which has documented: (1) a positive correlation between the firm's stock return and the overall return on the market, (2) that small stocks tend to outperform large stocks, (3) firms with high book-to-market ratios (value stocks) tend to outperform firms with low book-to-market ratios (growth stocks), and (4) stocks with high returns tend to outperform those doing poorly. In my multivariate analysis, I follow the methodology proposed by Ibbotson (1975) where all monthly returns first are aligned in an event time and abnormal returns are estimated across sample firms.

4. Empirical results

This section summarizes the main results of the first and consecutive share repurchase programs over the sample period. I begin with descriptive statistics for my sample firms and continue with a univariate analysis of repurchase fractions and liquidity effects within the repurchase year.

4.1. Descriptive statistics

Table 1 presents summary statistics and firm characteristics for firms with activated repurchase programs. Panel A reports that 107 different firms have initiated at least one program over the sample period. Mean market capitalization value of equity is SEK 19.7 billion and is also larger than the average firm listed on the SSE (SEK 11.3 billion). Mean B/M-ratio is 0.58 and varies between 0.35 (2005) and 0.82 (2003). The last column shows the repurchase fraction, defined as number of shares repurchased divided by total outstanding shares and expressed as a percentage. As shown, on average, my sample firms repurchase 4.39% of outstanding shares in the first repurchase year.

Table 1 also shows in Panel B that 228 programs have been activated over the sample period with a mean repurchase fraction of 3.04%. Since restriction on share repurchases was

removed in year 2000, two companies have activated programs each calendar year. Mean (median) number of repurchase days for the first program, as reported in Panel C, is 27.8 (17) days for the full sample and has declined over time. In untabulated results, I find that 82% of my sample firms pay dividends over the sample period and indicate that they have not replaced dividends with share repurchases. I also find that the mean (median) number of calendar days from the approval date to the first repurchase date is 77 (43) for the 2000 to 2007 time period and has declined over time. Examination of the number of firms with one repurchase program and firms with multiple programs also indicate that the mean number of calendar days between the approval and the first repurchase date is lower for firms with multiple programs. Overall, my result shows that Swedish firm seem to have similar repurchase fractions to U.S firms as reported by Vermaelen (2006) but that consecutive programs are smaller in size.

4.2. Univariate analysis of repurchase fractions and liquidity

Table 2 reports mean repurchase fractions and three proxies for liquidity for all months beginning from the approval date across firms, and also the univariate analysis which shows the relationship between my variables in the first and second six-month period in the repurchase year. The first proxy for liquidity is the ratio of shares repurchased divided by number of shares traded on the SSE in the period, denoted as repurchase-to-trading volume, (RTV), and expressed as a percentage. The second proxy is turnover, defined as number of shares traded on the SSE divided by total outstanding shares as of the end of December the year prior to the repurchase year and expressed as a percentage. The third liquidity measure is the illiquidity (ILLIQ) measure as suggested by Amihud (2002) which measures the price impact associated with the trading volume. It is defined as the absolute return on stock *i* on day *t* divided by SEK volume on day *t*. A high value of ILLIQ indicates that the stock is illiquid as the stock price moves significantly in response to a small trading volume. The

ILLIQ is only computed if I have at least 15 observations in each month. Panel A provides results for firms using all months (i.e., irrespective of a specific month includes actual repurchases or not) and Panel B shows results for firms with monthly repurchase activity. The sample firms have also been sorted into two groups based on the size of the program for the repurchase year; a total repurchase fraction up to 5% has been classified as a low buying firm while a total repurchase fraction between 5% and 10% has been classified as a high buying firm.

The results in panel A for all firms show that the average repurchase fraction over the repurchase year is 0.34% per month with a mean value of 0.42% (0.25%) in the first (second) six-month period. The mean difference between the first and second half of the repurchase year, 0.17%, is significant at the 1% level and verifies a higher repurchase activity in the beginning of the repurchase year. As expected, I find that the mean difference between the six-month periods is higher and significant at the 5% level for high buying firms (0.33%) compared to low buying firms (0.10%). The results in panel A indicate also that my liquidity measures give mixed results, although not always statistically significant, over the first and second half of the repurchase year. For instance, for all firms turnover and ILLIQ increase from 5.85% to 6.15% and from 5.52 to 6.26 respectively. For low (high) buying firms, my data suggest a higher (lower) turnover in the firm's stock in the second half of the repurchase year.

To investigate in more detail the implementation of a program, I raise the question whether repurchase patterns are different when data with actual repurchases are used. For instance, in the first month in the repurchase year 34 of 107 firms actually repurchase their stock, and in the first three months roughly one of three firms undertakes actual share repurchases. In other words, when we compute mean repurchase fractions across firms it also includes non-repurchasing firms.

Panel B of Table 2 exhibits the analysis when actual repurchase months are used. I find that the mean monthly repurchase fraction for all firms is 1.02% (3 times larger compared to the figure presented in Panel A) for the repurchase year and that high buying firms, on average, repurchase 1.48% compared to 0.59% for low buying firms. The pattern of higher repurchase fractions in the first, compared to the second half of the repurchase year, is similar to the pattern reported in panel A. For all firms my turnover rate shows a lower liquidity in the second half whereas the ILLIQ proxy indicates improved liquidity of the firm's stock. For high buying firms the mean ILLIQ increases from 1.24 to 3.04 and the difference is also statistically significant at the 5% level. Thus, for high buying firms liquidity in the firm's stock diminishes whereas for low buying firms liquidity improves.

To summarize, I find that the average repurchase fractions are higher in the first half of the repurchase year and consistent with the results presented by Ikenberry et al. (2000). Of particular interest is my finding that turnover is lower in the second half of the repurchase year using months with actual repurchases.

To further examine repurchases, and the time required to complete the repurchase program, I simply cumulate the monthly repurchase fractions within the repurchase year. The analysis shows (not reported) that for all firms 13% of the program has been completed after one month on average. After two months 33% has been completed, and after six months 65.9% is completed. By splitting my sample firms into low and high buying firms, I find that the speed of repurchase activities is higher for low buying firms in comparison to high buying firms as shown in Figure 1. After six months, my data indicate that for low (high) buying firms, 71.15% (67.95%) of the program is completed respectively. Thus, it is interesting to note that the intensity of repurchase activities varies between low and high buying firms but also that firms in general seem to complete their programs fairly quickly.

4.3. Multiple programs

One interesting issue is whether my basic finding of repurchase behaviour needs to be augmented to identify differences in firms with multiple repurchase programs. I explore this by comparing repurchase activities for the first (Program 1) and the four consecutive programs (Program 2-5).

Table 3 shows that the mean monthly repurchase fraction is higher in program 1 compared to program 2-5 with values of 0.34% and 0.22% and also a highly statistically mean difference (p-value = 0.000). A close examination of the repurchase fraction in the first month shows a mean difference of 0.39% between program 1 and program 2-5 and is also statistically significant (p-value = 0.001). We also see a higher repurchase activity in the first six-month period in comparison to the second six-month period. For program 2-5, the data suggest a fairly stable mean monthly repurchase fraction of 0.22% over the repurchase year. These statistics provide clear evidence that a repurchasing firm, on average, repurchases more in the first program and during the first half of the repurchase year. Figure 2 illustrates also that the difference, on average, in repurchase fractions between the first, second and the third repurchase program takes place early within the repurchase year, while after month 3 repurchase fractions are fairly stable.

Examination of my proxies for liquidity shows that mean monthly turnover over the repurchase year is 5.99% for program 1 and 5.29% for program 2-5. The mean difference is also statistical significant at the 1% level. My price impact variable, the ILLIQ measure, is 5.52 (6.26) in the first (second) half of the repurchase year for program 1 and 4.28 (6.30) for program 2-5. This indicates lower liquidity in the firm's stock in the second half of the repurchase year.

Overall, the results suggest some significant differences between program 1 and program 2-5. First, repurchase fractions are higher in the first program. Second, my proxies for liquidity effects indicate mixed results; turnover in the firm's stock is higher in the second

half for all repurchase years and indicates improved liquidity. In general, my price impact measure, ILLIQ, suggests reduced liquidity in the second half of the repurchase year and is consistent with findings from France and Hong Kong but not from the U.S. Therefore, I view my evidence supporting the information-asymmetry hypothesis as being quite strong.[7]

5. Abnormal stock returns

This section constitutes the most important contribution of my paper by providing empirical results for firms with share repurchases for all months in the repurchase year. In addition, I examine abnormal returns for low and high buying firms in the repurchase year. The last part in the section examines the relationship between abnormal return and repurchase size.

5.1. Abnormal stock returns

In the analysis of abnormal return following approval of a repurchase program I use the three-factors of Fama and French (1993) and the momentum factor as suggested by Carhart (1997). For each month I regress the monthly return for each firm, adjusted by the risk-free rate, on the monthly four-factors. The first month following the approval date is defined as month 1, and includes the 21 trading-day period starting on the approval date and month 2 is the successive 21-trading day period (i.e., days 22-42). To detect abnormal return I use the RATS-methodology, first proposed by Ibbotson (1975), where returns are first aligned in event time and risk is estimated across sample firms. This "rolling portfolio method", as recommended by Fama (1998) will control for the problem of cross-sectional dependence among event firms when events and returns are clustering in calendar time.

In particular, I estimate the model:

[7] In another study of share repurchases in Sweden, using intraday bid-ask quotes for a much more smaller sample, 53 firms, De Ridder and Råsbrant (2009) find that the bid-ask spread decrease on average by 3% on repurchasing days.

$$R_{i,t} - R_{f,t} = \alpha_p + \beta_p[MKT_t] + s_p[SMB_t] + h_p[HML_t] + m_p[MOM_t] + \varepsilon_{p,t}, \quad (2)$$

where $R_{i,t} - R_{f,t}$ is the monthly return on stock *i* in event month *t* and adjusted for the risk free rate (proxied by the three-month Treasury bill), *MKT* is the return on the value-weighted market portfolio (proxied by the OMXS-index) minus the monthly return on the three-month Treasury bill, *SMB* is the difference in the return of a portfolio of small firm and a portfolio of large firm, *HML* is the difference in the return of a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks, *MOM* is the Carhart momentum factor based on ranking firms by their return over the previous 12-month period and using the return on a portfolio of high momentum stocks less the return on a portfolio of low momentum stocks.[8] Using this model implies that the intercept term, α_p, provides a measure of the mean monthly abnormal return on an equally weighted event-time portfolio and corresponds to Jensen's alpha in a CAPM context.

In Table 4, I present the estimated coefficients from the event-time regressions (RATS) using the three as well as the four-factor models. Coefficients are reported for the first month, the first half (month 1-6), the second half (month 7-12) and all months (1-12) in the repurchase year. Panel A shows the results for all months within the program thus irrespective if the firm repurchased within a month or not, whereas Panel B shows results reflecting actual repurchase activities.

For the first repurchase year, as reported in Panel A, mean monthly abnormal return, 1.00%, is significantly positive at the 5% level. Using actual repurchase months, as noted in Panel B, mean monthly abnormal return is 2.00% (statistically significant at the 1% level) and 1.00% (statistically significant at the 5% level) when I use the three-factor and four-factor

[8] The factors SMB, HML, MOM are computed using data from Datastream. The momentum proxy, MOM, is defined as the previous 12-month nominal return lagged one month. The factor breakpoints are created by taking the lowest (losers) and the highest (winners) 25% of all firms listed on the SSE.

model respectively. The significant abnormal returns reported in Panel A average 1% per month, or about 12% per year. It is also interesting to note the lack of abnormal return in the first half of the program. Furthermore, note also that the betas of my sample firms are less than 1.00.

Figure 3 presents results of the event study of abnormal returns (based on the four-factor model), and also turnover and price spread for the first repurchase program for 107 firms. All graphs start at month -6, which represents six months before the approval of the repurchase program, month 1, and ends at the end of the repurchase year, month 12. The first graph indicates an increase in the CAR starting four months prior to the approval date. A close inspection of these dates is consistent with the following scenario. For most firms, the date of the AGM is released in the firm's financial report for the fiscal year which also includes the Board's proposal to a share repurchase program. This report, for most of my sample firms, is released in late January and in February, i.e., approximately four month's before the AGM and the approval date. Hence, my data indicate that the market reacts positively to this information. As indicated in the first graph, I find particularly large and statistically significant (at the 5% level) abnormal returns for month 5 (1.43%), month 9 (3.53%) and month 10 (4.74%). My proxy for liquidity in the firm's stock, turnover, the second graph in Figure 3, shows a mean value which in the repurchase year which is marginally lower than in the half year before the approval date (5.99% and 6.11% respectively). The third graph shows no particular pattern in the percentage price spread of the firm's stock using daily closing bid and ask prices.

Overall, the results in Table 4 and Figure 3 are generally consistent with the view that firm managers activate share repurchases to correct valuation errors of the firm. My finding also shows that this correction takes place in the second half of the repurchase year. As expected, when I use months with actual repurchase activities, the analyses show higher

average abnormal returns. In the next section, I explore the relationship between abnormal returns for low and high buying firms.

Table 5, Panel A (Panel B) presents the three and four-factor regression results for low (high) buying firms. As shown, none of the monthly estimated abnormal returns is statistically significant for firms classified as low buying firms. For high buying firms, mean monthly abnormal return is approximately 2.5%, and statistically significant at the 5% level, in the second half of the repurchase year. For all months, mean abnormal return is 1.1% and statistically significant at the 10% level. Of my control variables, only MKT and HML yield statistically significant estimates. To determine how sensitive my results are to the above definition of low and high buying firms, I also estimate the results in Table 5 by defining a high buying firm as a firm with a repurchase fraction between 7.5% and 10%. I find for 23 firms, that mean monthly abnormal return for the repurchase year is 2.35% and statistically significant at the 1% level. I also find that mean abnormal return is higher in the second half in the repurchase year, 4.63% and statistically significant at the 1% level, compared to the first half with mean abnormal return of 1.58% and statistically significant at the 10% level.

Overall, and as one might expect, my classification of a firm as a low or high buying firm shows differences in monthly estimates of abnormal returns within the repurchase year. Large repurchase programs seem to be associated with a high abnormal return.

The evidence of abnormal returns suggests that investors have problems to interpret how firms with approved programs will behave; will they repurchase the maximum number of shares or a smaller amount than approved? To examine the effects of possible outliers, I decided to winsorize the monthly returns to their 99% and 1% values respectively and re-examine the four-factor model for all months across all repurchase years in my sample. I find that mean monthly abnormal return is -0.10% (p-value = 0.768) in the first half of the repurchase year and 1.00% (p-value = 0.005) in the second half of the repurchase year. For all

months within the repurchase year, mean monthly abnormal return is 0.40% (p-value = 0.054). Thus, the evidence with the winsorized results does not change the results.

5.2. Repurchase Fractions and Abnormal Stock Returns

My discussions so far have focused on the repurchase behaviour of firms within the first repurchase year. Previous studies, for instance by Stephens and Weisbach (1998), find that open market share repurchases are negatively related to prior stock returns and Comment and Jarrell (1991) report that large repurchase programs imply higher announcement returns. With access to daily records of repurchase activity, I raise the question whether there is a relationship between monthly abnormal return and a set of firm specific variables.

Having shown that the repurchase behaviour but also the valuation impact, varies for my sample firms I now examine the relationship between price impacts and repurchase behaviour. I do this by using a simple OLS-model where the dependent variable in the regression model is the abnormal return on the stock and defined as the difference in the return for stock i in month t less the return on a non-repurchasing firm with roughly the same market capitalization and book-to-market ratio. The independent variables are: (1) repurchase fraction in value; (2) turnover; and (3) one-month prior cumulative abnormal return. Thus, the following OLS-model is used:

$$(ar_{i,t}) = \alpha + \gamma_1\left(\frac{Q_{i,t} \times P_{i,t})}{MV_i}\right) + \gamma_2\left(\frac{TV_{i,t,SSE}}{Total_i}\right) + \gamma_3(CAR_{i,t-1}) + e_{i,t}, \qquad (3)$$

where ($ar_{i,t}$) is the abnormal return on a stock in firm i in period t, ($Q_{i,t}$) is the number of shares repurchased in firm i in period t, ($P_{i,t}$) is the repurchase price for a stock in firm i in period t, and (MV_i) is the market capitalization value of equity in firm i as of the end of December the year prior to the repurchase year, ($TV_{i,t,SSE}$) is the number of shares traded in firm i in period t on the SSE, ($Total_i$) is total outstanding shares in firm i as of the end of December the year prior to the repurchase year, and ($CAR_{i,t-1}$) is the one-month cumulative

abnormal return on stock *i* in period *t-1*. In addition, and to further verify and check the robustness of the findings, I construct an equally weighted index for the 30 largest firms listed on the SSE and use this to compute abnormal return and I also use the actual cost instead of the relative cost for the repurchased shares.[9]

To assess the statistical significance of the estimated parameters I use White's (1980) heteroskedasticity adjustment in the standard error estimation. Of interest is my principal hypothesis, that the valuation effect of a share repurchase should be positively correlated to repurchase fraction; that is, a large share repurchase should imply a higher valuation effect than a small repurchase.

Table 6 presents the estimation results of the regression analysis. Column 3 of Table 6 presents the results with the monthly abnormal return as the dependent variable and the variables described above as independent variables for all firm months (n = 1,121), for the first repurchase year. The estimated intercept, 0.0223, is statistically significant at the 1% level and indicates a mean abnormal return of 2.23% per month over the first repurchase year. Thus, using a control firm to calculate abnormal return gives a higher value than the four-factor model. Repurchase fraction is positively related to abnormal return with an estimated coefficient of 0.0035 but statistically insignificant. The estimated coefficients on turnover and CAR the prior month are negative but statistically insignificant. Furthermore, and as expected, the adjusted R-squares are extremely small but are not that unusual for regression models predicting abnormal returns. To examine this issue further, I decided to re-estimate the OLS-model for the first four consecutive programs following the first program. The last column reports the estimated coefficients for program 2-5 and reveals a positive relationship, and statistically at the 10% level, between abnormal return and repurchase fraction. For these programs we also see a positive correlation to the CAR for the prior month.

[9] The equally weighted index is constructed by computing the market capitalization value of equity for all firms listed on the SSE as of December each calendar year and forming an equally weighted portfolio of the 30 largest firms and then compute the return for this portfolio.

Overall, my estimates suggest that there is a weak positive relationship between abnormal return and repurchase fraction. Furthermore, this relationship is also stronger in the second half of the repurchase year and is consistent with my results using RATS-methodology.[10] The estimated coefficient on turnover is negative and indicates that a higher turnover, and hence a higher liquidity, will imply a lower abnormal return. If firm manager's are eager to repurchase more following a price decline in the firm's stock, we should expect to identify a negative relationship between abnormal return and prior month's CAR. The negative relationship between the abnormal return and prior month's CAR, with an estimated coefficient of -0.1225, statistically significant at the 1% level, for the second half in the the first repurchase year, suggests that lower CAR in the prior month will have a higher impact on the current month's abnormal return. In addition, I also perform several tests to assess the robustness of my results with quantitatively the same results.[11]

6. Managerial timing

6.1. The bootstrap technique

Previous empirical studies (e.g., Brockman and Chung, (2001), Cook, Krigman and Leach, (2004), Ginglinger and Hamon, (2006), and McNally, Smith and Barnes (2008)), report mixed results regarding whether managers in repurchasing firms have an ability to reacquire shares at a lower price than an average investor. I use the bootstrapped methodology, proposed by Brockman and Chung (2001) in my examination. However, as some firms complete their program fairly early within the repurchase year, I exclude firms that terminate the program within a month. Also, when I calculate the bootstrapped cost, I use

[10] To examine the impact on monthly abnormal return I extended the four-factor model by adding a variable reflecting repurchase fraction. For all sample months and repurchase years, the estimated coefficient on repurchase fraction is 0.387 and statistically significant at the 10% level. Although not statistically significant, the estimated coefficient in the second half of the repurchase year is 1.8 times larger compared to the estimated coefficient for the first half of the repurchase year (0.612 and 0.347 respectively).

[11] Using the logarithm of the absolute repurchase volume as the independent variable in the OLS-model, or using the raw return as the dependent variable, yields similar results. Also, using an equally weighted index for the overall return on the market as a proxy for the CAR do not change the original findings. In addition, the results of using the raw return in the prior month as the independent variable are consistent with those presented in Table 6.

the same window as the firm; in other words, I only use periods when the firm is allowed to repurchase shares. To be included in this analysis, I also require at least six months of repurchase data for each firm. The last trading day in my bootstrapping is March 31, 2008.

The first step in the bootstrap procedure is to identify the number of repurchase dates for each firm in the repurchase year. I then compute, for each firm, the repurchase cost for each date as the repurchase price multiplied with the number of shares repurchased. I do this for all repurchase dates within the repurchase year and when these values are aggregated they will reflect the total cost for all shares which have been repurchased. Next, I replicate this repurchase behaviour for each firm by randomly selecting, over the same period, the same number of repurchase dates and on these days repurchase the equivalent number of shares where I use the average price (volume weighted) paid for the stock on the SSE.[12] I then compute the total cost for these shares which is defined as the bootstrapped cost. Finally, this bootstrapped cost is divided by the actual cost to clarify if managerial timing skill exists. Thus, a ratio greater (less) than 1 indicate existence (non-existence) of managerial timing skill for repurchasing firms. I repeat this procedure 100,000 times for each repurchase program to get the empirical distribution of this skill. To gain further insight into the empirical distribution, I compute the pseudo *p*-value as the percentage of bootstrapped cost with a value lower than the actual repurchase cost.

To examine the determinants of managerial timing skill, I use a simple OLS-model where the dependent variable is the mean bootstrapped cost divided by the actual repurchase cost for each firm and each program. I control for the following variables: (1) repurchase fraction; (2) total number of repurchase dates within the program; and (3) ownership concentration in the firm, defined as one minus the fraction owned by the top five largest shareholders in each firm. Data on ownership is obtained from *Euroclear Sweden*, which by

[12] Note that in this analysis I also exclude trading days which are located in "silent" periods, i.e. when the company by law is not allowed to repurchase shares, see also Keswani et al. (2007) who examine buy-backs in the U.K. in trading and non-trading periods.

law maintains a centralized register of ownership for virtually all companies listed on the SSE.

6.2. Managerial timing skill

My estimation results using the bootstrap technique are presented in Table 7. Panel A presents results for all repurchase years, Panel B provides results sorted by frequency of repurchase years, and Panel C shows results for low and high buying firms as previously defined.

As shown in Panel A of Table 6, for the overall sample period representing 169 repurchase years in 98 firms, the mean (median) bootstrapped-to-actual cost (B/A-cost) are 1.0259 (1.0119) with a minimum (maximum) value of 0.3038 (1.5385).[13] We see that this ratio is greater than 1 in six of eight years. It also appears to be economically significant for programs launched in 2004 and 2005. Repurchase years initiated in 2000 show that the mean (median) B/A-cost, was 1.0116 (1.0010) and 1.0397 (1.0177) in 2007 and indicate that the managerial skill has increased over time. The last column in Table 6 shows the proportion of repurchasing firms with managerial timing skills at the 10% significance level. In other words, the reported mean value of 36.01% for the full sample period should be interpreted as the probability of repurchasing shares at a lower cost than the actual repurchase cost. As reported, the proportion of firms with this managerial timing skill at the 10% level varies between 15.38% (2002) and 36.36% (2001).

As previously reported, most of my sample firms have launched one program. However, 41 firms have activated at least two programs and 27 firms have activated at least three programs. Thus, one interesting empirical question is if there is a relationship between managerial timing skills and frequency of programs.

[13] The mean (median) bootstrapped cost compared to the actual cost for share repurchases in Hong Kong is 1.09 (1.04) for the period 1992-99 as reported by Table 2 in Brockman and Chung (2001).

Panel B of Table 7 shows the results of this examination for the first five repurchase years. We see that seventy-three firms have activated one program and nine firms have activated at least five programs. As reported in Column 2, the mean B/A-cost varies between 1.0005 for firms with four repurchase years to 1.0734 for firms with five repurchase years. As reported in Column 4, the pseudo *p*-values are higher for repurchase years 2, 3 and 4 compared to the first repurchase year. The lowest *p*-value is for firms with 5 repurchase years (9 firms). This evidence supports the view that firms with multiple programs, reflecting more knowledge of buy-back activities, are also more likely to be associated with managerial timing of share repurchases.

Panel C reports the result when firms are sorted into low and high buying firms and indicates managerial skill in firms which repurchase up to 5% of outstanding shares. The results are consistent with my inspection of number of repurchase dates for each firm which shows that mean (median) number of trading days are 39 (26) for low buying firms and 54 (47) for high buying firms. In short, more repurchase trades will reduce the managerial timing skill and overall, my results are consistent with prior literature which support the managerial timing hypothesis.

I carried out further robustness check for the results in Table 7. I do this by sorting, for all repurchase years, my sample firms by market capitalization at the approval data and total repurchase fraction, and form three groups. Thus group I contain small firms (low total repurchase yield) and group III contain large firms (high total repurchase fraction). I find that the B/A-cost is 1.01, 1.01, and 1.02 respectively for the three groups sorted by market capitalization on the approval date and 1.04, 1.02, 0.99 respectively when sorted by total repurchase fraction. Taken together, my results suggest that managerial timing is more difficult when repurchase fractions increase but also that it is unrelated to firm size.

The last question I address is whether the managerial timing skill, the B/A-cost in the previous section, can be predicted. The intuition behind my model is as simple as my basic hypothesis, i.e., that there is a negative correlation between the B/A-cost and total repurchase fraction, and thus when companies repurchase more it is more difficult to do this at a lower price than for an average investor. Related to this view is the predicted negative correlation to number of repurchasing days. In contrast, I expect to find a positive correlation between the B/A-cost and my proxy for ownership concentration as liquidity should be higher in firms with few block holders. Thus for each firm (*i*) and each program (*p*), I regress the B/A-cost on three control variables where my empirical model takes the following form:

$$(B/A\text{-}cost_{i,p}) = \alpha_0 + \gamma_1(RP - fraction_{i,p}) + \gamma_2(RP - days_{i,p}) + \gamma_3(Ownership_{i,p}) + \varepsilon_{i,p}, \quad (4)$$

where *B/A-cost* is the bootstrapped to actual cost, *RP-fraction*, is the total repurchase fraction, *RP-days*, is total number of repurchase days and *Ownership* is defined as one minus holdings by the top five shareholders.

The estimated coefficients of a regression of B/A-costs on repurchase fractions, repurchasing days and ownership concentration are shown in Table 8. The estimated coefficient for repurchase fraction is negative and statistically significant at the 5% level in model (1) and for the first repurchase year. For all repurchase years, the estimated coefficient is negative but statistically insignificant. Adding two independent variables to model (1), total number of repurchase dates and ownership concentration, yields statistically insignificant estimates as reported in column 2 and 4, although that the R^2 increases.[14]

[14] In addition, I controlled for firm size, repurchase to trading volume, and stock price in models (1) and (2) (not reported). None of these variables was statistically significant at conventional levels.

Overall, the negative estimated coefficient on repurchase fraction indicates that the difference between a firm which repurchases 10% and a firm which repurchases 2% will reduce the B/A-cost by 9.37%, ceteris paribus.

7. Conclusion

In this paper, I investigate open market share repurchase programs on the Stockholm Stock Exchange in Sweden since restrictions on buy-backs were removed in March 2000. Using a new and superior hand-collected dataset with information of daily repurchase activities enables me to follow firm behaviour in detail. This has been a neglected topic in empirical finance since reliable repurchase data are difficult to obtain. In this study, I analyze repurchase behaviour for 107 Swedish corporations with 228 repurchase programs over the period 2000 to 2007. Three major conclusions emerge.

First, I show that repurchase activity is higher in the first compared to the second half of the program. Repurchase fractions are also higher for the first, compared to the four consecutive repurchase years. The volume of repurchased shares to total number of shares traded is substantial, almost 8% for all firms in the first repurchase year and close to 15% for high buying firms. Using turnover as a proxy for liquidity, I find that liquidity in the firms stock improve in the second half of the repurchase year.

Second, I provide evidence that stocks in repurchasing firms are associated with abnormal returns. By using the three-factor Fama and French model, augmented with a momentum factor, I find an abnormal return of roughly 12% for the first repurchase year. By focusing on monthly returns, I am able to present evidence that the abnormal returns are located in the second half of the repurchase year. Further inspection of data also indicates that firms with small repurchase programs (repurchase fractions up to 5% of outstanding shares over the repurchase year) are not associated with any statistically significant abnormal returns.

In addition, I find and document that monthly abnormal returns are positively related to repurchase size for the four repurchase programs following the first one.

Third, I find that firms can repurchase shares at a lower cost than an average investor can do and also that this skill is more evident in firms with multiple programs. Also, this managerial skill is negatively related to repurchase fraction but unrelated to number of repurchase dates and ownership concentration.

Figure 1
Completion Rate for the First Repurchase Program

This figure shows mean cumulative repurchase fraction for the first repurchase year for firms with an activated repurchase program. Repurchase fraction is defined as number of shares repurchased divided by total outstanding shares. The first 21-trading days following the approval date is month 1 and trading days 22 to 42 is month 2, etc. A low buying firm (solid line in the figure) is a firm with a total repurchase fraction between 0-5% and a high buying firm (dashed line in the figure) is a firm with a total repurchase fraction between 5-10%. Total number of firm in each group is 65 and 42 respectively.

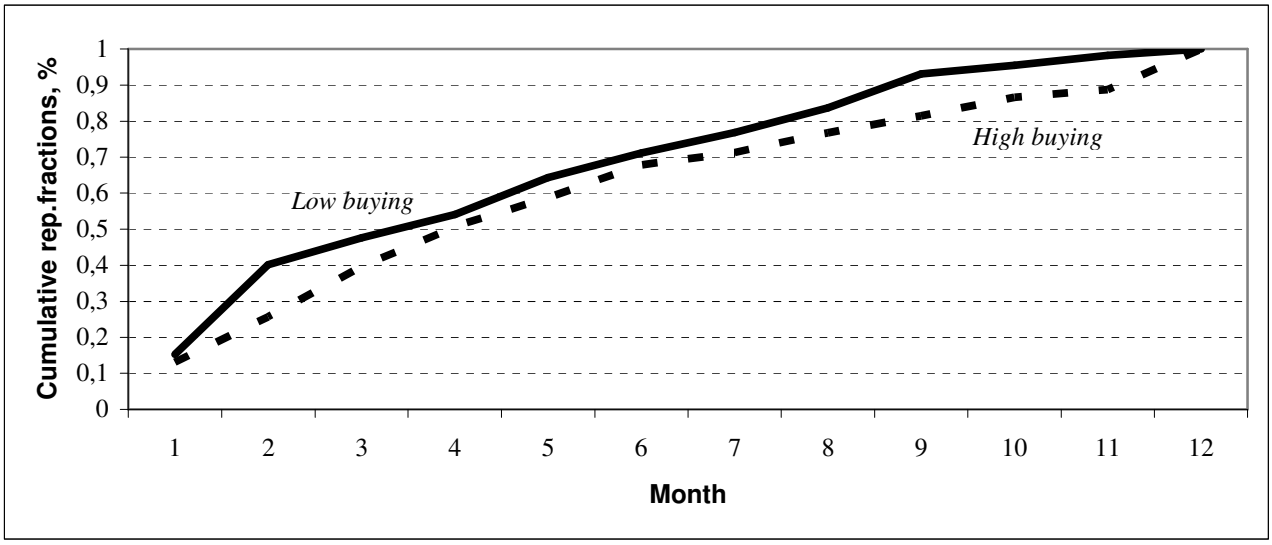


Figure 2
Monthly Repurchase Fraction in Different Programs

This figure shows mean monthly repurchase fraction, in percent, over the repurchase year for the first, second and the third repurchase year respectively (Program 1, 2 and 3 in the graph). The number of firms in each of these programs is 107, 52 and 34 respectively.

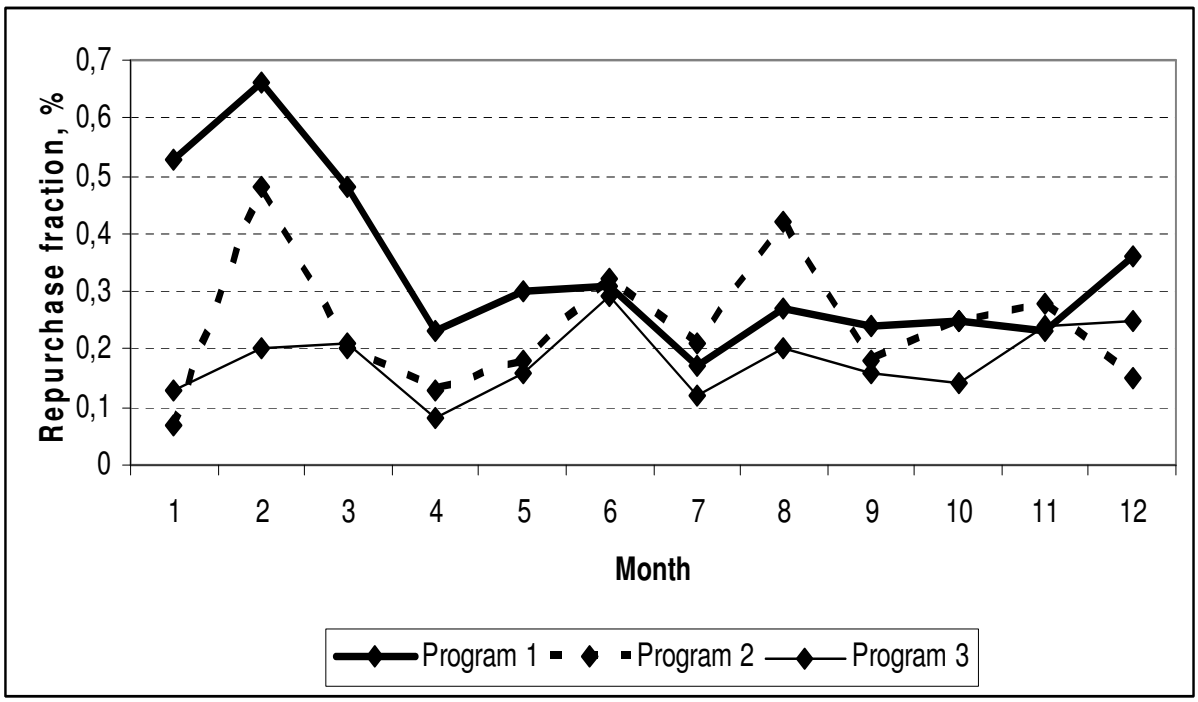
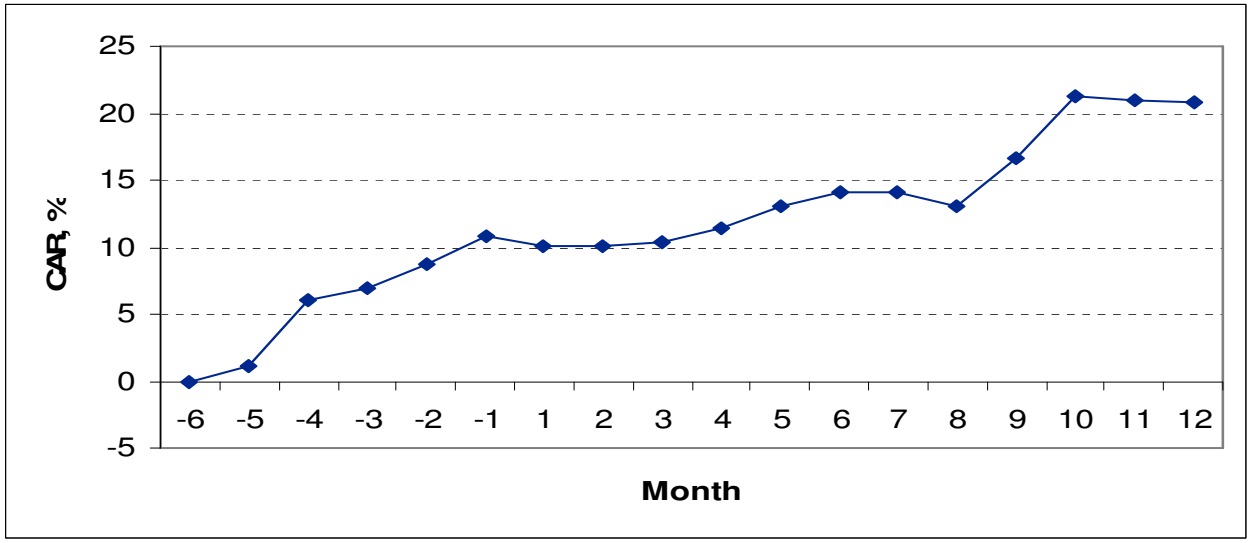
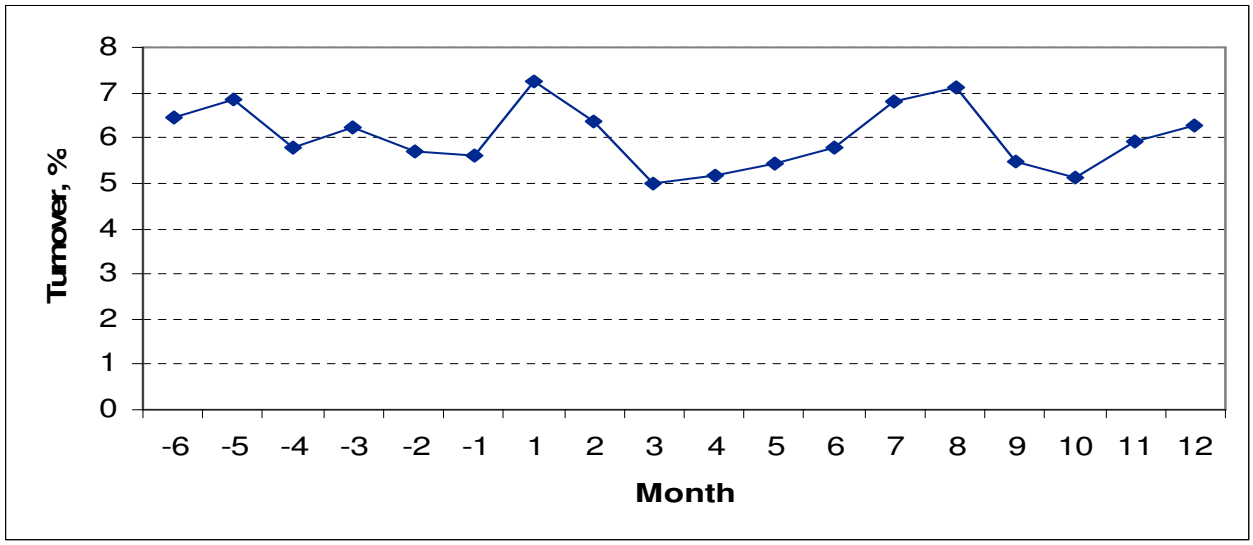


Figure 3
Cumulative Average Abnormal Returns, Turnover and Price Spread

This figure presents three graphs illustrating the average a) cumulative abnormal return (CARs), b) turnover and c) percentage price spread from event months -6 to +12 relative to the approval date of the repurchase program. See body text for definitions.





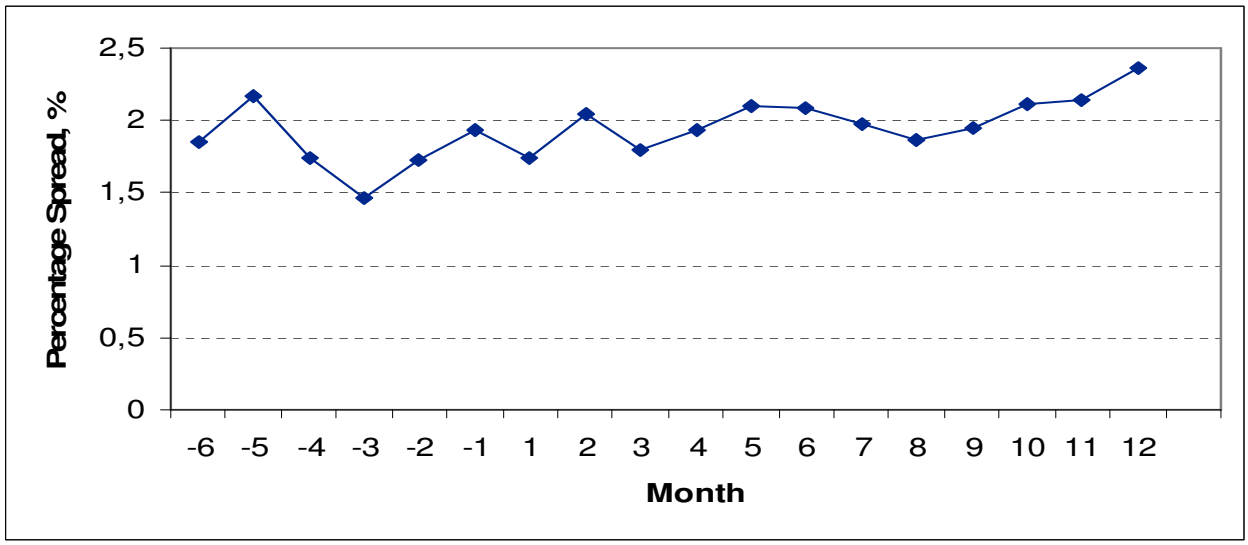


Table 1
Descriptive Statistics of Sample

This table reports descriptive statistics for the sample of repurchasing firms in Sweden that have activated one or multiple programs during 2000 to 2007. Firm characteristics and repurchase fraction (defined as number of shares repurchased divided by total outstanding shares expressed as a percentage) for the first program are presented in Panel A, frequency and size of programs in Panel B and number of repurchasing days in Panel C.

Panel A: Annual Descriptive Statistics for Repurchasing Firms (first program)

Year	Number of Programs	Mean market Cap. (SEK million)	Mean B/M-ratio	Mean Repurchase Fraction, %
2000	33	45,389	0.71	5.61
2001	21	15,237	0.71	3.90
2002	5	14,175	0.51	5.16
2003	9	1,388	0.82	2.49
2004	2	42,741	0.40	1.85
2005	3	2,391	0.35	0.40
2006	9	25,767	0.69	4.58
2007	25	10,755	0.44	2.07
All	107	19,730	0.58	4.39

Panel B: Number of Repurchase Programs per Firm and Repurchase Fraction

Order of Repurchase Programs	Number of Firms	Mean Repurchase Fraction, %
1	107	4.39
2	52	2.49
3	34	2.11
4	16	2.02
5	11	3.54
6	4	3.82
7	2	5.49
8	2	1.37
All	228	3.04

Panel C: Mean (Median) Number of Repurchasing Days per Firm by Year for the first program

Year	Mean (Median) Number of Repurchasing Days
2000	49.6 (42.0)
2001	34.0 (14.0)
2002	11.6 (2.0)
2003	18.8 (5.0)
2004	32.0 (32.0)
2005	14.2 (5.0)
2006	38.8 (39.0)
2007	23.2 (15.5)
All	27.8 (17.0)

Table 2
Monthly Repurchase Fraction, Repurchase to Trading Volume, and Market Liquidity

This table reports descriptive statistics for repurchasing firms listed on the Stockholm Stock Exchange and for their first open market share repurchase program during the period 2000 to 2007. Statistics is presented for each month but also for the first and second six-month period as well as for all months. Panel A shows mean of the variables: repurchase fraction, repurchase-to-trading volume (RTV), Turnover, and ILLIQ using repurchase as well as non-repurchase months. Firms are also sorted into low buying firms (total repurchase fraction is 0 to 5% and high buying firms (total repurchase fraction is between 5% and 10%). Panel B shows mean of the same variables but only for repurchase months. *p*-value are reported in brackets and shows significance level in mean difference between the first and the second six-month period.

	Period														
	1	2	3	4	5	6	7	8	9	10	11	12	1-6	7-12	All
	Panel A: All observations (n = 107)														
Repurchase fraction, %	0.53	0.66	0.48	0.23	0.30	0.31	0.17	0.27	0.24	0.25	0.23	0.36	0.42	0.25 [0.003]	0.34
RTV, %	10.07	9.67	17.11	6.15	8.12	7.05	4.62	5.94	6.50	4.94	5.52	6.63	9.71	5.68 [0.009]	7.82
Turnover,%	7.27	6.36	4.99	5.17	5.45	5.80	6.80	7.10	5.46	5.11	5.93	6.29	5.85	6.15 [0.268]	5.99
ILLIQ	4.34	6.27	5.74	5.26	4.68	6.86	5.00	5.32	7.13	5.40	5.82	9.32	5.52	6.26 [0.268]	5.87
	Total Repurchase Fraction for the Program is between 0 to 5 % (n = 65)														
Repurchase fraction, %	0.28	0.36	0.19	0.10	0.16	0.16	0.13	0.12	0.13	0.04	0.15	0.05	0.21	0.11 [0.017]	0.16
RTV,%	5.44	5.67	6.85	2.44	4.45	3.89	3.08	3.78	5.31	1.70	3.65	1.74	4.80	3.31 [0.050]	4.11
Turnover,%	6.90	5.85	4.97	5.26	5.49	5.58	6.96	6.55	5.65	5.35	6.83	6.67	5.68	6.34 [0.137]	5.98
ILLIQ	5.25	7.36	6.77	5.62	6.15	6.61	5.15	4.59	3.97	5.84	8.86	10.47	6.30	6.20 [0.473]	6.25
	Total Repurchase Fraction for the Program is between 5 to 10 % (n = 42)														
Repurchase fraction, %	1.01	0.66	1.07	0.49	0.59	0.62	0.27	0.56	0.47	0.59	0.36	0.83	0.84	0.51 [0.011]	0.68
RTV,%	19.06	17.45	38.26	13.68	15.57	13.48	7.75	10.26	8.80	10.17	8.46	14.29	19.56	9.92 [0.019]	14.85
Turnover,%	7.99	7.36	5.03	4.99	5.36	6.25	6.49	8.20	5.08	4.74	4.50	5.69	6.19	5.80 [0.313]	6.00
ILLIQ	2.56	4.14	3.62	4.52	1.68	7.34	4.70	6.77	13.24	4.70	1.06	7.50	3.96	6.38 [0.116]	5.15
	Panel B: All observations but only firms with repurchase activities														
Repurchase fraction, %	1.55	1.61	1.38	0.68	0.74	0.89	0.58	0.87	0.81	0.91	0.80	1.22	1.15	0.85 [0.021]	1.02
RTV,%	29.62	23.59	49.30	18.07	20.20	20.12	15.44	19.66	19.08	16.67	19.33	22.19	26.60	18.64 [0.050]	23.22
Turnover,%	7.29	9.10	5.09	6.65	6.85	6.66	7.39	8.99	5.36	4.38	4.60	4.76	7.01	6.05 [0.090]	6.59
ILLIQ	2.79	4.37	7.23	4.71	5.66	4.99	6.44	1.42	1.04	3.34	2.90	7.68	4.96	3.66 [0.248]	4.40
	Total Repurchase Fraction for the Program is between 0 to 5 %														
Repurchase fraction, %	1.08	1.08	0.76	0.40	0.46	0.57	0.50	0.47	0.41	0.18	0.63	0.25	0.72	0.42 [0.030]	0.59
RTV, %	21.12	17.00	26.58	9.33	13.15	14.04	11.76	15.11	17.32	7.08	15.58	8.18	16.69	13.05 [0.097]	15.12
Turnover,%	5.45	8.13	3.50	4.96	6.82	5.78	5.61	7.00	4.62	3.63	4.96	3.48	6.13	5.04 [0.078]	5.66
ILLIQ	4.08	7.48	13.13	8.52	9.24	7.42	8.48	1.77	1.31	3.94	4.56	6.17	8.31	4.19 [0.116]	6.54
	Total Repurchase Fraction for the Program is between 5 to 10%														
Repurchase fraction, %	2.01	2.23	2.01	0.98	1.10	1.24	0.71	1.38	1.16	1.52	0.97	1.92	1.62	1.29 [0.118]	1.48
RTV, %	38.12	31.23	72.02	27.36	29.32	26.95	20.66	25.25	21.66	26.27	23.08	32.98	37.58	25.07 [0.096]	32.32
Turnover,%	9.12	10.22	6.68	6.80	6.89	7.65	9.92	11.00	6.11	4.59	4.24	5.55	7.95	6.96 [0.246]	7.54
ILLIQ	1.51	0.77	1.33	0.66	1.02	2.25	3.55	0.99	0.63	2.75	1.24	8.84	1.24	3.04 [0.043]	2.00

Table 3
Repurchase Fraction, RTV, Turnover and Liquidity

This table reports mean values for repurchase fractions and measures for of the firm's stock for the first repurchase program and repurchase program 2-5. Values are reported for four periods: a) the first month, b) the first six-month period and c) the second six-month period within the repurchase year respectively and d) for all months within the repurchase year. Repurchase fraction is defined as number of share repurchased divided by total outstanding shares and expressed as a percentage. Repurchase-to-trading volume (RTV) is total number of repurchased shares divided by total number of shares traded on the SSE and expressed as a percentage. Turnover is total number of shares traded divided by total outstanding shares and expressed as a percentage. ILLIQ measures the illiquidity measure following Amihud (2002). *p*-value are reported in brackets and shows significance level in mean difference between the first and the second six-month period.

	Program 1 (n = 107)	Program 2-5 (n = 113)	Mean Difference
		Month 1	
Repurchase fraction, %	0.53	0.14	0.39 [0.001]
RTV, %	10.07	3.49	6.58 [0.004]
Turnover, %	7.27	5.29	1.98 [0.001]
ILLIQ	4.34	6.35	-2.01 [0.204]
		Month 1-6	
Repurchase fraction, %	0.42	0.23	0.19 [0.001]
RTV, %	9.71	5.91	3.80 [0.011]
Turnover, %	5.85	5.07	0.78 [0.018]
ILLIQ	5.52	4.28	1.24 [0.085]
		Month 7-12	
Repurchase fraction, %	0.25	0.21	0.04 [0.107]
RTV, %	5.68	9.80	-4.12 [0.214]
Turnover, %	6.15	5.53	0.62 [0.078]
ILLIQ	6.26	6.30	-0.04 [0.084]
		All Months	
Repurchase fraction, %	0.34	0.22	0.12 [0.000]
RTV, %	7.82	7.78	0.04 [0.018]
Turnover, %	5.99	5.29	0.70 [0.007]
ILLIQ	5.87	5.19	0.68 [0.067]

Table 4
Abnormal Returns for Open Market Share Repurchases in 2000-2007

This table reports monthly estimates, using Ibbotson (1975) RATS-methodology, on event-time monthly returns on the Fama-French (1993) three factors (MKT, SMB, HML) and Carhart´s (1997) momentum factor (MOM). Data is presented for four periods, the first month in the repurchase year (month 1), the first half (month 1-6), and the second half of the program (month 7-12) and for the repurchase year (all months). Panel A reports estimated coefficients for all months and Panel B reports estimated coefficients but includes only firms with actual buying activity. Standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Repurchasing period							
	Month 1		Month 1-6		Month 7-12		All months	
Panel A: All firms with activated repurchase program								
Intercept	-0.01	-0.02	0.00	0.00	0.01**	0.01***	0.01**	0.01**
	(0.01)	(0.02)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
MKT	0.07	0.07	0.68***	0.71***	0.67***	0.66***	0.67***	0.69***
	(0.23)	(0.23)	(0.08)	(0.08)	(0.08)	(0.09)	(0.06)	(0.06)
SMB	0.03	0.18	0.03	0.11	-0.15**	-0.17**	-0.08	-0.06
	(0.29)	(0.53)	(0.11)	(0.12)	(0.08)	(0.09)	(0.06)	(0.07)
HML	0.52**	0.43*	0.25***	0.17*	0.37***	0.39***	0.31***	0.28***
	(0.24)	(0.27)	(0.07)	(0.09)	(0.09)	(0.10)	(0.06)	(0.07)
MOM		0.22		0.14*		-0.03		0.05
		(0.27)		(0.09)		(0.09)		(0.06)
R-square adjusted	0.02	0.02	0.12	0.12	0.13	0.12	0.12	0.12
Number of observations	107	107	599	599	534	534	1,133	1,133
Panel B: Firms with actual buying activity								
Intercept	-0.01	0.00	0.01	0.01	0.03**	0.03**	0.02***	0.01**
	(0.02)	(0.03)	0.01	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
MKT	-0.07	-0.05	0.64***	0.65***	0.76***	0.88***	0.69***	0.74***
	(0.34)	(0.35)	(0.12)	(0.12)	(0.16)	(0.18)	(0.10)	(0.10)
SMB	-0.16	-0.41	0.09	0.15	-0.25*	-0.13	-0.08	-0.01
	(0.42)	(0.92)	(0.16)	(0.19)	(0.14)	(0.16)	(0.10)	(0.12)
HML	0.09	0.25	0.12	0.07	0.39***	0.27	0.24**	0.15
	(0.34)	(0.62)	(0.10)	(0.14)	(0.17)	(0.19)	(0.09)	(0.11)
MOM		-0.25		0.07		0.23		0.14
		(0.79)		(0.15)		(0.17)		(0.11)
R-square adjusted	-0.09	-0.12	0.12	0.12	0.14	0.14	0.12	0.12
Number of observations	34	34	215	215	163	163	378	378

Table 5
Abnormal Returns and Repurchase Size

This table reports monthly estimates, using Ibbotson (1975) RATS-methodology, on event-time monthly returns on the Fama-French (1993) three factors (MKT, SMB, HML) and Carhart´s (1997) momentum factor (MOM). Data is presented for four periods, the first month in the repurchase year (month 1), the first half (month 1-6), and the second half of the program (month 7-12) and for the repurchase year (all months). Panel A reports estimated coefficients for firms with a repurchase fraction up to 5% of outstanding shares (low buying firms) and Panel B reports estimated coefficients for firms with a repurchase fraction between 5% and 10% of outstanding shares (high buying firms). Standard errors are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Repurchasing period							
	Month 1		Month 1-6		Month 7-12		All months	
Panel A: Firms with repurchase size up to 5% of outstanding shares								
Intercept	0.01	-0.81	0.50	0.14	0.45	0.58	0.46	0.37
	(1.36)	(1.62	(0.49)	(0.51)	(0.55)	(0.58)	(0.36)	(0.38)
MKT	-0.07	-0.09	0.73	0.77	0.69***	0.66***	0.70***	0.72***
	(0.29)	(0.29)	(0.10)	(0.10)	(0.09)	(0.10)	(0.07)	(0.07)
SMB	0.15	0.45	0.09	0.24	-0.07	-0.10	-0.02	0.01
	(0.35)	(0.48)	(0.14)	(0.15)	(0.09)	(0.10)	(0.07)	(0.08)
HML	0.32	0.09	0.22	0.06	0.37***	0.42***	0.29***	0.25***
	(0.29)	(0.38)	(0.10)	(0.12)	(0.10)	(0.12)	(0.07)	(0.09)
MOM		0.37		0.25		-0.08		0.06
		(0.40)		(0.12)		(0.10)		(0.08)
R-square adjusted	-0.02	-0.02	0.13	0.14	0.15	0.15	0.14	0.14
Number of observations	65	65	393	393	337	337	730	730
Panel B: Firms with repurchase size between 5% and 10% of outstanding shares								
Intercept	-2.82	-5.96	0.10	0.03	2.48**	2.47**	1.07*	1.08*
	(2.65)	(3.85)	(0.71)	(0.82)	(0.01)	(0.01)	(0.60)	(0.65)
MKT	0.24	0.27	0.58	0.59	0.60***	0.60***	0.60***	0.60***
	(0.41)	(0.41)	(0.14)	(0.14)	(0.16)	(0.18)	(0.10)	(0.11)
SMB	0.73	0.08	-0.06	-0.05	-0.33**	-0.33**	-0.20*	-0.20*
	(0.47)	(0.59)	(0.17)	(0.18)	(0.14)	(0.17)	(0.10)	(0.12)
HML	-0.14	0.60	0.27	0.25	0.26	0.26	0.28***	0.28**
	(0.56)	(0.48)	(0.11)	(0.13)	(0.17)	(0.19)	(0.10)	(0.11)
MOM		0.54		0.03		0.00		-0.01
		(0.49)		(0.14)		(0.16)		(0.11)
R-square adjusted	0.01	0.02	0.08	0.08	0.10	0.09	0.09	0.09
Number of observations	42	42	200	200	193	193	393	393

Table 6
Abnormal Returns, Repurchase Fractions, Turnover and Prior Stock Return

This table reports the result of ordinary least square regression (OLS) where the dependent variable is the abnormal return, defined as the return on the stock minus the return on a stock in a non-repurchasing firm with roughly the same market capitalization and book-to-market ratio. Three explanatory variables are used: (a) repurchase fraction value, defined as value of repurchased shares divided by market capitalization value of equity as of the end of December the year prior to the repurchase year, (b) turnover, defined as number of shares traded on the SSE divided by total outstanding shares, and (c) prior month abnormal return, defined as above. Estimates from the OLS-model are reported for the first repurchase year (Program 1) and the consecutive four programs (Program 2-5) and for the three periods (Month 1-6, Month 7-12 and All Months). White (1980) heteroskedasticity-consistent standard errors are in parentheses. *, **, *** denotes statistical significance at the 10%, 5% and 1% level respectively.

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	Program 1			Program 2-5		
	Month (1-6)	Month (7-12)	All Months	Month (1-6)	Month (7-12)	All Months
Constant	0.0132**	0.0299***	0.0223***	0.0141*	0.0044	0.0071*
	(0.0052)	(0.0058)	(0.0038)	(0.0053)	(0.0064)	(0.0042)
Repurchase fraction value, as measured by value of repurchased shares to market capitalization of equity	0.0047	0.8561	0.0035	0.7430	0.9783	0.8621*
	(0.0274)	(0.5726)	(0.0288)	(0.5129)	(0.7712)	(0.4414)
Turnover, as measured by trading volume divided by outstanding shares	0.0255	-0.1305**	-0.0590	-0.2054**	0.0570	-0.0653
	(0.0568)	(0.0507)	(0.0376)	(0.0668)	(0.7497)	(0.0508)
Cumulative abnormal return for the prior month	0.0361	-0.1225***	-0.0407	0.1116	0.2116	0.0880***
	(0.0411)	(0.0425)	(0.0295)	(0.0909)	(0.0490)	(0.0321)
Adjusted R^2	0.002	0.022	0.004	0.017	0.035	0.013
Number of observations	593	528	1,121	645	595	1,240

Table 7
Share Repurchases and Managerial Timing

This table illustrates the result of the analysis between the empirical distribution (bootstrapped) of repurchase cost and actual repurchase cost for each program and firms with share repurchase programs in Sweden over the period 2000 to 2007. The ratio between the bootstrapped cost and actual repurchase is then computed and a ratio greater than 1 indicates existence of managerial timing within the repurchasing firm. This procedure is repeated 100,000 times for each program and the mean of the ratios is then computed. In the analysis, I exclude bootstrapping in months when the firm is not allowed by law, to repurchase any shares. In Panel A, the year indicates the starting year for each program. In Panel B, programs are sorted by order of program and in Panel C, firms are sorted by repurchase size where low (high) buying firms have a repurchase fraction between 0 and 5% (5% to 10%) of outstanding shares.

	Total number of share programs	Mean (median) bootstrapped cost divided by actual repurchase cost	Minimum (maximum) bootstrapped cost divided by actual repurchase cost	% of observations with a pseudo *p*-value less than 0.10
Panel A: Sorted By Year				
2000	25	1.0116 (1.0010)	0.8919 (1.2350)	24.00
2001	22	0.9921 (0.9781)	0.7654 (1.1621)	36.36
2002	26	1.0226 (1.0187)	0.8097 (1.2169)	15.38
2003	18	1.0270 (0.9857)	0.7974 (1.5188)	33.00
2004	18	1.0491 (1.0527)	0.8712 (1.3438)	16.67
2005	14	1.0301 (1.0379)	0.8717 (1.1500)	21.43
2006	19	0.9996 (1.0201)	0.3038 (1.2947)	21.05
2007	30	1.0397 (1.0177)	0.8748 (1.5385)	16.35
2000–2007	169	1.0259 (1.0119)	0.3038 (1.5385)	36.01
Panel B: Sorted Repurchase Year				
Repurchase year				
1	73	1.0320 (1.0114)	0.3038 (1.5385)	17.81
2	41	1.0190 (1.0116)	0.7654 (1.2648)	26.83
3	27	1.0192 (1.0090)	0.8717 (1.3454)	33.33
4	13	1.0005 (1.0068)	0.7974 (1.2947)	23.08
5	9	1.0734 (1.0762)	0.9522 (1.2172)	11.11
Panel C: Sorted by Repurchase Fractions				
Low buying	97	1.0306 (1.0143)	0.8097 (1.5188)	26.80
High Buying	59	0.9952 (1.0026)	0.3038 (1.2648)	22.03

Table 8
Determinants of Managerial Timing Skill

This table reports the result of ordinary least square regression (OLS) where the dependent variable is the mean bootstrapped-to-actual cost for each firm and each program and the independent variables, which are likely to have an impact on the managerial timing skill, are repurchase fraction, total number of repurchase days and ownership concentration of holdings. Estimates from the OLS-model are reported for two models and for the first program and all programs respectively. White (1980) heteroskedasticity-consistent standard errors are in parentheses. *, **, *** denotes statistical significance at the 10%, 5% and 1% level respectively.

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	Program 1		All Programs	
	(1)	(2)	(1)	(2)
Constant	1.0774*** (0.027)	1.1522*** (0.069)	1.0254*** (0.018)	1.0213*** (0.044)
Repurchase fraction, as measured by total number of repurchased shares to total number of outstanding shares	-1.1714** (0.473)	-0.9148* (0.509)	-0.3735 (0.356)	-0.2700 (0.373)
Total number of repurchase dates		-0.0005 (0.0004)		-0.0011 (0.0009)
Ownership concentration, as measured by one minus holdings by the five largest shareholders		-0.1027 (0.109)		0.0284 (0.070)
Adjusted R^2	0.081	0.116	0.007	0.018
Number of observations	71	71	157	157

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