Market overreaction to poor long-run performance? A case of repurchase firms in India

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Abstract

We find significant positive abnormal returns around the announcement of both tender and open market repurchases in India. This suggests that the equity markets in India regard repurchase announcements as positive information signals. We examine whether such abnormal returns are justified by the operating performance of firms during the post repurchase period. We find that firms which announce open market repurchases underperform their peers on several measures of operating performance. We infer from these results that the market overreacts to open market repurchase announcements. Moreover, most open market repurchases are preceded by sharp price declines, suggesting that these are more frequently used for price support than for signalling undervaluation. The tender repurchase firms, on the other hand, do not exhibit any significant decline in their operating performance in the long run.

Key words: Repurchase, information asymmetry, emerging markets, regulatory disclosure, repurchase overreaction, repurchase anomaly, operating performance, market reaction

JEL classifications: G12, G14, G15

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1 Introduction

Short-run positive abnormal returns on repurchase announcements are documented from different markets around the world (for instance, Manconi, Peyer & Vermaelen, 2011). The announcement related abnormal returns are linked to various factors such as the tax savings on excess cash distribution, increased leverage, signalling effects and reduced agency costs associated with free cashflows. Several studies (Lakonishok & Vermaelen, 1990; Ikenberry, Lakonishok & Vermaelen, 1995; Peyer & Vermaelen, 2009) also document long-run positive abnormal returns to repurchase firms, consistent with market underreaction to repurchase announcements. The long-run market reaction is regarded as an anomaly in efficient markets. In one of the early studies, Lakonishok & Vermaelen (1990) find that tender repurchase announcements are followed by abnormal returns, especially in the case of small firms.[1] Ikenberry et al. (1995) find that whereas the average abnormal returns to repurchase announcements during 1980-1990 period is only about 3.5%, the buy-and-hold returns over 4-years following announcements is about 12% in the US market. Overall, the research on open market repurchases suggests that the short-run initial market reaction is insufficient to reflect the information content of repurchase announcements.

In view of the abnormal returns around repurchase announcements, a number of papers examine the operating performance changes, around both open market and tender repurchases. Grullon & Michaely (2004), with a large sample of US repurchase announcements, find only a weak evidence of operating performance improvements in the 4 years following announcements. The positive market reaction to repurchase announcements, according to them, is linked to a decline in the risk of repurchase firms and not to any earnings improvement. On the other hand, Lie (2005) using quarterly data of the same sample as in Grullon & Michaely (2004), found that relative to peers, repurchase firms exhibit significant operating performance improvements. He found that the improvement is largely limited to firms which actually repurchased stock. However, the role of open market repurchases as a signal is highly contested. A number of researches take the view that an important motive behind repurchase announcements is price support, rather than signalling future performance. Recently, Peyer & Vermaelen (2009) examine the possible role of alternative factors behind long-term abnormal returns around open market repurchase announcements. They find that the abnormal returns are the outcome of investor overreaction to negative public information prior to repurchases rather than the disclosure of positive private information by the management. The findings from several researches on the execution of open market repurchases also suggest that it is dominated by price support motives (for instance, Obernberger, 2012; Agarwalla, Jacob & Vasudevan, 2013; Ginglinger & Hamon, 2007).

On the contrary, the evidence of operating performance changes around the announcements of tender offers, suggests a signalling role. For instance, Dann, Masulis & Mayers (1991) and Lie & McConnell (1998), found that repurchases through tender offers outperform their industry peers. Brav, Graham, Harvey & Michaely (2005) through a survey of the CFOs have identified that undervaluation is an important motive behind the repurchase announcements in the US. These findings suggest that repurchases tend to serve as a signal of future operating performance improvements.

We examine the two important aspects of equity repurchases in India - (a) the market reaction to repurchase announcements in the short- and long-run and (b) the long-run changes in operating performance of the repurchase firms. A strong and positive initial reaction would indicate that the market attaches a high signalling value to repurchase announcements and could signal future

[1] They found no long-run abnormal returns for the large firms

improvements in the operating performance of the firm. On the other hand, if a strong positive initial reaction is followed by a deterioration in the operating performance of firms, it could point to an initial market overreaction. If markets overreact to repurchase announcements, managers may take advantage of the overreaction by announcing repurchases following significant stock price declines. We also examine the long-run market reaction given the evidence of long-term repurchase anomaly in other markets. The research in the Indian repurchase context assumes significance for several reasons.

Firstly, an important element of the repurchase environment the disclosure of repurchases, is much more stringent in India than in many other markets. For instance, in the case of the open market repurchase activity, firms are required to report the number of shares repurchased and the average price on a daily basis. In the US, such a disclosure is required only on a monthly basis. This is likely to add a significant cost to execute open market repurchases in India. The higher cost of signalling through repurchases may make them a more reliable indicator of undervaluation in India, as compared to other markets, such as the US, where they could be undertaken at a lower cost. Secondly, the promoter-managers are not allowed to tender their shares during open market repurchases. This could add further credibility to announcements, as the promoter-managers will have significant wealth effects if the repurchase announcement is not backed up with strong fundamentals. Finally, the Indian financial market has a greater degree of information asymmetry between insiders and outsiders of firms. These features include the divergence between control and ownership (for instance, Claessens, Djankov & Lang, 2000) and poor information environment (Morck, Yeung & Yu, 2000), etc. A greater information asymmetry could lead to misplaced investor reactions to corporate actions like repurchases. The research could offer insights into the influence of these factors on the market reaction as well as on the repurchase motives employed by firms. Our key findings are as follows.

While we do not observe any decline in the stock prices before the tender repurchases, the open market repurchases are preceded by significant negative abnormal returns. We find that the initial market reaction to repurchase announcements in India is both positive and significant. Announcements of tender repurchases are accompanied by a 14% initial reaction while those of open market repurchases are accompanied by 5%. The initial market reaction is greater than those observed in many other markets. We do not observe any long-term abnormal returns post repurchase. We observe a downward trend in the operating performance measures of firms following open market repurchases. Most of the key operating performance measures show statistically significant decline during 2 to 3 years after the announcement of open market repurchases. Although, the statistical significance of these results weaken when we adjust the performance of firms with their peers, the negative trend is observed consistently across measures. On the contrary, we do not find any evidence of abnormal decline in the operating performance of firms undertaking tender offers.

We interpret these results as - (a) there is an initial overreaction to repurchases in India as we do not observe any long-term returns and also find the evidence of declining operating performance, especially in the case of open market repurchases (b) this market overreaction is used by firms undertaking open market repurchase for price-support as they are generally preceded by significant price declines, and (c) tender repurchases are less likely to be used for short-term price support and are a signal of undervaluation.

The rest of the paper is structured as follows. Section 2 describes the data and section 3 describes the methodology. Our findings are presented in section 4 and in section 5, we conclude.

2 Data

The data of repurchase announcements in India is obtained from the 'Prime' database, the most comprehensive database on security issuances in India. We include all the repurchase announcements which occurred in India until June 2012.[2] We only consider those instances where the repurchases were set to be carried out either at the National Stock Exchange (NSE) or at the Bombay Stock Exchange (BSE). The data has 225 repurchase announcements comprising 176 open market and 49 tender repurchase announcements. Most of the tender repurchase announcements occur during the earlier years of our sample period. On the contrary, most of the market repurchase announcements occur during the later years covered by the sample. It appears that the open market repurchases have become more popular among the firms in recent years. The firm-level financial data and stock prices are collected from the 'Prowess' database, maintained by the Centre for Monitoring Indian Economy (CMIE). The key characteristics of the repurchase sample are given in Table 1.

The frequency of repurchase announcements suggests that relatively fewer firms in India announce repurchases compared to the US market. For instance, only about 3% of the BSE listed firms announced repurchases during this period, as compared to about 84% in the US, reported by Grullon & Michaely (2002) for the year 2000. There are many firms with multiple repurchase announcements. Payout through repurchases is also much lower relative to dividends. While the repurchase to dividends ratio in the US is about 58% (Grullon & Michaely, 2002), in India it is only about 2% (not reported). The extent of market capitalization targeted in the repurchases also appears low. The average open market offer targets about 3.7% of the total equity market value. The tender offers target a larger share of the equity. The average premium offered in the tender repurchases is 38.3% and is 48% for the open market repurchases.

Noticeably, the tender repurchase firms are much smaller relative to firms which announce repurchases through open market offers. The average market capitalization of firms announcing open market repurchase is about ₹45 billion and the same for firms announcing tender offer is only ₹8 billion. While the firms which announce open market repurchase are bigger relative to the average listed firm in India, most of them can only be regarded as small firms by their absolute market capitalization. The repurchase firms appear to have negative returns during the one year immediately prior to the repurchase announcement. Firms announcing the open market repurchases experience nearly 15% negative stock returns. The total repurchase offer amount is about ₹350 billion and the actual repurchased amount is about ₹171 billion. This corresponds to a repurchase completion rate of nearly 41% for market repurchases and 94% for tender repurchases. The completion rate for the open market repurchases is marginally lower than the 54% reported from the US during the first year of repurchase (Stephen & Weisbach, 1998). Only in about 9% (15 offers) of the repurchase announcements the entire offer amount is bought back.

3 Methodology

3.1 Initial market reaction

We initially examine the equity market impact of repurchase announcements by measuring the abnormal returns with an event study approach. The market reaction is expected to reflect any

[2] Repurchases are allowed in India by the regulator since 1998.

price sensitive information contained in repurchase announcement. There are three milestones in the execution of a repurchase in India, board approval, public announcement, and commencement of repurchase. Among these milestones, the board approval is the primary repurchase information event as most of the key aspects of a firm's repurchase, including the amount and the method would become known to the market at that point.[3] Given the primacy of the board approval in repurchases we take it as the relevant event to examine the announcement impact. Primarily, we take an event window of 20 trading days spanning 10 days before and 10 days after the event to analyse the cumulative abnormal returns (CAR) around repurchase announcements. A marginally longer event window is used here to account for possible front running and inefficiency in the Indian market. We also examine the CAR for longer periods before and after the event. We use the four-factor model with Fama-French and momentum factors to estimate CAR. The factor returns are taken from Agarwalla, Jacob & Varma (2013) and the model is estimated with daily data of 3-years. Further, we examine the abnormal returns by grouping the repurchase firms by the (a) method of repurchase (Tender/Market)(b) size (c) book-to-market ratio and (d) prior stock returns.

3.2 Long-term market performance

As discussed elsewhere in the paper, long-run abnormal returns following repurchase announcements are documented from different markets around the world. We examine whether the stocks of the repurchasing firms exhibit any long-run performance during the period immediately following repurchases. The long-term abnormal returns are examined starting from two time points related to repurchases (a) from the repurchase announcement and (b) from the end of repurchase execution. By measuring the AR from the end of repurchase execution, we limit any confounding effects brought about by the repurchase activity on the long-run returns. Completion dates of tender offers can be easily identified as they are carried out in short periods of time and have the expiration date mentioned in the offer. The completion of open-market repurchases in India can also be identified, unlike in many developed markets (such as the US, the UK and France), as the firms are required to complete their repurchase within 12-months from the announcement. Further, the mandatory disclosure of the daily open market repurchase activity in India allow us to ascertain the closure of repurchase precisely for most of the cases. The daily repurchase data is taken from the Prowess database. However, it provides only limited daily data for the open-market repurchases carried out before 2004. For these cases (52 of them) we take the date of their mandatory completion (12-months from announcement) as the date of closure of repurchase. We exclude repurchases which target less than 5% of the outstanding equity from the analysis, so as to avoid routine repurchase of shares for reasons such as the exercise of ESOP. The long-term abnormal returns are examined with three different approaches (a) buy-and-hold returns (b) calendar-time approach and (c) Ibbotson RATS method (IRATS) .

3.2.1 Buy and hold returns

We calculate the buy-and-hold abnormal returns (AR) of the repurchase stocks relative to two benchmarks (a) market returns and (b) size-value matching portfolio returns. The estimation of the buy-and-hold returns is a standard approach followed in the literature (for instance, Ikenberry et al., 1995; Chan, Ikenberry & Lee, 2007).

$$AR_t = \frac{1}{N}\sum_{i=1}^{N} R_t^i - R_t^b \tag{1}$$

[3]Where the Articles of a company do not allow repurchases, or the repurchase amount exceeds 10% of a firm's equity, the repurchase decision of the board cannot be executed without the shareholders' approval.

where, t is the time period involved in the AR estimation (either from the announcement date or from the end of the repurchase), R^i is the repurchase stock return and R^b is the benchmark return. The market return is the value weighted return on a portfolio of all the stocks listed on the Bombay Stock Exchange (BSE), obtained from Agarwalla et al. (2013). For the size-value benchmarks, we first create the daily return series of 50 size-value portfolios (10 for size and 5 for value). We sort the stocks at the end of September of each year t into 10 market capitalisation based groups and 5 value based groups (based on the value of book-to-market ratio at end of March of year t), following the methodology in Agarwalla et al. (2013) for SMB and HML portfolio classification. We then calculate the equally weighted returns on each of the 50 portfolios for 12 months period from October of year t to September of year $t+1$. The portfolios are revised at the end of September $t+1$. The AR is the difference in the return of the repurchase stock and that of the size-value benchmark portfolio. The size-value benchmark portfolio of any repurchase stock is the size-value group that the repurchase stock falls into at the start of the buy-and-hold period. The ARs are estimated for periods up to 3 years from both the announcement date and from the end of the repurchase. To avoid the effects of the sub-prime induced 2008 market crash on our results, we also report the ARs for the repurchases that occur only during the non-crash periods. We thus exclude 32 open market repurchases and one tender offer (from our total sample of 225 repurchases) announced during the period of 7-months between September 2008 and March 2009. Earlier research documents the skewness of abnormal returns (Chan et al., 2007). To mitigate this issue when testing the significance of the mean abnormal returns, we use bootstrapped $t-Statistic$ as suggested by Sutton (1993).

3.2.2 Calendar-time approach

The long-term abnormal returns of repurchasing firms are also analysed using the calendar-time portfolio regressions, a standard approach in the literature (Manconi et al., 2011; Peyer & Vermaelen, 2009; Chan et al., 2007, for instance). For each month, we construct a portfolio of repurchase stocks which had a repurchase event within the previous T years of that month. The event is either the repurchase announcement or the closure of repurchase. T takes the value of either 1, 2 or 3. The equally weighted portfolio returns obtained in each month are regressed over the Fama-French and momentum factor returns to ascertain if there are abnormal returns (alpha) associated with the repurchase events. The monthly factor returns for the Indian market are taken from from the data library mentioned in Agarwalla et al. (2013)[4]. The calendar-time portfolio regression is given below:

$$R_t^p - R_t^f = \alpha + \beta_{Mkt}(R_t^m - R_t^f) + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \beta_{WML}WML_t + e \quad (2)$$

where, R_t^p is the equally weighted portfolio returns in month t, R_t^f represents the risk-free rate, R_t^m is the market return. SMB, HML and WML are the size, value and momentum factor returns respectively. The significance of α in the regression would suggest long-term abnormal returns following the repurchases.

3.2.3 Ibbotson RATS method (IRATS)

The buy-and-hold return and calendar-time regression do not accommodate probable changes in the risk profile of a repurchase firm over a long-horizon. Hence, we also measure the abnormal

[4] http://www.iimahd.ernet.in/~jrvarma/Indian-Fama-French-Momentum/

returns based on the returns across time and securities (RATS) method described in Ibbotson (1975). This method has been used in earlier research on repurchases involving long-horizon returns (Manconi et al., 2011; Peyer & Vermaelen, 2009; Chan et al., 2007, for instance) as a complimentary approach to calendar-time method to provide robustness. For each month in the event-time horizon, we run the following four-factor regression on the cross-sectional returns of firms as below:

$$R_{it} - R_{it}^{f} = \alpha_t + \beta_{Mkt}(R_{it}^{m} - R_{it}^{f}) + \beta_{SMB}SMB_{it} + \beta_{HML}HML_{it} + \beta_{WML}WML_{it} + e_{it} \quad (3)$$

where t is the month after the event, which takes values from 1 to 36, i represents the firm and subscript it denotes the factor values in the t^{th} month after the repurchase event of firm i. The abnormal returns (α_t) are cumulated over 12, 24 and 36 months from the event. As has been done in the calendar-time approach, we define the event either as the announcement or the closure of the repurchase execution.

4 Findings and discussion

4.1 Market reaction to repurchase announcements

The behaviour of the cumulative abnormal returns of an average repurchasing firm around the repurchase announcement (the board meeting) is given in Figure 1. The figure shows that there is a sharp positive market reaction to the repurchase event for both market and tender offers. It appears that there is front-running of repurchase announcements by investors in the market starting roughly 10 days prior to the event. The front running possibly happens due to the public knowledge of the repurchase agenda, 5 to 10 trading days before the board meeting date. We also notice that there is a post-event correction, mostly occurring in the case of market offers. The tender repurchases, on the other hand, exhibit post-event positive abnormal returns.

In view of the observed front-running and the post-event correction, we take a period of $t = -10$ to $+10$ to assess the initial market reaction to the repurchase event (referred as event window). As described in Table 2, the repurchase announcements in India are accompanied by significant positive abnormal returns. Overall, there is about 7% abnormal return during the event window. The tender offers exhibit a much greater market response (13.7%) relative to the open market repurchases (5.3%). Further, overall the repurchase events are preceded by sharp negative abnormal returns (-8.5% over a quarter). On close examination, we observe that only the firms announcing open market repurchases have significant negative abnormal returns during the prior period (-11.7%). The significant negative prior period abnormal returns observed here are similar to those reported by Vermaelen (1981) (-7% over a 3-months period) and Ikenberry et al. (1995) (-3% over a 1-month period) for the US open market repurchase announcements. We find no evidence of prior period negative abnormal return for the tender offers, similar to the findings of Vermaelen (1981). The evidence of negative prior period returns in the market repurchases suggests that they may be motivated by the need for price support.

Panel B of Table 2 provides the abnormal returns when the firms are sorted into the market capitalisation quintiles. Repurchase announcements by smaller firms appear to generate greater market interest. While the repurchase announcement of the small firms in our sample has a CAR of 13.7% over the event window, the large firms get only an insignificant market response. The prior period negative abnormal returns are also mostly limited to the large firms. The trend

in the prior period and event window abnormal returns taken together suggests that repurchases by the relatively larger firms may be primarily motivated by the need for price support. The relatively smaller firms, on the contrary, appear to be motivated by the signalling need. A similar trend of decreasing abnormal returns with size is observed by Ikenberry et al. (1995) for open market repurchases. Panel C and Panel D provide the abnormal returns when the firms are sorted based on their B/M and momentum returns. We observe that positive returns in the event window is highest for the value stocks. The greater market response to repurchase announcements by value firms may be due to a large number of repurchases that occur after significant market declines. The firms with lower momentum seem to have higher initial market reaction. Overall, it appears that the initial market reaction as a signal for undervaluation is relatively strong for small, value and lower-momentum firms.

4.2 Long-term performance

The long-run abnormal returns, estimated with three different approaches (a) buy-and-hold with respect to the market and size-value portfolios (b) calendar-time portfolio and (c) IRATS are given in Tables 3-10. The calendar-time portfolio approach and the IRATS are implemented with respect to (a) capital asset pricing model (b) Fama-French three factors and (c) Fama-French and momentum factors. The CAPM beta is estimated with alternative approaches for robustness.[5]

4.2.1 Buy-and-hold abnormal returns

The buy-and-hold excess returns given in Table 3 suggest that the repurchase firms in India do not earn significant long-run abnormal returns over one to three years period. This is true for both the open market and tender repurchases. For the open market repurchases, it appears that the excess returns are negative over the three year period. Moreover, the abnormal returns tend to decline with time for firms announcing repurchases under both the methods. The results are consistent even when the firms which have announced the repurchases during the sub-prime induced market crisis of 2008 are excluded from the sample. The abnormal returns are also estimated with respect to a size-value benchmark (results given in Table 4). Here again, the 3-year annualised abnormal returns are negative, which suggests that the repurchase firms underperform their peer group. The insignificant abnormal returns during the post repurchase period in India starkly contrast with findings in the US open market repurchases, where Ikenberry et al. (1995) report 12.6% annualised returns over size-value benchmark over 3-years. Manconi et al. (2011) also report significant buy-and-hold excess returns in the US market and many other countries around the world. The results from the US more or less show an increasing trend in the abnormal returns, thus bolstering the under-reaction hypothesis.

4.2.2 Calendar-time portfolio returns

The results of the calendar-time portfolio regressions are given in Tables 5, 6 and 7. The calendar-time portfolio regressions indicate that the alphas are not statistically or economically significant over the one to three year time periods. The insignificance of alpha holds more or less consistently in the case of market repurchases, irrespective of whether all the repurchases are included in

[5]The market model is also estimated with two alternative methods (a) returns calculated based on 'trade-to-trade' approach of over three years immediately prior to the event window, as many of the repurchasing firms had relatively low liquidity and (b) estimation of beta using lagged stock returns following Dimson (1979). The abnormal returns estimated based on these approaches is by and large very close to those obtained by the standard approach.

the portfolio or the crash period announcements are excluded. The tender repurchases also have insignificant alphas except in cases where the calendar-time period is immediately after the repurchase announcement and when the portfolio excludes the crash-period announcements. The alphas appear to decline over the course of the time period of three years.

4.2.3 IRATS method

The cumulative alphas of the IRATS methods are given in Tables 8, 9 and 10. The cumulative alphas are much greater for the tender repurchases. While they are significant when CAPM is employed as the return generating model, they turn insignificant (and lower) when the 3-factor (Fama-French) or 4-factor (Fama-French and momentum factors) models are employed. The alphas associated with the market repurchases are mostly insignificant in the longer horizons (24 and 36 months). These results confirm the insignificance of long-run abnormal returns associated repurchases in India, as identified by the other approaches.

Overall, the analysis of the long-term abnormal returns following repurchases points to the absence of any repurchase anomaly in India. Further, we infer from the results that the market response to repurchases in India is more likely concentrated in the observed high initial reaction. Given the high initial market reaction to repurchases in India, we investigate whether the initial reaction is justified by changes in the operating performance of the firm.

4.3 Post-repurchase performance

Repurchases can be considered as investment in one's own firm and managers are likely to announce a repurchase when they foresee improvements in operating performance (Grullon & Michaely, 2004), unless the announcement is primarily used for immediate price support. For the US market, Grullon & Michaely (2004) did not find any improvements in operating performance and associated the initial reaction and the long-term underreaction to the changes in cost of capital of the firm. On the contrary, Lie (2005), using quarterly data of US firms, finds significant operating performance improvement post repurchase announcements, especially for firms that actually repurchase shares.

We study the operating performance of the firms for a 3-year period following the repurchase announcement as outlined in earlier research (Lie, 2005; Grullon & Michaely, 2004, for instance). We report changes in (a) return on assets (b) return on sales (c) return on cash adjusted assets and (d) cash flow return on assets. We examine (a) the yearly changes in operating performance of firms (unadjusted changes) and (b) the changes in operating performance relative to peers (adjusted changes). Two different peers are employed - (a) a single firm within the industry which closely resembles the operating characteristics of the repurchase firm, as in Lie (2001) and (b) a group of firms which match the size decile of the firm just prior to the repurchase. The former involves minimizing the following equation within the industry of the repurchase firm to identify the peer:

$$|PM^{r}_{t=-1} - PM^{p}_{t=-1}| + |\Delta PM^{r}_{t=-2,-1} - \Delta PM^{p}_{t=-2,-1}| + |P/B^{r}_{t=-1} - P/B^{p}_{t=-1}| \qquad (4)$$

where, $PM^{r}_{t=-1}$ and $PM^{p}_{t=-1}$ are the performance measures of the repurchase firm r and the industry peer p at $t = -1$. $\Delta PM_t - 2, -1$ represents the change in the performance measure from $t = -2$ to -1 and $P/B_{t=-1}$ is the price-to-book ratio at $t = -1$. $t = -1$ is the financial

year just prior to the repurchase announcement. For each combination of the operating performance measure and repurchase firm a matching peer is chosen. We use the 2-digit National Industry Classification[6] (NIC) code for industry matching.[7] The operating performance changes are reported for (a) all repurchases (b) open market repurchases and (c) tender offers. For the comparison method involving size decile matching, we select a group of firms in the same size decile as that of the repurchase firm at the financial year-end just prior to the repurchase. We then adjust the performance changes in the firm's operating measures with the average changes of the group of firms.

Table 11 provides changes in the operating performance after the repurchase announcement. There is a decline in the operating performance of the open market repurchase firms over the years. For instance, the return on assets declines by more than 6% over the three year period. A similar decline is observed in three out of the four operating performance measures employed. Considering that an average open market repurchase firm has return on assets of 23% and a cash adjusted return on assets of 25%, the observed decline in the performance is non-trivial. The decline in performance is not statistically significant on the adjusted basis. However, for the longer end of the comparison period (2 to 3 years) all the measures of operating performance show a decline as reflected in their mean and median values. Contrary to the findings in open market repurchases, we do not find any significant performance decline for tender repurchases. On the other hand, we observe some performance improvement (on adjusted basis) in the first year after the announcement in case of tender offers. When all the repurchases are taken together, the operating performance trend, by and large, resembles that of the open market repurchases, as it is the more frequently employed repurchase method.

The analysis of the operating performance, based on size matched peer group of firms presents a similar trend in the performance of the repurchase firms. The results given in Table 12, indicate (a) no improvement in the operating performance of repurchase firms (b) decline in the operating performance of open market repurchase firms, especially in the case of cashflow return on assets and (c) no deterioration in the performance of tender repurchase firms.

5 Conclusion

We examine the initial market reaction to repurchase announcements, the long-run performance of repurchase stocks, and the operating performance of repurchase firms in the post-announcement period. The short-run and the long-run stock performance taken together allow us to understand the market perception of repurchases in India. The examination of the post-repurchase operating performance allows us to understand the extent to which repurchases act as a signal of the future performance of the firm. A comparison of these market reaction and the operating performance helps us to understand whether repurchase firms live up to the market expectations. Our findings on these aspects for open market repurchases and tender repurchases in India are as follows.

For the open market repurchases, we find economically significant excess returns around repurchase announcements, greater than those observed in many other markets. It indicates a market with a strong positive disposition towards the repurchase stocks. There is no evidence

[6] National Industry Classification (NIC) codes are classification of Indian industries published by Central Statistical Organisation of the Ministry of Statistics and Programme Implementation.

[7] The data of NIC code for each firm is obtained from CMIE-Prowess database.

of post-repurchase excess returns for the repurchase stocks. This is true across all the different methods used (a) buy-and-hold excess returns (b) calendar-time regressions with market, size, value and momentum factors and (d) the IRATS method. This is contrary to the findings from the several other markets, where significant excess returns persist during the post-repurchase period. If anything, there is a weak evidence of the reversal of the initial positive market reaction during the post-repurchase period. On the other hand, we find a decline in the operating performance of firms announcing open market repurchases in India, which does not fall in line with the observed initial reaction. From these results, we infer that the markets overreact to open market repurchase announcements. Combined with the sharp price decline observed before the repurchase announcements, this suggests that the market repurchases in India are weak signals of undervaluation. It also appears that the open market repurchase announcements are used as a short-term price support mechanism. Agarwalla et al. (2013) examine the execution of open market repurchase activity in India and find evidence in favour of price support instead of market timing. Our results provide further evidence that the managerial motivation behind open market repurchases in India is primarily short-term price support.

The tender repurchase announcements are also accompanied by significant positive market reaction, much greater than that of the open market repurchases. In contrast to the open market repurchases, the announcements of tender repurchases are not preceded by price declines. The long-run abnormal stock returns of these firms are positive and significant in both calendar-time and IRATS methods. By and large, we do not observe any decline in the operating performance of the tender repurchase firms. Rather, on some of the performance measures they show an improvement in the year immediately following the announcement. Together, these findings suggest that the tender repurchases are less likely to be primed by the need for short-run price support. We also infer from the findings that the tender offers are motivated by a stronger managerial perception of undervaluation than the open market repurchases.

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Figure 1: Cumulative abnormal return around the repurchase event

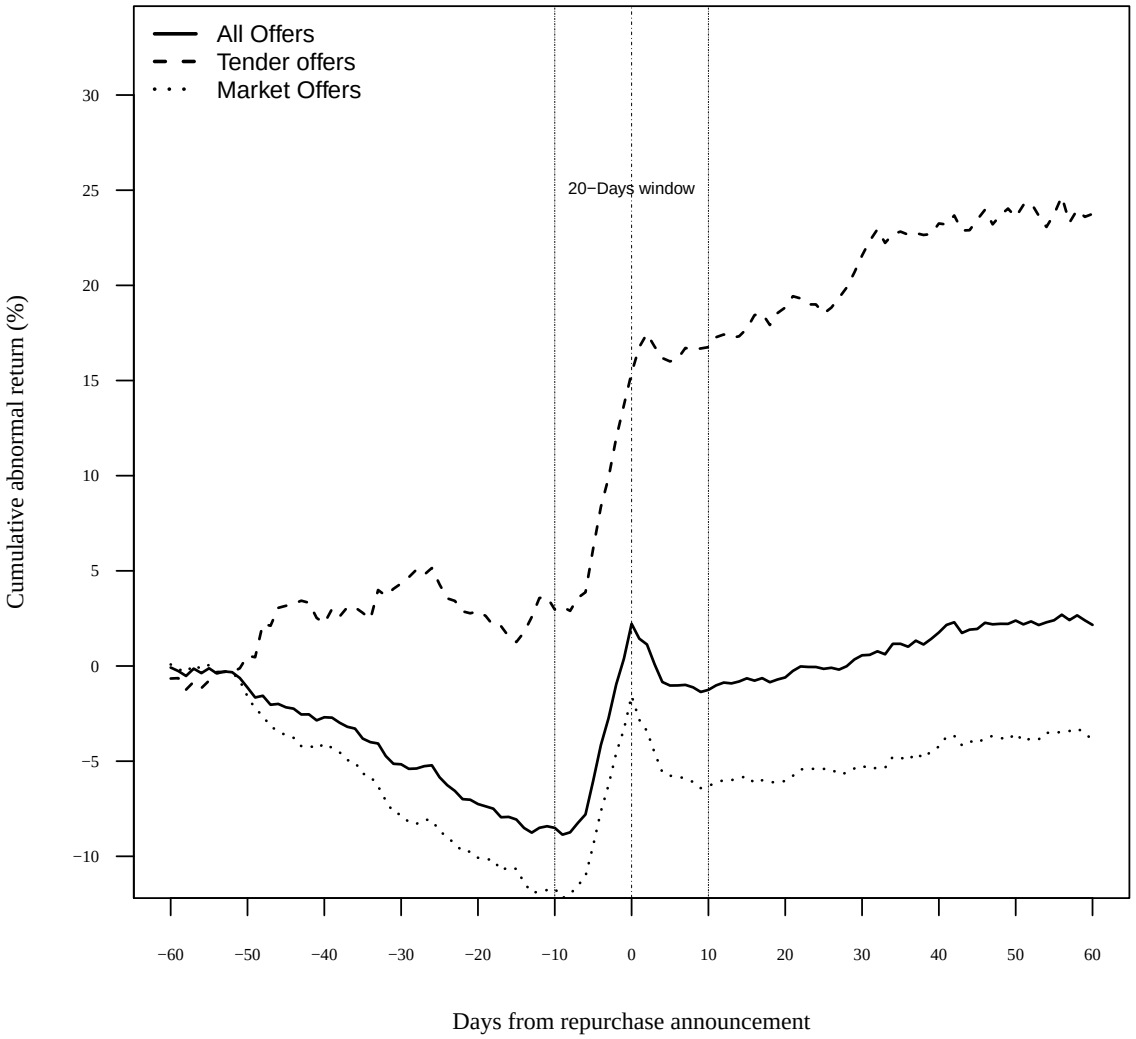

Table 1: Descriptives of the repurchase sample

Descriptive		Open market	Tender offer
Number of repurchase announcements		176	49
Number of firms involved	No. of listed firms = 5,179	122	42
Premium offered (%)		48.0%	38.3%
Offer amount per repurchase (₹ billion)		1.69	1.08
Average market cap. of firms (₹ billion)		45.2	7.7
Average repurchase to market capitalization ratio		3.7%	14.1%
Stock return one-year prior to repurchase announcement (%)		-0.6 (-15.1)	14.3 (-2.7)
Total value of actual repurchases (₹ billion)		121.1	50.3
Average amount per repurchase (₹ billion)		0.69	1.03
Overall completion rate		41%	95%

The number of listed firms represents that at the Bombay Stock Exchange (BSE). The premium offered in the open market repurchases is the maximum premium indicated in the offer document. The average market capitalization of the firms is estimated just prior to the repurchase announcement. The average repurchase to market capitalization ratio is obtained by dividing total repurchase offer amount by the total market capitalization of the firms. The stock return one-year prior to the repurchase announcements is measured by taking board approval as the event date. Overall completion rate is obtained by dividing the total actual repurchase amount by the total offer amount.

Table 2: Cumulative abnormal returns around the repurchase announcement

Grouping	No. of repurchases	Period around the repurchase event (board meeting day)		
		$t = -60$ to -11	$t = -10$ to 10	$t = 11$ to 60
Panel A - Method				
All repurchases	225	-8.50***	7.13***	3.59**
Market	176	-11.70***	5.30***	2.71
Tender	49	2.97	13.72***	6.74*
Panel B - Market capitalisation				
1-Small	45	2.11	13.70***	12.86**
2	45	-6.68*	10.26***	7.89**
3	45	-10.78***	5.74***	-2.67
4	45	-15.15***	4.61**	-1.05
5-Big	45	-12.01***	1.36	0.86
Panel C - B/M				
1-Growth	45	-9.94***	2.97*	-1.46
2	45	-15.63***	1.97	2.44
3	45	-10.72***	5.13**	2.31
4	45	-4.26	8.81***	4.54
5-Value	45	-1.96	16.79***	10.10*
Panel D - Momentum				
1-Low	45	-6.24*	7.85***	10.30***
2	45	-9.44**	11.17***	1.35
3	45	-11.24***	5.38**	2.30
4	45	-3.03	7.95***	3.85
5-High	45	-12.58***	3.33	0.09

The table provides abnormal returns around the repurchase event (board meeting). We take a window of 120 days around the repurchase event. This window is further broken down to three sub-windows: (a) $t-60$ to $t-11$ (b) $t-10$ to $t+10$ (c) $t+11$ to $t+60$, where $t = 0$ represents the announcement date of the repurchase. Abnormal returns are calculated using the four-factor model (Fama-French and momentum factors) with an estimation window of 3-years. The values in the table are the cumulative abnormal returns in each of the sub-windows. We also subdivide the 225 repurchases by method (Panel A), size quintiles (Panel B), B/M quintiles (Panel C) and momentum quintiles (Panel D). Size quintiles are formed based on the market capitalisation of the repurchasing firm before the repurchase announcement. B/M quintiles are based on the average B/M values of firms one month before the repurchase announcement and momentum quintiles are formed based on the firm's total returns before the event window. The cumulative returns are in percentage values. '***','**' and '*' represent the 1%, 5% and 10% significance level respectively.

Table 3: Buy-and-hold abnormal returns with the market benchmark

Holding period (yrs.)	Repurchases included	From the announcement date				From the close of repurchase			
		No. of obs.	Mean AR (%)	SD (%)	p-value	No. of obs.	Mean AR (%)	SD (%)	p-value
Panel A: Open market repurchases									
1	All	157	7.99	50.63	0.28	139	15.30	56.11	0.07
	Non-crash	129	6.13	46.33	0.41	111	10.64	56.26	0.26
2	All	129	3.51	33.31	0.53	118	3.66	35.52	0.56
	Non-crash	101	3.42	31.71	0.57	90	2.92	35.11	0.68
3	All	114	-1.24	26.49	0.81	107	0.16	28.80	0.96
	Non-crash	86	-0.77	25.45	0.91	79	0.33	28.32	0.95
Panel B: Tender repurchases									
1	All	48	16.78	68.15	0.39	46	14.71	62.80	0.38
	Non-crash	47	15.45	68.26	0.42	45	13.29	62.76	0.43
2	All	45	12.28	43.90	0.22	44	8.87	43.03	0.43
	Non-crash	44	10.54	42.81	0.31	43	6.89	41.47	0.51
3	All	39	12.49	32.94	0.21	39	9.74	32.82	0.34
	Non-crash	38	10.92	31.87	0.26	38	7.87	31.07	0.41

The 'announcement date' refers to the date of the board meeting and the 'close of repurchase' refers to 'the last repurchase date, wherever available or to the announced closing date. The non-crash figures are estimated by excluding 32 open market and one tender repurchase which are announced during the sub-prime induced crisis period. This corresponds to a seven month period between September 2008 and March 2009. The No. of obs. are the total number of repurchases where the price data is available until the end of the holding period. SD is the standard deviation of the abnormal returns. The *p-values* corresponding to the mean abnormal returns (Mean AR) are estimated through bootstrapping and the corresponding *t-statistics* are adjusted for skewness of the long-term abnormal returns. The buy-and-hold returns are estimated based on the market benchmark. It is the value weighted returns on all the Indian stocks listed on the Bombay Stock Exchange obtained from Agarwalla et al. (2013).

Table 4: Buy and hold abnormal returns with size-value matching portfolio as benchmark

Holding period (yrs.)	Repurchases included	From the announcement date				From the close of repurchase			
		No. of obs.	Mean AR (%)	SD (%)	p-value	No. of obs.	Mean AR (%)	SD (%)	p-value
Panel A: Open market repurchases									
1	All	157	0.50	54.57	0.94	139	0.61	58.20	0.95
	Non-crash	129	-1.99	49.61	0.86	111	-0.35	59.80	0.97
2	All	129	-4.47	33.36	0.47	118	-4.59	34.07	0.48
	Non-crash	101	-4.34	32.03	0.52	90	-4.53	34.57	0.55
3	All	114	-8.94	27.52	0.17	107	-7.56	29.41	0.21
	Non-crash	86	-10.24	27.80	0.16	79	-8.32	30.12	0.26
Panel B: Tender repurchases									
1	All	48	11.70	68.19	0.48	46	5.58	66.78	0.75
	Non-crash	47	10.81	68.65	0.51	45	5.40	67.52	0.78
2	All	45	3.01	42.24	0.84	44	-4.28	40.76	0.73
	Non-crash	44	1.57	41.60	0.92	43	-6.04	39.51	0.60
3	All	39	-2.83	32.54	0.79	39	-6.60	31.54	0.56
	Non-crash	38	-4.60	31.00	0.62	38	-8.55	29.49	0.36

The size-value benchmark for each repurchase is an equally weighted portfolio, which matches the size decile and value (B/M) quantile of the repurchase formed from among the listed stocks in the Bombay Stock Exchange. The 'announcement date' refers to the date of the board meeting and the 'close of repurchase' refers to the last repurchase date wherever available or to the announced closing date. The non-crash figures are estimated by excluding 32 open market and one tender repurchase which are announced during the sub-prime induced crisis period. This corresponds to a seven month period between September 2008 and March 2009. The No. of obs. are the total number of repurchases where the price data is available until the end of the holding period. SD is the standard deviation of the abnormal returns. The p-values corresponding to the mean abnormal returns (Mean AR) are estimated through bootstrapping and the corresponding *t-statistics* are adjusted for skewness of the long-term abnormal returns.

Table 5: Calendar-time method regressions - CAPM

	All repurchases						Excluding crash period repurchases					
	Announcement date as event			End of repurchase as event			Announcement date as event			End of repurchase as event		
	1–Year	2–Year	3–Year	1–Year	2–Year	3–Year	1–Year	2–Year	3–Year	1–Year	2–Year	3–Year
Panel A: Open market repurchases												
α	1.62	1.81	1.56	1.59	1.83	1.53	1.43	0.77	0.48	1.47*	0.75	0.45
β_{Mkt}	0.92***	0.93***	0.95***	0.93***	0.94***	0.96***	1.07***	1.05***	1.06***	1.07***	1.04***	1.05***
Adj. R^2	0.21	0.22	0.22	0.22	0.22	0.23	0.48	0.58	0.63	0.48	0.57	0.63
Num. obs.	166	168	168	166	168	168	152	153	153	152	153	153
Panel B: Tender repurchases												
α	1.12	0.88	0.81	1.00	0.75	0.68	1.37*	0.97*	1.07*	1.22	0.77	0.90*
β_{Mkt}	0.69***	0.66***	0.66***	0.66***	0.64***	0.64***	0.66***	0.64***	0.71***	0.61***	0.61***	0.68***
Adj. R^2	0.28	0.37	0.44	0.25	0.35	0.42	0.34	0.44	0.53	0.30	0.42	0.50
Num. obs.	161	173	173	153	173	173	158	169	169	156	169	169

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

The αs and βs are estimated by regressing the monthly return series of equally weighted portfolios of the repurchase stocks on the market return. The portfolio is formed by including all the repurchase stocks for which the repurchase related event (announcement or close of repurchase) has occurred within a period of n-years (1,2 or 3 years) for each month t in the calender-time.

Table 6: Calendar-time regressions - Fama-French 3-factor model

	All repurchases						Excluding crash period repurchases					
	Announcement date as event			End of repurchase as event			Announcement date as event			End of repurchase as event		
	1–Year	2–Year	3–Year	1–Year	2–Year	3–Year	1–Year	2–Year	3–Year	1–Year	2–Year	3–Year
Panel A: Open market repurchases												
α	1.40	1.44	1.13	1.00	0.36	0.09	1.37	1.45	1.11	1.03	0.34	0.05
β_{Mkt}	0.85***	0.84***	0.85***	0.97***	0.95***	0.96***	0.87***	0.85***	0.86***	0.96***	0.94***	0.96***
β_{SMB}	0.54*	0.57**	0.60**	0.62***	0.56***	0.52***	0.54*	0.58**	0.60**	0.61***	0.55***	0.51***
β_{HML}	0.03	0.14	0.17	0.22*	0.23**	0.22**	0.03	0.14	0.17	0.23*	0.23**	0.23***
Adj. R^2	0.24	0.25	0.27	0.58	0.68	0.73	0.24	0.26	0.27	0.58	0.68	0.73
Num. obs.	166	168	168	152	153	153	166	168	168	152	153	153
Panel B: Tender repurchases												
α	0.64	0.42	0.36	1.02	0.60	0.71	0.52	0.29	0.23	0.87	0.41	0.53
β_{Mkt}	0.60***	0.55***	0.57***	0.57***	0.55***	0.62***	0.57***	0.54***	0.55***	0.52***	0.52***	0.60***
β_{SMB}	0.43***	0.41***	0.37***	0.49***	0.40***	0.45***	0.41**	0.41***	0.37***	0.50***	0.40***	0.46***
β_{HML}	0.24*	0.32***	0.32***	0.19*	0.24***	0.22***	0.24*	0.32***	0.32***	0.19*	0.23***	0.22***
Adj. R^2	0.37	0.53	0.60	0.46	0.59	0.69	0.34	0.51	0.58	0.43	0.57	0.67
Num. obs.	161	173	173	158	169	169	153	173	173	156	169	169

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

The αs and βs are estimated by regressing the monthly return series of equally weighted portfolios of the repurchase stocks, with the return on market, *SMB* and *HML* factors. The portfolio is formed by including all the repurchase stocks for which the repurchase related event (announcement or close of repurchase) has occurred within a period of n-years (1,2 or 3 years) for each month t in the calender-time.

Table 7: Calendar-time regressions - Fama-French and momentum factors

	All repurchases							Excluding crash period repurchases						
	Announcement date as event				End of repurchase as event			Announcement date as event				End of repurchase as event		
	1–Year	2–Year	3–Year		1–Year	2–Year	3–Year	1–Year	2–Year	3–Year		1–Year	2–Year	3–Year
Panel A: Open market repurchases														
α	1.21	1.23	0.84		1.20	1.26	0.83	1.14	0.39	0.19		1.15	0.35	0.15
β_{Mkt}	0.86***	0.85***	0.86***		0.87***	0.86***	0.87***	0.95***	0.95***	0.95***		0.95***	0.94***	0.94***
β_{SMB}	0.54*	0.57**	0.60**		0.55*	0.58**	0.60**	0.60***	0.55***	0.51***		0.59***	0.55***	0.50***
β_{HML}	0.05	0.16	0.19		0.04	0.15	0.19	0.22*	0.23**	0.22**		0.23*	0.23**	0.23***
β_{WML}	0.08	0.09	0.12		0.07	0.08	0.12	−0.06	−0.01	−0.04		−0.05	0.00	−0.04
Adj. R^2	0.23	0.25	0.26		0.24	0.25	0.27	0.58	0.68	0.73		0.58	0.68	0.73
Num. obs.	166	168	168		152	153	153	166	168	168		152	153	153
Panel B: Tender repurchases														
α	0.76	0.55	0.58		0.62	0.39	0.43	1.04	0.73	0.83*		0.84	0.51	0.64
β_{Mkt}	0.60***	0.55***	0.56***		0.57***	0.53***	0.54***	0.57***	0.55***	0.62***		0.53***	0.52***	0.59***
β_{SMB}	0.43***	0.42***	0.38***		0.42**	0.41***	0.38***	0.49***	0.40***	0.45***		0.50***	0.40***	0.46***
β_{HML}	0.23*	0.31***	0.30***		0.23*	0.31***	0.30***	0.19*	0.23***	0.21***		0.19*	0.23***	0.22***
β_{WML}	−0.05	−0.06	−0.10		−0.04	−0.04	−0.09	−0.01	−0.06	−0.06		0.02	−0.05	−0.05
Adj. R^2 0.37	0.53	0.61		0.33	0.50	0.59		0.45	0.59	0.69		0.42	0.57	0.67	
Num. obs.	161	173	173		158	169	169		153	173	173		156	169	169

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

The αs and βs are estimated by regressing the monthly return series of equally weighted portfolios of the repurchase stocks, with the return on market, *SMB*, *HML*, and *WML* factors. The portfolio is formed by including all the repurchase stocks for which the repurchase related event (announcement or close of repurchase) has occurred within a period of n-years (1,2 or 3 years) for each month t in the calender-time.

Table 8: Abnormal returns from IRATS method - CAPM

Period (months)	Repurchases Included	Announcement date as event		Close of repurchase as event	
		AR (%)	t-value	AR (%)	t-value
Panel A: Open market repurchases					
12	All	7.80	2.07	10.51	2.70
	Non-crash	6.22	1.54	9.79	2.20
24	All	8.93	1.69	9.72	1.75
	Non-crash	8.15	1.38	11.02	1.70
36	All	8.44	1.24	7.00	1.03
	Non-crash	8.10	1.03	9.48	1.18
Panel B: Tender repurchases					
12	All	15.40	2.18	17.50	2.55
	Non-crash	14.16	1.99	16.36	2.35
24	All	22.75	2.48	25.59	2.80
	Non-crash	20.26	2.18	22.84	2.47
36	All	36.90	3.15	39.03	3.29
	Non-crash	32.99	2.77	34.34	2.84

For each month k from the repurchase event, a cross-sectional regression of the returns is run with the market model. The abnormal returns (AR %) in the table are the sum of α_k of the regressions for the period 1 to 12, 1 to 24 and 1 to 36 months. The non-crash figures are estimated by excluding 32 open market and one tender repurchase which are announced during the sub-prime induced crisis period. This corresponds to a seven month period between September 2008 and March 2009.

Table 9: Abnormal returns from IRATS method - Fama-French factors

Period (months)	Repurchases Included	Announcement date as event		Close of repurchase as event	
		AR (%)	t-value	AR (%)	t-value
Panel A: Open market repurchases					
12	All	5.39	1.43	6.04	1.59
	Non-crash	4.61	1.14	6.44	1.48
24	All	4.27	0.82	2.64	0.48
	Non-crash	4.94	0.85	3.86	0.60
36	All	-0.19	-0.03	-4.62	-0.69
	Non-crash	-0.20	-0.03	-2.89	-0.37
Panel B: Tender repurchases					
12	All	10.12	1.39	13.81	1.97
	Non-crash	9.13	1.24	12.64	1.78
24	All	12.39	1.32	12.89	1.38
	Non-crash	10.01	1.06	9.95	1.05
36	All	16.34	1.39	17.26	1.45
	Non-crash	12.61	1.06	12.51	1.03

For each month k from the repurchase event, a cross-sectional regression of the returns is run with the Fama-French 3-factor model. The abnormal returns (AR %) in the table are the sum of α_k of the regressions for the period 1 to 12, 1 to 24 and 1 to 36 months. The non-crash figures are estimated by excluding 32 open market and one tender repurchase which are announced during the sub-prime induced crisis period. This corresponds to a seven month period between September 2008 and March 2009.

Table 10: Abnormal returns from IRATS method - Fama-French and momentum factors

Period (months)	Repurchases Included	Announcement date as event		Close of repurchase as event	
		AR (%)	t-value	AR (%)	t-value
Panel A: Open market repurchases					
12	All	7.60	1.93	8.45	2.03
	Non-crash	6.07	1.44	8.41	1.78
24	All	9.35	1.67	4.80	0.79
	Non-crash	9.68	1.54	4.89	0.69
36	All	6.43	0.88	2.28	0.31
	Non-crash	5.10	0.60	6.23	0.71
Panel B: Tender repurchases					
12	All	8.93	1.16	11.27	1.53
	Non-crash	7.76	0.99	9.80	1.32
24	All	10.47	1.06	10.80	1.09
	Non-crash	7.78	0.78	7.52	0.75
36	All	19.30	1.48	14.29	1.11
	Non-crash	15.28	1.15	9.89	0.75

For each month k from the repurchase event, a cross-sectional regression of the returns is run with the four-factor model. The abnormal returns (AR %) in the table are the sum of α_k of the regressions for the period 1 to 12, 1 to 24 and 1 to 36 months. The non-crash figures are estimated by excluding 32 open market and one tender repurchase which are announced during the sub-prime induced crisis period. This corresponds to a seven month period between September 2008 and March 2009.

Table 11: Changes in the operating performance of repurchasing firms relative to industry peers

Period	All repurchases					Open market repurchases					Tender offers				
	N	Unadjusted		Peer adjusted		N	Unadjusted		Peer adjusted		N	Unadjusted		Peer adjusted	
		Mean	Median	Mean	Median		Mean	Median	Mean	Median		Mean	Median	Mean	Median
Panel A: Return on assets															
0 to 1	224	-1.44	-0.44	2.24	1.23*	175	-2.59	-0.45	1.34	0.79	49	2.62	-0.06	5.35*	1.70*
1 to 2	216	-2.82**	-0.62*	-2.00	0.08	168	-2.36**	-0.61	-1.76	0.04	48	-4.41	-0.94	-2.81	0.12
2 to 3	190	-0.97	-0.65	-1.02	-0.67	144	-1.51**	-0.88**	-1.14	-1.50	46	0.71	0.42	-0.62	1.45
Panel B: Return on sales															
0 to 1	224	-0.46	-0.34	0.51	-0.03	175	-0.18	-0.36	0.74	-0.03	49	-1.47	-0.33	-0.32	0.02
1 to 2	216	-1.55**	-0.37*	3.03	0.44	168	-1.01	-0.20	1.73*	0.57*	48	-3.44	-1.13	8.05	-0.34
2 to 3	190	-1.11**	-0.64**	0.06	0.14	144	-1.41**	-0.85***	-0.72	-0.05	46	-0.19	-0.14	2.66	0.68
Panel C: Return on cash adjusted assets															
0 to 1	224	-0.89	0.11	3.42*	0.83**	175	-2.19	-0.20	2.51	0.76	49	3.75	0.49	6.52*	1.83**
1 to 2	216	-3.66**	-0.70*	-3.02*	-0.01	168	-3.29**	-0.41	-3.11*	-0.07	48	-4.93	-1.20	-2.74	0.20
2 to 3	190	-1.24*	-0.71*	-2.42	-1.40	144	-1.88**	-1.04**	-1.86*	-1.72*	46	0.78	1.62	-4.10	-0.59
Panel D: Cash flow return on assets															
0 to 1	224	0.56	0.98	0.32	-0.57	175	1.43	1.72	0.59	-0.03	49	-2.53	-2.04	-0.59	-1.94
1 to 2	216	-1.39	-0.71	0.08	0.39	168	-1.53	-0.71	-0.11	0.14	48	-0.89	-1.13	0.75	0.62
2 to 3	190	-1.92**	-1.10**	-0.77	-1.59	144	-2.65**	-1.37**	-1.09	-2.17	46	0.42	0.81	0.31	-0.81

For each repurchase, we identify a matching peer firm in the same industry that has the least deviation from the repurchase firm on the following parameters: (a) operating performance measure at $t = 0$ (b) change in the operating performance measure from $t = -1$ to 0 (c) P/B ratio at $t = 0$. The time $t = 0$ represents the financial year just before the repurchase announcement. All values are in percentage points. The unadjusted values are the changes in the operating performance of the repurchasing firm. The peer adjusted values represent the changes in the firm's operating performance net of changes in the peer firm's operating performance. N is the number of repurchases where the peer firm is identified and both the firm and the peer firm have data for the corresponding period. '***','**' &'*' represent the 1%, 5% & 10% significance respectively.

Table 12: Changes in operating performance of repurchasing firms compared with size matched peer

Period	All repurchases					Open market repurchases					Tender offers				
	N	Unadjusted		Peer adjusted		N	Unadjusted		Peer adjusted		N	Unadjusted		Peer adjusted	
		Mean	Median	Mean	Median		Mean	Median	Mean	Median		Mean	Median	Mean	Median
Panel A: Return on assets															
0 to 1	221	-1.39	-0.44	-0.09	1.29**	172	-2.54	-0.45	-1.09	1.36*	49	2.62	-0.06	3.41	0.51
1 to 2	213	-2.66**	-0.61	-2.05*	0.19	165	-2.15**	-0.61	-1.52	0.30	48	-4.41	-0.94	-3.85	-0.42
2 to 3	187	-0.98	-0.62	-0.55	-0.12	141	-1.53**	-0.82**	-1.03	-0.47	46	0.71	0.42	0.92	0.63
Panel B: Return on sales															
0 to 1	221	-0.50	-0.34	0.40	0.23	172	-0.23	-0.42	0.60	0.26	49	-1.47	-0.33	-0.32	0.03
1 to 2	213	-1.56**	-0.40*	-0.32	0.46*	165	-1.01	-0.23	0.20	0.56*	48	-3.44	-1.13	-2.07	-0.06
2 to 3	187	-1.08**	-0.64**	-0.05	0.18	141	-1.37**	-0.81***	-0.31	-0.17	46	-0.19	-0.14	0.73	0.88*
Panel C: Return on cash adjusted assets															
0 to 1	221	-0.69	0.11	0.84	1.26**	172	-1.95	-0.20	-0.25	1.32**	49	3.75	0.49	4.65	1.04
1 to 2	213	-3.46**	-0.66	-2.84*	0.18	165	-3.03*	-0.38	-2.39	0.33	48	-4.93	-1.20	-4.37	-1.13
2 to 3	187	-1.25*	-0.70*	-0.79	-0.51	141	-1.92**	-1.05**	-1.36	-0.70*	46	0.78	1.62	0.98	1.93
Panel D: Cash flow return on assets															
0 to 1	221	0.03	0.99	-0.19	0.31	172	0.76	1.75	0.35	0.68	49	-2.53	-2.04	-2.06	-0.98
1 to 2	213	-1.22	-0.74	-1.19	-0.74	165	-1.31	-0.74	-1.22	-0.72	48	-0.89	-1.13	-1.07	-1.17
2 to 3	186	-1.96**	-1.12**	-1.65*	-0.78*	141	-2.72**	-1.56**	-2.34**	-0.92**	45	0.42	0.81	0.50	-0.25

For each repurchase, we identify a matching peer set of firms which belong to the same size-value group of the repurchase firm at the financial year just before the announcement. The operating performance of the repurchase firm is compared with the average of the peer firms over a 3-year period following the repurchase. All the values are in percentage points. The unadjusted values are the changes in the operating performance of the repurchase firm. The peer adjusted values represent the changes in the firm's operating performance net of the average value of changes in the peer set's operating performance. N is the number of repurchases where the peer set is identified and both the firm and the peer set have data for the corresponding period. '***','**' &'*' represent the 1%, 5% & 10% significance respectively.