ELSEVIER

Journal of Financial Economics 49 (1998) 187–222

JOURNAL OF Financial ECONOMICS

Share repurchases and firm performance: new evidence on the agency costs of free cash flow[1]

Tom Nohel*, Vefa Tarhan

Loyola University, Chicago, IL 60611, USA

Received 12 December 1996; received in revised form 13 November 1997

Abstract

In this paper we examine tender offer share repurchases to differentiate between the information signaling and free cash flow hypotheses. Previous work in this area has focused on announcement period returns. While we also examine announcement returns, our primary emphasis is on operating performance changes surrounding repurchases. We argue that the information contained in changes in operating performance, and its determinants, enables us to differentiate between the two hypotheses. Our primary finding is that operating performance following repurchases improves only in low-growth firms, and that these gains are generated by more efficient utilization of assets, and asset sales, rather than improved growth opportunities. Thus, repurchases do not appear to be pure financial transactions meant to change the firm's capital structure but are part of a restructuring package meant to shrink the assets of the firm. This evidence leads us to conclude that the positive investor reaction to repurchases is best explained by the free cash flow hypothesis.

JEL classification: G32; G34; G35

Keywords: Share repurchases; Free cash flow; Signaling; Restructuring

* Corresponding author: Tel.: 312/915-7065; fax: 312/915-6118; e-mail: tnohel@luc.edu.

[1] We would like to thank David Denis, Jon Garfinkel, K.C. Ma, Arthur Raviv, Dennis Sheehan, seminar participants at Loyola University, the University of Wisconsin, the 1997 FMA-International conference, and an anonymous referee for many helpful comments and suggestions. The research assistance of Ken Kotz, John Becker, and Emrah Yalaz are also greatly appreciated. All remaining errors are the responsibility of the authors.

PII S0304-405X(98)00022-1

1. Introduction

It is well documented that the stock market responds favorably to a company's announcement of its intention to acquire a portion of its outstanding shares through a tender offer (see Dann, 1981; Vermaelen, 1981; Lakonishok and Vermaelen, 1990; Comment and Jarrell, 1991). Though a number of explanations for the investor reaction can be found in the literature, two alternative hypotheses seem to be the most widely accepted. These alternative hypotheses are the information signaling hypothesis and the free cash flow hypothesis. The information signaling hypothesis argues that a company's willingness to pay a premium to purchase its own shares sends a strong signal to lesser-informed outside investors that the company's future prospects are improving. Alternatively, the free cash flow hypothesis argues that firms with excess cash and a poor portfolio of investment opportunities will face sizeable agency costs if the excess cash is not distributed to shareholders. Barring such a distribution, managers have incentives to invest the excess cash in perquisites, empire building (entrenchment), and other negative net present value projects. Stock repurchases allow a firm to distribute its excess free cash flow, thereby eliminating the incentive for wasteful investment and increasing firm value.

Lang and Litzenberger (1989) discuss these two alternative hypotheses in the context of an alternative form of corporate payout, namely dividends. They use Tobin's q, the ratio of the market value of assets to the replacement cost of assets, as a measure of a firm's investment opportunities, to show that, under certain assumptions, having a Tobin's q value of less than 1 is a sufficient condition for a firm to be categorized as over-investing.[2] By segmenting their sample into high-q ($q > 1$) and low-q ($q < 1$) firms, Lang and Litzenberger show that the market reacts more to dividend changes of low-q firms than to those of high-q firms. They argue that this evidence supports the free cash flow hypothesis rather than the information signaling hypothesis. Their conclusions are disputed in the more recent work of Howe et al. (1992) and Denis et al. (1994), but are supported in the work of Perfect et al. (1995). In short, most financial economists agree that changes in corporate payout policy convey information to outside investors, but there is little consensus regarding the nature of the information conveyed.

We focus on post-repurchase operating performance and its determinants as a means of differentiating between the signaling hypothesis and the free cash flow hypothesis as explanations of the market's reaction to the announcement of

[2] An over-investing firm is a firm that is investing sub-optimally, i.e., in negative net present value projects. Such a firm could increase its value by selling off the assets used in the losing projects, and paying out the proceeds to shareholders, either through dividends or through a stock repurchase.

a stock repurchase. If a firm's intention in announcing a repurchase is to 'signal' to outsiders that the firm's prospects are improving, then we should see a tangible improvement in operating performance following the repurchase, relative to what was expected. Alternatively, if the intention of management is to distribute free cash flow, in lieu of investing in perquisites, entrenchment, or other losing projects, investors should react to the repurchase announcement but the repurchasing firms may or may not exhibit improved performance. In short, signaling implies an improvement in performance, but a performance improvement need not imply signaling.

Consider a firm that has several poorly performing assets on its books. If that firm sells off its poorly performing assets and pays out the proceeds from those asset sales by executing a stock repurchase, we should see an improvement in performance. However, generating improved performance through such a restructuring of the firm's portfolio of assets is more in the spirit of the free cash flow hypothesis than the signaling hypothesis. Therefore, depending on how it is accomplished, an improvement in operating performance could be consistent with either the free cash flow hypothesis or the signaling hypothesis. For this reason, we examine the determinants of performance to distinguish between these two hypotheses.

While our discussion to this point has been cast in terms of changes in expectations regarding future cash flows, it is conceivable that the signal conveyed by the repurchase is about the riskiness of cash flows. This means that the positive stock market reaction to the announcement of a repurchase could imply either an upward shift in investor expectations of future cash flows, or a downward revision in the market's perception of the riskiness of the expected future cash flows, or both. For this reason, in examining firms during the post-repurchase period, we consider the possibility of changes in both profitability and risk.

Our purpose in this paper is to distinguish between the information signaling hypothesis and free cash flow hypothesis as explanations of the investor reaction to announcements of stock repurchases. We extend previous empirical work in several ways. First, we examine firm operating performance following share repurchases, in addition to announcement period returns, to differentiate between these two hypotheses. While firm performance has been investigated in the context of earnings changes following repurchases (see, e.g., Dann et al., 1991), earnings may not reflect true repurchase-related performance changes since changes in capital structure are not controlled for. Our measure of performance is not sensitive to capital structure changes. Firm operating performance following repurchases has also been examined in the context of analysts' revisions of earnings forecasts. However, this approach, in addition to not controlling for repurchase-related changes in capital structure, focuses only on expectations, and not on whether or not the expectations are realized, or how they are realized.

Second, we decompose firm operating performance into its components in order to isolate the factors affecting performance as a means of understanding the motive behind the repurchase. Third, we examine the extent to which investors anticipate changes in operating performance and risk by analyzing how these variables are related to announcement period returns. Additionally, we study long-run returns to see how investors' expectations are revised given the realization of anticipated performance and risk. Finally, since the motivation for repurchasing shares may differ across firms depending on their investment opportunities, we conduct our tests for subsamples low-q and high-q firms.

Using a sample of 242 tender offers (both fixed-price and Dutch auction type), announced between 1978 and 1991, we examine the post-announcement industry-adjusted performance of repurchasing firms, where performance is measured as the ratio of cash flow to the market value of the assets that generate the cash flow. Our results show that there is a significant improvement in the performance of repurchasing firms, relative to a set of control firms (matched on the basis of year -1 performance and other variables), following the repurchase. Furthermore, we show that the improvement in performance is coming entirely from low-growth firms, and stems from a more efficient deployment of repurchasing firms' existing assets rather than from new investment opportunities. We also find that there are asset sales before and during the repurchase period, and that capital expenditures do not increase significantly during or following the repurchase. Collectively, the results suggest that a firm's repurchase of stock is part of a restructuring program, rather than being an end unto itself. We argue that these results support the free cash flow hypothesis over the information signaling hypothesis.

Our other findings are as follows. We show that the performance improvement of low-growth firms is positively related to their announcement period abnormal returns. In contrast, the performance of high-growth firms is unrelated to announcement returns. Moreover, we show that the long-run abnormal returns of low-growth firms are unrelated to performance, implying that the performance improvement was capitalized on the announcement date, while the long-run returns of high-growth firms are correlated with performance, suggesting that any performance improvements, or declines, were not systematically anticipated at the announcement. These results show that the market is efficient in that investors correctly anticipate the actions of both types of firms. Finally, we document a decline in systematic risk following the repurchase. We show that, as expected, changes in systematic risk are negatively related to the announcement period abnormal returns, and positively related to long-run returns. Furthermore, the negative relation between announcement returns and risk changes, along with the positive relation between announcement returns and the terms of the repurchase, may explain why high-growth firms have significant positive announcement returns, even though they do not deliver improved performance.

The remainder of the paper is organized as follows. In Section 2, we discuss the implications of the information signaling hypothesis and the free cash flow hypothesis. In Section 3, we describe the data and discuss our choice of performance measure. Section 4 presents and interprets our empirical results, and Section 5 concludes.

2. Information signaling and free cash flow

In an environment of asymmetrically informed agents, a share repurchase can play a critical role in mitigating the information asymmetry between managers and outside shareholders (see, e.g., Vermaelen, 1984; Ofer and Thakor, 1987; Constantinides and Grundy, 1989). Furthermore, when there is separation of ownership and control within a firm, Easterbrook (1984) and Jensen (1986) suggest that the payout of cash flows to shareholders through either a share repurchase, or as dividends, can lower agency costs. But which of these is the dominant motivation behind the repurchase? Alternatively, when investors react to the decision to repurchase shares, what is driving their reaction? We believe that by studying the operating performance of repurchasing firms and the determinants of operating performance, as well as the reaction of investors to repurchases, we may better understand which of these hypotheses has empirical support.

In the existing literature, the motivation behind repurchases is examined in a framework that assumes that either the free cash flow hypothesis or the signaling hypothesis is correct. However, it may be the case that both hypotheses explain the data. It is possible that different firms repurchase shares for entirely different reasons. Some may be signaling future performance while others may be distributing, rather than wasting, excess cash. For instance, high-growth firms may be using the repurchase to signal improving investment opportunities, while low-growth firms may be distributing excess cash. For this reason we use Tobin's q to sort our sample into subsamples of high-growth and low-growth firms.[3]

In a recent paper, Lie and McConnell (1998) also examine operating performance associated with repurchases. However, their primary purpose is to examine the relative signal content of fixed-price and Dutch auction tender offers. They find a modest improvement in performance confined to the year of the repurchase, but no difference in performance between the two types of tender

[3] We define Tobin's q as the ratio of the market value of assets to the book value of assets, where the market value of assets is defined as (book value of assets − book value of equity + market value of equity), as in Morck et al. (1988), Lehn and Poulsen (1989), Servaes (1991), and Billett et al. (1995), among others.

offers. In contrast to Lie and McConnell, we find a significant improvement in performance. While this is true for the full sample, our results are driven by the low-q subsample. Since the motivation of Lie and McConnell (1998) is to test for the relative signaling strength of the two types of tender offers, and not to distinguish between the signaling hypothesis and the free cash flow hypothesis, they do not partition their sample on the basis of pre-repurchase period investment opportunities. A possible explanation for the difference between the findings obtained from our full sample and those of Lie and McConnell (1998) is that we use a market value-based performance metric, whereas their performance measure is based on book values. For an explanation on our choice of a market-based performance measure, see Section 3.2.

Two recent papers, Howe et al. (1992) and Perfect et al. (1995), analyze the reaction to stock repurchase announcements by applying, at least in part, the methodology introduced by Lang and Litzenberger (1989) to distinguish between the signaling hypothesis and the free cash flow hypothesis as explanations of the reactions of investors to large dividend changes. Following Lang and Litzenberger (1989), Howe et al. (1992) segment their sample of firms announcing repurchase tender offers (and specially designated dividends), based on the firm's Tobin's q ratio. Howe et al. (1992) do not find a significant difference in the announcement period abnormal returns of firms with q-ratios less than one and firms with q-ratios greater than one. This finding is in contrast to Lang and Litzenberger's results for changes in dividend policy (Lang and Litzenberger, 1989). They conclude that the free cash flow hypothesis is not the motivation behind firms' decisions to repurchase shares. Perfect et al. (1995) suggest that Howe et al. (1992) use a flawed measure of Tobin's q, namely the average q-ratio over the three years preceding the repurchase. Perfect et al. demonstrate that low-q firms do in fact show a stronger stock market reaction to the announced repurchase if Tobin's q is measured in the year immediately preceding the repurchase. They conclude that the free cash flow hypothesis best explains the motivation behind repurchases.

It may be difficult to extract the information content of repurchases by merely focusing on announcement period returns. For instance, assume that investors react more strongly to repurchases announced by low-q firms. It is conceivable that investors are reacting to the fact that low-q firms are selling off poorly performing assets and paying out the proceeds to investors, in the spirit of the free cash flow hypothesis. Alternatively, low-q firms might be signaling that they are becoming high-q firms, which is in the spirit of the signaling hypothesis. Examining the nexus of expectations (abnormal stock returns), realizations (performance and its determinants), and revisions in expectations (long-run returns) enables us to better discriminate between the two hypotheses.

Lang and Litzenberger (1989) go beyond an analysis of announcement period returns by looking at revisions in analysts forecasts following large dividend changes. They find no systematic revisions in analysts' forecasts following large

dividend changes, and conclude that the change in payout policy conveys no information about future performance. These findings are disputed by Denis et al. (1994), who show that analysts do in fact revise their forecasts, and these revisions are systematically related to the announcement period returns. However, it is not clear why the systematic relation between announcement period returns and the revision in analysts' forecasts necessarily implies signaling. Consider a firm that is undergoing a restructuring, whereby they are selling off poorly performing assets and streamlining operations to become more efficient. Under such circumstances, if analysts are aware of the actions being taken, the restructuring could easily affect analysts' expectations of future earnings favorably. However, a firm going through such a transformation would more likely be categorized as a firm that is restructuring to reduce agency costs, rather than a firm that is signaling better investment opportunities. In other words, the firm is conveying their intent to make better investment decisions instead of communicating that they are blessed with improving investment opportunities. A repurchase conducted within this framework is in the spirit of the free cash flow hypothesis.

The typical interpretation of the free cash flow hypothesis in the literature is that the agency problem in question is caused by the physical presence of excess cash. However, under a more general interpretation of the free cash flow hypothesis, the source of the conflict between shareholders and managers could be actual cash on hand, as well as investments that could be converted into cash, i.e., potential cash. Consider a firm with an existing project whose forward-looking net present value is negative (NPV). We assume the NPV of an existing project is negative if the present value of its expected cash flows is less than the proceeds that the firm can generate by selling the assets that comprise the project. Given the negative NPV of the project, investors would prefer that the firm liquidate this project and return the proceeds of the liquidation to them, possibly in the form of a repurchase. The free cash flow hypothesis would predict that investors would react favorably to such a decision. There may appear to be a difference between the agency problem created by actual cash, and the agency problem created by potential excess cash. However, in the case of a firm with excess cash, investors are concerned that the firm may use the excess cash to fund negative NPV projects. In the case of potential cash, investors are concerned with the possibility that the firm will destroy value by continuing to fund a project whose NPV is negative. The decision to sell an asset whose forward-looking NPV is negative does not eliminate the agency problem. What eliminates the agency problem is to take the next step, and return the proceeds of the liquidation to the shareholders.

In order to understand the nature of the information conveyed through the share repurchase, we examine firm performance. By focusing on the actual performance of repurchasing firms, and integrating that analysis into a larger analysis of announcement-period returns, we are able to understand what

investors anticipate in their announcement-period reaction. Furthermore, once a performance improvement is documented, we study the causes of the performance improvement to determine whether it is coming from more efficient deployment of assets (turnover) or containment of costs (margin).

Our desire to distinguish between the free cash flow hypothesis and the signaling hypothesis as an explanation of the investor reaction to repurchases leads us to examine tender offer, rather than open market, repurchases. If the investor reaction to repurchases can be explained by the free cash flow hypothesis, then tender offer repurchases have more promise to uncover this relation. Unlike open market repurchases, which carry with them uncertainty of execution with respect to both the magnitude of the distribution (the firm may discontinue its open market repurchase plan), and with respect to timing (it may take the firm months or years to complete the open market repurchase), in a tender offer, the firm commits itself to distribute cash over a short time span. If, on the other hand, the signaling hypothesis can explain investor reaction to share repurchases, tender offers are again more likely to reveal this fact, since purchasing shares at a premium is a stronger signal than purchasing shares at market prices. Thus, an attempt to differentiate between the two hypotheses is more likely to succeed when tests are conducted with a sample of tender offer repurchases.

3. Data and methodology

Our sample consists of all tender offer stock repurchases announced between 1978 and 1991. Our starting point is the tender offer database listed in the Appendix of Comment and Jarrell (1991), consisting of 165 tender offers between 1984 and 1989. We fill in the remaining years from the Wall Street Journal Index by utilizing various keywords, including 'securities buybacks' and 're-acquired shares' We find a total of 282 announcements of both fixed-price and Dutch auction tender offers. To be included in our sample, each tender offer had to meet the following requirements. First, each company had to have a listing on either the primary, supplementary, tertiary, full coverage, or research 1994 COMPUSTAT tape. Second, each company had to be listed on the Center for Research in Security Prices 1994 tapes which cover the NYSE, AMEX, and NASDAQ markets. Third, observations lacking complete data on several items for the year prior to the repurchase (event year -1) were deleted.

The last restriction is necessary to implement our matching procedure and, to compute Tobin's q values. We avoid imposing a survivorship bias on the data by requiring data only in the year prior to the repurchase, and not in the post-repurchase period. Many of the repurchasing firms in our sample are in transition, facing either a corporate restructuring or a potential change in corporate control. Thus, if we were to impose the requirement that firms in our

sample have data in the post-repurchase period, we would be left with only those firms that were successful in restructuring or fending off takeover attempts.[4] After imposing the three restrictions outlined above, our original sample of 282 announcements was reduced to a total of 242 announcements. The final sample includes a total of 48 announcements from 1978 and 1979, 122 announcements between 1980 and 1987, and 72 announcements after 1987. Finally, our data come from a wide variety of industries.

We define abnormal performance, as well as other variables of interest, as paired differences between repurchasing firms and control firms selected using a variation of the matching procedure suggested by Barber and Lyon (1996). They suggest that if the tests of interest are to be designed to detect abnormal performance following an event, control firms should be matched with sample firms based on pre-event performance as of year minus one. Barber and Lyon (1996) provide evidence that this procedure yields more powerful, and unbiased, test statistics than matching procedures based on other variables, such as size. Our matching procedure attempts to match repurchasing firms with control firms on the basis of several variables. In particular, we select control firms based on the following criteria, stated in order of importance: performance, standard industrial classification code, q classification (high-q versus low-q), and leverage. We search the entire 1994 COMPUSTAT database using one Primary, Supplemental, and Tertiary tape, two Full Coverage tapes, and three research tapes five times, imposing progressively weaker restrictions each time. These restrictions, where percentages are potential deviations from repurchasing firms' values, are as follows:

1. Performance $\pm$ 10%, same two-digit SIC code, same q classification, Leverage $\pm$ 20%.[5]
2. Performance $\pm$ 10%, same two-digit SIC code, same q classification.
3. Performance $\pm$ 10%, same two-digit SIC code.
4. Performance $\pm$ 10%, same one-digit SIC code.
5. Performance $\pm$ 10%, no SIC restriction.

The tightest restrictions result in 123 matches of actuals and controls, while eliminating the leverage restriction produces an additional 62 matches. Eliminating the q classification restriction provides another 25 matches, and

[4] We thank the referee for making this suggestion.

[5] We define performance as earnings before interest and taxes, plus depreciation and amortization, scaled by the beginning of year market value of assets. Leverage is defined as the ratio of market value of assets and market value of equity. Performance $\pm$ 10% indicates that if the repurchasing firm's performance in year -1 is X, then the control firm's performance in year -1 should be between 0.9X and 1.1X.

weakening the SIC restriction to a one-digit match produces another 26 matches. Only 6 repurchasing firms have control firms matched only on performance.

We collect data for the years surrounding each repurchase, defining year zero as the year of the repurchase. Year-zero data are taken from the fiscal year-end following the expiration of the tender offer. For this reason, we treat year zero as belonging to the post-repurchase period. Other years are defined relative to year zero. For cases in which the fiscal year-end of the repurchase firm differs from the control firm, in some cases, we perform a calendar adjustment procedure so as to maximize the data period in common between repurchasing and control firms. For example, if the repurchasing firm's fiscal year ends in June and the corresponding control firm has a fiscal year ending in September, the control firm data would not be adjusted because, for each year, there would be an overlap of nine months between the data of the repurchasing firm and the control firm. In this case, in the year 1990, the fiscal year would run from June 1989 to June 1990 for the repurchasing firm, while it will run from September 1989 to September 1990 for the control firm. Now assume a firm announced a repurchase in August of 1990. The repurchasing firm's data would be adjusted forward by 1 year, such that 1990 data (year zero) would run from June of 1990 to June of 1991. Thus, in this case, year zero is clearly in the post-repurchase period. Furthermore, even though the control firm's unadjusted 1990 year-end data are from the post-repurchase period, the control firm's data are adjusted forward by one year, September 1990 to September 1991, to provide the maximum overlap with the data of the repurchase firm.

We follow Healy et al. (1992), Cornett and Tehranian (1992), and Tarhan et al. (1998) in measuring firm performance as the ratio of an upstream measure of cash flow, defined as earnings before interest and taxes, plus depreciation and amortization, (EBITDA), to the market value of the assets that generate the cash flow. We define the market value of assets as the market value of equity, plus book values of preferred stock and debt net of cash (short term debt + long term debt − cash). The rationale for using the market value of the assets that generate the cash flow, rather than the book value, is that market values represent the opportunity cost of the assets, and therefore facilitate intertemporal and cross-sectional comparisons. Furthermore, using the market value of assets mitigates any effects arising from the choice of the method of accounting for the transaction, or the effects of any restructuring charges if the repurchase is part of a 'package' of actions. As in Healy et al. (1992), we make an adjustment to the market value of assets during the post-repurchase period. In particular, we deduct the change in equity value of the repurchasing firm in the announcement period from the asset base. This adjustment is made because, if investors anticipate an improvement in operating performance, stock price will increase. If this increase is not deducted from the asset base, the cash flow return on assets measure will underestimate the actual performance improvement. Alternatively, if investors interpret the repurchase pessimistically, leaving the asset base

unadjusted for this stock price decline would make performance appear to be better than it actually is.

To document changes in performance, we examine the performance of the repurchasing firms, relative to their control firms, chosen on the basis of performance, SIC code, q classification, and leverage ratio. We examine year-by-year, as well as post-repurchase cumulative, 'excess' operating performance focusing on median values and non-parametric significance tests. Furthermore, we regress post-repurchase performance on pre-repurchase performance, and also regress post-repurchase values of other variables, such as turnover and leverage, on their pre-repurchase values. We conclude that there is a change in performance if the constant term is different from zero at a standard level of significance (see Healy et al., 1992).

In addition to studying cash flow return on the market value of assets, we examine market-model adjusted announcement period returns, as well as long-run 'buy-and-hold' returns (as in Lakonishok and Vermaelen, 1990), and changes in risk. To compute announcement-period returns, we use standard event study techniques, with an adjustment to allow for event-induced volatility, as suggested by Boehmer et al. (1991). Market risk (β) and total risk (σ) are computed over 36-month windows, using event months -38 through -3 and event months $+1$ through $+36$, based on monthly returns. We use monthly returns to compute post- and pre-event risk to avoid the bias problems caused by infrequent trading that are discussed in Denis and Kadlec (1994).

4. Empirical findings and interpretation

In this section we describe our empirical results. The results are grouped in the following way. In Sections 4.1.1 and 4.1.2, we report univariate statistics on performance-related variables. Furthermore, we document differences between the pre-repurchase period and the post-repurchase period for several performance-related variables, based on regressions of median post-repurchase values on median pre-repurchase values. In Section 4.2, we examine asset sales and investments in a similar way. Section 4.3 investigates the determinants of changes in operating performance in the context of multivariate regression models, while in Section 4.4 we explain the reaction of outside investors, and determine the extent to which investors anticipate performance changes and long-run returns.

4.1. Performance relative to industry controls

In this section, we look at the progression through time of several important indicators of firm performance. We cover the period beginning three years prior to the year of the repurchase to three years after the year of the repurchase. Our

focus is on how the repurchasing firms perform relative to control firms selected on the basis of pre-repurchase performance, industrial classification, q classification, and leverage. In addition, we estimate regressions with median post-repurchase value as the dependent variable, and median pre-repurchase value as the explanatory variable, focusing on the significance and the sign of the intercept term. The equations we estimate are of the form:

$$POSTVAL = \alpha + \beta PREVAL + \varepsilon, \tag{1}$$

where $POSTVAL$ represents the paired difference of median post-repurchase values of a variable of interest, $PREVAL$ represents the paired difference of median pre-repurchase values of that variable, α is a constant term that captures the impact of the repurchase on the variable in question, and β captures the possible trend from the pre-repurchase period to the post-repurchase period.

4.1.1. Performance relative to industry controls: univariate statistics

The definitions of the variables we use in our analysis are described in Table 1. Table 2 reports the sample medians for paired differences (repurchasing firm minus control firm) of several variables of interest on a year-by-year basis in annual event time. We report values for the full sample of 242 announcements, as well as for the subgroups separated according to the firm's Tobin's q. Note that the sample sizes for the full sample and low-q and high-q subsamples are reported as 242, 107, and 135, respectively. These are the sample sizes in the pre-repurchase period. Moving into the post-repurchase period, the full sample diminishes to 232, 213, 196, and 186, in years 0, + 1, + 2, + 3, respectively. The sample size of low-q firms drops to 79 in year + 3 and the high-q sample size drops to 107 in year + 3. Of the firms that disappear from the sample in the post-repurchase period, 29 were acquired or merged with other firms, 15 went private, 2 firms did a partial liquidation and spin-off, and 1 firm went through a bankruptcy reorganization, according to the Center for Research in Security Prices tapes. In the case of 9 firms, we were not able to identify a reason why they disappeared.

Our focus will be on the ratio of cash flow to the market value of assets. This variable represents the cash flow generated by a firm before taxes and interest payments. Therefore, it is an operating performance measure that mitigates the effects of changes in capital structure. Furthermore, because this measure is calculated before depreciation, it is also immune to any bias due to cross-sectional variation in accounting methods. Panel A of Table 2 displays the results for the full sample. For the full sample, we see no significant difference in performance between the repurchasing firms and the control firms in years − 3 to − 1. However, following the repurchase, there is a significant improvement in operating performance. In years 0, + 1, and + 3 there is a 1.29%, 2.41%, and 2.16% median abnormal cash flow return, respectively, in the repurchasing firm (year 1 is significant at the 1% level, and years 0 and + 3 are significant at the

Table 1
Definitions of variables used to analyze performance of firms executing tender offer share repurchases between 1978 and 1991

Variable	Definition
Panel A: *Operating characteristics*	
Cash flow return on assets	Earnings before depreciation, interest, and taxes (EBITDA), as a percentage of beginning-of-year market value of assets (market value of equity, plus book values of debt and preferred stock, minus cash).
Asset turnover	Sales divided by beginning-of-year market value of assets.
Cash flow margin	EBITDA divided by sales.
Leverage	End-of-year market value of assets, divided by end-of-year market value of equity.
Market-to-book ratio	End-of-year market value of common equity, divided by end-of-year book value of common equity.
Panel B: *Investment characteristics*	
Capital expenditures	Capital expenditures, as a percentage of beginning-of-year market value of assets.
Asset sales	Change in book value of assets, less capital expenditures, plus depreciation, as a percentage of beginning-of-year book value of assets.
Asset growth rate	Change in market value of assets, as a percentage of beginning-of-year market value of assets.
Sales growth rate	Change in Sales, as a percentage of previous year's sales.
Cash	Cash and marketable securities, as a percentage of beginning-of-year market value of assets.

5% level). The abnormal return in year $+2$ is also positive, but insignificant. However, once the sample is partitioned according to the value of Tobin's q, we see that the improvement is coming entirely from the low-q firms. In particular, low-q firms, displayed in Panel B of Table 2, show abnormal cash flow returns of 5.13%, 4.95%, 4.04%, and 7.59% in years 0, $+1$, $+2$, and $+3$ respectively. The returns for years 0, $+1$, and $+3$ are significant at the 1% level, and year $+2$ is significant at the 5% level. In contrast, high-q firms show no improvement in performance in any of the years following the repurchase. To further document the contrast in post-repurchase performance between high-q and low-q firms, we also calculated the cumulative abnormal cash flow return on market value of assets. These results are given in Table 3. For the full sample, the cumulative abnormal return as of year $+3$ is 6.85%, significant at the 1% level. This result for the full sample is largely due to the returns generated by the low-q

Table 2
Median firm operating performance and other related variables surrounding tender offer share repurchases completed between 1978 and 1991. The data are taken from the primary, supplementary, tertiary, full coverage, and research COMPUSTAT tapes. The results are shown for the full sample of 242 firms, and for subsamples of firms based on Tobin's q values. Sample firms are matched with control firms on the basis of cash flow return on market value of assets, SIC code, q classification, and financial leverage. Results shown are for the median paired differences for each variable. Our definitions of each variable are displayed in Table 1. Results are evaluated using a nonparametric difference of medians test, and differences significantly different from zero at 1% and 5% level are marked with ** and *, respectively. Year zero is the year of the repurchase.

Year	Cashflow return on assets	Leverage	Market to book	Asset turnover	Margin
Panel A: *Full sample* ($N = 242$)					
− 3	0.0049	0.0373*	− 0.0809	0.1425*	− 0.0004
− 2	0.0013	− 0.0358	− 0.0154**	0.0248	0.0048
− 1	0.0002	− 0.0691	− 0.0747*	0.0330	0.0100
0	0.0129*	0.0675	− 0.0082	0.0466	− 0.0045
+ 1	0.0241**	0.0932*	− 0.0554	0.1384	− 0.0041
+ 2	0.0166	0.0935	− 0.1063	0.0070	− 0.0089
+ 3	0.0216*	0.0441	0.0040	− 0.0413	− 0.0063
Panel B: *Firms with* $q < 1$ ($N = 107$)					
− 3	0.0098	0.1379**	0.1245**	0.5527**	− 0.0115
− 2	0.0019	− 0.0911	− 0.1211**	0.1444	− 0.0054
− 1	0.0001	− 0.0171	− 0.1462**	0.2783*	− 0.0180*
0	0.0513**	0.1057	− 0.1471**	0.6122**	− 0.0041
+ 1	0.0495**	0.0296	− 0.1637**	0.4613*	− 0.0134
+ 2	0.0404*	0.0401	− 0.1509*	0.4151	− 0.0120
+ 3	0.0759**	0.0281	− 0.1081	0.3748*	− 0.0075
Panel C: *Firms with* $q > 1$ ($N = 135$)					
− 3	0.0047	− 0.0228	0.0347	− 0.0303	0.0170
− 2	0.0002	− 0.0656	− 0.0781	0.0006	0.0171
− 1	0.0002	− 0.0986*	0.0557	− 0.026	0.0057
0	− 0.0011	0.0569	0.3267*	− 0.1626	0.0094
+ 1	0.0161	0.1296*	0.1130	0.0089	0.0150
+ 2	− 0.0022	0.1009	0.0868	− 0.1271	0.0150
+ 3	0.0043	0.0995*	0.2589	− 0.1239	0.0108

subsample, which has a 3-year cumulative abnormal return of 23.30%, significant at the 1% level, while the high-q firms are unable to outperform their control counterparts. In fact, the cumulative performance of high-q firms is 1.94% below that of controls, though this figure is insignificantly different from 0.

Table 3
Median cumulative cash flow return on market value of assets, following tender offer share repurchases executed between 1978 and 1991. The results are shown for the full sample of 242 firms, and for subsamples of firms based on Tobin's q values. Sample firms are matched with control firms on the basis of cash flow return on market value of assets, SIC code, q classification, and financial leverage. Results shown are for the median paired differences for each variable. Our definitions of each variable are displayed in Table 1. Results are evaluated using a nonparametric difference of medians test, and differences significantly different from zero at 1% and 5% level are marked with ** and * respectively. Year zero is the year of the repurchase.

Year	Panel A: Full sample		Panel B: Firms with $q < 1$		Panel C: Firms with $q > 1$	
	N	Median	N	Median	N	Median
0	230	0.0129*	102	0.0513**	128	− 0.0011
+ 1	210	0.0296**	92	0.0846**	118	0.0046
+ 2	194	0.0422**	83	0.2007**	111	− 0.0215
+ 3	172	0.0685**	74	0.2330**	98	− 0.0194

Earlier papers documented that investors react more favorably to the repurchase announcements of low-q firms as compared to high-q firms (see, e.g., Howe et al., 1992). Our performance-based results indicate that the stronger reaction of investors to the repurchase announcements of low-q firms may be justified. Furthermore, this evidence provides little support for the information signaling hypothesis. In particular, the idea that high-q firms are signaling improved investment opportunities is not supported by our results, which show no tangible performance improvement in high-q firms. Finally, while it is possible that low-q firms could signal that they are becoming high q firms, the evidence we present in the next section shows otherwise.

To see the source of the improvement in cash flows, we decompose the cashflow return on assets into its two components: cashflow margin and asset turnover. Cashflow margin is calculated as cashflow, divided by sales, and asset turnover is measured as sales, divided by the market value of assets. An increase in cashflow margin indicates that firms are improving their expense control, or shifting to products with higher margins, whereas higher asset turnover shows that assets are being deployed more efficiently. Since the performance improvement is confined to the low-q firms, the analysis of these firms is more likely to reveal the basis for this improvement. From our results, asset turnover appears to be an important determinant of performance. While low-q firms have superior turnover relative to control firms both before and after the repurchase, the evidence suggests that this difference widens following the repurchase. The evidence on cashflow margin is less clear. On the basis of univariate statistics, there appears to be little if any difference in margin between repurchasing firms and their controls. The manner in which successful firms improve performance

following the repurchase is an important issue that needs more careful examination. In Section 4.3, we return to this issue, with an analysis based on a multivariate regression.

Managers frequently argue that the decision to repurchase shares is prompted by their belief that the firm's stock is undervalued. Judging by the median values of the market-to-book ratio of equity for the whole sample, repurchasing firms do appear to be somewhat undervalued relative to control firms. However, subsample results indicate that it is primarily the low-q firms that are undervalued. Moreover, the repurchase does little to convince investors to change their valuation of low-q firms since the market-to-book ratios of these firms remain significantly below those of control firms following repurchases.

To investigate how repurchases are financed, we examine the cash holdings and leverage ratios for the firms in our sample. The leverage ratio is calculated as the market value of assets, divided by the market value of equity. The evidence suggests that repurchases are primarily financed by borrowing. In particular, the leverage ratio increases in the year of the repurchase, and during the post-repurchase period. There is also some evidence (see Table 5 described below) of a build-up in cash of 3.54% of the market value of assets in excess of control firms in the case of low-q firms in the year preceding the repurchase (p-value of 0.11, not reported in the table).

4.1.2. Performance relative to industry controls: Regressions analysis

It is conceivable that the changes that occur in the post repurchase period are simply the result of correlations between the pre- and post-repurchase values, signifying a possible trend. As a more direct test of the impact of the repurchase on cash flow return, and other variables of interest, we estimate regressions of the form described in Eq. (1). We regress the median value in the post-repurchase period of the variable in question on its median value in the pre-repurchase period, and test for a zero intercept term (as in Healy et al., 1992). A non-zero intercept term would indicate that repurchases have an impact on the variable of interest.

The results of these estimations are reported in Table 4. In all regressions, we use trimmed data with 1% of the observations removed from each tail of the distribution, to control for outliers. Once again, Panel A reports estimates for the full sample, while Panels B and C report estimates for low-q and high-q firms respectively. For the full sample, the constant term in the regression of median post-repurchase cashflow return on assets on median pre-repurchase cashflow return on assets is positive (1.55%) but insignificant. When the sample is divided according to Tobin's q, the results show that low-q firms are able to generate abnormal performance following the repurchase. In particular, low-q firms show post-repurchase median abnormal cash flow returns of 4.59%, significant at the 5% level, while high-q firms show no significant abnormal performance. Additionally, regressions of post-q differential (actual q − control q) on pre-q

Table 4
Results from regressing post-repurchase values on pre-repurchase values, for a series of variables. The full sample consists of 242 firms that underwent a tender offer share repurchase executed between 1978 and 1991. The sample is subdivided, on the basis of Tobin's q values, into low-q and high-q subsamples. Each sample firm is matched with a control firm. The data are taken from Standard and Poor's COMPUSTAT database. The table reports regression results of the form:

$$POSTVAL = \alpha + \beta PREVAL + \varepsilon,$$

where $POSTVAL$ represents the paired difference of median post-repurchase values of a variable, and $PREVAL$ represents the paired difference of median pre-repurchase values of a variable. Variables are defined in Table 1. The pre-repurchase period covers years -3 through -1, and the post-repurchase period covers years 0 through $+3$, where year zero is the year of the repurchase. If there is missing data, the median is computed using data for the remaining years. Numbers in parentheses are t-statistics, and estimates significantly different from zero at 1% and 5% level are marked with ** and * respectively.

Variable	Intercept	β-Value	R^2	F-Statistics
Panel A: *Full sample*				
Cash flow return on assets	0.0155 (1.458)	0.0008 (−0.01)	$R^2 = 0.000$,	$F = 0.00$
Market-to-book ratio	0.0382 (0.368)	0.4746 (7.458)**	$R^2 = 0.200$,	$F = 55.63$**
Leverage	0.1495 (2.095)**	0.6393 (10.41)**	$R^2 = 0.326$,	$F = 102.63$**
Asset turnover	0.2019 (2.200)**	0.9480 (18.98)**	$R^2 = 0.623$,	$F = 360.26$**
Cash flow margin	0.0060 (0.916)	0.8159 (15.01)**	$R^2 = 0.496$,	$F = 225.26$**
Panel B: *Firms with* $q < 1$				
Cash flow return on assets	0.0459 (2.336)**	0.0709 (0.414)	$R^2 = 0.002$,	$F = 0.178$
Market-to-book ratio	−0.0853 (−1.011)	0.5840 (10.55)**	$R^2 = 0.529$,	$F = 111.34$**
Leverage	0.1200 (0.971)	0.5654 (6.449)**	$R^2 = 0.296$,	$F = 41.59$**
Asset turnover	0.4621 (2.571)**	0.8946 (11.88)**	$R^2 = 0.606$,	$F = 141.21$**
Cash flow margin	0.0137 (1.301)	0.8218 (8.182)**	$R^2 = 0.399$,	$F = 66.95$**
Panel C: *Firms with* $q > 1$				
Cash flow return on assets	−0.0099 (−0.923)	0.0762 (−0.906)	$R^2 = 0.007$,	$F = 0.839$

Table 4. Continued

Variable	Intercept	β-Value	R^2	F-Statistics
Market-to-book ratio	0.1798 (1.037)	0.3874 (3.814)**	$R^2 = 0.107$,	$F = 14.55$**
Leverage	0.1948 (2.375)**	0.7888 (8.808)**	$R^2 = 0.397$,	$F = 77.58$**
Asset turnover	0.0380 (0.417)	1.0003 (14.098)**	$R^2 = 0.616$,	$F = 198.46$**
Cash flow margin	− 0.0001 (− 0.016)	0.8195 (12.92)**	$R^2 = 0.57$,	$F = 166.91$**

** Significantly different from zero at the 1% level (two-tailed test).
* Significantly different from zero at the 5% level (two-tailed test).

differential (not reported) had insignificant intercept terms in the full sample and both subsamples. In particular, in the low-q subsample, the intercept term is 0.0306, with a t-value of 0.014. This result is inconsistent with the hypothesis that low-q firms are signaling their intent to become high-q firms.

The intercept term from the estimation of Eq. (1) for asset turnover is 0.20, significant at the 5% level. This improvement in turnover is coming from low-q firms (0.46, significant at the 5% level), rather than from high-q firms (0.04, insignificant). While turnover improves following the repurchase, there is no evidence that margin, the other component of performance, improves at all. This reinforces our year-by-year results, based on medians, that suggest that the primary source of improvement in performance is asset turnover. As we noted earlier, this issue will be further explored in Section 4.3.

Judging by the market-to-book ratio, the results in Table 4 indicate that there is no change in investor valuation of repurchasing firms following repurchases. Finally, leverage also appears to increase following repurchases. This result is driven by the high-q subsample.

4.2. Acquisition and sale of assets

So far, our results suggest that, following repurchases, operating performance improves for low-q firms, and the improvement comes from better utilization of assets. We next address how turnover increases. Firms can use their investment policy to improve the efficiency of their assets in two ways. One strategy is to acquire highly productive assets, resulting in an increase in the overall sales-to-asset ratio. The other strategy is to increase turnover by liquidating unproductive assets. The first alternative leads to efficiency gains via growth, whereas the latter alternative accomplishes the same objective through asset reduction. How

firms improve asset utilization is important in distinguishing between the signaling and free cash flow hypotheses.

The information signaling hypothesis argues that managers repurchase shares to signal their improved growth prospects. The free cash flow hypothesis argues that managers return cash to shareholders in lieu of investing in unproductive assets. Thus, documenting that increases in turnover are accomplished through asset acquisitions would be consistent with the signaling hypothesis. Alternatively, evidence indicating that managers increase asset productivity by eliminating poorly performing assets would be more consistent with the free cash flow hypothesis. For this reason, we examine how repurchasing firms acquire and dispose of assets. In particular, we focus on capital expenditures, disposal of assets, and the growth rates of assets and sales. The univariate statistics and regression results on these variables are reported in Tables 5 and 6, respectively. All variables in Tables 5 and 6 are paired differences of repurchasing firms and control firms.

Our proxy for asset sales over year t is computed as assets at end of year t, minus assets at end of year $(t-1)$, minus capital expenditures in year t, plus depreciation in year t. As an alternative, we considered summing sale of property, plant, and equipment (COMPUSTAT item #107) and sale of investments (COMPUSTAT item #109). However, this resulted in the loss of a substantial number of observations, due to the fact that many firms either do not report proceeds from asset sales, or they combine these proceeds with other items. Furthermore, Kim (1997) shows that the sum of property, plant, and equipment, plus sale of investments, dramatically understates the level of asset sales.

The evidence in Tables 5 and 6 indicates that share repurchases are accompanied by both a lower growth rate in assets, and sales of existing assets, but not by a significant change in capital expenditures. These observations are all relative to control firms. For low-q firms, we see a significant decline in the growth rate in assets prior to the repurchase, as well as significant sales of assets prior to, and following, the repurchase. High-q firms show a decline in asset growth following the repurchase, and also display increases in asset sales just prior to and continuing after the repurchase. Examination of asset sales as a percentage of the market value of assets in Table 5 reveals that, for the full sample (Panel A), repurchasing firms dispose of assets at a higher rate than their industry counterparts. It appears that this process begins as early as two years prior to the repurchase and continues through the post-repurchase period. The results in Table 6 indicate that the increase in asset sales is related to the repurchase. In particular, the intercept term in the asset sales equation is significant at the 1% level. An examination of the two subsamples reveals that both high-q and low-q firms are engaged in asset sales. This evidence also suggests that firms make both an investment decision regarding the disposal of their assets, and a distribution decision vis-a-vis the returning of the proceeds of the sale to shareholders, by executing a share repurchase.

Table 5
Median firm investment policy variables surrounding tender offer share repurchases completed between 1978 and 1991. The data are taken from the primary, supplementary, tertiary, full coverage, and research COMPUSTAT tapes. The results are shown for the full sample of 242 firms, and for subsamples of firms based on Tobin's q values. Sample firms are matched with control firms on the basis of cash flow return on market value of assets, SIC code, q classification, and financial leverage. Results shown are for the median paired differences for each variable. Our definitions of each variable are displayed in Table 1. Results are evaluated using a nonparametric difference of medians test, and differences significantly different from zero at 1% and 5% level are marked with ** and * respectively. Year zero is the year of the repurchase.

Year	Capital expenditures	Asset growth	Sales growth	Asset sales	Cash
Panel A: *Full sample* ($N = 242$)					
− 3	0.0105	0.0279	− 0.0105	0.0124	− 0.0004
− 2	− 0.0021	− 0.0789*	− 0.0351	0.0182	0.0048
− 1	− 0.0059	− 0.1084**	− 0.0663**	0.0499**	0.0100
0	− 0.0019	− 0.0647*	− 0.0577**	0.1019**	− 0.0045
+ 1	− 0.0013	0.0065	− 0.0158	0.0128	− 0.0041
+ 2	0.0008	− 0.0919*	− 0.0314*	0.0400*	− 0.0089
+ 3	0.0039	0.0277	− 0.0191	0.0279	− 0.0063
Panel B: *Firms with* $q < 1$ ($N = 107$)					
− 3	0.0234*	− 0.0115	0.0157	0.0023	0.0095
− 2	0.0084	− 0.1166*	− 0.0934	0.0375	0.0008
− 1	− 0.0073	− 0.1150**	− 0.0765**	0.0682*	0.0354
0	0.0014	− 0.0545	− 0.0384*	0.1264	− 0.0212
+ 1	0.0043	0.0366	− 0.0026	0.0082	− 0.0170
+ 2	0.0030	− 0.1367	0.0183	0.0409	− 0.0125
+ 3	0.0142	0.0413	− 0.0323	0.0404	− 0.0122
Panel C: *Firms with* $q > 1$ ($N = 135$)					
− 3	0.0064	0.0422	− 0.0122	0.0180	− 0.0035
− 2	− 0.0048	− 0.0628	− 0.0278	0.0107	0.0048
− 1	− 0.0056	− 0.0975*	− 0.0644**	0.0455**	0.0061
0	− 0.0087	− 0.0696**	− 0.0645**	0.0872**	0.0043
+ 1	− 0.0020	− 0.0216	− 0.0163	0.0179	0.0006
+ 2	0.0007	− 0.0562	− 0.0524**	0.0378*	− 0.0048
+ 3	0.0016	0.0143	− 0.0062	0.0214	− 0.0046

**Significantly different from zero at the 1% level (two-tailed test).
*Significantly different from zero at the 5% level (two-tailed test).

The fact that repurchasing firms engage in asset sales in an environment where their capital expenditures remain stable favors the free cash flow hypothesis over the signaling hypothesis. First, asset sales, and curtailment of the growth rates of assets and sales, are more in the spirit of the free cash flow hypothesis

Table 6
Results from regressing post-repurchase values on pre-repurchase values, for a series of variables. The full sample consists of 242 firms that underwent a tender offer share repurchase executed between 1978 and 1991. The sample is subdivided, on the basis of Tobin's q values, into low-q and high-q subsamples. Each sample firm is matched with a control firm. The data are taken from Standard and Poor's COMPUSTAT database. The table reports regression results of the form:

$$POSTVAL = \alpha + \beta PREVAL + \varepsilon,$$

where $POSTVAL$ represents the paired difference of median post-repurchase values of a variable, and $PREVAL$ represents the paired difference of median pre-repurchase values of a variable. Variables are defined in Table 1. The pre-repurchase period covers years -3 through -1, and the post-repurchase period covers years 0 through $+3$, where year zero is the year of the repurchase. If there is missing data, the median is computed using data for the remaining years. Numbers in parentheses are t-statistics, and estimates significantly different from zero at 1% and 5% level are marked with ** and * respectively.

Variable	Intercept	β-Value	R^2	F-statistics
Panel A: *Full sample*				
Capital expenditure	−0.0006	0.2394	$R^2 = 0.080$,	$F = 18.10$**
	(−0.097)	(4.254)**		
Asset sales	0.0676	0.1629	$R^2 = 0.029$,	$F = 6.08$*
	(3.378)**	(−2.466)*		
Asset growth	0.0399	0.2347	$R^2 = 0.029$,	$F = 6.748$**
	(−1.282)	(−2.598)**		
Sales growth	−0.0287	0.2309	$R^2 = 0.020$,	$F = 4.727$*
	(−1.100)	(−2.174)*		
Panel B: *Firms with* $q < 1$				
Capital expenditure	0.0020	0.0709	$R^2 = 0.002$,	$F = 0.178$
	(0.161)	(0.414)		
Asset sales	0.0637	0.5840	$R^2 = 0.529$,	$F = 111.34$**
	(1.829)	(10.55)**		
Asset growth	0.0167	0.5654	$R^2 = 0.296$,	$F = 41.59$**
	(0.340)	(6.449)**		
Sales growth	0.0235	0.8946	$R^2 = 0.606$,	$F = 141.21$**
	(0.445)	(11.88)**		
Panel C: *Firms with* $q > 1$				
Capital expenditure	−0.0033	0.1823	$R^2 = 0.067$,	$F = 8.55$**
	(−0.476)	(2.923)**		
Asset sales	0.0715	0.2022	$R^2 = 0.024$,	$F = 2.79$
	(3.026)**	(−1.669)		
Asset growth	−0.0689	0.4115	$R^2 = 0.100$,	$F = 13.60$**
	(−1.742)	(−3.698)**		
Sales growth	−0.0711	0.2396	$R^2 = 0.047$,	$F = 6.27$*
	(−3.617)**	(−2.503)*		

which argues that firms conduct repurchases in lieu of acquiring unproductive assets. Second, even high-q firms, with presumably more attractive investment opportunities, appear to engage in similar restructuring activities. More importantly, there is no evidence to suggest that the investment opportunities of high-q firms are expanding, judging by their negative sales growth, insignificant growth in their capital expenditures, and insignificant change in their q. Therefore, even in the case of our high-q subsample, it seems unlikely that repurchases are a signal of improving growth opportunities.

One conclusion that emerges from these results is that share repurchases are rarely pure financial transactions designed merely to change the firm's capital structure. Instead, the evidence suggests that repurchases are used as part of a corporate restructuring package. In fact, many of the companies in our sample announced major restructuring plans which included asset sales, simultaneously with the repurchase announcement.[6] While the capital structure of repurchasing firms is altered in the expected direction, this change is accompanied by changes in the operations and assets of the firm. The end result of the restructuring is that the growth rate of assets is curtailed, relative to control firms. This slowdown appears to be accomplished in part through asset sales. Another conclusion that can be drawn is that this restructuring is not a short-term event. Judging by the timing of asset sales, the restructuring package is put into place prior to the repurchase and continues through the post-repurchase period.

Since these results suggest that the restructuring package that includes repurchases enhances performance, we examine the determinants of performance in the context of a multivariate regression.

4.3. How does performance improve?

We have documented significant abnormal performance in our sample of firms executing self-tender offers, but how does performance improve? To explore this question we decompose cashflow return on assets into its components, turnover and margin, as shown below:

$$CFRA_{post,i} = a_0 + a_1 TURN_{post,i} + a_2 MARG_{post,i}, \tag{2}$$

[6] Some examples include Tesoro Petroleum, Fuqua Industries, Firestone Tire and Rubber, and CSX Corp. A 7/29/82 Wall Street Journal article with the headline 'Tesoro Petroleum to Offer to Repurchase 18% of its Common in Restructuring Plan', states: 'After studying ways to restructure the company, (Tesoro) will offer to repurchase 4,000,000 shares for $22/share … in addition Tesoro said it plans to sell … most of its domestic oil and gas exploration acreage'. In its repurchase announcement, Fuqua Industries said it will finance the repurchase 'with internally generated funds from the sale of assets'. Firestone, in its repurchase announcement, indicated 'Firestone is flush with cash because it sold several businesses … Firestone began a major restructuring of its tire operations which involved closing seven US and Canadian plants … Firestone also sold a plastics subsidiary'. A Wall Street Journal article discussing CSX's repurchase and asset sale plan, dated 9/20/88, indicated that analysts estimated that the asset sales in question account for 15% of CSX's revenue.

where $CFRA_{post,i}$ is the median paired difference between the cash flow return of repurchasing firm i and its corresponding control firm, in the post-repurchase period (years 0, +1, +2, and +3). $TURN_{post,i}$ and $MARG_{post,i}$ are similarly defined for turnover and margin, respectively.

Given that an increase in asset efficiency can be accomplished either by acquiring positive NPV assets, or by selling off negative NPV assets, we specify turnover as a function of capital expenditures, and asset sales, to judge the relative importance of these two strategies:

$$TURN_{post,i} = b_0 + b_1 CAPX_{pre,i} + b_2 ASALES_{pre,i}, \quad (3)$$

where $CAPX_{pre,i}$ is the median abnormal capital expenditure, as a percentage of assets, of repurchasing firm i in the pre-repurchase period. We define capital expenditures in this way because, if capital expenditures affect performance, the effects would appear with a lag, while $CFRA_{post,i}$ could be from either year 0, +1, +2, or +3. In fact, given the evidence in Bar-Yosef et al. (1987) and Lee and Nohel (1997),[7] it is likely that higher cash flows induce greater capital expenditures. For this reason, regressing median abnormal performance in the post-repurchase period on median abnormal capital expenditures in the post-repurchase period would not provide evidence on the direction of causality, making it impossible to interpret a significant coefficient on capital expenditures. In Eq. (3), $ASALES_{pre,i}$ is the median value of excess asset sales from the pre-repurchase period, as a percentage of the market value of assets. Substituting Eq. (3) into Eq. (2) yields:

$$CFRA_{post,i} = c_0 + c_1 CAPX_{pre,i} + c_2 ASALES_{pre,i} + c_3 MARG_{post,i} + \varepsilon_i. \quad (4)$$

The results of the estimation of Eq. (4) are presented in Table 7. For the full sample, asset sales are positively and significantly related to post-repurchase abnormal performance at the 1% level. Partitioning the sample shows that the full sample results are generated by the low-q subsample. These subsample results indicate that successful repurchasing firms increase their asset efficiency by disposing of poorly performing assets.[8]

[7] Both of these papers document that earnings Granger-cause investment. Though Lee and Nohel (1997) also document causality from investment to earnings, both of these papers conclude that the causality from earnings to investment is stronger. This implies a problem if one were to run a regression of earnings, or cashflow on investment. If one were to find a positive coefficient on investment, this would not necessarily indicate that investment is an important determinant of performance, measured as cash flow, because it would not rule out cash flow as an important determinant of investment.

[8] We estimated Eq. (4) by including a dummy variable to capture the extent of insiders' participation in the repurchase. This dummy variable, ODRISK, is described in Table 8. If insiders do not participate in the repurchase, the increased insiders' stake may lead to better performance. However, we find that the coefficient on ODRISK is insignificant, while other coefficients remain qualitatively the same.

Table 7
Determinants of repurchase-related changes in cash flow return on market value of assets following tender offer share repurchases. The data are taken from Standard and Poor's COMPUSTAT database. Results are shown for regression equations of the form:

$$CFRA_{post,i} = c_0 + c_1 CAPX_{pre,i} + c_2 ASALES_{pre,i} + c_3 MARG_{post,i} + \varepsilon,$$

where $CFRA_{post,i}$ is the median post-repurchase value of cash flow return for firm i in excess of its control firm. $CAPX_{pre,i}$ is the median paired difference in capital expenditures, as a ratio of the beginning-of-year market value of assets, in the pre-repurchase period. $ASALES_{pre,i}$ is the median paired difference of asset sales deflated by market value of assets in the pre-repurchase period. $MARG_{post,i}$ is the median paired difference in the operating margin between repurchasing firm i and its control firm in the post-repurchase period. Cash flow return is defined as the ratio of sales, less cost of goods sold, less selling and administrative expenses, plus depreciation, deflated by beginning of year market value of assets (market value of equity, plus book values of debt and preferred stock, minus cash). Asset sales in a given year are defined as the change in book value of assets, plus capital expenditures, less depreciation. Operating margin is defined as operating cash flow divided by sales.

Model results	Intercept	Variable coefficients		
		Capital expenditures	Asset sales	Operating margin
Panel A: *Full sample*				
$R^2 = 0.087$ F-STAT = 6.42** $N = 207$	0.0091 (0.867)	0.1306 (1.264)	0.1380 (3.820)**	0.1380 (1.657)
Panel B: *Firms with* $q < 1$				
$R^2 = 0.158$ F-STAT = 5.32** $N = 89$	0.0398 (2.145)*	0.1906 (0.987)	0.1603 (3.281)**	0.3091 (1.880)
Panel C: *Firms with* $q > 1$				
$R^2 = 0.024$ F-STAT = 0.915 $N = 118$	− 0.0116 (− 0.996)	0.0781 (0.708)	0.0789 (1.312)	0.0545 (0.631)

**Significantly different from zero at the 1% level (two-tailed test).
*Significantly different from zero at the 5% level (two-tailed test).

The fact that there is no connection between capital expenditures and post-repurchase performance for high-q firms, combined with the evidence that performance only improves in the low-q firms and that this improvement is positively correlated with asset sales, provides more support for the free cash flow hypothesis than the signaling hypothesis.

4.4. Firm performance and the market's reaction to repurchases

Several earlier studies show that investors react very favorably to the announcement of a firm's intention to make a tender offer for its own shares (e.g., Dann, 1981; Vermaelen, 1981; Comment and Jarrell, 1991, among others). The focus of this paper thus far has been on firm operating performance, rather than stock market performance. In this section, we examine announcement-period and long-run returns associated with repurchases, and we analyze the link between investor reaction and firm operating performance. In particular, we investigate the extent to which investors anticipate an improvement in cash flow performance, and also the extent to which performance is reflected in long-run returns. Since investor reaction could also be driven by anticipated changes in risk, we study the relation between changes in systematic risk and announcement-period returns. We begin by analyzing the announcement-period returns for our sample of tender offers.

4.4.1. Announcement period returns

The announcement-period returns of our sample are presented in Table 8. The average firm executing a repurchase in our sample realizes a mean market model excess return of 7.60% in the 3-day period surrounding the announcement of the repurchase. This figure is similar to the figures reported in Comment and Jarrell (1991) for announcements from a subset of our sample years. They

Table 8
Investor response to tender offer announcements. Results shown are percentage mean and median abnormal returns computed using data from the Center for Research in Security Prices for a sample of 242 repurchases occuring between 1978 and 1991. The full sample is sorted into two subsamples based on Tobin's q values. Abnormal returns are computed over a three-day window from the day before to the day after the repurchase announcement, and are based on the market model. The estimation period for the market model parameters runs from day -110 to day -11. The announcement-to-expiration return is the raw return for repurchasing firms based on the closing stock price on the day prior to the announcement, and the closing price on the expiration date of the announcement.

Sample	Announcement return (%)		Announcement-to-expiration return (%)	
	Mean	Median	Mean	Median
Full sample	7.60**	6.15**	12.26**	11.25**
Low-q firms ($q < 1$)	9.43**	7.96**	16.93**	17.51**
High-q firms ($q > 1$)	6.18**	5.49**	8.50**	8.35**
Subsample differences	3.25**	2.47**	8.43**	9.16**

**Significantly different from zero at the 1% level (two-tailed test).
*Significantly different from zero at the 5% level (two-tailed test).

report announcement-period excess returns of 8.3% and 7.5% for fixed-price and Dutch auction share repurchases, respectively. Our results indicated differences in post-repurchase performance when firms are partitioned by Tobin's q. Therefore, we test whether announcement returns also vary on the basis of Tobin's q. Table 8 shows that announcement-period abnormal returns are significantly lower for high-q firms. In particular, high-q firms show mean announcement-period returns of 6.18%, in contrast to 9.43% for low-q firms. The difference in the subsamples is significant at the 1% level.

Lakonishok and Vermaelen (1990) find that investors continue to react positively to repurchases beyond the standard 3-day announcement period. In particular, they show that if an investor were to purchase shares in a repurchasing firm after the announcement, 6 days prior to expiration, and tender at expiration, they would earn a 6.18% abnormal return. For this reason, in addition to the announcement-period returns, we calculated returns using an announcement-to-expiration window. The results displayed in Table 8 support Lakonishok and Vermaelen (1990) in that share prices appear to continue to increase beyond the announcement period. The mean announcement-to-expiration returns are 12.26%, 16.93%, and 8.50% for the full sample, low-q subsample, and high-q subsample respectively: All results shown in Table 8 are significant at the 1% level. Furthermore, the difference in the announcement-to-expiration returns between the high-q and low-q subsamples is 8.43%, again significant at the 1% level.

Denis (1990) shows that the reaction to defensive repurchases, i.e., those undertaken to avert a potential takeover, have a dramatically lesser effect on shareholders than those documented for the universe of repurchases. We refer to these firms as being 'in play'. Furthermore, Comment and Jarrell (1991) find that announcement returns are higher when officers and directors are 'at risk'. They define officers and directors as being at risk when they pledge not to participate in the repurchase, along with other criteria. We investigated the importance of the repurchasing firm being in play as well as the impact of officers and directors being at risk, for both announcement-period returns (AR) and announcement-to-expiration returns (AER). We regress AR (and AER) on INPLAY, a dummy variable that takes on a value of 1 if the firm was mentioned as a takeover target in the Wall Street Journal in a window surrounding the repurchase announcement, and 0 otherwise, and ODRISK, a dummy variable that equals 1 when insiders are at risk, and 0 otherwise. The results reported in Table 9 show that both INPLAY and ODRISK are significantly related to announcement- period returns, as well as to announcement-to-expiration returns. The negative coefficient on INPLAY supports the results of Denis (1990). This indicates that firms that are in play use repurchases as a defensive move against a takeover threat. Thus, it appears that when these firms announce a repurchase, investors revise downward the probability that the firm will be taken over. An alternative explanation would be that investors anticipate the possibility of a repurchase

Table 9
Regression results, testing for the effect of takeover rumors and at-risk directors on announcement returns, for a sample of 242 repurchases occuring between 1978 and 1991. For these equations, announcement returns are the abnormal returns over the 3-day event window from the day before to the day after the repurchase announcement, and announcement-to-expiration returns are raw returns for repurchasing firms, based on the closing stock prices for the day prior to the announcement and the expiration date of the tender offer. Data are taken from the Wall Street Journal, the Center for Research in Security Prices, and the SEC Official Summary of Insiders Transactions and Holdings. *INPLAY* is a dummy variable that equals one if the firm is a takeover target, or rumored to be, and zero otherwise. *ODRISK* is a dummy variable that equals one when the firms' officers and directors are at risk, and zero otherwise. Insiders are defined as being at risk if the tender offer premium is at least 2% above the pre-announcement stock price, and if insiders' proportional ownership does not decline as a result of the repurchase.

Returns	Intercept	Coefficients		Test statistics	Sample size
		INPLAY	ODRISK		
Announcement	0.0503	− 0.0536	0.0452	$R^2 = 0.09$	$N = 231$
	(4.20)**	(− 3.10)**	(3.39)**	$F = 11.43$**	
Announcement-to-expiration	0.0766	− 0.0754	0.0748	$R^2 = 0.09$	$N = 227$
	(4.06)**	(− 2.79)**	(3.58)**	$F = 10.97$**	

**Significantly different from zero at the 1% level.
*Significantly different from zero at the 5% level.

when the firm becomes a target, and bid up the stock price at that time, mitigating the surprise when the repurchase is announced. Comment and Jarrell (1991) interpret the positive coefficient on ODRISK as supporting the signaling hypothesis on the grounds that, by not participating in the repurchase, insiders are sending a strong signal about the firm's prospects. However, an alternative explanation of the positive coefficient on ODRISK within the agency cost framework is that, by not participating in the repurchase, insiders increase their stake, thereby lowering agency costs.

4.4.2. Changes in risk

Recently, Hertzel and Jain (1991) report that firms executing self-tender offers show a significant decline in risk following the repurchase. Their results are based on an estimate of systematic risk for the period beginning just after the repurchase announcement, and extending forward for 250 trading days. They then compare that estimate with an estimate of systematic risk obtained using an alternative 250 trading day window, ending just prior to the repurchase. They document that both market and total risk decline, based on the estimates of a market model using daily data. More recently, Denis and Kadlec (1994) question these and others' findings of event-induced changes in risk. They argue

Table 10
Risk changes following share repurchases. β is an estimate of the systematic risk, and the change in β is defined as the change from the pre-repurchase period to the post-repurchase period. Pre-repurchase β's are computed using three years of monthly data running from 38 months prior to the event to 3 months prior to the event, and post repurchase β's are computed using three years of monthly data starting with the month after the event month, and running to 36 months after the event month. The change in the standard deviation of returns ($\Delta\sigma$) is similarly defined. If a firm disappears prior to the end of the post repurchase period it is assumed to earn the market return for the balance of the post repurchase period. These variables are computed using stock return data from the Center for Research in Security Prices for a sample of 242 repurchases occuring between 1978 and 1991. The full sample is sorted into two subsamples based on Tobin's q values.

Sample	Change in β		Change in σ	
	Mean	Median	Mean	Median
Full sample	− 0.15**	− 0.03**	− 0.05**	− 0.04**
Low q firms	− 0.18**	− 0.04**	− 0.05**	− 0.05**
High q firms	− 0.14**	− 0.02*	− 0.05**	− 0.04**

**Significantly different from zero at the 1% level (two-tailed test).
*Significantly different from zero at the 5% level (two-tailed test).

that the reduction in risk can be entirely attributed to a post-event widening of the bid–ask spread, and to problems of non-synchronous trading. To avoid the problems raised by Denis and Kadlec (1994), we estimate pre- and post-event risk using 3 years of monthly data. It is unlikely that monthly returns suffer from the problem of non-synchronous trading.

Table 10 reports our estimation of pre- and post-repurchase systematic risk, as well as total risk. The entire sample shows a dramatic drop in both systematic risk (β) and total risk. Partitioning the sample according to pre-event Tobin's q shows that the decline in risk is substantial in both sub-samples. Additionally, for either risk measure, the difference between low-q and high-q firms is insignificant at standard significance levels.[9]

4.4.3. Performance, announcement returns, and risk changes

In this section, we investigate to what extent announcement returns anticipate changes in operating performance. However, it has been documented in earlier work (see, e.g., Bagwell, 1992) that announcement returns are positively related to the premium on the tender offer, as well as the fraction of shares sought. For

[9] We also investigated the sources of post-repurchase period risk changes, by regressing risk changes, both systematic and total risk, against performance, asset sales, turnover, and margin. Only asset sales had explanatory power. The negative coefficient that we estimate on this variable indicates that asset sales are partially responsible for the decline in risk.

this reason, we include these variables in Eq. (5), below. Additionally, in explaining the announcement returns, in this regression we also control for changes in systematic risk (as in Hertzel and Jain, 1991), whether or not the firm was in play (as in Denis, 1990), whether insiders are at risk (as in Comment and Jarrell, 1991), and pre- and post-repurchase asset sales:

$$AR_i = d_0 + d_1 CFRA_{post,i} + d_2 PREM_i + d_3 FRAC_i + d_4 \Delta\beta + d_5 ASALES_{pre,i} + d_6 INPLAY_i + d_7 ASALES_{post,i} + d_8 ODRISK_i + \varepsilon_i, \quad (5)$$

where AR is the market model adjusted 3-day abnormal return from day -1 to $+1$, PREM represents the premium offered above and beyond the current price, as a percentage of the current price, FRAC represents the fraction of outstanding shares sought, and $\Delta\beta$ represents the change in market risk following the repurchase.[10] $ASALES_{pre,i}$ and $ASALES_{post,i}$ are the median excess asset sales, as a percentage of the market value of assets, in the pre-repurchase period and the post-repurchase period, respectively, and $CFRA_{post,i}$ is the median excess cash flow return in the post-repurchase period. $INPLAY$ and $ODRISK$ are defined as in Section 4.4.1. Eq. (5) is estimated for the full sample, as well as for the two sub-samples. In order to control for heteroskedasticity, all variables, except the dummy variables $ODRISK$ and $INPLAY$, are standardized by the standard error of the stock returns for the repurchasing firms during the 100-day window beginning on day -110. The estimates of Eq. (5) are presented in Table 11.

After controlling for these relevant variables, we find that announcement period returns are significantly related to post-repurchase abnormal performance. In particular, the estimated coefficient on performance is positive and significant at the 5% level. Partitioning the sample reveals that this result is again generated by the low-q subsample. The fact that performance is positive and significant in the low-q subsample, and insignificant in the high-q subsample, indicates that investors correctly anticipate the superior performance of low-q firms and the mediocre performance of high-q firms. For both subsamples, the coefficients on $PREM$, $FRAC$, and $INPLAY$ have the expected signs, and are all significant. The results in Table 11 point to a possible explanation for the higher announcement returns of low-q firms documented in Table 8. The premium offered, the fraction of shares sought, and the firm being 'in play' are all

[10] It is not obvious how PREM should be defined in the case of Dutch auction repurchases because, at announcement, investors are unaware of what the final repurchase price will be. For Dutch auction repurchase we define PREM using the high-end price of the range of acceptable prices specified in the announcement. We also tried alternative specifications, where PREM is calculated using either the low end of the price range or the midpoint of the price range. The results for these alternative specifications are similar to those reported in Table 11 and are thus not reported.

Table 11
Relation between repurchase-related announcement returns, terms of the repurchase, and post repurchase period performance and actions. $CFRA_{post,i}$ is the median post-repurchase value of cash flow return for firm i in excess of its control firm. $FRAC$ is the fraction of shares sought in the repurchase, $PREM$ is the tender offer price less the pre-offer price divided by the pre-offer price. $\Delta\beta$ is the change in systematic risk from the pre-repurchase period to the post-repurchase period. $ASALES_{pre,i}$ is the median paired difference of asset sales deflated by market value of assets in the pre-repurchase period. $ASALES_{post,i}$, is similarly defined for the post-repurchase period. $INPLAY$ is a dummy variable that equals one if the firm is a takeover target, or rumored to be, and zero otherwise. $ODRISK$ is a dummy variable that equals one when the firms' officers and directors are at risk, and zero otherwise. To control for heteroskedasticity, all variables (except for the dummy variables $ODRISK$ and $INPLAY$) are standardized by the standard error of repurchasing firms' stock returns during the 100-day window beginning on day -110. Coefficients significant at the 1% and 5% levels are noted with a ** and a *, respectively (two-tailed test).

$$AR_i = d_0 + d_1 CFRA_{post,i} + d_2 PREM_i + d_3 FRAC_i + d_4 \Delta\beta_i + d_5 ASALES_{pre,i} + d_6 INPLAY_i + d_7 ASALES_{post,i} + d_8 ODRISK_i + \varepsilon_i$$

	Full sample	Low q firms	High q firms
Intercept	−0.7111	−1.9910	−0.0174
	(−0.929)	(−0.962)	(−0.023)
Cash flow	0.0942	0.1691	0.0459
	(2.066)*	(2.089)*	(0.853)
Premium	0.2012	0.1796	0.2802
	(5.920)**	(3.650)**	(5.388)**
Shares sought	0.2386	0.3098	0.1655
	(5.427)**	(3.962)**	(3.135)**
Change in risk	−0.0209	0.0055	−0.0218
	(−1.915)	(0.211)	(−1.944)
Asset sales(pre-repurchase)	−0.0109	0.0812	−0.0791
	(−0.399)	(1.505)	(−2.405)*
Takeover target	−3.5482	−3.6253	−3.7562
	(−3.746)**	(−2.035)*	(−3.422)**
Asset sales(post-repurchase)	0.0361	0.0836	−0.0151
	(0.955)	(1.253)	(−0.540)
Directors at risk	2.0043	2.8800	1.3218
	(2.771)**	(1.579)	(1.758)
R^2	0.458	0.474	0.527
F	16.60**	6.42**	12.67**
N	166	66	100

important determinants of the announcement-period returns in both subsamples. The fact that low-q firms both generate performance improvement and that this improvement is anticipated by investors, may account for the higher announcement-period returns of the low-q firms. The results in Table 11 also

indicate that there is a weakly positive, although insignificant, relation between announcement-period returns and pre-repurchase asset sales in the low-q subsample, and a strongly negative and significant relation between announcement returns and pre-repurchase asset sales in the high-q subsample.

Earlier, we reported that systematic risk declines significantly for both subsamples (Table 10). However, this decline in risk is only related to the announcement returns for high-q firms. This anticipation of lower risk, combined with the importance of the premium offered and fraction of shares sought, could explain why the announcement returns are positive for high-q firms, in spite of a lack of positive abnormal performance following the repurchase. It appears that investors focus on changes in expected risk when evaluating the repurchase announcements of high-q firms, but not in the case of low-q firms.

4.4.4. Long-run returns

Finally, we study the impact that share repurchases have on long-run 'buy-and-hold' returns. Announcement returns reflect expectations about the changes firms will undergo as a result of repurchases, while long-run returns capture how investors revise their expectations due to realizations. There is prior evidence that investors revise their expectations upward following repurchases. In particular, using the sample period from 1962–1986, Lakonishok and Vermaelen (1990) document that, starting 3 months after a repurchase tender offer, investors earn significant excess returns (12.34%, significant at the 1% level) for buying and holding shares in a portfolio of repurchasing firms for the ensuant 24 months. However, they also find that long-run returns depend on the sample period selected. For example, their estimate of the mean long-run return is only 5.05%, and insignificant, in the 1980–86 period, a period which better matches our sample. We use a similar methodology to compute long-run returns over a period of 3 years following the repurchase, to better match in with our window of performance measurement. For our entire sample, we see a mean 3-year abnormal return of 10.30%, which is insignificantly different from zero. The figures for low-q and high-q subsamples are 15.44% and 6.23% respectively, both also insignificantly different from zero. The fact that investor expectations are not revised indicates that the market is correct, on average, in interpreting the information in the repurchase announcement.

To examine the relation between operating performance improvements and long-run returns, we estimate the following regression:

$$LR_i = e_0 + e_1 CFRA_{post,i} + e_2 PREM_i + e_3 FRAC_i + e_4 \Delta\beta_i + e_5 INPLAY_i + \varepsilon, \quad (6)$$

where LR is the 3-year monthly compounded buy-and-hold return, other variables are as defined earlier. To control for heteroskedasticity, all variables, other than the $INPLAY$ dummy, are standardized by the standard error of the

monthly stock returns of repurchasing firms during the three-year pre-repurchase period beginning 38 moths before the event. The estimation of Eq. (6) is given in Table 12. The most interesting result comes from comparing the results for low-q versus high-q firms. The estimate of e_1 is significant at the 1% level for high-q firms, but is smaller and insignificant for low-q firms. This indicates that the systematic performance improvements displayed by low-q firms are correctly anticipated by investors, and capitalized at the repurchase announcement. It also indicates that investors do not expect systematic post-repurchase

Table 12
The relation between long-run returns and post-repurchase operating performance and risk changes, and the terms of the tender offer, for a sample of 242 firms making repurchase tender offers between 1978 and 1991. Long-run returns are computed based on monthly returns from the Center for Research in Security Prices. The relation is estimated using the equation:

$$LR_i = e_0 + e_1 CFRA_{post,i} + e_2 PREM_i + e_3 FRAC_i + e_4 \Delta\beta + e_5 INPLAY_i + \varepsilon_i,$$

where LR_i is the market-adjusted buy-and-hold long-run return during the three years following the repurchase starting at the expiration of the tender offer. $CFRA_{post,i}$ is the median post-repurchase value of cash flow return for firm i in excess of its control firm. $FRAC$ is the fraction of shares sought in the repurchase, $PREM$ is the tender offer price less the pre-offer price divided by the pre-offer price. $\Delta\beta$ is the change in systematic risk from the pre-repurchase period to the post-repurchase period. $INPLAY$ is a dummy variable that equals one if the firm is a takeover target, or rumored to be, and zero otherwise. To control for heteroskedasticity, all variables (other than the $INPLAY$ dummy) are standardized by the standard error of repurchasing firms' monthly stock returns during the three year pre-repurchase period.

Estimate	Full sample	Low q	High q
Intercept	2.9307	3.9746	2.1071
	(1.974)*	(1.578)	(1.128)
Cash flow	1.7446	1.0425	3.0176
	(2.947)**	(1.275)	(3.225)**
Premium offered	0.3903	0.3932	0.5127
	(0.984)	(0.777)	(0.742)
Shares sought	− 0.4265	− 0.4165	− 0.1723
	(− 0.79)	(− 0.499)	(− 0.233)
Change in risk	0.7055	1.0408	0.5538
	(4.825)**	(3.973)**	(3.029)**
Takeover target	− 2.9144	− 7.3787	− 0.0071
	(− 1.033)	(− 1.641)	(− 0.002)
R^2	0.171	0.218	0.182
F	7.34**	4.08**	4.41**
N	184	79	105

**Significantly different from zero at the 1% level (two-tailed test).
*Significantly different from zero at the 5% level (two-tailed test).

improvements from high-q firms, and are positively surprised when such improvements happen. Thus, they react to these gains when they occur, and not at the announcement.

Another significant result in Table 12 is that, as expected, changes in systematic risk and long-run returns are positively related for the full sample, as well as both subsamples. The change in systematic risk has a negative coefficient in the announcement return regression (Table 11), and a positive coefficient in the long-run returns equation (Table 12). This indicates, as in French et al. (1987), that in anticipation of future risk changes, there is an immediate negative relation and a future positive relation between changes in systematic risk and stock returns.[11]

4.5. Robustness of results

Our findings appear to be robust with respect to: control firm and repurchasing firm sample selection criteria, alternative definitions of some variables, and the length of the window used to measure investor reaction to the repurchase. For example, in each iteration of the paper, we have refined the control firm selection criteria to generate the best possible matches for our repurchasing firms. In particular, we initially selected SIC code as the highest priority matching variable. Subsequently, the paper of Barber and Lyon (1996) drew our attention to the importance of performance as a matching variable, and therefore we included it as the highest priority criterion, while keeping SIC code as the second-highest priority, in the next version. In the final version of the paper, we refined our criteria further to include q classification, given the importance of q classification in our results. Repeating the empirical tests with control firms chosen by these three different matching procedures produced qualitatively similar results.

Additionally, we initially had a requirement that, to be included in our sample, repurchasing firms needed to have complete data for the entire 8-year window surrounding the repurchase. Another indication of the robustness of our results is that when we relaxed this requirement, to eliminate the potential for survivorship bias, our results remain qualitatively similar.

Finally, we have also repeated all of our tests excluding all firms that were rumored to be takeover targets. Furthermore, we have used alternative definitions of premium, in Dutch auction repurchases, and investor reaction to the repruchase, using announcement-to-expiration returns instead of announcement-period returns, in all of the appropriate tests. Our results are robust with respect to each of these alternative specifications.

[11] We thank the referee for pointing this out.

5. Conclusion

In this paper, we examine why investors react favorably to tender offer share repurchases. The two most widely accepted explanations of the motivation behind share repurchases are the information signaling hypothesis and the free cash flow hypothesis. Previous studies attempt to distinguish between these two hypotheses by examining announcement-period abnormal returns. However, announcement-period returns may not contain sufficient information to differentiate between these two hypotheses. We propose that firm operating performance following repurchases, and its determinants, can be examined to determine whether or not the growth prospects of firms indeed improve, as suggested by the signaling hypothesis. Furthermore, we acknowledge the possibility that different firms may execute repurchases for different reasons, based on their investment opportunities. Accordingly, we conduct all our tests on the full sample of repurchasing firms, as well as subsamples partitioned on the basis of Tobin's q. Our results support the free cash flow hypothesis as the predominant explanation of the positive investor reaction to repurchase announcements.

We observe that firm operating performance improvements following share repurchases are confined to the low-q subsample. In particular, 3-year median post-repurchase cumulative operating performance is a highly significant 23.30% for low-q firms, compared with an insignificant -1.94% for high-q firms.

Further evidence that the repurchase-related actions of firms in our sample are supportive of the free cash flow hypothesis over the signaling hypothesis is provided by our following findings. We find that the performance gains of low-q firms are generated by their ability to significantly improve their asset utilization (turnover). Our results indicate that improvements in turnover are generated by a combination of asset sales and a lack of growth in capital expenditures. The net impact of these two actions is such that the growth rate of assets declines. Thus, repurchases do not appear to be pure financial transactions meant to change the firm's capital structure, but are part of a restructuring package meant to shrink the assets of the firm. Moreover, asset sales are positively correlated with post-repurchase performance only in the case of low-q firms. This indicates that successful repurchasing firms (low-q) are engaged in restructuring by selling off assets and distributing cash. This evidence, combined with the lack of repurchase-related gains in high growth firms, leads us to conclude that the positive investor reaction to share repurchases is best explained by the free cash flow hypothesis.

Finally, the tests we conduct on announcement-period and long-run returns indicate that investors correctly anticipate that low-q firms generate performance improvements, and high-q firms do not. Thus, investors value repurchases efficiently. The fact that low-q firms generate performance improvement,

and this improvement is anticipated by investors, may account for the higher announcement returns of the low-q firms.

References

Bagwell, L., 1992. Dutch auction repurchases: an analysis of shareholder heterogeneity. Journal of Finance 47, 71–105.

Barber, B., Lyon, J., 1996. Detecting abnormal operating performance: the empirical power and specification of test statistics. Journal of Financial Economics 41, 359–399.

Bar-Yosef, S., Callen, J., Livnat, J., 1987. Autoregressive modeling of earnings-investment causality. Journal of Finance 42, 11–28.

Billett, M., Flannery, M., Garfinkel, J., 1995. The effect of lender identity on a borrowing firm's equity return. Journal of Finance 50, 699–718.

Boehmer, E., Musumeci, J., Poulsen, A.B., 1991. Event-study methodology under conditions of event-induced variance. Journal of Financial Economics 30, 253–272.

Comment, R., Jarrell, G., 1991. The relative signaling power of Dutch auction and fixed price self-tender offers and open-market share repurchases. Journal of Finance 46, 1243–1271.

Constantinides, G., Grundy, B., 1989. Optimal investment with stock repurchase and financing as signals. Review of Financial Studies 2, 445–466.

Cornett, M., Tehranian, H., 1992. Changes in corporate performance associated with bank acquisitions. Journal of Financial Economics 31, 211–234.

Dann, L., 1981. Common stock repurchases: an analysis of returns to bondholders and stockholders. Journal of Financial Economics 9, 113–138.

Dann, L., Masulis, R., Mayers, D., 1991. Repurchase tender offers and earnings information. Journal of Accounting and Economics 14, 217–251.

Denis, D.J., 1990. Defensive changes in corporate payout policy: share repurchases and special dividends. Journal of Finance 45, 1433–1456.

Denis, D.J., Denis, D.K., Sarin, A., 1994. The information content of dividend changes: cash flow signaling, overinvestment, and dividend clienteles. Journal of Financial and Quantitative Analysis 29, 567–588.

Denis, D., Kadlec, G., 1994. Corporate events, trading activity, and the estimation of systematic risk: evidence from equity offerings and share repurchases. Journal of Finance 49, 1787–1812.

Easterbrook, F., 1984. Two agency-cost explanations of dividends. American Economic Review 74, 650–659.

French, K., Schwert, G., Stambaugh, R., 1987. Expected stock returns and volatility. Journal of Financial Economics 19, 3–29.

Healy, P., Palepu, K., Ruback, R., 1992. Does corporate performance improve after mergers. Journal of Financial Economics 31, 135–175.

Hertzel, M., Jain, P., 1991. Earnings and risk changes around stock repurchase tender offers. Journal of Accounting and Economics 14, 253–274.

Howe, K., He, J., Kao, G., 1992. One time cash flow announcements and free cash flow theory: share repurchases and special dividends. Journal of Finance 47, 1963–1976.

Jensen, M., 1986. Agency costs of free cash flow, corporate finance, and take overs. American Economic Review 76, 323–329.

Kim, C., 1997. The effects of asset liquidity on managerial decisions: evidence from the contract drilling industry. Unpublished working paper. University of Chicago, IL.

Lakonishok, J., Vermaelen, T., 1990. Anomalous price behavior around repurchase tender offers. Journal of Finance 45, 455–477.

Lang, L., Litzenberger, R., 1989. Dividend announcements: cash flow signaling vs. free cash flow hypothesis. Journal of Financial Economics 24, 181–191.

Lee, B., Nohel, T., 1997. Value maximization and the information content of corporate investment with respect to earnings. Journal of Banking and Finance 21, 661–683.

Lehn, K., Poulsen, A., 1989. Free cash flow and stockholder gains in going private transactions. Journal of Finance 44, 771–788.

Lie, E., McConnell, J., 1998. Earnings signals in fixed price and Dutch auction self tender offers. Journal of Financial Economics, forthcoming.

Morck, R., Shleifer, A., Vishny, R., 1988. Management ownership and market valuation: an empirical analysis. Journal of Financial Economics 20, 293–316.

Ofer, A., Thakor, A., 1987. A theory of stock price responses to alternative corporate cash disbursement methods: stock repurchases and dividends. Journal of Finance 42, 365–394.

Perfect, S., Petersen, D., Petersen, P., 1995. Self tender offers: the effects of free cash flow, cash flow signaling, and the measurement of Tobin's Q. Journal of Banking and Finance 19, 1005–1023.

Servaes, H., 1991. Tobin's Q and the gains from takeovers. Journal of Finance 46, 409–420.

Tarhan, V., Spindt, P., Nohel, T., 1998. Investor valuation of corporate acquisitions as joint investment and financing decisions. Unpublished working paper, Tulane University, New Orleans, LA.

Vermaelen, T., 1981. Common stock repurchases and market signaling: an empirical study. Journal of Financial Economics 9, 139–183.

Vermaelen, T., 1984. Repurchase tender offers, signaling, and managerial incentives. Journal of Financial and Quantitative Analysis 19, 163–181.