The Nature and Persistence of Buyback Anomalies

Urs Peyer

and

Theo Vermaelen

INSEAD

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ABSTRACT

Using recent data on buybacks, we reject the hypothesis that the market has become more efficient and has eliminated anomalies first reported by Lakonishok and Vermaelen (1990) and Ikenberry, Lakonishok and Vermaelen (1995). Buying and tendering shares before the expiration of a self-tender offer still generates large excess returns of 9 % in a few weeks. Furthermore, long-run abnormal returns persist after self-tender and open market repurchases. They are highest for firms with very negative returns in the six months prior to the repurchase announcement and firms where managers motivate the repurchase by saying their stock is undervalued.

Urs Peyer and Theo Vermaelen, INSEAD, Boulevard de Constance, 77305 Fontainebleau, France. Email: urs.peyer@insead.edu and theo.vermaelen@insead.edu. We would like to thank seminar participants at the University of Frankfurt.

1. Introduction

In an efficient market, anomalies, once detected and made public, should disappear. Schwert (2003) argues that many notorious anomalies have disappeared in recent years, even if the anomalies existed in the sample period in which they were first identified. The argument is that the activities of practitioners who implement strategies to take advantage of anomalous behavior can cause the anomalies to disappear, as research findings cause the market to become more efficient.[1] The alternative explanation might be that the abnormal returns are sample-specific and therefore due to chance (Fama, 1998). In this paper we study whether important anomalies related to share repurchases, documented in the nineties, still exist. The empirical results of these studies are based on data that are at least 15 year old. Moreover, the number of share repurchase announcement has increased dramatically in recent years (Grullon and Michaely, 2004). If (almost) every company is repurchasing its own shares, it seems less plausible that a trading rule based on share buybacks can beat the averages.

Lakonishok and Vermaelen (1990) find a trading rule that involves buying shares of a company that has announced a self-tender offer. Their rule involves buying shares six days prior to the expiration of the offer and tendering those shares, whenever the stock price trades at least 3 % below the tender price. If the company repurchases the shares, it is at the tender price. If the repurchase is oversubscribed, shares that are not repurchased are sold 12 days after the expiration date at the then prevailing market price. In the

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[1] Similar cautious statements can be found in finance textbooks. For example Grinblatt and Titman (2001) write on p. 684: "Of course, even a market that was inefficient in the past may not continue to be so in the future. We thus urge readers who plan to implement trading strategies that take advantage of these apparent inefficiencies to exercise caution". Ross, Westerfield and Jaffe (2005) write on p. 375: "These papers [Ikenberry, Lakonishok and Vermaelen (1995) and Loughran and Ritter (1995)], *if they stand the test of time*, constitute evidence against market efficiency."

sample period of 1962-1986, this rule generated a 6.18% abnormal return (not annualized), with 89.1% of the trades resulting in positive abnormal returns. Following a similar strategy using a sample of 22 French repurchase tender offers, Lücke and Pindur (2002) report similar large excess returns of more than 8 %.

The second puzzle relates to long-run abnormal returns after share repurchase announcements. In the same sample, Lakonishok and Vermaelen (1990) find excess returns of 8.76% over a period of 21 months, starting 3 months after the self-tender offer announcement. This excess return is calculated relative to a size and market factor. Furthermore, the market seems to underreact to open market share repurchase announcements as well. Ikenberry, Lakonishok and Vermaelen (1995) investigate the stock price performance of firms that announce an open market share repurchase between 1980 and 1990. They find average abnormal buy-and-hold returns of 12.1% over the four years following the announcement. A more significant underreaction of 45.3% is observed for 'value' stocks (high book-to-market firms), which Ikenberry et al. (1995) use as a proxy to identify firms that are more likely to be undervalued at the time of the repurchase announcement. Market under-reaction is consistent with the survey results of Brav, Graham, Harvey and Michaely (2005) who find that 90 % of all CFOs "agree or strongly agree" with the statement that they repurchase stock when the shares are undervalued. Without under-reaction, such a timing strategy could not be successful.

The first purpose of this paper is similar to Schwert (2003), i.e., to test whether these anomalies persist. Second, we address the criticism of Mitchell and Stafford (2000) and Fama (1998) who argue that the buy-and-hold return methodology of Ikenberry et al. (1995) is biased. We use the methodology they recommend, i.e. the calendar-time

portfolio method. This method forms portfolios in calendar-time, rather than event-time, so that biases induced by potential clustering are minimized. Third, we test Grullon and Michaely (2004) 's hypothesis that long-run excess returns after open market repurchase programs are signaling a decline in risk rather than an in increase in expected cash-flows. In order to test this hypothesis, we use the Fama-French three factor model and Ibbotson's (1975) returns-across-time-and-security (RATS) methodology. Unlike the calendar-time portfolio method, Ibbotson's method allows us to estimate average abnormal returns each event month and adjust for monthly risk changes after the event. By adjusting monthly for risk-changes, if Grullon and Michaely's hypothesis holds, no long-run excess returns should exist if one uses Ibbotson's methodology.

The advantage of testing the first trading rule (buying and tendering around the expiration date of tender offers), is that the investment period is limited to a few days. Thus, model based biases are less likely to explain the abnormal returns. We find that the trading rule around the expiration date of self-tender offers still produces economically and statistically significant abnormal returns. In our sample from 1987-2001, we find average abnormal returns of 8.6% (median of 4.1%), both statistically significant at the 1% level, and 84% of the events produce positive excess returns. We offer a possible "explanation" for this apparent mispricing: the market sets prices as if it expects all shares to be tendered. This means that, when a company announces a repurchase tender offer for 20 % of its shares outstanding, an investor who buys 100 shares six days before the expiration date and tenders them, will be able to sell 20 shares at the tender price. In reality, very few investors tender, so that, on average, firms repurchase 80% of all tendered shares.

With respect to the second set of anomalies, we find that the long-run abnormal returns are insignificant for the full sample of self-tender offers using the Fama-French three-factor model. Only if we focus on the small firms, do we get statistically significant results. However, this is similar to Lakonishok and Vermaelen (1990), even though they only control for size and the market. They too find that the abnormal returns are concentrated in the small firms.

The market apparently also has not become more efficient after open market repurchase announcements. Consistent with Ikenberry, Lakonishok and Vermaelen (1995) we find that long-run abnormal returns are significantly positive and higher for small firms as well as for 'value' firms. This result holds, regardless of the methodology employed.

Fama (1998) argues that the Fama-French (1993) three-factor model "has systematic problems explaining the average returns on categories of small stocks". Specifically, from Table 9a in Fama-French (1993), it appears that growth stocks in the smallest size quintile experience statistically significant *negative* excess returns. While this could potentially explain the long-run underperformance after IPOs (as documented by Loughran and Ritter, 1995), it cannot explain the positive excess returns in this paper, especially considering that only 8 of the 3,481 firms in our open market repurchase sample are growth firms in the smallest size quintile[2].

Our analysis goes beyond simply confirming the persistence of the anomaly. We also want to get more insights in the nature of the anomaly. Past research tests the market timing hypothesis by conditioning abnormal returns on book-to-market, implicitly

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[2] The number of events in each quintile varies because the quintile cutoffs are based on the Compustat universe of firms.

assuming that this ratio proxies for the likelihood of undervaluation. In this paper we condition on two other variables: (1) the stated reason for the repurchase and (2) the stock return in the 6 months prior to the announcement.

Academic signaling models typically assume that there has to be a cost to false signaling as it is always assumed that "talk is cheap" and managers lie unless if they bear a cost. However, using Ibbotson's RATS methodology, we find significant long-run abnormal returns of 32 % for the sub-sample of repurchasing firms where the stated motivation to do the repurchase is "undervaluation" and "best use of money". When the stated motivation is "reducing dilution" and "increasing earnings-per-share" we find insignificant long-run abnormal returns of 9%. So when managers say they are trying to time the market, they actually are successful. When they say they don't try to time the market, it turns out that they are not. Thus, managerial talk is not as cheap as investors seem to think it is.

Grullon and Michaely (2004) find that open market repurchase programs are not followed by an increase in operating performance, but by a reduction in risk. This could still be consistent with a managerial timing story, but the undervaluation is caused by the fact that the market overstates risk, not because it underestimates cash flows. But from the results in this paper we have to reject this interpretation as the long-run excess returns persist after using a methodology (Ibbotson RATS method) that adjusts for risk-changes after the event. We find an answer to this apparent contradiction between the lack of abnormal operating performance and the large post-announcement abnormal stock returns. We find that past returns are the best predictor of future abnormal stock returns: companies that have experienced large price declines in the 6 months prior to the open

market repurchase announcement, experience the largest positive abnormal returns in the future. So when companies are repurchasing shares because they are "undervalued", they are not doing this because they expect earnings to increase. They are buying back stock because they disagree with the market's forecast that earnings will *decline* in future years. Thus, the lack of evidence of improving operating performance reported by Grullon and Michaely (2004) is not inconsistent with a market timing story that assumes managers believe that the market is too pessimistic about the long-term earnings prospects of the company.

Given our findings that (1) market-to-book (2) what managers say and (3) the prior six-month return are good predictors of future abnormal returns, we investigate whether a simple undervaluation-index that combines the different proxies for undervaluation helps to predict future performance better than any individual proxy. In addition to these three proxies, we also use size as a proxy for undervaluation, as it seems reasonable that small firms are more likely to be mis-priced than large firms. The top quintile sample of the index, i.e., the subsample most likely to be undervalued, generates excess returns of around 50% in the four years following the open market repurchase announcement. The lowest quintile portfolio generates only marginally significant abnormal returns of between 6% and 13%.

Employing this index we then test whether the performance is time dependent, by forming each year, from 1991 to 2001, a portfolio that consists of 50 stocks with the highest undervaluation index. The fact than 10 out of the 11 portfolios, which each contain different stocks, show statistically significant excess returns after 48 months strongly supports the notion that the buyback anomaly is time-independent. Finding long-

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run abnormal returns year-after-year, and compared to ILV also in more recent data reduces the likelihood that the abnormal returns are sample (time) specific. Moreover, in this paper we compute long-run (48 months) abnormal returns after open market repurchases for 35 sub-samples and all of them are positive. It is therefore rather unlikely that simple chance has generated the abnormal returns documented by ILV. It seems more likely that managers are indeed capable of buying back stock when the shares are undervalued.

This paper is organized as follows: In the next section we investigate the persistence of the anomalies around self-tender repurchases documented in Lakonishok and Vermaelen (1990). Section 3 starts with a review of the long-run abnormal returns after open market repurchases. We show additional evidence that supports the conclusion that the market underreacts to information conveyed by the repurchase. Section 4 concludes.

2. Tender offer repurchases

We start our investigation with fixed price tender offer repurchases. In a fixed price tender offer, firms offer to repurchase shares at a fixed price, the tender price[3]. There are two trading rules that Lakonishok and Vermaelen (1990) [henceforth LV] find to be profitable. The first trading strategy is around the expiration date of the tender offer, the second is after the expiration date.

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[3] Kadapakkam and Seth (1994) report statistically significant average abnormal returns of 2.89% by trading around the expiration date of Dutch auction tender offers. Note that trading strategies are likely to be less profitable and more risky as investors determine the repurchase price, not the company who only specifies a range of a maximum and a minimum price. In order to verify whether these trading profits still exist, we select Dutch auction tender offers in the years 1987-2001 from SDC. Of the 200 events with available data, we find an average abnormal return of 2.9% with a t-statistic of 4.31. This involves buying shares six days prior to the expiration date and tendering those shares at the price paid. If the final Dutch auction price is higher, the shares are repurchased (if oversubscribed, we assume pro rating), any shares not repurchased are sold 12 days after the final expiration date. The abnormal return is calculated subtracting the market return over the corresponding days.

2.1 Sample description

We draw our initial sample from Securities Data Corporation's (SDC) mergers and acquisition database and supplement it with data from SDC's repurchases database. There are 261 self-tender offer announcements between 1987 and 2001. We do not include Dutch auction tenders and repurchases where the firm intends to go private, i.e., repurchasing all shares outstanding.

We further limit our analysis to repurchases of common stock (excludes 35 events, mostly repurchases of warrants) and also exclude repurchases announced by closed end funds (17 observations). We eliminate repurchases where the stock price five days prior to the announcement was less than $3 since bid-ask spreads could lead us to find relative big returns without the possibility for an arbitrageur to exploit such returns. This leaves us with a sample of 188 announcements. Of those, we have incomplete information on the details of the repurchase offer for 11 events. Finally, we exclude 15 odd-lot repurchases, i.e., repurchases announced with the intention to buy back shares from stockholders with less than (usually) 100 shares. These repurchases are made exclusively from small shareholders. The maximum fraction sought in those repurchases was 2% of the shares outstanding. The usual repurchase size in such odd-lot repurchases is less than 1% of the shares outstanding.

Finally, there are 19 events where the firm does not complete the repurchase. 11 of the tenders withdrawn were related to either a successful acquisition of the firm or to the failure of being acquired. Of the remaining 8 events three were withdrawn because they did not meet the conditions set forth by the company, and one company cited regulatory issues. Four did not mention a reason for withdrawing. Except for one event, the three

others were withdrawn soon after the announcement. One company withdrew the offer only three days before the expiration date.[4]

This leaves us with a sample of 141 self-tender offers that are completed and have data available. The descriptive statistics for the sample are reported in Table 1. Compared to the tender offers described in LV, we find about the same premium being paid (22.18% relative to their 21.79%). However, in our sample, the fraction sought and the fraction repurchased are higher than in LV. We find that the average repurchasing firm seeks 29.42% of the shares outstanding (LV: 17.06%) and ends up repurchasing on average 25.87% (LV: 16.41%). Thus, the ratio of the fraction repurchased to the fraction tendered (F_P/F_T) has slightly decreased from 86.61% in LV to 79.98% in the later years.

Panel B shows descriptive statistics for the 19 events that did not complete the repurchase. It is interesting to note that those events display very similar average repurchase premium and fraction sought alleviating concerns that those offers systematically differ ex ante.

2.2 Trading around the expiration date of the tender offer

2.2.1 Returns to the trading strategy

We replicate the LV-trading rule around the expiration date of the tender offer. It involves buying shares prior to the first expiration date of the offer and tendering those shares to the company. If the repurchase is undersubscribed (i.e., the fraction of shares tendered, F_T, is less than the fraction of shares sought by the company), the company repurchases all shares that are tendered or extends the offer period[5]. In the case of oversubscription, the company either repurchases all shares tendered, i.e., more than it

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[4] Including this event does not alter the inferences drawn from the following analysis.
[5] Of the 141 events, 25 extend the offer period once, 5 twice and one four times.

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initially wanted to repurchase, or it pro rates. Thus, only a fraction F_P/F_T is repurchased. Since the maximum price one can get by tendering is P_T, we only enter the trading strategy if the stock price six days prior to the first expiration date is at least 3% below P_T (this should also cover transaction costs). There are 80 events where the stock price 6 days prior to the first expiration date is at least 3% below the tender price. We buy shares six days prior to the first expiration date and tender the shares to the company.[6] If they are bought fully, we receive the repurchase price. If the shares are pro rated, we sell the remaining shares 12 days after the final expiration date.[7] The return to this strategy is calculated as follows:

$$\text{Return} = [F_P/F_T \times P_T + (1 - F_P/F_T) \times P_{12}] / P_{-6} - 1 \qquad (1)$$

where F_P is the fraction of shares outstanding that the company did repurchase, F_T is the fraction of shares outstanding that is tendered, P_T is the tender price, P_{12} (P_{-6}) is the stock price 12 (6) days after (before) the final (first) expiration date. To compute the abnormal return, we subtract the market return (equally-weighted CRSP index) over the corresponding period. Qualitatively similar results are obtained if we subtract returns computed based on the market model (not shown).

Table 2 reports the results. The average abnormal return from this strategy is 8.6%, significant with a t-statistic of 5.5. The median return is 4.1% and also significant at the

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[6] 14 events extend the tender period.
[7] The choice of buying 6 six days prior to the expiration is driven by the usual settlement procedure by which an investor becomes the owner of the stock five business days after the purchase date. The 12 days after are chosen because the pro-rata decision is not final until 10 days after the expiration (see LV for more details). However, our findings are almost identical if we assume to sell 2 days after the expiration, at P_2, instead of P_{12} (not tabulated).

1% level. 84% of the trades generate positive returns. The abnormal returns in the period from 1987-2001 are comparable to the period of 1962-1986 investigated in LV. They find an average (median) return of 6.18% (4.64%), with 89.1% of the trades generating a positive return. Thus we conclude that the anomaly around the self-tender offer expiration date still exists today.

2.2.2 Possible explanations

LV investigate two possible explanations for the observed abnormal trading gains of this strategy. The first is related to the fact that managers have some discretion over how many shares to repurchase in an oversubscribed tender. If the price prior to expiration was lower relative to the tender price managers may repurchase more shares than initially sought to further strengthen the signal. If this was the case, the observed returns might be difficult to achieve for an arbitrageur since he might increase the price prior to the tender expiration, thus reducing the propensity of management to repurchase more shares than initially sought. However, LV find a negative, but statistically insignificant relation between the ratio of the price prior to expiration and the tender price (P_{-6}/P_T) and F_P/F_T. In our sample, we find a significant positive correlation in the subsample of oversubscribed events where P_{-6} is at least 3% below P_T. Furthermore, the correlation between the ratio of fraction sought to fraction purchased (F_s/F_P) and P_{-6}/P_T is insignificant, but negative. Thus, the data does not seem to support this potential explanation in our sample period either.

The second reason investigated was whether liquidity dropped after the repurchase announcement. LV find an increase and conclude that the market is liquid and the strategy feasible. Ahn, Cao and Choe (2001) reach similar conclusions by showing that

during the offer period bid-ask spreads fall and trading volume and quotation depth increase.

Table 3 also reports abnormal trading volume in the 21 days around the expiration of the tender offer. In the days between ten and two days prior to the expiration date, trading volume is significantly greater than the average trading volume computed between 50 and 25 days prior to the tender offer announcement.

We add to this by investigating whether the abnormal returns are lower in more liquid stocks. We use two proxies for liquidity. First, we take the average of the shares traded divided by shares outstanding in the days between 50 and 25 days prior to the tender offer announcement (a proxy for normal trading volume). Second we take the average of the ratio of actual trading volume to the normal volume over the 10 days prior to the first expiration date. Then we correlate these proxies of liquidity with the trading strategy returns. The correlation turns out to be positive and significant (not tabulated). For the first (second) proxy the coefficient is 0.45 (0.19), significant at the 1% (5%) level. Thus, our tests strongly reject the notion that the abnormal returns are merely a reflection of illiquidity.

A further possibility raised in LV is that the market might underestimate F_P/F_T and/or P_{12}. We take this argument a step further by testing whether the market assumes that all shares will be tendered. Such an assumption may not seem unreasonable as the trading strategy involves buying shares when the stock price trades significantly below the tender price. In this case, the price after expiration is expected to be below the tender price, so that everyone *should* tender. In that case, P_{-6} is determined by the following relation:

$$P_{-6} = [F_P \times P_T + (1- F_P) \times P_{12}] \tag{2}$$

In other words, investors still weigh P_T by F_P/F_T, but assume that $F_T = 1$. If the market followed this logic, then the expected return from buying shares six days prior to the first expiration date and tendering (selling the ones not repurchased by the company at P_{12}) would be as follows:

$$E(\text{Return}) = [F_P \times P_T + (1- F_P) \times P_{12}] / P_{-6} - 1 \tag{3}$$

The results are reported in Table 2, Panel B. Over the whole period from 1987-2001, the average expected return is an insignificant 1.54%.[8] Interestingly, the early part of the sample did still display significant returns (1987-1995: 2.47%), while the latter half of the sample shows an average expected return of 0.00%, with 48% of the observations being positive. Note that we get similar results if we shorten the event window by assuming that we can sell two days after the final expiration date (Panel C in Table 2). While the magnitudes of the returns are very similar, the standard errors are smaller, such that the average return for the full sample is significant again. When we compare returns across the two event windows, we find that the minimum (maximum) is -15.4% (49%) for the longer window and -8.9% (19%) for the shorter event window. Nevertheless, the second half of the sample period displays again a zero return.

These findings are consistent with the interpretation that especially in recent years the market sets prices assuming that all shares will be tendered. Another way of stating this is

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[8] We chose to report returns, not abnormal returns since the tender price is fixed. Subtracting the market return from the expected return results in an average expected abnormal return of 0.8% (for the early part 2.0%, the later part −1%). All averages are insignificant.

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that the market sets prices as if the average investor, not the marginal investor, determines the stock price.[9] From this perspective, there are two puzzles: One, why are not all shares tendered? Two, why would anyone be willing to sell their shares at such a discount from fair value rather than tendering to the company?

Capital gains taxes and corporate control issues might explain why not all shares are tendered. If we assume that those issues are less important for institutional investors, then we expect that excess returns are lower if institutional ownership is higher prior to the self-tender offer announcement. For one, institutional owners would be more likely to tender, thus increasing F_T towards 1. Second, institutions hold diversified portfolios and would be more familiar with a repurchase tender offer, a rather unique event in a company's history. For example, the 141 tender offers in our sample are made by 135 different companies as only 6 companies make more than one tender offer. Hence, stocks should be priced more efficiently during the tender period if they are held by institutions.

We collect information on institutional ownership from 13f filings with the SEC (Thomson Financial). On average, 30.3% of the shares of the companies in our sample are owned by institutions in the quarter prior to the repurchase announcement. We find that institutional ownership fraction is negatively, but insignificantly correlated with F_P/F_T (correlation of −0.18, with a p-value of 0.11). Furthermore, we find that the strategy's excess returns are positively (0.17), but insignificantly correlated with institutional ownership. In sum, stocks that have a bigger institutional ownership fraction are neither more likely to have a higher F_T, nor are they priced more efficiently.

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[9] Since the fraction repurchased, F_P, is not known exactly six days prior to the expiration, we have recomputed the results of equation 3 with the fraction sought, F_S. Not surprisingly, the implications are the same (not tabulated separately) since the average fraction sought and fraction repurchased are very similar (see Table 1).

Another possibility might be that the dollar gains from this arbitrage strategy might be too small for professional investors to exploit. However, if we assume that the abnormal trading volume on day six prior to the first expiration (which is 2.54)[10] is entirely due to arbitrageurs buying, then we find that the dollar gain, on average (median), is $1.32m ($0.35m).[11] This would seem to be the lower limit of possible arbitrage gains as it is based on only one day of trading. As shown in table 3 abnormal trading volume is high throughout the period from 10 days to one day prior to the first expiration of the self-tender offer (comparable to LV, table V). The abnormal trading volume in the days just before the tender offer expiration also suggests that the strategy's excess returns are not determined by just a few sellers in an illiquid market. To the contrary, more liquidity is available just prior to the expiration of the tender period.

We are unable to find a satisfactory explanation as to why we observe such excess returns to this tender-strategy and why they prevail. We are left to conclude that these excess returns are an anomaly that the market has not (yet) arbitraged away. Gray (2003) argues that the excess returns overstate "ex-ante implementable excess returns". His argument is that when arbitrageurs buy and tender, F_T increases and abnormal returns fall. On average, in our sample, an arbitrageur could have made a non-trivial $ 1.32m by buying and tendering the abnormal trading volume on the sixth day prior to the expiration, which represents a trivial fraction (1.04%) of the percentage of shares outstanding. Of course, if he buys up more shares, the marginal return from tendering

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[10] LV find that the average trading volume six days prior to the expiration date is 2.72 times the average trading volume measured over 25 days, 25 days prior to the announcement. We compute abnormal trading volume the same way. The findings are robust to a longer measurement period for normal trading (not shown) over 180 days ending 25 days prior to the announcement day.

[11] The dollar gain per firm is computed as: [(number of shares traded on day –6 minus average number of shares traded) x P_{-6} x strategy abnormal return].

will decrease as the fraction of shares tendered increases. But Gray's argument is somewhat internally inconsistent: on the one hand he makes the reasonable assumption that arbitrageurs care about wealth maximization, not return maximization, but on the other hand he is concerned about the fact that when wealth increases, excess returns to the arbitrageur fall. This decline in marginal returns cannot explain why wealth-maximizing arbitrageurs don't arbitrage away the anomaly.

2.3 Trading rules after the expiration date

LV also document abnormal returns after the expiration date. In particular, they find an average 23.11% abnormal return over the period from three to 24 months after the tender offer announcement using as a benchmark model the value-weighted market model. Using a size (size and market) benchmark, the abnormal returns decrease to 8.57% (8.76%), although still significant. They show that the average abnormal returns are significant only in the early half of their sample using benchmark models other than the value-weighted index. Interestingly, the abnormal returns do not uniformly disappear. LV find significant long-run abnormal returns in small firms even in the second half of the sample period using the size and market adjustment benchmark (22.27% with a t-statistic of 1.77. See their Table 10). In the following we investigate whether those long-run abnormal returns pertain using more recent data and various methodologies to compute abnormal returns.

2.3.1   Fama-French Calendar-time Portfolio Approach

In order to avoid biases due to data clustering, Fama (1988) and Mitchell and Stafford (2000) advocate the use of the calendar-time portfolio approach to measure long-term

abnormal returns. The Fama-French calendar-time portfolio methodology does not rely on an estimation period prior to the event in order to compute the abnormal returns. Portfolios are formed by event month but in calendar-time. The portfolio in month t contains all the stocks of firms that had an event in the prior 24 months. A single regression is then run where the dependent variable is the time series of calendar portfolio returns. The intercept represents the mean monthly excess return in the event period (here months (+1,+24) where months 0 is the expiration date of the self-tender offer.

We do not follow Mitchell and Stafford (2000)'s suggestion to calculate value-weighted portfolio returns. First, as pointed out by Loughran and Ritter (2000) value-weighting decreases the power to identify abnormal returns, as it is less likely that large companies repurchase stock because they are undervalued. Consistent with this argument, we will show *infra* that at least three proxies for the likelihood of undervaluation are significantly negatively correlated with firm size. If anything, if one would want to increase the power of the test to detect mis-pricing, weighting should be based on the *inverse* of size. Second, the weighting scheme should be determined by the economic hypothesis of interests. In this paper we try to estimate excess returns experienced by an average firm announcing a share repurchase. We are not trying to assess the macro-economic relevance of an anomaly or to make an inference about the general level of efficiency of the stock market[12]. We are simply asking whether managers are capable to time the market, something that 90 % of them claim to be able to do (Brav et al., 2005).

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[12] In other words, we are perfectly willing to accept the hypothesis that 99% of all stocks are priced correctly. We just want to investigate where there is something systematic about the exceptions.

The results are shown in Panel A of Table 4. In our sample of 141 events, we find an average abnormal return of 0.5% per month using equally-weighted portfolios. The t-statistic, however, is only 1.8. Over the 24 months, this represents a 12% average abnormal return. The magnitude of the long-run abnormal return is therefore comparable to the earlier time period of 1962-1986 in LV. When we split the sample into large and small stocks, we only find significant abnormal returns in the small firms: the average monthly abnormal return for small (large) firms is 0.92% (-0.21%) with a t-statistic of 2.05 (-0.68). This is again consistent with the findings in LV who also only find significant long-run abnormal returns for small firms.

The disadvantage of this calendar-time method is that we potentially throw away a lot of information since the portfolio approach attaches as much weight to a month with 20 observations as it does to a month with one observation. The following test is designed to alleviate this concern.

2.3.2   Fama-French Three Factor Model Combined with Ibbotson's RATS

The second test is based on the Fama-French three factor model combined with Ibbotson's (1975) returns-across-time-and-securities (RATS) method. In this approach security excess returns are regressed on the three Fama-French factors for each month in event time, and the estimated intercept represents the monthly average abnormal return for each event-month. We consider long-run abnormal returns between one and 48 months (j) after the final expiration of the self-tender repurchase.

The following cross-sectional regression is run each event month j (j=0 is the event months in which the self-tender offer expired):

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$$\left(R_{i,t} - R_{f,t}\right) = a_j + b_j\left(R_{m,t} - R_{f,t}\right) + c_j SMB_t + d_j HML_t + \varepsilon_{i,t}, \tag{4}$$

where $R_{i,t}$ is the monthly return on security i in calendar month t corresponding to event month j. $R_{f,t}$, $R_{m,t}$, SMB_t and HML_t are the risk-free rate, the return on the equally-weighted CRSP index, the monthly return on the size and book-to-market factor in calendar month t corresponding to event month j, respectively. The coefficient a_j is the result of a monthly (in event time) cross-sectional regression. The numbers reported in Table 4, Panel B are sums of the intercepts a_j over the relevant event-time windows after the expiration of the tender offer.

The advantage of this methodology is that changes in the riskiness of the equity from before to after the buyback, e.g., due to changes in leverage, are better accounted for. The reason is that month-by-month after the buyback the factor loadings are allowed to change – albeit only in the cross-sectional average, not for each firm individually.[13]

We present the abnormal returns for the same event windows as LV in their Table VIII. As shown in Table 4, Panel B, the long-run abnormal returns in the 24 months after the expiration of the self-tender offer are not significant for the full sample. However, the small firms, i.e., firms with a below median size relative to the universe of Compustat firms in a given year, outperform the benchmark model. The average long-run abnormal return is 21.94% with a t-statistic of 2.14, significant at the 5% level. The economic magnitude is again similar to the findings in LV for the earlier period.

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[13] The potential drawback of this method is the clustering of events in calendar-time and the associated cross-correlation problems. Ibbotson (1975) suggests to randomly select one event per calendar month only to be included in the analysis (for a more detailed description see section 3.2 below). This alternative does not affect the inferences mostly because we only have 141 observations and little clustering (not tabulated).

2.3.3 Interpretation

Our analysis of the post-expiration abnormal returns reveals little change relative to the 1962-1986 period studied in LV. Long-run abnormal returns are still observable, but again mostly significant because of the small firms. Our results exclude the possibility of interpreting the LV findings as an anomaly that has disappeared because the market became more efficient after learning of the mispricing. Furthermore, the persistently positive abnormal returns suggest that the event abnormal returns do not appear to be related to a low frequency pricing factor that would have changed in the recent decades. However, given the possibility that small firms might be a source of bad model problems (e.g., Fama, 1998; Mitchell and Stafford, 2000), we refrain from making stronger claims. In the following section, we investigate open market share repurchases where we have more observations and can more easily assess the importance of the bad model problem due to the small firms.

3. Open market share repurchases

In this section we review the findings of Ikenberry, Lakonishok and Vermaelen (1995) [henceforth ILV] who report long-run abnormal returns after open market share repurchase announcements in a sample between 1980 and 1990. As in the previous section, we use more recent data to analyze whether the anomalies still exist.

3.1 Sample description

Our starting point for the sample selection is the SDC mergers and acquisition database. We supplement these events with events from the SDC repurchases database. Our sample spans the time period of 1991 to 2001 and includes 5348 events. We require

that we can identify the announcement in Lexis Nexis. This results in 3725 events. In addition, we require that the event firms have CRSP and Compustat data available. We also exclude events where the stock price ten days before the announcement is less than $3. The final sample consists of 3481 events.

Table 5 reports univariate statistics for the open market repurchase sample. We find a significant 2.39% average abnormal return in the three days around the announcement, still positive, consistent with earlier findings (e.g., Vermaelen, 1981). Also the fraction sought in the repurchase is comparable to ILV with 7.37% of the shares outstanding. The number of observations has increased threefold in the eleven-year period we are investigating relative to ILV's period of 1980-1990. Peak years are 1998 with 682 events, followed by 1999 with 549 and 1996 with 407. Interestingly, repurchases have decreased to only 185 announcements in 2001. A casual observation is that the low number of events corresponds to high book-to-market ratios through the years. We will investigate the correlations between book-to-market and frequency of event further in Table 10.

3.2 Trading rules after the announcement date

Our first test is to investigate whether there are still long-run abnormal returns after the announcement of open market share repurchases. We use the Fama-French three factor model combined with Ibbotson's RATS method to compute abnormal returns. (see previous sections for details of the methodology). We start measuring abnormal returns in the calendar month after the repurchase announcement.

For the full sample of 3481 events in 1991-2001, we find significant abnormal returns from the first month after the announcement onwards. For example, over 12 (24, 36, 48)

months we find cumulative average abnormal returns of 3.98% (11.66%, 18.50%, 20.49%), all significant at the 0.1% level, as reported in Panel A of Table 6.

The economic magnitude of the abnormal returns seems to have increased compared with the ILV results. However, a direct comparison is difficult since their benchmark returns are based on a portfolio of firms selected to match the size and book-to-market ranking, but not the market factor. Nevertheless, they find significant abnormal returns using buy-and-hold returns of 2.04% in the first year to 7.98% over four years after the announcement. Using compounded holding-period returns, they find an average 12.14% abnormal return over four years.

Our finding of a significant average abnormal return after open market share repurchase announcements is robust to two additional tests of the long-run abnormal performance that are designed to alleviate the problem of clustering of events in calendar-time and the associated cross-correlation problems.[14] We follow Ibbotson (1975) more closely by selecting one event per *calendar* month only to be included in the regression. This limits the maximum number of observations per regression to 132 (one event per month between 1/1991 and 12/2001). For example, when we estimate the abnormal return for the initial announcement month $(0,0)$[15] we randomly select one event among all the events first announced in a given calendar month. We repeat this random selection for each calendar month. Thus, the regression includes events that are non-overlapping in calendar-time. For the event month $(1,1)$ we proceed similarly by selecting randomly

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[14] Fama (1998) suggests a method that is based on Jaffe (1974) and Mandelker (1974) where expected returns of portfolios, formed in calendar time, are estimated based on pre-event data. We do not follow that method because share repurchases usually increase leverage and thus the riskiness and expected return of equity after the event (e.g., Grullon and Michaely, 2004).

[15] $(0,0)$ stands for (beginning, end) months in event time, where 0 is the month in which the initial announcement was made. $(0,0)$ thus refers to the return in the months of the announcement of the event.

among events in their first month after the announcement – again one event per calendar month. The results are qualitatively similar to those reported in Panel A and are omitted for brevity.

The drawback of this method, as pointed out in Ibbotson (1975), is that the estimators are not minimum variance because of the heteroskedastic disturbances caused by the fact that the sampled security is changing from month to month, thus having differing b_j, c_j, d_j, and $\sigma^2(\varepsilon_{i,t})$. Forming a portfolio of securities can alleviate this issue. Thus, as a second test we implement the Fama-French calendar-time portfolio approach as advocated by Mitchell and Stafford (2000). As described earlier, in this approach, securities are formed into portfolios by calendar-time. In panel B of table 6, we report the intercept of the time series regression of equally-weighted repurchase portfolio returns for 12 (24, 36, 48) months starting the month after the buyback announcement.

For the full sample of 3481 events, we find significant average monthly abnormal returns of 0.48% (0.59%, 0.37%, 0.51%) using 12 (24, 36, 48) months event windows. Thus, we conclude that the abnormal returns after open market buyback announcements persist, regardless of the methodology employed.

Not all repurchases are motivated by undervaluation. ILV hypothesize that *ceteris paribus* value stocks are more likely to be undervalued than other stocks. Following their approach, we classify firms into quintiles according to their book-to-market ratio using data at the fiscal year end prior to the repurchase announcement. The quintile ranges are determined by all Compustat firms in a given year[16]. Consistent with ILV, as shown in Table 6, high book-to-market firms (value stocks) outperform more than glamour stocks.

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[16] We compute the market value of all Compustat firms in the given fiscal year month of the event firm but take the last available book value of equity.

For example, after 36 months, the 623 firms in the top book-to-market quintile display a positive and significant abnormal return of 29.11% (significant at the 0.1% level). The 439 firms in the lowest book-to-market quintile outperform by 11% (significant at the 5% level). Using the Fama-French calendar-time approach, reported in Panel B of Table 6, we find that the average monthly abnormal return is 0.84% (significant at the 0.1% level) for value stocks. Glamour stocks, on the other hand, display an insignificant average monthly abnormal return of 0.41%. Since we are controlling for the value premium using the Fama-French three factor model, the findings would not seem to be an artifact of the difference in stock returns between value and growth stocks (Lakonishok, Shleifer and Vishny, 1994). ILV conclude that 'value' stocks are companies that are more likely to make the repurchase because they are undervalued and that the market is systematically underestimating the information contained in the repurchase announcement. According to our analysis, using more recent data, that is still the case.

We also analyze whether size is correlated with long-run abnormal returns. We form size quintiles based upon the size of the event firm (measured by equity market value at the fiscal year end prior to the repurchase announcement) relative to the size of all Compustat firms in the year prior to the event. First, notice that the quintiles do not contain an equal number of firms since the quintiles are formed based on the full distribution of all Compustat firms. In particular, the smallest firm quintile contains only 4.8% (169) of the 3481 event firms. As shown in Table 6, that subsample displays the highest long-run abnormal returns after 48 months of 54.55% using Ibbotson's RATS, and 1.38% (significant at the 5% level) using the Fama-French calendar time approach. The largest firms (992 event firms) also outperform the benchmark. Using Ibbotson's

RATS method, there is a 12.91% (significant at the 1% level) abnormal return. The Fama-French calendar time approach results in a monthly average abnormal return of 0.28% (significant at the 10% level).

These findings clearly raise the question whether our findings of long-run abnormal returns after share repurchases are an artifact of the bad model problem (Fama, 1998) since the Fama-French three factor model has been shown to not explain the cross-section of stock returns completely. In particular, Fama and French (1993) find in their table 9a that small growth firms display a *negative* average abnormal return even after controlling for size and BM. Given their finding, it is less likely that the model bias can explain our *positive* abnormal returns. Secondly, it is only the small growth firms that display significant negative abnormal returns. Of the 169 firms that are in the small firm quintile in our sample, we find only 8 to be also in the lowest BM quintile (i.e., growth) firms (see table 10). While we cannot exclude the possibility that the bad model problem influences our findings, we proceed to investigate whether firms that say they feel undervalued at the time of the repurchase display higher long-run abnormal returns. In other words, we want to investigate whether the abnormal returns are more likely to be observed if insiders disagree with the market's valuation. Since it is unlikely that there is a correlation between what managers say why they repurchase shares and a possible model misspecification, we believe the following tests to be an important contribution to understanding the long-run abnormal returns after share repurchases.

3.3 Stated motivation and long-run abnormal returns

The conclusion from our updated sample is that the market still underreacts to the announcement of open market share repurchases, in particular to announcements of high

book-to-market and small firms. This is consistent with the joint hypothesis that high-book-to market (small) firms are more likely to be undervalued and managers take advantage of this undervaluation. In this section, we explore whether another indicator, i.e., the stated motivation in the press release, could also be an indicator of potential undervaluation. Theoretical signaling models would not predict this as a credible signal requires a cost to false signaling and "talk is cheap". In particular, we read all the information related to the announcement of the open market share repurchase by searching through the sources in Lexis-Nexis. Of the 5348 events initially collected from SDC, we can identify the announcement date on 3725 events. For the remaining 1623 events we cannot find any information at the time of the announcement related to an open market share repurchase. As described above, further data requirements limit the sample to 3481 events.

The statements have been read and classified into the following categories of "motivation" for the share repurchase.

1. *Undervalued*. The announcement contains the explicit mentioning of undervaluation of the firm's shares or refers to the low current stock price and the stock price underperformance.

2. *Best use of money*. The announcement states that the money of the company is best spent on repurchasing its own shares.

3. *Distribution of cash*. The announcement justifies the repurchase as being in the interest of shareholders primarily because cash (or excess cash) is returned to shareholders.

4. *Dilution and EPS*. The announcement says that the repurchased shares help to avoid dilution or that the repurchase strengthens earnings-per-share (EPS).

5. *ESOP*. The repurchase is made in conjunction with an employee stock option plan.

6. *Restructuring*. The repurchase is part of a restructuring.

7. *Others*. Other reasons.

In 647 press releases no motivation was given for the repurchase. Often multiple motivations are mentioned in the announcements. Table 7 gives the frequency of observing each motivation. In addition it lists the frequency with which one particular motive is mentioned simultaneously with any of the other six motives. For example, only 54 announcements state "undervaluation" as a single motive. However, 222 mention "undervaluation" and one of the other six motives. In total, 724 announcements mention undervaluation as the reason (or part of the reasons) for the repurchase.

We select the firms which mention "undervaluation" as well as "best use of money" to be the category of firms that make the strongest statement about being mispriced.[17] We expect these companies' motivation to be that the current stock price is too low. In contrast, we expect that firms that motivate the repurchase by saying that they want to avoid "dilution" or manage "EPS" but do neither mention "undervaluation" nor "best use of money" do not repurchase shares because they feel undervalued.

Using this simple classification, we look at the announcement and long-run abnormal returns of these sub-samples. As shown in Table 5, the abnormal announcement return (AR), calculated using the market model in the three days around the repurchase announcement, is 2.39% for the full sample. In Table 7 we find that the AR is higher for firms with motivation 'undervaluation' or 'best use of money' (both together) with 3.70% and 2.87% (3.99%). In contrast, the AR for firms which mention 'dilution' or 'EPS'

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[17] While this categorization is somewhat arbitrary, it is consistent with survey evidence provided in Brav et al. (2005). They report in their Table 6 that 86.4% of the respondents find the 'market price' of their stock to be an important or very important factor to the company's repurchase decision. The definition of the 'market price' is "if our stock is a good investment, relative to its true value".

management (but neither 'undervaluation' nor 'best use of money') is only 1.41% (0.34%).

There are two interesting observations relating to the long-run abnormal returns reported in Table 8. First, the long-run abnormal returns using Fama-French factors with Ibbotson's RATS methodology are economically important (e.g., 31.89% over 48 months) and statistically significant (0.1% level) for the sample of "undervalued" and "best use of money" firms. The sample which is not expected to repurchase because of undervaluation does indeed not display any long-run abnormal returns (e.g., 9.36%, t-value of 1.137 over 48 months). Similar inferences can be drawn using the Fama-French calendar-time approach shown in Panel B of Table 8.

We believe this is an important finding because we have a new way of differentiating between managers that repurchase for reasons related to undervaluation relative to managers that repurchase for reasons unrelated to undervaluation: simply read the press releases. Managers, on average, are right, although the market apparently does not believe them.

The second interesting finding is that firms which say they repurchase for reasons related to undervaluation actually experienced a bigger drop in their stock price in the six months prior to the repurchase announcement. This suggests an alternative measure to proxy for the likelihood of undervaluation: past stock returns.

3.4 Past returns and long-run abnormal returns

When a stock has collapsed and is followed by a repurchase announcement, it may indicate that the management repurchases because it believes its stock is undervalued. In order to test this hypothesis we stratify the sample by prior returns. In particular, we

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allocate events to prior return quintiles based upon their raw stock returns in comparison with all CRSP firms' raw returns in the six months prior to that firm's repurchase announcement, ending 5 days prior to the announcement day. In other words, the quintile cutoffs are determined by the full distribution of all CRSP firms with available return data for the corresponding time period. While this procedure results in a slightly uneven number of observations per quintile it avoids the problem that the lowest return quintile is more likely to pick up events in down markets (see Table 5 for average raw returns per year).

As shown in Panel A of Table 9 and Figure 1, firms in the lowest prior return raw quintile experience average abnormal returns of -40.65% in the six months prior to the announcement of the repurchase. The quintile with the highest prior raw returns, experiences an abnormal stock price increase of 21.12%. Interestingly, we find that the firms which were beaten up the most prior to the repurchase announcement experience the highest long-run abnormal returns after the repurchase announcement. The abnormal returns in the lowest prior return quintile reach 40% thirty-three months after the repurchase. The firms with the highest prior returns reach an average abnormal return of only 12.33% over that interval. Although both average abnormal returns are significant, there is an economically significant difference between the two quintiles.[18]

These findings suggest that managers do not necessarily repurchase because of private information about the future operating performance of their company but because they disagree with the hammering received in the stock market. Hence, the finding by Grullon and Michaely (2004) that operating performance does not improve after open

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[18] In panel B we report average abnormal returns using the Fama-French calendar-time approach. We find average monthly abnormal returns for the subsamples with the lowest (highest) prior returns of 1.02% (0.53%), both significant at the 1% level.

market share repurchases can still be consistent with managers repurchasing because they believe that their firm is undervalued. However, it is not undervalued because future performance is improving, but because the market believes, incorrectly, that its performance will decline.

Jegadeesh and Titman (1993) also focus on a six months period where they calculate returns and find that returns tend to continue in the same direction for the next six months. Our finding of a reversal after a big drop suggests that we might even underestimate the long-run abnormal returns if there is this momentum factor (Carhart, 1997). Table 9, Panel C and D, report long-run abnormal returns for samples stratified by prior return using the Fama-French three factor model augmented with the momentum factor. Consistent with our expectation, adding the momentum factor increases the long-run abnormal returns. For example, in Panel C we find that the sample of repurchase firms in the lowest prior return quintile displays long-run abnormal returns of 60% over 48 months (Ibbotson RATS). Similar implications are found for different windows and using the Fama-French calendar-time approach, as reported in Panel D.

In contrast to Jegadeesh and Titman (1993), De Bondt and Thaler (1985) find reversals. However, the reversals happen after a much longer period of decline (three to five years). Hence, long-run abnormal returns after open market share repurchases cannot be explained by momentum. It is also difficult to interpret our findings as overreaction to information because the share repurchase announcement itself contains information. Investors clearly seem to underreact to that information.

3.5 Employee stock option plans and open market share repurchases

Kahle (2002) argues that repurchases made for the reason of employee stock option plans (ESOP) are different from others. She finds that the announcement returns are lower if the firm has an ESOP compared with firms that do not. Using our information on the motivation for the repurchase, we confirm her findings (see Table 7). The average announcement return of the 378 firms where the only motivation is ESOP is 1.43% (significant at the 5% level). If we include all 1143 firms that have mentioned ESOP as part of their motivation, the average abnormal announcement return is 1.87% (significant at the 5%) level. Compared to the average 2.39%, indeed the market reacts less positively to repurchase announcements motivated by ESOP.

However, the long-run abnormal returns after the repurchase announcement motivated by ESOP are positive and significant as shown in Table 8. Over the 48 months after the event, the 378 firms that motivated their repurchase purely by ESOP outperform by a significant 20% (using the Fama-French three factor model with Ibbotson's RATS methodology). Including all firms that had mentioned ESOP as a reason for repurchasing (1143 firms) we find a similar 23% abnormal return over the 48 months following the repurchase announcement.[19] The long-run abnormal return is very much of the same magnitude as for the whole sample indicating that buybacks on average are announced by firms that are undervalued. Kahle's (2002) conclusion "that the market realizes that shares repurchased as a result of stock options do not have the signaling impact of other repurchases..." (p. 241) seems to be an artifact of only looking at the short-term announcement return. Adding the long-run abnormal returns after the announcement indicates that the market also underreacts to buybacks motivated by ESOP. The positive

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[19] Average abnormal returns for the Fama-French calendar-time approach are reported in panel B and are significant, more so for the large sample of 1143 events.

abnormal returns after ESOP motivated repurchases makes sense if managers believe their stock is undervalued. In this case the repurchase is a strategy to offset the losses from granting undervalued stock options to employees by buying shares in the open market. In essence the firm buys back stock at a low price to distribute it to their employees – potentially at a later stage. Thus, there is a wealth transfer from outside shareholders who sell the shares to employees. Since the wealth transfer is bigger the more undervalued the firm, our findings are consistent with the interpretation that the market also underreacts to this information. In the end, it seems that a repurchase is a repurchase after all.

These results clearly show that it is important to distinguish between two questions: *why* do companies repurchase stock and *when* do they repurchase stock. Companies repurchase stock for many reasons (ESOP, reducing excess cash, improving capital structure), but they tend to buy back stock when shares are cheap, at least if they can afford to wait for the right moment to buy.

3.6 Combining the indicators: the undervaluation-index

The previous sections show that various intuitively appealing proxies for "the likelihood of undervaluation" such as size, book-to-market, stated motivations and prior return can all be used to predict abnormal return. An interesting question is whether a combination of these characteristics is a better predictor of abnormal returns than the indicator that seems to do the best job in predicting excess returns, i.e. prior returns. This is not obvious, to the extent that these indicators of undervaluation are all highly correlated.

From table 10, which shows the frequency distribution of any combination of these criteria, we find indeed evidence of such correlation. Specifically, Panel B shows that firms are more likely to say they are undervalued[20] if they are in the highest book-to-market (BM) quintile (22.3%) than in the lowest quintile (18.5%). This adds some support to the notion that managers of value stocks perceive the stock price to be too low. We get an even bigger difference if we focus on size. Firms that say they are undervalued are more likely to be in the smallest quintile (30.8%) than in the largest (13%). Finally, firms that say they are undervalued are also more likely to be in the lowest quintile of prior returns (28.4%) than in the highest (14.4%). Also evident from the table is the correlation between size, BM and prior return quintile. Importantly, among the high BM firms, the fraction of firms in the lowest (highest) prior return quintile is 26.9% (8.3%). Similarly, small firms are more than three times as likely to be in the lowest prior return quintile (9.1%) as opposed to the highest (2.8%). Note also that the quintile with the smallest firms and the lowest book-to-market stocks contains only 8 stocks. So it is unlikely that our results are driven by the fact that the Fama-French three factor model systematically misprices very small growth stocks (see, Fama and French, 1993, Table 9a). Thus, the bad model problem (e.g., Fama, 1998; Mitchell and Stafford, 2000) seems to have limited power in explaining the long-run abnormal returns of repurchasing firms, as those firms are very rarely small growth firms.[21]

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[20] The category 'undervalued' in the context of motivations derived from what managers say is still based upon the same definition as before, i.e., if managers mention "undervaluation" and "best use of money". However, for expositional purposes, we refer to this category as just 'undervalued'.

[21] Even if the bad model problem was a significant issue, Fama and French (1993) find in their Table 9a that small growth firms display a *negative* average monthly abnormal return.

We thus ask the question whether combining prior return, motivation, BM and size into a measure might help to identify undervalued firms. We compute this Undervaluation-index in the following way:

The Undervaluation-index is the sum of the ranks of the following four categories:

1) BM (ranks 1-5): lowest BM (glamour stocks) receives a 1; highest (value stocks) a 5

2) Size (ranks 1-5): small firms get a 5, large firms a 1

3) Prior return (ranks 1-5): firms with the lowest prior return get a 5, highest a 1

4) Motivation (ranks 1,3,5): Firms where the motivation is 'undervaluation' and 'best use of money' get a 5; where the motivation is 'dilution' or 'EPS management' but neither 'undervaluation' nor 'best use of money' get a 1; the remaining firms are assigned a 3

We then add up the ranks.[22] The empirical distribution of the Undervaluation-index is presented in Figure 2. Based upon the empirical distribution, the quintile cutoffs are 9, 11, 13, 15. The higher the Undervaluation-index, the more likely it is that the firm is undervalued according to our score.

In Table 11 we report the long-run abnormal returns of the sample of firms with Index<9 and Index>15. Those are the two samples that are at the extreme of the distribution of the Index. The sub-sample of 446 firms with Index>15 displays significant positive long-run abnormal returns. The maximum abnormal return is 51.46% achieved 41 months after the buyback announcement. After 36 (48) months, the abnormal return is 46.60% (46.10%). All these abnormal returns are significant at the 0.1% level. Using

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[22] This is an arbitrary rule of equally weighting the four characteristics. The idea is to test whether the correlation between the factors leads to a significant improvement in identifying undervalued firms by taking into account some potential for cross-correlation.

Fama-French's calendar-time approach, we also find significant average abnormal returns. For example, over 36 (48) months, the equally-weighted portfolios result in an average monthly abnormal return of 0.77% (0.92%), significant at the 1% (0.1%) level, as shown in panel B.

If we compare the maximum abnormal return of 51.46% after 41 months to the abnormal return of the lowest prior return quintile-sample of 45.76% after 41 months we conclude that creating the Index and using it to select a portfolio increases the long-run abnormal return but only marginally. This is consistent with the results in Table 10 where we find a strong correlation between prior return and motivation, BM and size. It seems reasonable that prior return affects the measures of BM and size relatively mechanically. The motivation, however, is an interpretation by the managers of the value of the company. According to the long-run abnormal return results, the motivation seems to be, at least partially, driven by the prior returns.

The sub-sample of 517 firms with Index<9 exhibits much lower abnormal returns. The maximum here is 13.12% (significant at the 5% level) after 48 months. As a robustness test, we also report the long-run abnormal returns for the sub-sample with Index<10. There are 834 firms in that sub-sample. The long-run abnormal returns are again low and of similar size as for Index<9.

In sum, combining the information of prior return, motivation, BM and size seems to identify firms that are most undervalued. The market does not realize this, which leads us to conclude that open market share repurchase announcements are still followed by abnormal price increases even if the managers put their word out that they believe the firm to be undervalued.

3.7 How stable is the anomaly?

It remains puzzling why such long-run abnormal returns are still observed even after previous studies have shown simple strategies to outperform the benchmark. One possible explanation is that implementing a buyback strategy is very risky because the performance depends on when the strategy is implemented. In other words, the observed "excess" returns are compensating for an omitted risk factor associated with share repurchase programs. We test this directly by forming a buyback portfolio every year in the period from 1991-2001. All stocks of firms that announced an open market repurchase in a given calendar year are eligible for the buyback portfolio. We select the 50 stocks with the highest undervaluation index, but require that the index be at least 14 (the cutoff for the second highest quintile is 13)[23]. All stocks selected are used to form an equally-weighted portfolio on February 1st of the following year.[24] The long-run abnormal returns of these 11 portfolios, using the Fama-French three factor model with Ibbotson's RATS methodology, are shown in Figure 3. The portfolios are labeled according to the year in which they are purchased, i.e., one year after the firms actually announced the buyback. Ten out of eleven portfolios show significant positive cumulative abnormal returns over 48 months. The stars are the 2000 and 2001 portfolios, followed by the 1994 and 1995 portfolios, all delivering more than 80% cumulative abnormal returns over 48 months. Only the portfolio entered into in 1993 delivers an

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[23] With the exception of the 1992-1994 and 2002 portfolios, we can always find 50 stocks with an undervaluation index of at least 14. In the 1992-1994 years, the number of firms is 29 each (same number every year by chance). In 2002 it is 43. The 2002 portfolio only runs until the end of 2004 due to data constraints.

[24] Interestingly, if we started in January, the abnormal returns would be almost uniformly higher since the January portfolio abnormal returns are all positive with the exception of 1998 and 1999, where they are –0.64% and –2.80%, both insignificant. The conclusions are robust to changes in the strategy. For example, when we buy stocks the month after the announcement of an open market repurchase conditional on the firm's undervaluation index being at least 14, and we buy until we have 50 different firms in our portfolio before 'closing' the fund, we also find no instance of negative abnormal returns over 48 months.

insignificant long-run abnormal return over 48 months. It is interesting to note that in the first 12 months after the repurchase announcement, two portfolios display negative abnormal returns, the 1993 and 2002-portfolios. However, only the 1993-portfolio has significantly negative abnormal returns with –29%. Over 24 months, only the 1993-portfolio still displays negative cumulative abnormal returns. But by month 48, even the 1993-portfolio has returned to a zero abnormal return. While the repurchase strategy is not a risk-free strategy, the odds are such that risk would not seem to be the main deterrent for markets to take advantage of the long-run abnormal returns, provided the investor has a long investment horizon.

4. Conclusion

The abnormal price behavior related to tender offer and open market share repurchases, documented in Lakonishok and Vermaelen (1990) and Ikenberry, Lakonishok and Vermaelen (1995) still persist. We find that the trading rule around the expiration date generates an average return of about 10% in a very short time span. The market seems to set prices as if they are determined by the average investor, not the marginal investor. That is, the price reflects the weighted average of the tender price and the post-expiration price, where the weight on the tender price is the fraction of shares repurchased. The no-arbitrage pricing rule, however, would require that the weight is the fraction repurchased relative to the fraction tendered. While tender offer repurchases are rare and unique in the life of a company, it is still disturbing that these arbitrage opportunities can exist even today. Moreover, the trading strategy of buying shares after the expiration of self-tender offers is still profitable. Consistent with LV, the anomaly is concentrated in small firms.

The analysis of open market share repurchases in the period from 1991-2001 shows that there are still significant long-run abnormal returns in the 48 months following the buyback announcement. This underreaction is consistent with the survey results of Brav, Graham, Harvey and Michaely (2004) who report that 90% of all CFOs "agree or strongly agree" with the statement that they repurchase stock when their shares are undervalued. The biggest underreaction is observed in the sample of firms that experience a high drop in the stock price in the six months prior to the announcement. This result sheds light on the finding of Grullon and Michaely (2004) who find no significant change in operating performance around the repurchase announcement and conclude that managers are not repurchasing because they have private information. Given that firms whose stock price has been beaten down display the biggest long-run abnormal returns, it seems more likely that managers react to an overreaction of the market. Investors in turn are only slowly correcting their mistake and underreact to the managers repurchase decision.

Our analysis of the stated motivation for the open market repurchase reveals that investors simply do not trust managers when they claim they repurchase shares because they are undervalued. However, managers seem to be quite honest since if they say they are undervalued, the long-run abnormal returns are significantly positive and higher than for the subsample that repurchases to reduce dilution and manage earnings-per-share. It rather seems that managers' statements should be trusted more and their statement not be discarded as cheap talk or costless signal. If there is ex-post settling up (Fama, 1980) managers have incentives not to lie and cheat.

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Table 1
Descriptive Statistics

Univariate Statistics for a sample of 141 self-tender offers between 1987 and 2001. The premium offered is measured as the difference between the tender price (P_T) and the stock price five days before the announcement (P_{-5}). The fraction of shares sought is the number of shares the company seeks to repurchase relative to the number of shares outstanding before the repurchase. The fraction of the shares purchased is the number of shares repurchased divided by the number of shares outstanding prior to the repurchase.
Panel B reports statistics for the 19 events excluded from our analysis because they were withdrawn after the announcement but before the expiration date (only one event was withdrawn within 6 days prior to the expiration date).

Panel A: Full Sample of 141 Self-Tender Repurchase Offers

	Mean	Min	Max
Premium (P_T-P_{-5})/ P_{-5}	22.18%	0%	82%
Fraction of shares sought	29.42%	2.2%	90%
Fraction of shares purchased	25.87%	0.8%	90%
Fraction of shares purchased relative to shares tendered	79.98%	10%	100%

Panel B: Descriptive Statistics for Self-Tender Repurchase Offers Withdrawn

	Mean	Min	Max
Premium (P_T-P_{-5})/ P_{-5}	24.49%	0%	60%
Fraction of shares sought	28.68%	2.5%	80%

Table 2

Abnormal Returns from Trading Strategy around Expiration Date of Self-Tender Offers

The table reports abnormal returns following the strategy of buying shares six days prior to the first expiration date, tendering the shares and selling the shares not repurchased by the company in the market 12 (2) days after the final expiration date. The strategy is only executed if the price six days prior to the first expiration date is at least 3% below the repurchase tender price. This results in 80 events. Panel A calculates the returns using the marginal pricing rule where Return = $[F_P/F_T \times P_T + (1- F_P/ F_T) \times P_{12}] / P_{-6} -1$. F_P (F_T) is the number of shares repurchased (tendered) relative to the number of shares outstanding prior to the repurchase. P_T, P_{12} (P_{-6}) are the tender offer price and the stock price 12 days after (6 days prior to) the final (first) expiration date. We report the abnormal returns by subtracting the market return during the period from the strategy's return. Panel B and C report expected returns if the market priced the stock according to an average pricing rule $E(Return) = [F_P \times P_T + (1- F_P) \times P_{12}] / P_{-6} -1$, i.e., where the market assumes all shares are tendered (with $F_T=1$). ***, ** indicate significance levels of 1 and 5 percent, respectively.

Panel A: Marginal Pricing Rule

Sample Period (observations)	Mean	t-value	Median	% Positive
1987-2001 (80 obs)	8.6%	5.5	4.1%***	84%
1987-1995 (51 obs)	8.2%	5.3	5.1%***	87%
1996-2001 (29 obs)	9.3%	2.8	3.0%**	79%

Panel B: Average Pricing Rule. Selling 12 days after the final expiration date

Sample Period (observations)	Mean	t-value	Median	% Positive
1987-2001 (80 obs)	1.54%	1.52	1.27%	58%
1987-1995 (51 obs)	2.47%	2.26	2.73%**	62%
1996-2001 (29 obs)	0.00%	0.00	-0.004%	48%

Panel C: Average Pricing Rule. Selling two days after the final expiration date

Sample Period (observations)	Mean	t-value	Median	% Positive
1987-2001 (80 obs)	1.67%	2.64	1.25%**	64%
1987-1995 (51 obs)	2.69%	3.44	2.23%**	74%
1996-2001 (29 obs)	0.03%	0.04	-0.005%	47%

Table 3

Abnormal Trading Volume Around Repurchase Tender Offer Expiration Date

The table displays average and median trading volume (number of shares traded) relative to normal trading volume, where normal trading volume is the average daily trading volume between days –50 to –25 before the announcement of the self-tender offer. Day indicates the trading day relative to the first tender offer expiration date (day 0). The sample contains 80 events where the stock price six days prior to the first expiration of the repurchase offer is at least 3% below the repurchase tender price. An average ratio of one is expected under the null hypothesis. Due to the highly skewed distribution of the trading volume ratio, the median ratio for normal periods is less than one.

Day	-10	-9	-8	-7	-6	-5	-4
Mean	2.87**	2.41**	3.20**	2.95**	2.54**	4.88**	3.79**
Median	1.27	0.89	1.18	0.91	0.93	0.75	1.26

Day	-3	-2	-1	0	1	2	3
Mean	3.30**	4.81**	7.42	3.01**	2.89**	2.61**	1.26
Median	1.31	1.13	0.86	0.88	0.84	1.11	0.73

Day	4	5	6	7	8	9	10
Mean	0.97	1.29	1.40	1.14	1.10	0.95	0.88
Median	0.58	0.52	0.57	0.65	0.45	0.52	0.57

Table 4

Long-run Abnormal Returns after Self-Tender Repurchase Offers

The table reports long-run abnormal returns for the sample of 141 self-tender share repurchases in 1987-2001 calculated in two different ways. Panel A reports coefficients of regressions using the Fama-French three factor model run in calendar time. We use equally-weighted portfolios. The intercept shows the average monthly abnormal return over the 24 months starting the months after the tender offer's final expiration. Also reported are the coefficients on the market return (b), SMB (c), and HML (d). Panel B shows cumulative abnormal returns in percentages for various windows. The CAR(-40,-1) and CAR(+1,+24) are monthly abnormal returns based on a Fama-French three factor model using Ibbotson's (1975) returns across time and securities method (IRATS). The following regression is run each event-month j:

$$\left(R_{i,t} - R_{f,t}\right) = aj + b_j\left(R_{m,t} - R_{f,t}\right) + cjSMB_t + djHML_t + \varepsilon_{i,t},$$

where $R_{i,t}$ is the monthly return on security i in calendar month t that corresponds to the event month j with j=0 being the month after the tender offer's final expiration (or the announcement month). $R_{f,t}$ and $R_{m,t}$ are the risk-free rate and the return on the equally-weighted CRSP index, respectively. SMB_t and HML_t are the monthly return on the size and book-to-market factor in month t, respectively. The numbers reported are sums of the intercepts a_t of cross-sectional regressions over the relevant event-time periods expressed in percentage terms. The t-statistics of the window cumulative abnormal returns is reported below the abnormal returns in parentheses. CAR($P_{ann-5days}, P_{ex+1day}$) is based on daily, market-model adjusted, abnormal returns. It is the cumulative abnormal return from 5 days prior to the announcement to 1 day after the final expiration date of the tender offer. ***, **, * indicate significance levels of 1, 5 or 10 percent, respectively.

Panel A: Fama-French Calendar-time Portfolio Approach

	Equally-weighted	
	Coefficient	t-value
a (Abnormal Return)	0.0050	1.8*
b	0.8923	11.43***
c	0.6973	7.18***
d	0.6416	6.08***
R-squared	0.5293	

Panel B: Fama-French Three Factor Model Combined With Ibbotson's (1975) RATS

Window:	CAR (-40,-1)	CAR($P_{ann-5days}, P_{ex+1day}$)	CAR(+1,+24)
Frequency:	monthly	daily	monthly
Time 0 is:	announcement	announcement, expiration	expiration
All	-0.45%	8.08%***	6.79%
(141 obs)	(-0.07)	(5.48)	(1.21)
Small firms	0.72%	10.76%***	21.94%**
(56 obs)	(0.06)	(5.67)	(2.14)
Large firms	1.08%	6.29%**	-2.88%
(85 obs)	(0.13)	(3.00)	(-0.38)

Table 5
Descriptive Statistics on Open Market Share Repurchases

Univariate statistics for 3481 open market share repurchases. CAR[-1,+1] is the cumulative abnormal return over the three days around the repurchase announcement date using the market model with an equally-weighted CRSP index. Fraction sought is the fraction of shares that the company announced it wants to repurchase. The book-to-market ratio is calculated as the book value of equity from Compustat divided by the market value of equity at the fiscal year end prior the repurchase announcement. Prior 6-months raw returns is the return of the company in the six months prior to the repurchase announcement.

Year	Number of events	CAR[-1,+1]	Fraction sought	Book-to-Market ratio	Prior 6-months raw returns
1991	88	2.62%	6.90%	0.994	2.57%
1992	129	2.97%	8.10%	0.677	3.70%
1993	146	2.45%	6.99%	0.641	2.04%
1994	300	1.61%	6.32%	0.684	-1.50%
1995	299	2.21%	6.10%	0.710	3.71%
1996	407	2.21%	6.61%	0.680	3.78%
1997	394	2.40%	6.98%	0.567	8.11%
1998	682	2.13%	8.09%	0.650	-4.75%
1999	549	2.64%	8.35%	0.802	-3.13%
2000	302	2.66%	7.99%	0.842	-2.95%
2001	185	3.53%	7.16%	0.873	5.12%
All years	3481	2.39%	7.37%	0.714	0.43%

Table 6
Long-run Abnormal Return After Open Market Repurchase Announcements

Panel A and C report monthly cumulative average abnormal return in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model for the sample of 3481 firms that announced an open market share repurchase and various subsamples. The following regression is run each event-month j:

$$\left(R_{i,t} - R_{f,t}\right) = a_j + b_j\left(R_{m,t} - R_{f,t}\right) + c_j SMB_t + d_j HML_t + \varepsilon_{i,t} ,$$

where $R_{i,t}$ is the monthly return on security i in calendar month t that corresponds to the event month j with j=0 being the month of the repurchase announcement. $R_{f,t}$ and $R_{m,t}$ are the risk-free rate and the return on the equally weighted CRSP index, respectively. SMB_t and HML_t are the monthly return on the size and book-to-market factor in month t, respectively. The numbers reported are sums of the intercepts a_t of cross-sectional regressions over the relevant event-time periods expressed in percentage terms. Abnormal returns are reported for subsamples based on book-to-market (BM) and size, respectively. Firms are assigned to BM (size) quintiles based on the BM ratio (size) of the repurchasing firm at the year-end prior to the repurchase announcement relative to the BM ratio (size) of all Compustat firms in that particular year. Panel B and D report abnormal returns of equally-weighted calendar-time portfolios using the Fama-French (1993) three factor model. In this method, event firms that have announced an open market buyback in the last 12 (24, 36, 48) calendar months, form the basis of the calendar month portfolio. A single time-series regression is run with the excess return of the calendar portfolio as the dependent variable, and the return on three factors as the independent variables (the excess market return, a high-minus-low book-to-market and a small-minus-big capitalization factor). The significance levels are indicated by $, *, **, and ***, and correspond to a significance level of 10%, 5%, 1%, and 0.1%, respectively, using a two-tailed test. Obs (mths) refers to observations (months).

Table 6 (continued)

Panel A: Fama-French IRATS

Months	Full Sample		BM lowest (glamour stocks)		BM 2		BM 3		BM 4		BM highest (value stocks)	
	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic
(-6,-1)	-9.05%	-17.844***	-0.87%	-0.503	-4.39%	-3.484***	-10.34%	-10.162***	-10.01%	-11.196***	-17.56%	-13.301***
(-5,-1)	-8.86%	-19.470***	-1.71%	-1.088	-5.87%	-5.262***	-9.89%	-10.700***	-9.35%	-11.505***	-15.60%	-13.254***
(-4,-1)	-7.97%	-19.735***	-2.66%	-1.976*	-6.08%	-6.091***	-8.84%	-10.775***	-7.71%	-10.539***	-13.45%	-12.817***
(-3,-1)	-6.91%	-19.520***	-3.58%	-3.078**	-6.02%	-6.894***	-7.69%	-10.743***	-6.22%	-9.507***	-10.72%	-11.560***
(-2,-1)	-6.00%	-20.749***	-5.37%	-5.910***	-5.49%	-7.925***	-6.18%	-10.177***	-5.18%	-9.509***	-8.70%	-11.531***
(-1,-1)	-3.70%	-17.124***	-2.96%	-4.391***	-3.71%	-7.389***	-4.27%	-9.030***	-2.95%	-7.028***	-4.93%	-8.845***
(0,0)	0.23%	0.849	-3.97%	-4.666***	-1.39%	-2.295*	-0.73%	-1.615	1.11%	2.410*	5.27%	5.608***
(+1,+1)	0.70%	2.276*	-0.99%	-1.251	0.96%	1.784$	0.74%	1.611	0.62%	1.57	2.04%	1.488
(+1,+2)	1.10%	2.294*	-1.16%	-1.065	1.93%	2.490*	1.19%	1.673$	0.62%	0.961	3.04%	1.377
(+1,+3)	1.49%	2.746**	-0.68%	-0.455	2.44%	2.622**	1.87%	2.201*	0.52%	0.677	3.56%	1.529
(+1,+4)	1.73%	2.948**	-0.52%	-0.317	2.73%	2.511*	2.59%	2.689**	0.66%	0.758	3.32%	1.392
(+1,+5)	1.89%	3.008**	-0.15%	-0.082	2.62%	2.120*	2.56%	2.410*	0.76%	0.768	3.42%	1.396
(+1,+6)	1.64%	2.467*	-0.92%	-0.465	2.00%	1.509	1.78%	1.527	1.02%	0.951	3.68%	1.469
(+1,+7)	2.03%	2.868**	-0.35%	-0.162	2.32%	1.633	2.27%	1.780$	1.34%	1.173	4.22%	1.628
(+1,+8)	2.00%	2.635**	-1.17%	-0.504	2.91%	1.871$	2.07%	1.476	1.14%	0.927	4.55%	1.685$
(+1,+9)	2.31%	2.895**	-0.58%	-0.233	3.55%	2.147*	2.26%	1.504	1.01%	0.771	4.75%	1.713$
(+1,+10)	2.70%	3.238**	-1.19%	-0.456	4.17%	2.389*	2.83%	1.797$	1.43%	1.026	5.18%	1.816$
(+1,+11)	3.10%	3.542***	0.35%	0.124	4.95%	2.654**	3.20%	1.897$	1.76%	1.201	4.87%	1.672$
(+1,+12)	3.98%	4.374***	1.19%	0.403	4.90%	2.519*	5.00%	2.820**	2.39%	1.557	5.80%	1.941$
(+1,+13)	4.35%	4.592***	0.35%	0.115	5.44%	2.700**	5.21%	2.815**	3.53%	2.171*	6.30%	2.056*
(+1,+14)	4.64%	4.705***	0.06%	0.019	5.51%	2.631**	5.44%	2.809**	3.67%	2.163*	7.38%	2.313*
(+1,+15)	5.89%	5.609***	1.05%	0.309	7.21%	2.977**	6.15%	3.025**	4.76%	2.703**	9.58%	2.910**
(+1,+16)	6.94%	6.382***	1.68%	0.483	7.98%	3.199**	6.91%	3.289***	5.18%	2.820**	12.49%	3.635***
(+1,+17)	7.63%	6.737***	2.95%	0.822	7.79%	3.042**	7.52%	3.381***	5.94%	3.004**	13.83%	3.913***
(+1,+18)	8.10%	6.920***	4.78%	1.288	7.84%	2.953**	8.99%	3.869***	5.66%	2.755**	14.01%	3.893***
(+1,+19)	8.71%	7.243***	4.28%	1.118	9.28%	3.395***	10.16%	4.232***	5.57%	2.638**	15.13%	4.122***
(+1,+20)	8.97%	7.251***	5.41%	1.375	9.49%	3.386***	10.01%	4.053***	5.17%	2.325*	15.64%	4.195***
(+1,+21)	9.53%	7.496***	5.40%	1.347	10.04%	3.502***	10.75%	4.234***	5.10%	2.220*	16.91%	4.406***
(+1,+22)	9.84%	7.554***	5.57%	1.359	10.05%	3.441***	11.39%	4.363***	6.06%	2.546*	16.26%	4.154***
(+1,+23)	10.27%	7.709***	5.38%	1.286	10.14%	3.394***	12.29%	4.576***	6.40%	2.627**	17.29%	4.330***
(+1,+24)	11.66%	8.445***	7.18%	1.671$	10.85%	3.544***	12.70%	4.598***	7.69%	3.071**	20.63%	4.847***
(+1,+25)	11.92%	8.422***	5.69%	1.297	11.19%	3.582***	12.40%	4.376***	8.57%	3.330***	22.09%	5.048***
(+1,+26)	12.27%	8.458***	5.50%	1.224	11.79%	3.674***	12.80%	4.373***	8.91%	3.369***	22.44%	5.034***
(+1,+27)	13.09%	8.790***	5.08%	1.11	12.90%	3.921***	13.49%	4.499***	9.86%	3.580***	23.72%	5.203***
(+1,+28)	14.31%	9.352***	6.63%	1.418	13.42%	3.965***	13.84%	4.528***	11.13%	3.923***	26.14%	5.567***
(+1,+29)	14.69%	9.391***	7.51%	1.564	12.50%	3.620***	14.51%	4.652***	11.36%	3.909***	27.63%	5.768***
(+1,+30)	15.44%	9.678***	6.85%	1.405	13.47%	3.819***	15.04%	4.702***	13.32%	4.476***	27.84%	5.738***
(+1,+31)	16.18%	9.881***	7.68%	1.542	13.47%	3.745***	16.99%	5.031***	13.57%	4.462***	28.33%	5.753***
(+1,+32)	16.95%	10.130***	8.72%	1.723$	14.49%	3.888***	17.54%	5.086***	15.23%	4.869***	27.73%	5.565***
(+1,+33)	18.00%	10.561***	8.81%	1.710$	15.27%	4.009***	18.65%	5.305***	16.46%	5.157***	29.64%	5.868***
(+1,+34)	18.43%	10.614***	10.77%	2.049*	15.25%	3.928***	18.69%	5.187***	16.72%	5.137***	29.97%	5.874***
(+1,+35)	17.82%	10.087***	10.37%	1.939$	14.14%	3.562***	18.13%	4.942***	16.42%	4.958***	29.33%	5.685***
(+1,+36)	18.50%	10.290***	11.00%	2.027*	14.44%	3.570***	18.84%	5.061***	17.36%	5.131***	29.11%	5.553***
(+1,+37)	19.05%	10.402***	11.85%	2.144*	13.94%	3.397***	18.65%	4.924***	19.10%	5.527***	30.61%	5.720***
(+1,+38)	18.99%	10.193***	10.89%	1.937$	14.05%	3.357***	18.38%	4.763***	19.63%	5.586***	30.26%	5.588***
(+1,+39)	19.27%	10.129***	10.81%	1.894$	16.32%	3.777***	17.66%	4.501***	19.69%	5.472***	29.70%	5.409***
(+1,+40)	19.66%	10.126***	12.91%	2.215*	15.78%	3.593***	18.33%	4.574***	19.71%	5.369***	30.00%	5.344***
(+1,+41)	19.69%	9.941***	12.74%	2.150*	14.90%	3.338***	18.15%	4.457***	20.59%	5.488***	31.48%	5.428***
(+1,+42)	19.63%	9.717***	13.13%	2.168*	15.16%	3.326***	17.89%	4.329***	21.27%	5.556***	30.17%	5.114***
(+1,+43)	19.28%	9.385***	13.91%	2.263*	14.04%	3.031**	17.56%	4.176***	20.91%	5.347***	29.92%	4.997***
(+1,+44)	18.69%	8.933***	12.71%	2.039*	14.00%	2.958**	16.88%	3.954***	20.69%	5.168***	29.88%	4.923***
(+1,+45)	18.79%	8.834***	13.84%	2.190*	14.49%	3.010**	17.72%	4.071***	20.21%	4.951***	28.55%	4.652***
(+1,+46)	18.80%	8.663***	13.72%	2.122*	14.37%	2.936**	18.70%	4.218***	19.78%	4.743***	27.20%	4.356***
(+1,+47)	19.68%	8.780***	15.95%	2.331*	15.00%	3.000**	19.11%	4.223***	19.93%	4.661***	28.49%	4.476***
(+1,+48)	20.49%	8.965***	14.87%	2.136*	17.08%	3.353***	20.42%	4.425***	19.71%	4.536***	28.89%	4.473***
obs	3481		439		699		820		900		623	

Panel B: Fama-French Calendar-time Approach (Equally-weighted)

	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic
12 mths	0.48%	2.15*	0.40%	1.08	0.19%	0.77	0.61%	2.74*	0.60%	3.30**	0.58%	1.71
24 mths	0.59%	2.97**	0.41%	1.36	0.37%	1.29	0.51%	2.39**	0.57%	2.97**	0.90%	3.04**
36 mths	0.37%	2.02$	0.41%	1.53	0.11%	0.56	0.48%	2.93**	0.65%	3.32***	0.84%	3.49***
48 mths	0.51%	2.79**	0.41%	1.62	0.10%	0.54	0.43%	2.70**	0.57%	3.76***	0.83%	3.74***

Table 6 (continued)

Panel A: Fama-French IRATS

Months around repurchase announcement	Largest firm quintile		Second largest firm quintile		Middle firm quintile		Second smallest firm quintile		Smallest firm quintile	
	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic
(-6,-1)	-4.71%	-5.989***	-8.02%	-7.596***	-11.23%	-10.062***	-12.73%	-9.458***	-17.94%	-5.010***
(-5,-1)	-4.89%	-6.838***	-8.23%	-8.782***	-10.94%	-10.843***	-11.05%	-9.099***	-18.37%	-5.718***
(-4,-1)	-4.23%	-6.553***	-8.57%	-10.473***	-9.81%	-10.949***	-8.74%	-8.082***	-16.42%	-5.739***
(-3,-1)	-3.84%	-6.765***	-7.61%	-10.837***	-8.29%	-10.553***	-7.22%	-7.527***	-13.68%	-5.373***
(-2,-1)	-3.87%	-8.393***	-6.74%	-11.985***	-7.12%	-11.097***	-6.17%	-7.834***	-10.28%	-4.851***
(-1,-1)	-2.56%	-7.578***	-4.29%	-10.210***	-4.37%	-8.752***	-3.77%	-6.576***	-5.94%	-3.727***
(0,0)	-0.68%	-1.745$	-1.95%	-3.661***	0.22%	0.405	2.05%	3.206**	12.42%	3.678***
(+1,+1)	-0.18%	-0.538	1.71%	3.290***	0.15%	0.309	0.28%	0.482	5.05%	1.05
(+1,+2)	0.02%	0.045	2.47%	3.438***	-0.58%	-0.788	1.96%	1.022	7.75%	1.426
(+1,+3)	0.39%	0.593	2.86%	3.347***	-0.68%	-0.747	2.02%	1.01	9.72%	1.660$
(+1,+4)	0.06%	0.076	3.44%	3.541***	0.22%	0.218	2.28%	1.097	8.25%	1.36
(+1,+5)	0.04%	0.054	3.18%	2.960**	0.62%	0.545	2.10%	0.975	7.28%	1.17
(+1,+6)	-0.15%	-0.173	2.72%	2.356*	-0.51%	-0.414	2.41%	1.079	8.28%	1.292
(+1,+7)	0.27%	0.283	2.78%	2.234*	0.06%	0.042	2.68%	1.153	10.64%	1.606
(+1,+8)	0.54%	0.531	1.99%	1.483	0.12%	0.081	2.36%	0.958	14.28%	2.030*
(+1,+9)	1.24%	1.131	2.14%	1.513	0.45%	0.287	2.15%	0.846	14.59%	1.993*
(+1,+10)	1.47%	1.278	2.98%	1.996*	0.89%	0.541	1.87%	0.716	14.89%	1.980*
(+1,+11)	1.88%	1.549	3.77%	2.386*	1.24%	0.719	1.62%	0.598	19.27%	2.458*
(+1,+12)	2.61%	2.061*	4.01%	2.447*	2.52%	1.389	2.92%	1.036	19.60%	2.444*
(+1,+13)	3.25%	2.468*	4.02%	2.361*	2.76%	1.453	4.82%	1.652$	20.26%	2.460*
(+1,+14)	3.31%	2.424*	3.65%	2.032*	3.23%	1.628	7.18%	2.357*	18.98%	2.239*
(+1,+15)	3.36%	2.385*	3.86%	2.068*	5.50%	2.454*	9.86%	3.085**	22.32%	2.541*
(+1,+16)	3.95%	2.724**	4.38%	2.270*	6.22%	2.659**	11.68%	3.556***	26.60%	2.927**
(+1,+17)	4.29%	2.868**	4.43%	2.217*	7.55%	3.130**	13.68%	3.930***	24.72%	2.662**
(+1,+18)	4.96%	3.203**	4.86%	2.348*	8.65%	3.439***	13.45%	3.772***	24.21%	2.571*
(+1,+19)	5.33%	3.346***	5.50%	2.584**	9.58%	3.688***	14.70%	4.042***	24.67%	2.572*
(+1,+20)	5.38%	3.290***	5.44%	2.489*	10.20%	3.774***	15.71%	4.230***	23.50%	2.417*
(+1,+21)	6.03%	3.602***	6.01%	2.667**	10.46%	3.780***	15.86%	4.168***	25.97%	2.613**
(+1,+22)	6.54%	3.807***	6.89%	2.986**	10.26%	3.641***	16.56%	4.250***	25.70%	2.531*
(+1,+23)	6.73%	3.825***	7.31%	3.075**	11.94%	4.132***	17.36%	4.377***	25.42%	2.463*
(+1,+24)	7.21%	3.995***	8.53%	3.499***	13.57%	4.588***	20.20%	4.820***	27.80%	2.632**
(+1,+25)	6.71%	3.653***	8.61%	3.435***	14.71%	4.881***	22.38%	5.210***	30.85%	2.835**
(+1,+26)	6.79%	3.614***	9.71%	3.792***	15.36%	4.964***	22.71%	5.176***	32.38%	2.936**
(+1,+27)	6.99%	3.627***	10.84%	4.147***	16.22%	5.110***	23.57%	5.269***	33.99%	3.028**
(+1,+28)	7.86%	4.005***	11.77%	4.392***	17.15%	5.270***	25.55%	5.564***	38.16%	3.362***
(+1,+29)	8.05%	4.008***	11.57%	4.232***	18.32%	5.520***	26.97%	5.781***	35.22%	3.053**
(+1,+30)	8.27%	4.046***	12.55%	4.516***	19.57%	5.806***	28.18%	5.936***	37.77%	3.216**
(+1,+31)	8.43%	4.050***	13.19%	4.659***	20.77%	6.058***	29.94%	6.125***	37.40%	3.137**
(+1,+32)	8.98%	4.194***	14.35%	4.969***	22.64%	6.504***	30.08%	6.082***	39.54%	3.264**
(+1,+33)	9.59%	4.403***	14.89%	5.080***	23.30%	6.591***	32.37%	6.454***	42.49%	3.447***
(+1,+34)	10.20%	4.606***	15.13%	5.053***	24.19%	6.738***	32.84%	6.489***	43.08%	3.500***
(+1,+35)	9.78%	4.350***	14.59%	4.802***	23.51%	6.455***	33.50%	6.550***	44.77%	3.508***
(+1,+36)	10.95%	4.788***	15.10%	4.900***	24.60%	6.670***	34.17%	6.593***	47.06%	3.283**
(+1,+37)	10.67%	4.610***	15.91%	5.088***	26.35%	7.025***	35.86%	6.841***	46.75%	3.194**
(+1,+38)	10.92%	4.643***	15.67%	4.937***	27.15%	7.146***	36.03%	6.811***	50.30%	3.370***
(+1,+39)	11.97%	5.014***	16.76%	5.177***	27.48%	7.137***	36.96%	6.892***	51.73%	3.395***
(+1,+40)	11.88%	4.901***	17.57%	5.344***	27.39%	7.028***	39.13%	7.186***	50.95%	3.480***
(+1,+41)	11.88%	4.840***	17.96%	5.385***	28.62%	7.241***	40.54%	7.342***	51.77%	3.483***
(+1,+42)	12.46%	5.008***	18.84%	5.548***	28.38%	7.076***	40.23%	7.204***	51.78%	3.629***
(+1,+43)	12.77%	5.064***	18.54%	5.389***	28.76%	7.067***	41.06%	7.250***	50.47%	3.689***
(+1,+44)	12.19%	4.779***	18.58%	5.322***	28.32%	6.875***	40.85%	7.142***	48.66%	3.535***
(+1,+45)	11.99%	4.638***	18.35%	5.197***	30.55%	7.306***	42.20%	7.304***	47.60%	3.439***
(+1,+46)	12.51%	4.737***	19.14%	5.360***	30.73%	7.261***	41.79%	7.160***	49.22%	3.478***
(+1,+47)	12.37%	4.635***	19.35%	5.343***	32.30%	7.407***	41.15%	6.994***	51.05%	3.541***
(+1,+48)	12.91%	4.780***	18.96%	5.183***	33.92%	7.688***	40.84%	6.883***	54.66%	3.679***
observations	992		870		830		620		169	

Panel B: Fama-French Calendar-time Approach (Equally-weighted)

	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic
12 months	0.48%	2.29*	0.25%	0.97	0.49%	1.69	0.53%	1.68	1.08%	1.58
24 months	0.35%	2.22$	0.49%	2.21$	0.60%	2.64*	0.77%	2.83**	0.98%	1.74
36 months	0.36%	2.49*	0.28%	1.59	0.52%	2.34*	0.73%	2.91**	1.35%	1.78
48 months	0.28%	2.01$	0.24%	1.43	0.58%	2.80*	0.67%	2.87**	1.38%	2.28*

Table 7
Frequency Distribution and Announcement Returns of Open Market Share Repurchases Stratified by
Motivation

The table reports the number of observations per motivation for firms that announced an open market share repurchase between 1991 and 2001. The motivation for the repurchase is determined by reading the announcements in Lexis Nexis. We classify motivations into 7 categories: *Undervalued*. The announcement contains the explicit mentioning of undervaluation of the firm's shares or refers to the low current stock price and the stock price underperformance. *Best use of money*. The announcement states that the money of the company is best spent on repurchasing its own shares. *Distribution of cash*. The announcement justifies the repurchase as being in the interest of shareholders primarily because cash (or excess cash) is returned to shareholders. *Dilution and EPS*. The announcement says that the repurchased shares help to avoid dilution or that the repurchase strengthens earnings-per-share. *ESOP*. The repurchase is made in conjunction with an employee stock option plan. *Restructuring*. The repurchase is part of a restructuring. *Others*. Other reasons. One announcement can be related to several (maximum 7) motives. For example, there are 54 events where the only motivation is "undervaluation". 222 additional events report one other motivation besides "undervaluation". 647 events did not report any motivation. AR is the abnormal announcement return measured over the three days around in the share repurchase announcement using the market model with the equally-weighted CRSP index. *,**,*** indicates significance levels of 10%, 5%, 1%, respectively.

Number of motivations per announcement	Undervalued	Best use of money	Distribution of cash	Dilution and EPS	ESOP	Restructuring	Other
1	54	457	149	77	378	6	8
2	222	687	363	144	274	21	1
3	244	525	425	195	293	30	1
4	169	236	228	135	166	22	0
5	32	36	35	35	29	13	0
6	3	3	3	3	3	3	0
Total	724	1944	1203	589	1143	95	10
Abnormal Announcement Return (AR)	3.70%***	2.87***	2.78%**	1.41%*	1.87%**	1.17%*	0.68%

Table 8

Long-run Abnormal Returns After Open Market Repurchase Announcement Stratified by Motivation

Panel A reports monthly cumulative average abnormal return in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model for subsamples formed based on the motivation for doing the open market share repurchase. The following regression is run each event-month j:

$$\left(R_{i,t} - R_{f,t}\right) = aj + b_j\left(R_{m,t} - R_{f,t}\right) + cjSMB_t + djHML_t + \varepsilon_{i,t},$$

where $R_{i,t}$ is the monthly return on security i in calendar month t that corresponds to the event month j with j=0 being the month of the repurchase announcement. $R_{f,t}$ and $R_{m,t}$ are the risk-free rate and the return on the equally weighted CRSP index, respectively. SMB_t and HML_t are the monthly return on the size and book-to-market factor in month t, respectively. The numbers reported are sums of the intercepts a_t of cross-sectional regressions over the relevant event-time periods expressed in percentage terms. Abnormal returns are reported for six samples. First, all 2834 firms which mention at least one motivation to do the share repurchase. Motivations are classified based upon the stated reasons at the time of the share repurchase announcement as described in Table 7. The second subsample consists of 692 firms that motivate their repurchase by saying they are "undervalued" and it is the "best use of money". The third subsample contains 1456 firms that say neither "undervalued" nor "best use of money". The forth subsample contains the 188 firms that repurchase to avoid "dilution" or manage "earnings-per-shares" (EPS) but do neither say "undervalued" nor "best use of money". The fifth (sixth) subsample containts the 378 (1143) events where the firm motivates the repurchase by mentioning "employee stock option programs" as the only reason (as one of the reasons). Panel B reports abnormal returns of equally-weighted calendar-time portfolios using the Fama-French (1993) three factor model. In this method, event firms that have announced an open market buyback in the last 12 (24, 36, 48) calendar months, form the basis of the calendar month portfolio. A single time-series regression is run with the excess return of the calendar portfolio as the dependent variable, and the return on three factors as the independent variables (the excess market return, a high-minus-low book-to-market and a small-minus-big capitalization factor). The significance levels are indicated by $, *, **, and ***, and correspond to a significance level of 10%, 5%, 1%, and 0.1%, respectively, using a two-tailed test.

Table 8 (continued)

Panel A: Fama-French IRATS

Months	All events with at least one motivation		Motivation: "Undervalued" and "Best use of money"		Motivation: Neither "undervalued" nor "best use of money"		Motivation: "dilution" & "EPS". Neither "undervalued" nor "best use of money"		Motivation: "ESOP" only		Motivation: "ESOP" and others	
	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic
(-6,-1)	-7.96%	-14.454***	-18.02%	-12.517***	-7.13%	-9.764***	-7.74%	-3.693***	-4.52%	-3.414***	-7.42%	-8.561***
(-5,-1)	-7.87%	-15.936***	-17.15%	-13.247***	-7.00%	-10.587***	-7.57%	-3.954***	-4.55%	-3.856***	-7.49%	-9.841***
(-4,-1)	-7.32%	-16.713***	-15.95%	-14.271***	-6.17%	-10.353***	-5.60%	-3.282**	-4.52%	-4.204***	-6.51%	-9.596***
(-3,-1)	-6.44%	-16.702***	-14.40%	-14.693***	-4.99%	-9.591***	-4.40%	-2.958**	-4.32%	-4.653***	-5.75%	-9.698***
(-2,-1)	-5.77%	-18.185***	-11.74%	-14.549***	-4.27%	-10.095***	-3.74%	-3.124**	-4.15%	-5.554***	-5.23%	-10.829***
(-1,-1)	-3.56%	-14.896***	-7.18%	-11.435***	-2.48%	-8.028***	-1.33%	-1.448	-2.11%	-3.680***	-3.07%	-8.671***
(0,0)	0.04%	0.135	0.07%	0.074	0.20%	0.533	0.96%	0.847	0.87%	1.42	0.52%	1.377
(+1,+1)	0.43%	1.748$	0.29%	0.43	0.49%	1.648$	-0.53%	-0.641	0.84%	1.631	0.80%	2.040*
(+1,+2)	0.88%	1.746$	1.52%	1.531	0.36%	0.805	-1.28%	-0.937	1.14%	1.509	0.65%	1.137
(+1,+3)	1.01%	1.802$	1.35%	1.108	0.68%	1.169	-2.38%	-1.492	2.19%	2.343*	0.93%	1.33
(+1,+4)	1.38%	2.260*	1.53%	1.107	0.90%	1.353	-1.95%	-0.976	2.51%	2.356*	1.75%	2.243*
(+1,+5)	1.34%	2.059*	1.87%	1.194	1.22%	1.648$	-0.89%	-0.402	2.42%	2.069*	2.26%	2.593**
(+1,+6)	0.88%	1.275	1.08%	0.642	1.39%	1.728$	0.17%	0.073	2.81%	2.137*	2.15%	2.270*
(+1,+7)	1.37%	1.857$	1.67%	0.91	1.31%	1.51	-0.08%	-0.032	3.87%	2.676**	3.21%	3.175**
(+1,+8)	1.19%	1.505	0.77%	0.386	1.35%	1.434	-0.19%	-0.07	4.40%	2.687**	3.52%	3.143**
(+1,+9)	1.56%	1.869$	1.46%	0.685	2.24%	2.219*	0.51%	0.171	5.41%	3.064**	3.82%	3.237**
(+1,+10)	1.73%	1.986*	1.96%	0.871	2.70%	2.527*	-0.28%	-0.091	6.24%	3.240**	4.69%	3.727***
(+1,+11)	2.21%	2.427*	2.33%	0.975	2.73%	2.401*	-0.05%	-0.015	6.37%	3.016**	5.14%	3.865***
(+1,+12)	2.88%	3.054**	2.97%	1.187	3.54%	2.970**	0.69%	0.209	7.22%	3.266**	6.17%	4.461***
(+1,+13)	3.28%	3.346***	4.13%	1.58	3.86%	3.111***	0.43%	0.127	7.79%	3.371***	7.06%	4.856***
(+1,+14)	3.68%	3.618***	4.75%	1.742$	3.84%	2.966**	0.12%	0.032	8.07%	3.347***	7.47%	4.881***
(+1,+15)	4.62%	4.228***	7.76%	2.482*	5.06%	3.739***	-0.37%	-0.096	9.65%	3.793***	8.29%	5.221***
(+1,+16)	5.48%	4.867***	9.14%	2.844**	5.74%	4.074***	0.79%	0.197	10.35%	3.947***	9.70%	5.855***
(+1,+17)	6.15%	5.217***	10.26%	2.987**	6.32%	4.325***	1.43%	0.35	11.15%	4.092***	10.44%	5.946***
(+1,+18)	7.06%	5.784***	11.54%	3.252**	6.26%	4.129***	3.04%	0.704	11.44%	4.048***	11.19%	6.133***
(+1,+19)	7.47%	5.965***	11.74%	3.233**	7.00%	4.460***	3.33%	0.754	11.78%	4.046***	11.76%	6.269***
(+1,+20)	7.73%	5.985***	13.26%	3.560***	6.82%	4.225***	3.63%	0.8	11.33%	3.802***	12.11%	6.311***
(+1,+21)	8.29%	6.246***	14.15%	3.688***	7.12%	4.282***	2.68%	0.574	11.50%	3.723***	12.71%	6.408***
(+1,+22)	8.50%	6.258***	14.44%	3.684***	7.36%	4.331***	3.18%	0.664	11.77%	3.716***	12.98%	6.357***
(+1,+23)	9.08%	6.534***	14.77%	3.676***	7.73%	4.419***	2.93%	0.591	12.10%	3.751***	13.38%	6.399***
(+1,+24)	10.13%	7.059***	16.19%	3.929***	9.01%	4.981***	4.73%	0.93	12.50%	3.798***	14.81%	6.899***
(+1,+25)	10.45%	7.106***	16.36%	3.869***	9.33%	5.012***	3.28%	0.635	13.08%	3.893***	15.15%	6.911***
(+1,+26)	11.12%	7.391***	17.04%	3.930***	9.79%	5.126***	4.08%	0.773	14.08%	4.079***	16.26%	7.200***
(+1,+27)	11.91%	7.754***	17.92%	4.050***	10.38%	5.290***	5.05%	0.94	14.45%	4.074***	17.22%	7.406***
(+1,+28)	13.03%	8.304***	20.16%	4.437***	11.22%	5.548***	5.34%	0.97	15.47%	4.220***	18.49%	7.747***
(+1,+29)	13.45%	8.399***	20.80%	4.490***	11.49%	5.543***	6.21%	1.094	14.99%	3.992***	18.17%	7.417***
(+1,+30)	14.48%	8.882***	21.39%	4.538***	11.95%	5.652***	8.56%	1.487	15.33%	4.004***	19.59%	7.802***
(+1,+31)	15.52%	9.309***	24.03%	4.975***	11.74%	5.430***	9.67%	1.633	14.69%	3.755***	19.75%	7.727***
(+1,+32)	16.35%	9.632***	24.97%	5.051***	12.79%	5.767***	10.43%	1.731$	16.05%	3.901***	20.68%	7.880***
(+1,+33)	17.50%	10.154***	27.13%	5.380***	13.47%	5.966***	10.56%	1.719$	17.84%	4.243***	21.78%	8.127***
(+1,+34)	18.10%	10.344***	28.01%	5.449***	13.69%	5.940***	9.34%	1.497	17.65%	4.118***	22.22%	8.094***
(+1,+35)	17.88%	10.070***	27.10%	5.196***	13.20%	5.614***	9.52%	1.494	16.96%	3.844***	21.78%	7.749***
(+1,+36)	18.49%	10.288***	26.45%	5.006***	14.79%	6.134***	12.44%	1.910$	19.37%	4.259***	22.96%	7.976***
(+1,+37)	19.37%	10.633***	27.52%	5.096***	15.09%	6.143***	12.37%	1.871$	18.71%	4.061***	23.33%	7.960***
(+1,+38)	19.87%	10.751***	27.11%	4.933***	15.17%	6.055***	11.93%	1.768$	19.79%	4.175***	24.83%	8.286***
(+1,+39)	20.97%	11.170***	27.41%	4.849***	15.32%	5.998***	11.46%	1.663$	20.03%	4.172***	24.70%	8.068***
(+1,+40)	21.75%	11.411***	29.57%	5.091***	15.50%	5.946***	11.59%	1.653$	21.43%	4.372***	25.61%	8.203***
(+1,+41)	22.15%	11.462***	30.30%	5.054***	15.85%	5.961***	10.71%	1.48	21.41%	4.303***	24.72%	7.778***
(+1,+42)	22.62%	11.540***	31.00%	5.027***	15.98%	5.889***	10.60%	1.438	20.70%	4.065***	24.47%	7.557***
(+1,+43)	22.85%	11.528***	30.77%	4.910***	15.57%	5.622***	9.55%	1.275	20.56%	3.966***	23.33%	7.070***
(+1,+44)	22.60%	11.265***	30.47%	4.766***	15.04%	5.326***	9.44%	1.234	19.59%	3.706***	22.41%	6.660***
(+1,+45)	23.46%	11.558***	31.55%	4.841***	15.63%	5.431***	11.00%	1.406	19.97%	3.708***	22.51%	6.569***
(+1,+46)	23.63%	11.489***	29.89%	4.486***	15.46%	5.275***	11.08%	1.39	18.94%	3.466***	22.67%	6.488***
(+1,+47)	23.78%	11.443***	31.19%	4.605***	17.38%	5.611***	10.18%	1.26	20.43%	3.629***	23.51%	6.560***
(+1,+48)	24.16%	11.504***	31.89%	4.597***	17.67%	5.580***	9.36%	1.137	20.06%	3.467***	23.18%	6.331***
obs	2834		692		1456		188		378		1143	

Panel B: Fama-French Calendar-time Approach (Equally-weighted)

	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic
12 months	0.50%	2.98**	0.61%	3.17***	0.37%	1.06	0.33%	0.95	0.69%	2.53**	0.63%	2.61*
24 months	0.58%	4.07***	0.61%	3.96***	0.22%	0.85	0.22%	0.79	0.56%	2.13$	0.55%	2.34*
36 months	0.55%	3.91***	0.56%	3.99***	0.30%	1.48	0.28%	0.80	0.54%	2.03$	0.54%	2.73**
48 months	0.51%	3.76***	0.49%	3.70***	0.33%	1.66	0.20%	0.89	0.42%	2.11$	0.47%	2.62*

Table 9
Long-run Abnormal Returns After Open Market Repurchases Stratified by Six-Months Prior Return

Panel A reports monthly cumulative average abnormal return in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model for subsamples formed based on the six-months return prior to the open market share repurchase announcement. The following regression is run each event-month j:

$$\left(R_{i,t} - R_{f,t}\right) = a_j + b_j\left(R_{m,t} - R_{f,t}\right) + c_j SMB_t + d_j HML_t + \varepsilon_{i,t},$$

where $R_{i,t}$ is the monthly return on security i in calendar month t that corresponds to the event month j with j=0 being the month of the repurchase announcement. $R_{f,t}$ and $R_{m,t}$ are the risk-free rate and the return on the equally weighted CRSP index, respectively. SMB_t and HML_t are the monthly return on the size and book-to-market factor in month t, respectively. The numbers reported are sums of the intercepts a_t of cross-sectional regressions over the relevant event-time periods expressed in percentage terms. Abnormal returns are reported for five subsamples. The sample is stratified into 'prior return quintiles' by the six-months prior raw return relative to the distribution of the six-months raw returns of all CRSP firms ending 5 days before the announcement. *Prior return lowest* contains events where the prior return of the repurchasing firm is in the lowest quintile relative to the cross-section of all CRSP firms over the same 6-months period. Firms are assigned to prior return quintiles based on the raw 6-months prior returns of the repurchasing firm relative to the prior 6-months returns of all firms with available CRSP data in that particular months. The Panel B reports abnormal returns of equally-weighted calendar-time portfolios using the Fama-French (1993) three factor model. In this method, event firms that have announced an open market buyback in the last 12 (24, 36, 48) calendar months, form the basis of the calendar month portfolio. A single time-series regression is run with the excess return of the calendar portfolio as the dependent variable, and the return on three factors as the independent variables (the excess market return, a high-minus-low book-to-market and a small-minus-big capitalization factor). The significance levels are indicated by $, *, **, and ***, and correspond to a significance level of 10%, 5%, 1%, and 0.1%, respectively, using a two-tailed test. Panels C and D augment the three-factor model with the momentum factor of Carhart (1997).

Table 9 (continued)

Panel A: Fama-French IRATS

Months around repurchase announcement	Prior return lowest		Prior return 2		Prior return 3		Prior return 4		Prior return highest	
	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic
(-6,-1)	-40.65%	-29.927***	-17.68%	-18.056***	-7.55%	-8.621***	2.26%	2.529*	21.12%	16.717***
(-5,-1)	-34.50%	-27.600***	-15.22%	-16.891***	-7.75%	-9.911***	0.64%	0.807	14.64%	13.050***
(-4,-1)	-28.88%	-25.886***	-12.60%	-15.674***	-7.14%	-10.167***	0.26%	0.37	9.51%	9.629***
(-3,-1)	-22.27%	-22.098***	-10.07%	-14.250***	-6.08%	-9.809***	-0.95%	-1.506	5.05%	6.111***
(-2,-1)	-14.87%	-18.037***	-7.57%	-12.765***	-5.13%	-9.687***	-2.27%	-4.435***	-0.48%	-0.752
(-1,-1)	-5.29%	-8.357***	-3.63%	-7.902***	-3.54%	-8.111***	-2.52%	-6.508***	-3.60%	-7.638***
(0,0)	1.24%	1.277	-0.19%	-0.34	0.54%	1.109	-0.40%	-0.912	0.11%	0.211
(+1,+1)	1.20%	0.97	0.02%	0.029	0.64%	1.369	-0.23%	-0.643	1.24%	2.481*
(+1,+2)	2.78%	1.379	0.62%	0.793	0.78%	1.193	-0.79%	-1.459	1.51%	2.082*
(+1,+3)	2.04%	0.953	1.53%	1.514	1.86%	2.170*	-0.98%	-1.433	2.37%	2.813**
(+1,+4)	2.53%	1.136	1.12%	1.012	1.68%	1.739$	-0.75%	-0.907	3.61%	3.743***
(+1,+5)	1.95%	0.843	0.83%	0.682	2.32%	2.168*	-0.81%	-0.873	4.01%	3.772***
(+1,+6)	0.75%	0.316	1.41%	1.062	1.97%	1.719$	-1.36%	-1.353	3.92%	3.381***
(+1,+7)	1.81%	0.726	2.12%	1.469	1.68%	1.373	-0.84%	-0.764	3.90%	3.097**
(+1,+8)	1.55%	0.596	1.43%	0.917	1.53%	1.124	-0.35%	-0.282	4.50%	3.289***
(+1,+9)	1.64%	0.612	2.33%	1.388	0.86%	0.596	0.77%	0.565	4.69%	3.204**
(+1,+10)	1.34%	0.484	2.79%	1.573	1.51%	0.995	1.46%	1.017	5.22%	3.376***
(+1,+11)	2.41%	0.842	3.50%	1.849$	1.11%	0.702	1.17%	0.759	6.30%	3.811***
(+1,+12)	3.55%	1.195	4.51%	2.286*	2.48%	1.479	1.54%	0.962	6.93%	4.025***
(+1,+13)	3.69%	1.195	4.80%	2.338*	3.31%	1.897$	1.60%	0.967	6.66%	3.695***
(+1,+14)	4.78%	1.479	4.86%	2.261*	3.16%	1.749$	1.10%	0.644	7.01%	3.715***
(+1,+15)	7.52%	2.215*	5.93%	2.644**	3.54%	1.889$	1.57%	0.875	8.36%	3.852***
(+1,+16)	8.91%	2.547*	6.71%	2.889**	4.56%	2.305*	2.00%	1.075	9.81%	4.362***
(+1,+17)	10.26%	2.864**	7.81%	3.167**	5.38%	2.615**	2.50%	1.284	9.56%	4.013***
(+1,+18)	11.72%	3.170**	8.85%	3.478***	5.48%	2.550*	2.12%	1.047	10.54%	4.308***
(+1,+19)	12.54%	3.308***	10.34%	3.941***	6.70%	3.025**	2.55%	1.22	9.97%	3.980***
(+1,+20)	15.00%	3.830***	10.03%	3.726***	5.88%	2.597**	2.25%	1.041	9.76%	3.803***
(+1,+21)	15.80%	3.907***	10.52%	3.777***	6.26%	2.712**	2.08%	0.937	10.38%	3.954***
(+1,+22)	14.15%	3.428***	11.82%	4.150***	6.55%	2.728**	3.03%	1.307	10.88%	4.063***
(+1,+23)	17.88%	4.218***	11.61%	3.994***	6.63%	2.708**	3.10%	1.3	10.04%	3.663***
(+1,+24)	22.75%	5.200***	13.36%	4.459***	8.07%	3.024**	3.85%	1.561	9.97%	3.563***
(+1,+25)	25.18%	5.569***	13.85%	4.499***	7.71%	2.830**	3.26%	1.293	10.05%	3.521***
(+1,+26)	25.80%	5.552***	14.16%	4.470***	8.46%	3.024**	3.31%	1.279	10.17%	3.483***
(+1,+27)	28.42%	5.935***	14.08%	4.321***	8.54%	2.986**	2.82%	1.067	11.42%	3.823***
(+1,+28)	31.21%	6.299***	16.12%	4.827***	9.22%	3.151**	2.94%	1.085	11.59%	3.801***
(+1,+29)	32.36%	6.405***	15.89%	4.655***	10.19%	3.409***	3.28%	1.174	11.42%	3.669***
(+1,+30)	33.07%	6.448***	17.29%	4.882***	10.02%	3.291***	3.86%	1.35	12.05%	3.798***
(+1,+31)	36.35%	6.852***	17.03%	4.710***	10.02%	3.227**	4.60%	1.57	12.53%	3.873***
(+1,+32)	37.94%	7.069***	17.64%	4.761***	12.33%	3.859***	5.53%	1.807$	11.84%	3.580***
(+1,+33)	40.60%	7.459***	18.94%	4.999***	13.10%	3.991***	5.37%	1.724$	12.33%	3.664***
(+1,+34)	41.93%	7.601***	20.60%	5.307***	12.16%	3.635***	5.77%	1.811$	12.29%	3.576***
(+1,+35)	42.69%	7.643***	19.21%	4.877***	13.55%	3.943***	4.93%	1.512	9.94%	2.839**
(+1,+36)	42.85%	7.534***	19.88%	4.982***	14.76%	4.234***	5.26%	1.589	9.80%	2.735**
(+1,+37)	45.56%	7.818***	20.58%	5.057***	14.43%	4.077***	5.69%	1.687$	9.88%	2.706**
(+1,+38)	45.58%	7.694***	21.04%	5.087***	13.75%	3.818***	6.63%	1.921$	9.06%	2.434*
(+1,+39)	45.76%	7.598***	22.31%	5.272***	12.84%	3.494***	7.11%	2.021*	10.05%	2.610**
(+1,+40)	45.49%	7.374***	21.88%	5.092***	12.79%	3.390***	7.36%	2.038*	12.15%	3.098**
(+1,+41)	45.76%	7.269***	21.72%	4.941***	13.61%	3.486***	7.67%	2.086*	12.12%	3.037**
(+1,+42)	45.49%	7.061***	22.74%	5.030***	13.29%	3.336***	8.49%	2.281*	10.87%	2.666**
(+1,+43)	45.07%	6.839***	22.02%	4.810***	13.25%	3.274**	8.57%	2.264*	9.93%	2.394*
(+1,+44)	45.12%	6.677***	22.23%	4.774***	11.50%	2.798**	7.65%	1.985*	10.22%	2.419*
(+1,+45)	42.57%	6.215***	22.10%	4.675***	12.37%	2.959**	8.18%	2.073*	11.18%	2.595**
(+1,+46)	41.98%	5.992***	23.20%	4.806***	11.23%	2.613**	8.31%	2.073*	12.06%	2.740**
(+1,+47)	44.29%	6.130***	22.65%	4.593***	12.07%	2.757**	9.41%	2.302*	13.23%	2.823**
(+1,+48)	45.44%	6.192***	24.36%	4.843***	11.81%	2.647**	11.64%	2.758**	13.24%	2.761**
observations	740		668		650		664		759	

Panel B: Fama-French Calendar-time Approach (Equally-weighted)

	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic
12 months	0.01%	0.22	0.08%	0.31	0.21%	0.69	0.14%	0.45	0.60%	2.80*
24 months	0.55%	1.91$	0.47%	2.38*	0.33%	1.16	0.17%	0.87	0.41%	2.05$
36 months	0.96%	2.24*	0.52%	3.16**	0.35%	1.40	0.21%	1.31	0.25%	1.49
48 months	0.68%	2.55*	0.48%	3.07**	0.29%	1.28	0.25%	1.53	0.22%	1.42

Table 9 (continued)

Panel C: Fama-French Three-factor Model plus Momentum Factor of Carhart, IRATS

Months around repurchase announcement	Prior return lowest (stratified by year)		Prior return 2		Prior return 3		Prior return 4		Prior return highest	
	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic
(-6,-1)	-38.13%	-25.532***	-15.75%	-14.676***	-6.45%	-6.627***	2.31%	2.365*	20.79%	15.300***
(-5,-1)	-31.47%	-23.132***	-13.31%	-13.448***	-6.56%	-7.494***	0.57%	0.656	14.11%	11.659***
(-4,-1)	-26.35%	-21.920***	-10.82%	-12.224***	-6.00%	-7.546***	0.10%	0.127	8.96%	8.334***
(-3,-1)	-19.70%	-18.385***	-8.32%	-10.688***	-4.91%	-6.937***	-1.16%	-1.660$	4.42%	4.873***
(-2,-1)	-13.19%	-15.107***	-6.57%	-10.164***	-4.14%	-6.730***	-2.68%	-4.641***	-1.13%	-1.615
(-1,-1)	-4.56%	-6.775***	-3.23%	-6.601***	-2.90%	-5.624***	-2.87%	-6.529***	-4.28%	-8.243***
(0,0)	2.44%	2.464*	0.36%	0.605	0.90%	1.691$	-0.62%	-1.267	-0.86%	-1.533
(+1,+1)	2.18%	1.713$	0.48%	0.851	1.16%	2.360*	-0.11%	-0.293	1.24%	2.383*
(+1,+2)	5.31%	2.528*	1.47%	1.787$	1.57%	2.256*	-0.51%	-0.866	1.62%	2.091*
(+1,+3)	4.81%	2.151*	2.61%	2.415*	2.48%	2.665**	-0.62%	-0.834	2.79%	3.055**
(+1,+4)	5.70%	2.453*	2.88%	2.440*	2.74%	2.587**	0.07%	0.083	4.02%	3.851***
(+1,+5)	5.19%	2.159*	2.95%	2.282*	4.05%	3.455***	0.59%	0.589	4.82%	4.165***
(+1,+6)	4.19%	1.689$	3.58%	2.537*	3.89%	3.099**	0.44%	0.408	4.65%	3.699***
(+1,+7)	5.65%	2.187*	4.94%	3.226**	3.57%	2.668**	1.32%	1.124	4.95%	3.641***
(+1,+8)	5.64%	2.083*	4.56%	2.773**	3.57%	2.430*	2.57%	1.938$	5.85%	3.963***
(+1,+9)	6.05%	2.172*	5.51%	3.116**	3.03%	1.934$	4.25%	2.932**	6.75%	4.289***
(+1,+10)	6.19%	2.144*	6.26%	3.359***	4.23%	2.601**	5.26%	3.449***	7.42%	4.490***
(+1,+11)	8.10%	2.709**	6.89%	3.480***	3.88%	2.285*	5.20%	3.211**	8.69%	4.924***
(+1,+12)	9.51%	3.053**	7.73%	3.741***	5.27%	2.924**	5.73%	3.413***	10.10%	5.495***
(+1,+13)	10.34%	3.197**	8.44%	3.941***	6.33%	3.382***	6.24%	3.591***	10.45%	5.445***
(+1,+14)	13.31%	3.925***	8.62%	3.861***	6.56%	3.389***	6.00%	3.347***	11.36%	5.666***
(+1,+15)	15.82%	4.451***	10.39%	4.443***	7.35%	3.676***	6.71%	3.604***	12.63%	5.532***
(+1,+16)	17.48%	4.783***	11.18%	4.627***	8.54%	4.049***	7.23%	3.759***	14.54%	6.171***
(+1,+17)	19.21%	5.146***	12.67%	4.935***	9.65%	4.404***	8.04%	4.002***	14.28%	5.754***
(+1,+18)	20.05%	5.221***	13.70%	5.180***	9.95%	4.361***	7.77%	3.729***	15.50%	6.092***
(+1,+19)	21.23%	5.407***	15.23%	5.597***	11.09%	4.734***	8.35%	3.895***	15.65%	6.034***
(+1,+20)	23.58%	5.844***	14.99%	5.380***	10.34%	4.312***	8.20%	3.710***	15.71%	5.929***
(+1,+21)	24.31%	5.853***	15.54%	5.410***	10.73%	4.395***	8.42%	3.711***	16.50%	6.110***
(+1,+22)	23.47%	5.554***	17.34%	5.909***	11.14%	4.396***	9.50%	4.027***	17.25%	6.268***
(+1,+23)	27.48%	6.353***	18.28%	6.117***	11.42%	4.422***	9.71%	4.027***	17.18%	6.097***
(+1,+24)	32.01%	7.206***	19.37%	6.321***	13.29%	4.770***	11.14%	4.481***	17.60%	6.121***
(+1,+25)	34.70%	7.629***	20.27%	6.473***	12.91%	4.543***	11.13%	4.355***	18.09%	6.187***
(+1,+26)	36.18%	7.802***	20.88%	6.511***	14.02%	4.818***	11.05%	4.224***	18.69%	6.266***
(+1,+27)	38.54%	8.131***	20.93%	6.399***	14.33%	4.830***	10.75%	4.031***	20.47%	6.732***
(+1,+28)	41.48%	8.545***	23.02%	6.917***	15.22%	5.031***	10.96%	4.026***	20.80%	6.722***
(+1,+29)	42.20%	8.566***	23.59%	6.949***	16.66%	5.400***	11.56%	4.154***	20.61%	6.545***
(+1,+30)	42.67%	8.572***	25.54%	7.328***	17.69%	5.643***	12.40%	4.376***	21.10%	6.592***
(+1,+31)	45.60%	8.939***	25.89%	7.315***	17.84%	5.611***	13.24%	4.585***	21.54%	6.625***
(+1,+32)	46.84%	9.097***	27.55%	7.647***	19.91%	6.135***	15.16%	5.092***	21.24%	6.407***
(+1,+33)	48.93%	9.389***	28.86%	7.857***	21.65%	6.562***	15.84%	5.249***	21.72%	6.456***
(+1,+34)	49.56%	9.411***	31.41%	8.408***	22.80%	6.259***	15.97%	5.205***	22.09%	6.464***
(+1,+35)	50.11%	9.424***	30.46%	8.063***	23.41%	6.323***	16.02%	5.127***	20.21%	5.828***
(+1,+36)	50.37%	9.359***	31.13%	8.152***	25.01%	6.689***	16.80%	5.295***	20.97%	5.937***
(+1,+37)	53.01%	9.714***	31.99%	8.256***	25.20%	6.666***	17.54%	5.451***	21.36%	5.973***
(+1,+38)	54.19%	9.837***	33.43%	8.482***	24.79%	6.480***	18.68%	5.701***	21.03%	5.802***
(+1,+39)	54.74%	9.830***	35.24%	8.793***	25.51%	6.573***	19.02%	5.719***	22.59%	6.074***
(+1,+40)	56.30%	10.000***	36.02%	8.869***	25.47%	6.474***	19.55%	5.772***	24.24%	6.425***
(+1,+41)	58.83%	10.337***	36.95%	8.974***	26.94%	6.722***	19.99%	5.817***	23.93%	6.255***
(+1,+42)	59.35%	10.316***	38.68%	9.232***	27.19%	6.705***	20.36%	5.871***	23.29%	5.989***
(+1,+43)	60.75%	10.424***	38.97%	9.208***	27.90%	6.808***	20.66%	5.878***	24.00%	6.058***
(+1,+44)	60.48%	10.271***	39.57%	9.249***	27.34%	6.613***	19.94%	5.599***	24.87%	6.187***
(+1,+45)	60.25%	10.162***	40.69%	9.388***	28.94%	6.924***	21.34%	5.884***	25.78%	6.329***
(+1,+46)	59.74%	9.998***	42.41%	9.680***	29.20%	6.895***	22.85%	6.138***	26.64%	6.440***
(+1,+47)	60.12%	9.978***	41.65%	9.411***	29.65%	6.932***	24.04%	6.389***	27.54%	6.413***
(+1,+48)	60.69%	10.007***	42.68%	9.527***	30.34%	7.022***	24.71%	6.487***	27.07%	6.210***
observations	740		668		650		664		759	

Panel D: Fama-French Calendar-time Approach (Equally-weighted)

	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic
12 months	0.40%	1.22	0.27%	1.05	0.88%	2.41*	0.73%	3.37**	0.98%	3.83***
24 months	0.94%	3.48***	0.65%	3.19**	0.61%	2.16$	0.58%	2.92**	0.80%	4.48***
36 months	1.02%	4.45***	0.66%	3.88***	0.73%	2.09*	0.58%	3.24**	0.53%	3.80***
48 months	0.99%	5.28***	0.65%	4.09***	0.72%	2.69*	0.54%	3.38**	0.51%	3.60***

Table 10
Frequency of Observations by Size, Book-to-Market, Prior Return and Motivation

The sample contains 3481 open market share repurchase events. Each event is classified by book-to-market, size, prior return and motivation. Book-to-market, size and prior return are divided into quintiles. Each firm is assigned to a quintile based upon its rank relative to the universe of Compustat and CRSP firms in the year prior to the repurchase announcement. Book-to-market is measured as the book value of equity divided by the market value of equity. Size is the market value of the equity. Prior return is the raw stock returns over the six months prior to the repurchase put into quintiles based upon the distribution of the six months raw returns of all CRSP firms ending 5 days before the announcement. Motivation is classified into three categories. Motivation class 5 represents all announcements that state that the motivation for the repurchase is "undervaluation" and "best use of money". Motivation 1 represents motivations to avoid "dilution" or for reasons of "earnings-per-share"-management, but do neither state that they repurchase due to "undervaluation" nor because the company thinks it is the "best use of money". All the remaining events are classified as motivation 3. See Table 7 for a description of the motivations.

Panel A shows the frequency distribution, reporting number of observations for each pair. Panel B reports the fraction of observations in each row, per column category. For example, in the first row, of the firms with low book-to-market, 14.6% have motivation 1, 67% motivation 3 and 18.4% motivation 5.

Panel A: Number of Observations

		dilution (MOTIVATION) 1	3	undervalued 5	low (BM) 1	2	3	4	high 5	large (SIZE) 1	2	3	4	small 5	by row
low	1	64	294	81											439
	2	128	447	124											699
BM	3	133	535	152											820
	4	124	611	165											900
high	5	48	436	139											623
large	1	190	673	129	247	323	250	132	40						992
	2	139	568	163	90	213	250	226	91						870
SIZE	3	105	551	174	65	111	193	281	180						830
	4	56	421	143	29	43	109	232	207						620
small	5	7	110	52	8	9	18	29	105						169
lowest	1	89	441	210	83	120	158	180	199	127	170	204	172	67	740
	2	74	449	145	70	119	159	173	147	188	170	150	122	38	668
RETURN	3	98	456	96	61	118	170	179	122	200	149	158	119	24	650
	4	109	454	101	78	138	160	196	92	223	162	148	112	19	664
highest	5	127	523	109	147	204	173	172	63	254	219	170	95	21	759
by column		497	2323	661	439	699	820	900	623	992	870	830	620	169	

Table 10 (continued)

Panel B: Fraction of Observations (numbers reported are percentages)

		MOTIVATION			BM					SIZE				
		dilution		undervalued	low				high	large				small
		1	3	5	1	2	3	4	5	1	2	3	4	5
low	1	14.6	67.0	18.5										
	2	18.3	63.9	17.7										
BM	3	16.2	65.2	18.5										
	4	13.8	67.9	18.3										
high	5	7.7	70.0	22.3										
large	1	19.2	67.8	13.0	24.9	32.6	25.2	13.3	4.0					
	2	16.0	65.3	18.7	10.3	24.5	28.7	26.0	10.5					
SIZE	3	12.7	66.4	21.0	7.8	13.4	23.3	33.9	21.7					
	4	9.0	67.9	23.1	4.7	6.9	17.6	37.4	33.4					
small	5	4.1	65.1	30.8	4.7	5.3	10.7	17.2	62.1					
lowest	1	12.0	59.6	28.4	11.2	16.2	21.4	24.3	26.9	17.2	23.0	27.6	23.2	9.1
	2	11.1	67.2	21.7	10.5	17.8	23.8	25.9	22.0	28.1	25.4	22.5	18.3	5.7
RETURN	3	15.1	70.2	14.8	9.4	18.2	26.2	27.5	18.8	30.8	22.9	24.3	18.3	3.7
	4	16.4	68.4	15.2	11.7	20.8	24.1	29.5	13.9	33.6	24.4	22.3	16.9	2.9
highest	5	16.7	68.9	14.4	19.4	26.9	22.8	22.7	8.3	33.5	28.9	22.4	12.5	2.8

Table 11
Long-run Abnormal Returns Stratified by Undervaluation Index

We compute the Undervaluation-index for all open market share repurchases between 1991 and 2001 in the following way: The Index is the sum of the ranks of the following four categories: BM (ranks 1-5): lowest BM (glamour stocks) receives a 1; highest (value stocks) a 5; Size (ranks 1-5): small firms get a 5, large firms a 1; Prior return (ranks 1-5): firms with the lowest prior return get a 5, highest a 1; Motivation (ranks 1,3,5): Firms where the motivation is 'undervaluation' and 'best use of money' get a 5; where the motivation is 'dilution' or 'EPS management' but neither 'undervaluation' nor 'best use of money' get a 1; the remaining firms are assigned a 3. We then add up the ranks. Based upon the empirical distribution, the quintile cutoffs are 9, 11, 13, 15. The higher the Index, the more likely it is that the firm is undervalued. Panel A reports monthly cumulative average abnormal return in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model. Panel B shows average monthly abnormal returns using the Fama-French calendar-time approach with equally weighted portfolio returns. More details on the methodologies are provided in table 9. The significance levels are indicated by $, *, **, and ***, and correspond to a significance level of 10%, 5%, 1%, and 0.1%, respectively, using a two-tailed test.

Panel A: Fama-French IRATS						
Months around repurchase announcement	Undervaluation index <9		Undervaluation index<10		Undervaluation index>15	
	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic
(-6,-1)	13.89%	10.267***	9.68%	9.234***	-34.17%	-19.040***
(-5,-1)	10.24%	8.647***	6.28%	6.783***	-29.56%	-17.988***
(-4,-1)	7.10%	6.664***	3.86%	4.624***	-24.30%	-16.288***
(-3,-1)	3.53%	3.844***	1.29%	1.800$	-19.97%	-14.857***
(-2,-1)	-0.74%	-1.059	-2.18%	-3.956***	-15.03%	-14.057***
(-1,-1)	-2.26%	-4.247***	-3.09%	-7.515***	-7.11%	-8.468***
(0,0)	-1.52%	-2.540*	-0.92%	-1.912$	6.14%	4.539***
(+1,+1)	0.40%	0.695	0.38%	0.86	2.27%	1.158
(+1,+2)	0.31%	0.398	0.23%	0.38	4.33%	1.337
(+1,+3)	0.79%	0.851	0.91%	1.145	4.27%	1.258
(+1,+4)	0.77%	0.699	0.99%	1.091	4.19%	1.202
(+1,+5)	0.99%	0.811	0.83%	0.83	3.05%	0.856
(+1,+6)	0.60%	0.455	0.35%	0.324	1.98%	0.545
(+1,+7)	-0.13%	-0.095	-0.14%	-0.12	2.07%	0.551
(+1,+8)	0.02%	0.012	0.07%	0.054	1.98%	0.506
(+1,+9)	1.09%	0.649	0.99%	0.74	2.14%	0.533
(+1,+10)	1.06%	0.602	1.16%	0.821	2.66%	0.645
(+1,+11)	0.63%	0.337	1.42%	0.949	2.75%	0.65
(+1,+12)	1.54%	0.784	2.07%	1.324	3.48%	0.805
(+1,+13)	1.45%	0.707	1.95%	1.192	5.42%	1.203
(+1,+14)	0.62%	0.288	1.40%	0.821	7.39%	1.578
(+1,+15)	0.20%	0.091	1.46%	0.831	10.87%	2.244*
(+1,+16)	1.50%	0.659	2.71%	1.5	13.47%	2.705**
(+1,+17)	1.35%	0.572	2.75%	1.472	14.74%	2.850**
(+1,+18)	2.51%	1.025	3.44%	1.777$	15.08%	2.861**
(+1,+19)	2.80%	1.111	3.82%	1.916$	16.06%	2.997**
(+1,+20)	2.37%	0.913	3.11%	1.521	17.64%	3.227**
(+1,+21)	3.37%	1.267	3.85%	1.833$	20.45%	3.606***
(+1,+22)	3.80%	1.386	4.61%	2.135*	19.38%	3.354***
(+1,+23)	3.52%	1.255	4.11%	1.853$	22.14%	3.755***
(+1,+24)	4.14%	1.438	4.64%	2.039*	28.26%	4.627***
(+1,+25)	3.72%	1.267	4.38%	1.887$	32.69%	5.155***
(+1,+26)	4.14%	1.375	4.95%	2.082*	33.66%	5.196***
(+1,+27)	4.48%	1.45	5.21%	2.142*	35.91%	5.387***
(+1,+28)	4.45%	1.415	5.65%	2.279*	39.83%	5.762***
(+1,+29)	5.07%	1.564	5.82%	2.289*	39.71%	5.648***
(+1,+30)	5.87%	1.775$	6.14%	2.366*	40.31%	5.652***
(+1,+31)	6.11%	1.814$	6.29%	2.366*	42.06%	5.792***
(+1,+32)	6.63%	1.875$	6.46%	2.340*	43.10%	5.837***
(+1,+33)	7.74%	2.132*	6.18%	2.188*	45.43%	6.068***
(+1,+34)	7.91%	2.131*	6.16%	2.126*	46.62%	6.156***
(+1,+35)	6.87%	1.809$	4.81%	1.625	47.14%	6.141***
(+1,+36)	8.08%	2.074*	5.44%	1.795$	46.60%	5.949***
(+1,+37)	7.35%	1.855$	4.73%	1.535	50.49%	6.253***
(+1,+38)	7.08%	1.751$	4.58%	1.457	50.58%	6.186***
(+1,+39)	6.75%	1.643	4.87%	1.523	50.60%	6.083***
(+1,+40)	8.09%	1.929$	5.08%	1.557	51.08%	5.946***
(+1,+41)	7.17%	1.684$	4.61%	1.389	51.46%	5.771***
(+1,+42)	7.79%	1.785$	4.92%	1.452	51.07%	5.624***
(+1,+43)	7.70%	1.735$	4.67%	1.352	48.68%	5.231***
(+1,+44)	7.08%	1.561	4.05%	1.149	48.30%	5.077***
(+1,+45)	8.13%	1.761$	4.31%	1.201	46.39%	4.806***
(+1,+46)	9.66%	2.029*	5.04%	1.374	42.58%	4.310***
(+1,+47)	12.13%	2.356*	6.30%	1.624	45.17%	4.467***
(+1,+48)	13.12%	2.518*	6.85%	1.745$	46.14%	4.496***
observations	517		834		446	
Panel B: Fama-French Calendar-time Approach (Equally-weighted)						
	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic	Average Monthly AR	t-statistic
12 months	0.28%	1.23	0.40%	1.88$	0.12%	0.25
24 months	0.23%	1.17	0.31%	1.61	1.04%	2.39**
36 months	0.23%	1.37	0.21%	1.24	0.77%	2.50**
48 months	0.19%	0.94	0.15%	0.80	0.92%	3.48***

Figure 1
Prior Return and Long-run Abnormal Returns

The figure presents cumulative abnormal returns based upon the Fama-French three factor model and IRATS. For a description of the methodology see Table 6. The portfolios (quintiles) presented are formed based on the raw returns of stocks in the six months prior to the open market share repurchase announcement relative to the distribution of all CRSP firms' stock returns over the same time period.
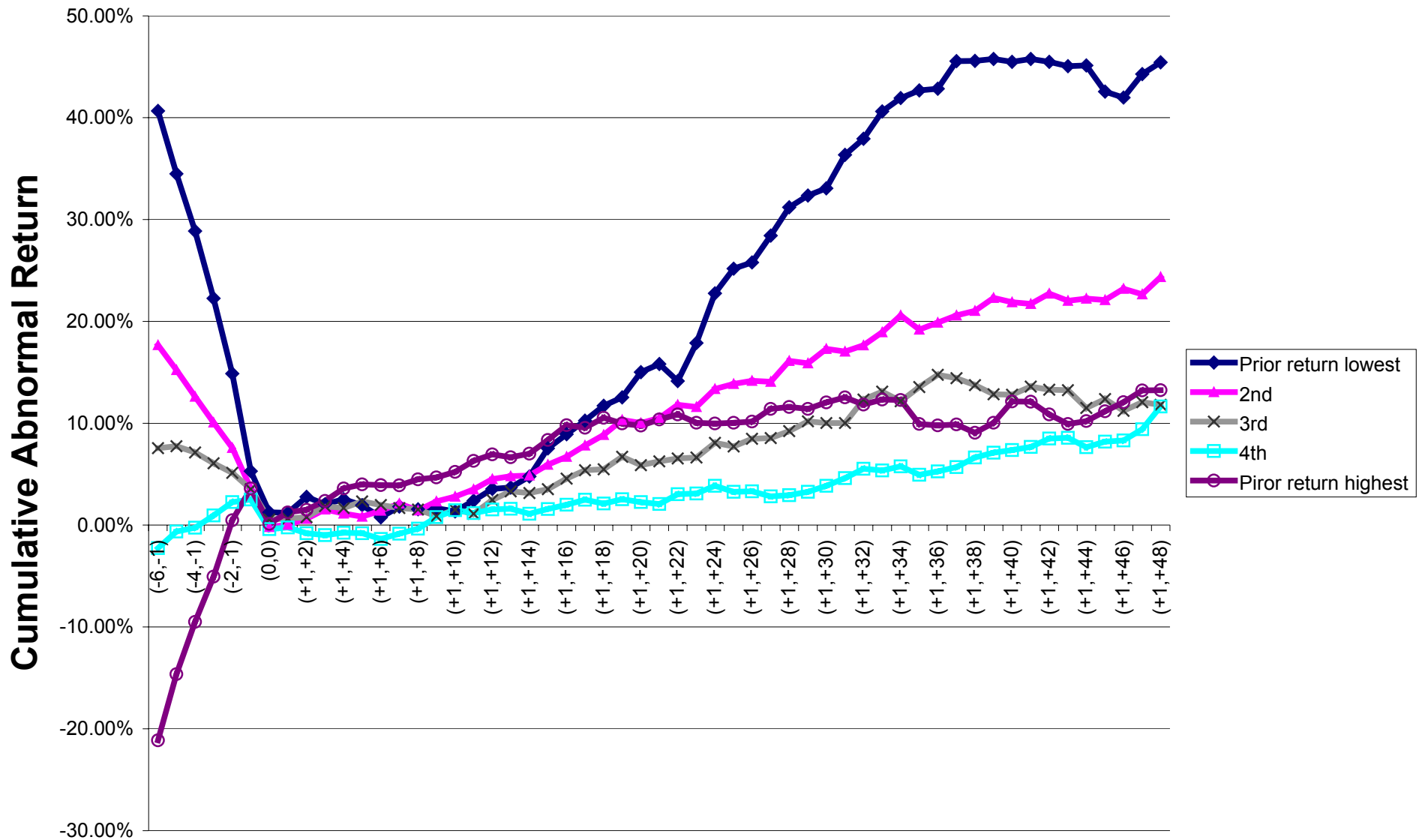
Figure 2
Empirical Distribution of the Undervaluation-index

We compute the Undervaluation-index for all open market share repurchases between 1991 and 2001 where we can find an announcement in Lexis-Nexis in the following way: The undervaluation-index is the sum of the ranks of the following four categories: BM (ranks 1-5): lowest BM (glamour stocks) receives a 1; highest (value stocks) a 5; Size (ranks 1-5): small firms get a 5, large firms a 1;Prior return (ranks 1-5): firms with the lowest prior return get a 5, highest a 1; Motivation (ranks 1,3,5): Firms where the motivation is 'undervaluation' and 'best use of money' get a 5; where the motivation is 'dilution' or 'EPS management' but neither 'undervaluation' nor 'best use of money' get a 1; the remaining firms are assigned a 3. We then add up the ranks. Based upon the empirical distribution, the quintile cutoffs are 9, 11, 13, 15. The higher the undervaluation-index, the more likely it is that the firm is undervalued according to the index.
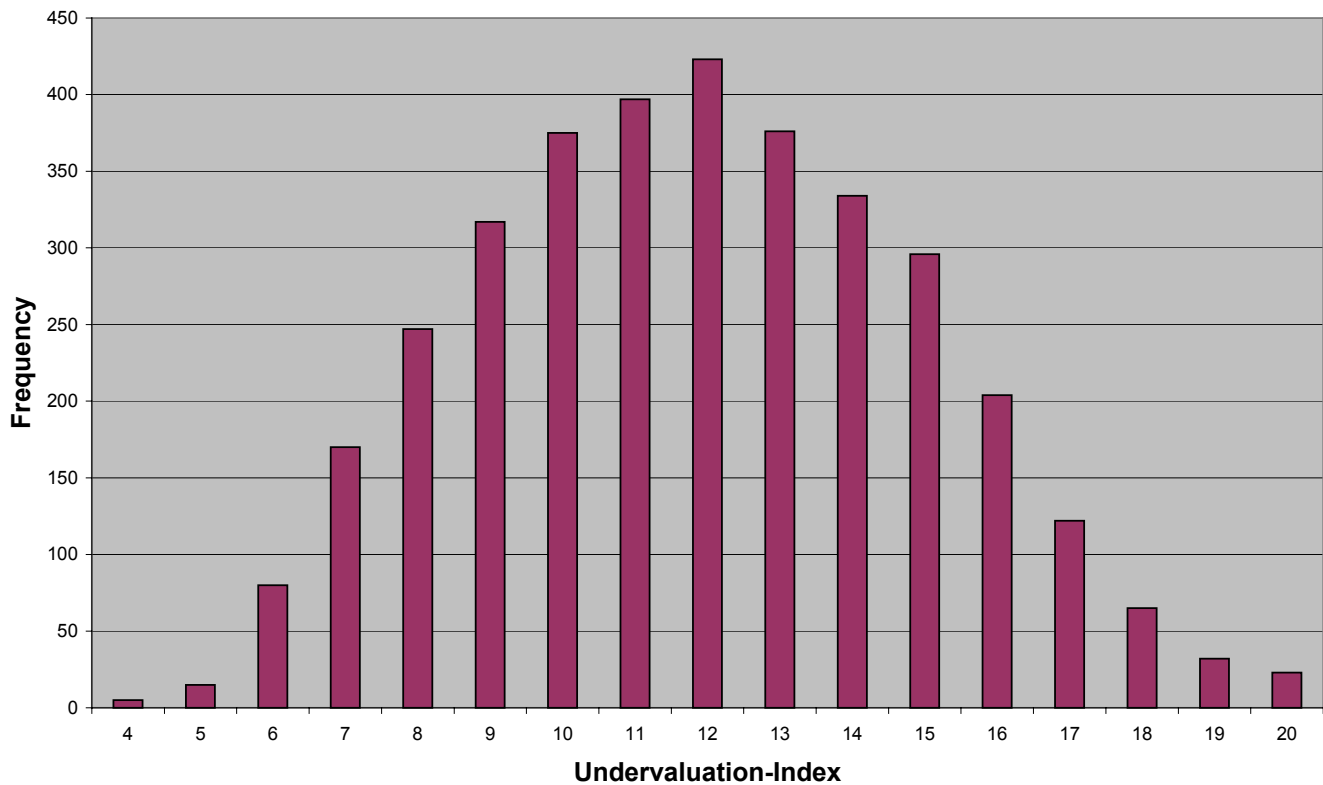
Figure 3

Long-run Abnormal Returns of Portfolios Selected every Calendar Year Based Upon the Undervaluation-Index

The figure presents abnormal returns based upon the Fama-French three factor model and IRATS. See Table 6 for a description of the methodology. The portfolio returns presented are formed based on the undervaluation index. Every calendar year a portfolio is formed consisting of the 50 stocks with the highest undervaluation index (minimum index required is 14). The undervaluation-index is the sum of the ranks of the following four categories: BM (ranks 1-5): lowest BM (glamour stocks) receives a 1; highest (value stocks) a 5; Size (ranks 1-5): small firms get a 5, large firms a 1;Prior return (ranks 1-5): firms with the lowest prior return get a 5, highest a 1; Motivation (ranks 1,3,5): Firms where the motivation is 'undervaluation' and 'best use of money' get a 5; where the motivation is 'dilution' or 'EPS management' but neither 'undervaluation' nor 'best use of money' get a 1; the remaining firms are assigned a 3. We then add up the ranks. The higher the Undervaluation-index, the more likely it is that the firm is undervalued. The portfolios are purchased on February 1st and held for 48 month (the portfolio purchased in 2002 only for 36 months due to data limitations). Month zero is January and its abnormal return is not cumulated in the graph. Adding it results in long-run abnormal returns of portfolios purchased at the beginning of January.

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