

Information Asymmetry, Signaling, and Share Repurchase

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We examine whether share repurchase announcements or actual share repurchases provide reliable signals to convey information to investors. We find that increases in operating performance and decreases in systematic risk are correlated with actual repurchase amounts but are not correlated with repurchase announcements. Further, we find that long-run abnormal stock returns are correlated with actual repurchase amounts but not with repurchase announcements. The paper has important implications for research on stock repurchases, since most literature to date has focused on the announced repurchase magnitude, which may lead to misleading results.

Keywords: Share repurchase, operating performance, signaling

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Information Asymmetry, Signaling, and Share Repurchase

Repurchasing of shares has represented a growing proportion of total U.S. corporate payouts in recent years. The ratio of expenditure on the purchase of common and preferred stocks to market value has risen from 0.19% in 1972 to 1.36% in 2000, whereas the ratio of total dividends declared on common stocks to market value has decreased from 2.19% to 1.2% over the same period (Grullon and Michaely, 2002). Moreover, both Fama and French (2001) and Grullon and Michaely (2002) show that the number of firms that repurchase has increased dramatically. As the importance of share repurchases increases, the economic motivations behind the decision to repurchase shares have attracted increased academic attention.

Most researchers and managers agree that share repurchases convey information, which reflects the economic motivations behind repurchase decisions (Brav, Graham, Harvey, and Michaely (2005)). The literature proposes two potential ways that managers can use share repurchases as signals to overcome the information asymmetry that exists between principal and agents. The first rationale is the signaling hypothesis (Bhattacharya (1979), Miller and Rock (1985), and Vermaelen (1984)), which suggests that managers who have private information about future cash flows can use repurchases as a signal of future profitability. The signaling hypothesis implies that profitability will improve after share repurchases. The second rationale is the free cash-flow hypothesis, which suggests that firms repurchase their shares to mitigate potential waste of cash by management (Jensen (1986)). The theory suggests that firms that have been experiencing a reduction in growth opportunities are more likely to repurchase their shares, leaving fewer funds available to invest in uneconomic projects. When the value of growth options represents a

lower portion of the firm's total value, the overall risk of the firm will decline (because the growth options of the firm are likely to be riskier than the assets in place). Therefore, the free cash-flow hypothesis also implies that firms' systematic risk will decrease after repurchase decisions.

In this paper we attempt to determine the nature of the signal conveyed by open-market share repurchases. We examine the repurchase announcement and the actual repurchase decision separately, as they convey different signals. We are motivated by the fact that extant literature provides no consensus as to what information the repurchase announcements actually contain. For example, Bartov (1991), Comment and Jarrell (1991), and Lie (2005) favor the signaling hypothesis, whereas Jagannathan and Stephens (2003), Grullon and Michaely (2004), and Li and McNally (2007) favor the free cash-flow hypothesis. This controversy may be due to the uncommitted nature of repurchase announcements (Lie (2005)). This represents an important difference between the declaration of share repurchase programs and the declaration of dividend payments – the latter becomes a firm's obligation once declared whereas the former does not. For example, firms may simply announce repurchase intentions to mimic competitors that have previously made such announcements (Massa, Rehman and Vermaelen (2007)). Consequently, we conjecture that it may be the actual repurchase activities and not the repurchase intention announcements that convey information associated with the economic motivations of share repurchases.

Evidence documented in this paper suggests that the real changes associated with share repurchases (i.e., the improvements in firms' operating performance and the reduction in firms' systematic risk) are correlated only with the actual repurchase

magnitude, but not with the announced magnitude. With respect to operating performance, we find significantly positive abnormal operating performance only among firms that repurchase more than three percent of shares outstanding in that year; firms that repurchase less than one percent of shares outstanding actually experience significantly negative abnormal operating performance in that year. With respect to change in systematic risk, we find a significant reduction in systematic risk after the announcement of share repurchases. Using the CAPM model, we find that the market beta decreases by 0.095 on average. Using the Fama-French Three-Factor model, we find that while the factor loadings on market excess return and HML do not change at a statistically significant level, the factor loading on SMB decreases by 0.12 on average. This finding suggests that, consistent with the free cash-flow hypothesis, firms that repurchase shares behave more like larger firms than before. However, we do not find a statistically significant reduction in systematic risk over the 36-month period subsequent to repurchase announcements among firms that do not actually repurchase shares for more than 0.5 percent of total shares outstanding. With these findings (and others reported in the paper), we conclude that the information content of share repurchases is revealed by the actual repurchase activities and that the announced magnitude conveys little, if any, information about the economic motivations behind share repurchase decisions.

We further examine the stock returns of repurchasing firms to see whether the signal is being received by investors. If only the actual repurchase magnitude conveys information associated with share repurchases, the abnormal returns around the repurchase announcement dates should be correlated only with the actual future (unknown) magnitude, but not with announced magnitude. However, our evidence

suggests the exact opposite: the abnormal returns around the announcement dates are positively correlated with the announced magnitude, but not with the actual repurchase magnitude. This indicates that investors fail to take actual repurchase magnitude into account when responding to the repurchase announcements. However, it may be difficult for investors to estimate future actual repurchase magnitude on announcement dates (Stephens and Weisbach (1998), Jagannathan, Stephens, and Weisbach (2000)).

To find out whether investors' inability to estimate the actual repurchase magnitude causes the above mentioned inconsistency, we examine the long-run abnormal stock returns of repurchasing firms. We conjecture that as real changes and actual repurchase magnitude are revealed gradually and since actual repurchase magnitude was not incorporated into announcement returns, long-run abnormal stock returns subsequent to repurchase announcements should be correlated with the actual repurchase magnitude; and since announced magnitude has already been incorporated into announcement returns, long-run stock abnormal returns should not be correlated with the announced magnitude. Our findings confirm this conjecture: we find that the abnormal stock returns of repurchasing firms over the 36 months subsequent to the announcements are only correlated with the actual repurchase magnitude, but not with the announced magnitude.

This paper is related to several strands of literature. The first strand of related literature investigates the motivations of open-market share repurchases and the source of economic gain from open-market share repurchases. Bartov (1991) documents positive unexpected annual earnings in the repurchase announcement year and positive revisions of earnings forecasts by analysts around announcement dates. He concludes that, overall, open-market repurchases convey information about earnings. Maxwell and Stephens

(2003) analyze stock and bond returns around repurchase announcements. They find evidence consistent with both signaling and wealth redistribution (from bondholders to shareholders) hypotheses. Chan, Ikenberry, and Lee (2003) analyze three key economic motivations – undervaluation, disgorgement of free cash flow and leverage. They find evidence supporting the undervaluation and free cash-flow hypotheses and little support for the leverage hypothesis. In contrast, Grullon and Michaely (2004) document evidence that announcements of open-market share repurchase programs are not followed by an increase in operating performance. They therefore conclude that the information content of share repurchases is primarily related to a reduction in agency conflict and preclude the possibility that earnings are likely to recover in the long run¹. All of these studies use announced repurchase magnitude to proxy for the economic scale of repurchase programs. Lie (2005) highlights the importance of actual share repurchases by providing evidence that firms' operating performance improves only after firms actually repurchase a significant portion of shares outstanding. Gong, Louis, and Sun (2008) further find that both post-repurchase abnormal returns and reported improvement in operating performance are at least in part driven by pre-repurchase downward earnings management. Our study extends Lie's study by providing striking new evidence (1) that whether the motivation of share repurchases is for signaling future profitability or showing managers' commitment to reduce agency costs, only actual repurchase magnitude matters and announced repurchase magnitude provides little additional information beyond what is already known by the market; and (2) that even for firms that actually repurchase a significant portion of their total equity value, announced repurchase

¹ Using samples of special dividends, regular dividend increases, and self-tender offers, Lie (2000) also finds that the stock price reaction is positively related to excess funds for self-tender offers.

magnitude still conveys little additional information. Since announced repurchase magnitude is often used as the most important variable to proxy for the economic motivation of the repurchase program in prior studies, our study has important implications for future research by highlighting the need to differentiate between announced and actual repurchase magnitudes.

The second related literature focuses on the “option” nature of open-market share repurchases. Bhattacharya and Dittmar (2004) argue that undervalued and ignored firms may use “cheap talk” (e.g., announce open-market share repurchase programs but do not actually repurchase shares) to attract the attention of speculators. Chan, Ikenberry, Lee, and Wang (2005) investigate whether some repurchase programs are motivated by intent to mislead the market. They find evidence consistent with the notion that, in some cases, managers may be using repurchase programs to manipulate market opinion. Two conditions are presumably required for the existence of “cheap talk” behavior. First, to give firms motivation to pursue “cheap talk”, the market reaction should be positive to the “talk” itself, at least in the short term. Second, there should be no significant real changes caused by the “cheap talk” in the long run (otherwise, it is no longer “cheap”). Our results suggest that these two conditions can indeed be satisfied. Our study thus provides supplemental evidence for the possible existence of “cheap talk” behavior.

Finally, the third related literature analyzes the source of the long-run abnormal return experienced by repurchasing firms. Ikenberry, Lakonishok, and Vermaelen (1995) examine long-run firm performance following open market share repurchase announcements. They attribute the long-run drift of repurchasing firms’ stock returns to investors’ under-reaction to the information conveyed by the repurchase announcements.

Using data from Canadian market, Ikenberry, Lakonishok, and Vermaelen (2000) find that mis-pricing affects repurchasing firms' completion rate. Peyer and Vermaelen (2005) find that long-run abnormal stock performance is related to the stated reasons at the announcement. Our study provides another explanation for the long-run abnormal stock returns of repurchasing firms: announced repurchased magnitude conveys little information necessary to eliminate information asymmetry; however, the market only uses announced repurchase magnitude to re-assess the firm's value at the announcement. Consequently, mis-pricing is not fully eliminated at announcement dates and is revealed through long-run abnormal stock returns.

The remainder of this paper is organized as follows. Section I describes data sources, sample selection criteria and the methodology to estimate the actual repurchase magnitude. Sections II and III examine whether actual repurchase magnitude or announced repurchase magnitude conveys information about future profitability and changes in systematic risk, respectively. Section IV examines whether stock abnormal returns of repurchasing firm support our findings in Sections II and III. Section V concludes.

I. Data and Sample Selection

We obtain our sample from announcements reported in the Security Data Corporation's U.S. Mergers and Acquisitions database. This database contains the most comprehensive sample of open-market share repurchase programs available, and covers most of the share repurchase programs announced after 1984 (Grullon and Michaely (2004)). As with Grullon and Michaely's sample, our sample includes regulated firms

(e.g., financial institutions and utilities), because they represent a large proportion of the total repurchase sample.

Our final sample satisfies the following criteria:

- (1) Each firm is present on Compustat at the beginning of the fiscal year in which the open-market share repurchase program is announced.
- (2) Common stock return is available in CRSP.
- (3) The firm discloses the number or the percentage of shares sought during the duration of the share repurchase program. If the firm announces only the number of shares sought, we calculate the percentage of shares sought by using the number of shares outstanding at the time the firm announces the share repurchase program.
- (4) We exclude any repurchase programs that occur within three years from another repurchase programs, whether open-market or not, of the same firm. The purpose of this exclusion is to avoid confounding effects and to ensure the accuracy of the actual repurchase magnitude.

These selection criteria create a sample of 1,946 open-market share repurchase announcements for the period 1987 to 2005. The actual sample size for each individual test may vary, depending on the variables used in the test.

Table I reports the distribution of repurchasing firms by calendar years. Grullon and Michaely (2004) report that most repurchase announcements are concentrated in the 1990s. We find the same result in our sample. The average (median) market reaction around open-market repurchase announcements is 2.85 percent (1.99 percent), a finding that is consistent with previous evidence (e.g., Vermaelen (1981), Comment and Jarrell

(1991), Ikenberry, Lakonishok, and Vermaelen (1995), and Grullon and Michaely (2004)). These positive announcement returns confirm the notion that open-market repurchases convey information to the investors. Table I also shows that the average (median) proportion of share sought by the firms is 7.44 percent (5.91 percent), which is consistent with the figures (6.77 percent for mean and 5.00 percent for median) reported in Grullon and Michaely (2004).

Stephens and Weisbach (1998) suggested four methods to estimate actual repurchase magnitude of US firms. However, Banyl, Dyl and Kahle (2005) show that the Compustat purchase of common and preferred stock (adjusted for the change in preferred stock) is the most accurate measure of actual repurchases among these four methods. Following Jagannathan, Stephens and Weisbach (2000), Dittmar (2000), and Lie (2005), we use this method to estimate the actual repurchase magnitude. Specifically, we extract the value of firms' repurchases on their Statement of Cash Flows from Compustat database (data item #115) and then adjust the value by the yearly change in the value of preferred stocks (data item #55). The value of firms' repurchases (data item #115) is an aggregation of many other types of transactions and overstates actual share repurchase. This aggregation includes conversions of other classes or preferred stock, and redemptions of redeemable preferred stock. The purchases of treasury stock also include privately negotiated repurchases and self-tender offers in addition to open market repurchases. Since our measure is adjusted for changes in preferred stocks and our sample includes only firms that do not have other repurchase program during the 73 months around the announcement month, our measure is still overstated by the amount of conversions of other classes of stocks. However, Dittmar (2000) points out that the frequency of these

events is much less than that of stock repurchase. Furthermore, Stephens and Weisbach (1998) find that most firms repurchase all of the stock they ultimately will during the two years subsequent to the initiation of a program. Hence, we measure actual repurchase magnitude at the end of fiscal year 0, 1, and 2, respectively.

Table I also shows the mean actual repurchase magnitude and mean completion rate for fiscal year 0, 1, and 2. Completion rate is defined as actual repurchase value divided by target repurchase value. The completion rates reported in Table 1 are very close to those reported in Stephens and Weisbach (1998). Not surprisingly, the mean completion rates reported in Table I indicate that sample firms on average do not repurchase as many shares as they have announced.

II. Operating Performance and Repurchase Magnitude

The signaling hypothesis predicts that share repurchases convey information about future profitability. Controversy exists on whether repurchases are indeed associated with improvements in operating performance. Bartov (1991) documents positive unexpected annual earnings in the repurchase announcement year and positive revisions of earnings forecasts by analysts around announcement dates. They conclude that, overall, open-market repurchases convey information about earnings. In contrast, Grullon and Michaely (2004) document the notion that announcements of open-market share repurchase programs are not followed by an increase in operating performance. They therefore conclude that the information content of share repurchases is primarily related to a reduction in agency conflict and preclude the possibility that earnings are likely to recover in the long run. Lie (2005) finds operating performance improvement among

firms that actually repurchase shares during the fiscal quarter of repurchase announcement. He concludes that actual repurchases, and not announcements per se, signal future performance improvement. Gong et al (2008) further find that at least part of the improvement of operating performance is driven by pre-repurchase downward earnings management.

Evidence from these studies suggests that if share repurchases convey information about future profitability, the information is likely revealed by the actual repurchase magnitude. In this section, we explicitly test this hypothesis. Our test has two purposes. The first purpose is to examine whether the actual repurchase magnitude conveys information about future profitability, as Lie's finding implies. However, Lie's study does not say much about whether the announced magnitude conveys information about future profitability. Therefore, our second purpose is to examine whether the announced magnitude conveys information about future profitability.

Following Barber and Lyon (1996) and Lie (2005), we use operating income before depreciation (Compustat item 13) scaled by the average of beginning- and ending-period book value of total assets as the measure of operating performance. This measure has the advantage that it is not affected by changes in capital structure. Furthermore, operating performance of repurchasing firms is adjusted by operating performance of a matching firm. Following Lie (2005), we choose matching firms that closely resemble the sample firms in industry classification, operating performance in year 0, and market-to-book ratio in year 0. Specifically, for each sample firm, we first identify all firms with the same two-digit SIC code, operating performance within +/-20% or within +/-0.01 of the performance of the sample firm in the announcement year, and market-to-book value of

assets at the beginning of the announcement year within +/-20% or within +/-0.01 of that of the sample firm. If no firms meet these criteria, we relax the industry criterion to a one-digit SIC. If still no firms meet the criteria, we disregard the SIC code. Finally, we choose the firm with operating performance closest to the sample firm.

Table II reports the summary statistics of changes in operating performance. Overall, changes in operating performance in fiscal year 1 and 2 are negative. However, for firms that actually repurchase less than 1% of total shares outstanding in the fiscal year 1, the mean adjusted change in operating performance of that year is negative; for firms that actually repurchase more than 4% of total shares outstanding in the fiscal year 1, the mean adjusted change in operating performance of that year is positive. The results are similar for fiscal year 2. These results are consistent with the empirical evidence documented in previous studies. On the one hand, the overall deterioration of sample firms' profitability is consistent with Grullon and Michaely's (2004) finding that announcements of open-market share repurchase programs are not followed by an increase in operating performance. On the other hand, the statistically significant increase in operating performance is consistent with Lie's (2005) finding that a sub-sample of firms that actually repurchase shares experiences improvements in operating performance.

Our main interest is to investigate whether the information about future profitability is conveyed through the announced repurchase magnitude or through the actual repurchase magnitude. To test this, we use a model similar to the one in Dittmar (2000):

$$\begin{aligned}
 RepMagnitude_{i,t} = & \alpha + \beta_1 OP_{i,t \text{ or } t+1} + \beta_2 CASHFLOW_{i,t-1} \\
 & + \beta_3 CASH_{i,t-1} + \beta_4 MKBK_{i,t-1} + \beta_5 PAYOUT_{i,t-1} \\
 & + \beta_6 ASST_{i,t-1} + \beta_7 RETURN_{i,t-1} + \beta_8 LEVER_{i,t-1} + e_i,
 \end{aligned} \tag{1}$$

where i represents the repurchasing firm and t is the fiscal year in which shares are repurchased or the repurchase program is announced. OP represents change or level of operating performance of year t or year $t+1$. Operating performance of sample firms is adjusted by that of matching firms. $CASHFLOW$ is operating income in year $t-1$ scaled by total assets. $MKBK$ is market-to-book ratio at the end to year $t-1$. $PAYOUT$ is cash dividend paid in year $t-1$ scaled by net income. $ASST$ is total assets at the end of year $t-1$. $RETURN$ is the past 36-month cumulative stock return measured at the end of year $t-1$. $LEVER$ is leverage ratio at the end of year $t-1$, adjusted by industry (2-digit SIC code) median leverage ratio. To reduce the noise caused by conversions of class A, class B, and special stock into common stock, we screen stock repurchases as in Dittmar's (2000) study by setting repurchases equal to zero for any firm-year that does not repurchase at least 1% of its market value of equity at the announcement date.

Table III reports the analysis for the actual repurchase magnitude. Following Dittmar (2000), we use a Tobit model because actual repurchase magnitude is left-censored at zero. The results in Table III strongly support the notion that actual repurchase magnitude conveys information about future operating performance. All of the coefficients on operating performance measures are positive and all except one are highly significant, indicating that better operating performance in the current or next year leads to more shares actually repurchased in the current year. Coefficients on other variables have the expected signs as well. Specifically, all of the coefficients on $CASHFLOW$ are positive and highly significant and all of the coefficients on $CASH$ are positive (although not significant), indicating that the more cash the firm has, the more shares it actually buys back. All of the coefficients on $MKBK$ are negative and highly significant, suggesting

that growth firms tend to repurchase fewer shares than value firms do. All of the coefficients on *lnASST* are positive, suggesting that mature firms tend to repurchase more shares than do younger firms. All of the coefficients on *PAYOUT* are negative (although not statistically significant), suggesting that firms may use share repurchases as a substitution for cash dividends (Grullon and Michaely (2002)). Finally, all of the coefficients on *LEVER* are negative, suggesting that firms may use share repurchases to adjust leverage to the optimal level. The market timing hypothesis predicts that *RETURN* should have a negative coefficient, whereas our results are mixed for *RETURN*. Our results, however, are consistent with those in Dittmar (2000). Dittmar points out that the use of annual data may explain the mixed results for *RETURN*.

Table IV reports the analysis for the announced repurchase magnitude. Since the measure of announced magnitude is not censored, we use a conventional OLS model instead of a Tobit model. Models (1) to (4) use the entire sample, whereas models (5)-(8) use a sub-sample where the actual repurchase magnitude in that year is greater than 4 percent of the market value at the announcement date. We differentiate firms that actually repurchase a significant portion of shares from those that do not so that we can investigate whether announced magnitude is more strongly associated with future profitability for this subgroup of firms. The results reported in Table IV indicate that, for both of the entire sample and the sub-sample, the announced magnitude is not associated with the operating performance in year 1 and year 2. As expected, the signs of the coefficients of *MKBK* are consistently negative. Surprisingly, the signs of the coefficients of *ASST* are consistently positive, whereas these signs in Table III are negative. These results suggest that larger firms tend to announce a relatively higher repurchase target but

actually repurchase relatively fewer shares, implying a lower completion rate for bigger firms. In an unreported test, we indeed find that the completion rate at the end of year 1 for smaller firms (below median of NYSE firm size) is 68% and for bigger firms (above median of NYSE firm size) it is 45%; the completion rate at the end of year 2 for smaller firm is 89% and for bigger firms is 62%². Furthermore, none of coefficients of CASHFLOW, CASH, PAYOUT, and LEVER are statistically significant. This evidence suggests that the announced repurchase magnitude, unlike the actual repurchase magnitude, is not closely related to firms' financial condition. This detachment between announced repurchase magnitude and firms' financial conditions further strengthens the notion that announced repurchase magnitude may be an ad hoc amount and may convey little information about the motivation behind the repurchase decisions.

Overall, our evidence in Tables III and IV suggests that the actual repurchase magnitude is related to firms' financial condition. Moreover, the actual repurchase magnitude is related to future profitability even when firms' characteristics such as market-to-book ratio and past cash flow are controlled. This suggests that the actual repurchase magnitude contains additional information beyond what the market knows at the time of the repurchase announcement. In contrast, the announced repurchase magnitude is not related to future profitability once firms' characteristics such as market-to-book ratio and size are controlled. Since these variables are already known at the repurchase announcement, we conclude that the announced repurchase magnitude conveys little additional information about firms' future profitability.

² Using data from the Canadian market, Ikenberry, Stephens, and Weisbach (200) also find that firm size has an negative impact on completion rate.

III. Change in Systematic Risk and Repurchase Magnitude

The free cash-flow hypothesis (Easterbrook (1984) and Jensen (1986)) suggests that share repurchases mitigate the agency costs associated with the possible overinvestment of free cash-flows. Thus, share repurchases convey information to the market about managers' commitment to reduce the potential agency costs of free cash flow. Positive announcement returns reflect the good news that the likelihood of overinvestment is lower.

The condition required by the free cash-flow hypothesis is that the firm experiences a contraction in its investment opportunity set. Given this condition, the firm should experience a decline in risk as well. This is because the growth options of the firm are likely to be riskier than the assets in place (since growth implies uncertainty). As a result, when the value of growth options represents a lower portion of the firm's total value, the overall risk of the firm will decline. In the framework of the free cash-flow hypothesis, the repurchase magnitude should convey information about managers' commitment to reduce the agency costs of overinvestment. The more severe the overinvestment problem the firm faces, the more cash should it pay out through share repurchases. Presumably, either announced repurchase magnitude or actual repurchase magnitude may effectively convey information about managers' commitment to reduce the agency costs of overinvestment. In this section, we try to answer this question empirically. Our test model is as follows:

$$\begin{aligned} \Delta Risk_i = & \alpha + \beta_1 RepMagnitude_i + \beta_2 Risk_i \\ & + \beta_3 MKBK_i + \beta_4 ASST_i + \beta_5 LEVERAGE_i + e_i, \end{aligned} \quad (2)$$

where i represents the i th repurchasing firm in our sample. Risk is the level of the firm's systematic risk before year 0 and Δ Risk is change in the firm's systematic risk after year 0. RepMagnitude is either announced repurchase magnitude or actual repurchase magnitude. MKBK is market-to-book ratio measured at the end of year $t-1$. ASST is the firm's total asset measured at the end of year $t-1$. LEVERAGE is the firm's leverage ratio measured at the end of year $t-1$. Following Grullon and Michaely (2004), we measure change in the systematic risk of equity (Risk and Δ Risk) based on the CAPM model and the Fama and French (1993) three-factor model. We let t_0 be the month of the repurchasing announcement. Then, for each repurchasing firm in our sample, we estimate the following monthly regressions for month t_0-36 to t_0+36 (73 monthly observations) around the repurchase announcement:

$$R_{i,t} = \alpha_i + \alpha_{\Delta i} D_t + b_i R_{m,t} + b_{\Delta i} D_t R_{m,t} + e_t, \quad (3a)$$

and

$$R_{i,t} = \alpha_i + \alpha_{\Delta i} D_t + b_i R_{m,t} + b_{\Delta i} D_t R_{m,t} + s_i SMB_t + s_{\Delta i} D_t SMB_t + h_i HML_t + h_{\Delta i} D_t HML_t + e_t, \quad (3b)$$

where R_{it} is monthly excess return on stock i , and R_{mt} is the monthly excess return on the NYSE/AMEX/Nasdaq value-weighted index. SMT_t is the difference between the monthly return on a portfolio of small firms and the monthly return on a portfolio of large firms. HML_t is the difference between the monthly return on a portfolio of high book-to-market stocks and the monthly return on a portfolio of low book-to-market stocks. D_t is a dummy variable that is equal to one if $t > t_0$, where t_0 is the month in which the share

repurchase program is announced. We use the estimated change in factor loadings (i.e., $b\Delta_i$, $s\Delta_i$, and $h\Delta_i$) as the measure of change in systematic risk (ΔRisk).

Table V reports summary statistics of the changes in systematic risk of repurchasing firms. Panel A reports changes in market beta based on the CAPM model. Overall, the market beta decreases by 0.095 after the repurchase announcement and we can reject the null hypothesis that the decrease is zero at 1% significance level. This result is consistent with the evidence reported by Grullon and Michaely (2004), who also find a statistically significant decrease in CAPM market beta for the repurchasing firms³. The decrease in CAPM market beta is also consistent with the prediction of the free cash-flow hypothesis that repurchasing firms should experience a reduction in risk.

For a sub-sample of firms that do not repurchase more than 1% of total equity value during the years 0, 1, and 2, the decrease in market beta is just 0.076 and we can not reject the null hypothesis that the decrease is zero at a 5% significance level. In contrast, for a sub-sample of firms that repurchase more than 4% of total equity value during the year 0, 1, and 2, the decrease in market beta is 0.154 and we can reject the null hypothesis that the decrease is zero at a 1% significance level. If the changes in market beta reflect the shift of firms' value from growth options to assets in place, these results suggest that actual repurchase magnitude likely conveys information about managers' commitment to reduce agency costs of overinvestment.

Panel B reports changes in factor loadings on market return, SMB, and HML, based on the Fama and French (1993) three-factor model. In this case, while the mean change in market beta is still negative, it is no longer statistically significant. This result

³ Denis and Kadlec (1994) do not find a change in systematic risk after share repurchases. But they use a relatively small sample (166 observations) of self-tender offers rather than a large sample of open-market repurchases.

also holds for the two sub-samples of firms that actually buy either less than 1% of total equity value or buy more than 4%. The loss of statistical significance for change in market beta should not be surprising, since Fama and French (1992) show that market beta loses its power to explain cross-sectional stock returns once size is taken as a factor. Indeed, we find that mean decrease in factor loading on SMB is 0.122 and statistically significant at a 1% level. This result is also consistent with the evidence reported by Grullon and Michaely (2004), who point out that change in the SMB beta suggests that share repurchases make firms behave more like large firms and less like small firms, consistent with the idea that firms increase their payouts when they move from a growth phase to a more mature phase. Similar to the findings for the CAPM market beta, the decrease in factor loading on SMB for firms that actually repurchase less than 1% of total equity value is just 0.014 and not statistically significant. In contrast, the decrease for firms that actually repurchase more than 4% of total equity value is 0.171 and statistically significant at a 1% level. Finally, there is no evidence for overall decreases in HML beta. However, firms that actually repurchase more than 4% of total equity value experience an increase in HML beta. The results in Section II indicate that firms that aggressively repurchase are more likely motivated by undervaluation and signaling better future profitability. Hence, the value of growth options likely has more weight on total value of these firms. Consequently, the stock returns of these firms behave more like growth firm than the stock returns of the rest repurchasing firms.

In sum, the results of the univariate tests suggest that repurchasing firms experience a decrease in systematic risk, which is reflected by a decrease in market beta in the CAPM model and a decrease in the SMB beta in Three-Factor model. The

univariate tests also indicate the important role of actual repurchase magnitude in conveying information about changes in firms' behavior. To explicitly test which of announced magnitude or actual magnitude matters for conveying such information, we must resort to multivariate tests.

Table VI reports the result from analysis on the relationship between changes in systematic risk and actual repurchase magnitude. In Panel A of Table VI, the dependent variable is the change in the CAPM market beta. The independent variables include the actual repurchase magnitude (measured at the end of year 0, 1 and 2, respectively) and firms' characteristics (market beta before repurchase announcements, market-to-book ratio, total assets, and leverage) measured at the beginning of announcement year. Our results indicate that the coefficients on all three measures of actual repurchase magnitude are negative and statistically significant at a 1% level. These results suggest that, consistent with the free cash-flow hypothesis, the more that a firm actually buys back shares, the more reduction in systematic risk it experiences.

In Panel B of Table VI, the dependent variable is the change in market beta, SMB beta, and HML beta based on Three-Factor model. When the dependent variable is market beta, the coefficients on the three measures of actual magnitude are all negative, but not always significant. We believe that this is because in Three-Factor model, market beta does not have strong explaining power to expected return (see Fama and French (1992)). We are most interested in the relationship between SMB beta and repurchase magnitude for two reasons. First, the free cash-flow hypothesis suggests that firms repurchase their shares when they become mature and hence behave more like big firms and less like small firms. Therefore, changes in SMB beta should be more relevant for

repurchasing firms than the other two betas. Second, our univariate tests indicate that the SMB beta is indeed the only factor loading that decreases significantly after repurchase announcements. The results in Panel B of Table VI confirm this conjecture. All of the coefficients on the three measures of actual magnitude are negative and statistically significant (one at a 10% level, and two at a 1% level). Finally, although in the univariate test, we find firms that buy back shares aggressively experience an increase in HML beta, we do not find any statistically significant correlation between HML beta and actual repurchase magnitude in the multivariate test.

In the next step, we examine whether the announced repurchase magnitude conveys information about changes in systematic risk. Presumably, it is possible that managers use the announced repurchase magnitude to convey information to the market about their commitment to reduce the agency costs of overinvestment. Table VII reports that results from the multivariate test. Models (1)-(4) use the entire sample. The results indicate that none of the coefficients on the announced repurchase magnitude is significant, suggesting that announced repurchase magnitude is not correlated with the firm's change in systematic risk. To further test whether there is a difference for firms that actually repurchase a significant portion of total equity value, models (5)-(8) use only firms that repurchase more than 4% of total equity value over the three-year period between year 0 and year 2. The results turn out to be similar to those with the entire sample: even for firms that actually buy back a significant portion of total equity value, announced repurchase magnitude is not correlated with changes in systematic risk. If the change in systematic risk reflects the consequence of managers' commitment to reduce agency cost, our results imply that the announced repurchase magnitude does not convey

information about managers' commitment.

In sum, the results reported in this section confirm the results reported in the prior section: only actual repurchase magnitude conveys information about the economic motivations behind the repurchase decisions, whereas the announced repurchase magnitude does not. This seems to be true both for firms that repurchase to signal undervaluation and for firms that repurchase to signal managers' commitment to reduce the agency costs of overinvestment.

IV. Stock Abnormal Return and Repurchase Magnitude

In the prior two sections we have shown that the actual repurchase magnitude conveys information about the economic motivation behind repurchase decisions, whereas the announced repurchase magnitude does not. A natural follow-up question is: does the market reaction incorporate this difference? We start by examining the relationship between abnormal returns around the announcement date and the repurchase magnitude. If information about repurchase motivation is conveyed only through actual magnitude and if investors can correctly estimate the actual repurchase magnitude ex ante, the abnormal returns around the announcement date should be correlated with the actual repurchase magnitude, but not with the announced repurchase magnitude. We use the following model to test this hypothesis:

$$\begin{aligned} CAR_i = & \alpha + \beta_1 RepMagnitude_i + \beta_2 \Delta ROA(0)_i + \beta_3 \Delta ROA(3)_i \\ & + \beta_4 b_{\Delta i} + \beta_5 s_{\Delta i} + \beta_6 h_{\Delta i} + \beta_7 MKBK_i + \beta_8 ASST_i + \beta_9 CASH_i \\ & + \beta_{10} LEVERAGE_i + \beta_{11} CASH \times LowMB_i + e_i, \end{aligned} \tag{4}$$

where RepMagnitude represents actual or announced repurchase magnitude. $\Delta ROA(0)$ represents the change in ROA between year t-1 and year 0. $\Delta ROA(3)$ represents the changes in ROA between year 0 and year 3. We include these two variables to examine whether future profitability is incorporated into announcement returns. $b\Delta$, $s\Delta$, and $h\Delta$ represent changes in market beta, SMB beta, and HML beta respectively. We include them to examine whether changes in systematic risk are incorporated into announcement returns. MKBK represents market-to-book ratio of the firm's assets at the beginning of the repurchase announcement year. ASST represents the firm's total assets at the beginning of the repurchase announcement year. CASH represents the firm's cash holding at the beginning of the repurchase year scaled by total assets. LEVERAGE represents the firm's leverage ratio at the beginning of the repurchase year. CASHxLowMB is the product of CASH and LowMB, which is equal to one if the firm's market-to-book ratio is below one and equal to zero if not.

Table VIII reports the results from this analysis. There is a significant correlation between abnormal return around the announcement date and the announced repurchase magnitude. This finding is consistent with evidence reported by Grullon and Michaely (2004). In contrast, there is no evidence that announcement return and actual repurchase magnitude are correlated; none of the coefficients on the three measures of actual repurchase magnitude are statistically significant. Moreover, neither of the coefficients on $\Delta ROA(0)$ and $\Delta ROA(3)$ is significant. Thus, there is no evidence that future operating performance is incorporated into announcement returns. There is mixed evidence that changes in SMB beta are incorporated into announcement returns, suggesting that investors may expect some reduction in systematic risk when repurchase decisions are

announced. Finally, the coefficient on $CASH \times LowMB$ is positive and statistically significant. Consistent with the free cash-flow hypothesis, this result suggest that for a certain cash level, firms with fewer growth opportunities experience higher announcement return, because firms with fewer growth opportunities are more likely to suffer overinvestment.

These findings suggest that the market reaction is correlated with the announced repurchase magnitude, but not with the actual repurchase magnitude. This result seems to be inconsistent with the findings in the previous two sections, where we find that the real changes associated with share repurchases are only correlated with the actual repurchase magnitude, but not with the announced repurchase magnitude. A possible reason for this inconsistency is that actual repurchase magnitude is too difficult for investors to estimate at the time of repurchase announcements (Stephens and Weisbach (1998)). If this is the case, then we expect that the information conveyed by the actual repurchase magnitude should be revealed gradually and incorporated into the long-run abnormal returns of the repurchasing firms. Specifically, the long-run abnormal returns should be correlated with actual repurchase magnitude, but not with the announced repurchase magnitude. We use the following model to test this hypothesis:

$$\begin{aligned}
 Drift_i = & \alpha + \beta_1 RepMagnitude_i + \beta_2 \Delta ROA(0)_i + \beta_3 \Delta ROA(3)_i \\
 & + \beta_4 b_{\Delta i} + \beta_5 s_{\Delta i} + \beta_6 h_{\Delta i} + \beta_7 MKBK_i + \beta_8 ASST_i + \beta_9 CASH_i \\
 & + \beta_{10} LEVERAGE_i + \beta_{11} CASH \times LowMB_i + e_i,
 \end{aligned} \tag{5}$$

where Drift is the abnormal return over the period between month 1 and month 36. Other variables are the same as those in Equation (4).

We follow Barber and Lyon (1997) to estimate long-run abnormal stock returns. We choose matching firms that closely resemble the sample firms in market value of equity and market-to-book ratio at month 0. Specifically, for each sample firm, we first identify all firms with market value between +/-30% of the sample firm. Then we choose the firm with market-to-book ratio closest to the sample firm.

Table IX reports the results from this analysis. Announced repurchase magnitude and firm characteristics, including those that affect announcement returns, are not correlated with long-run abnormal returns. This is not surprising, since information contained in these variables are already known at the announcement and should have been incorporated into the announcement returns. In contrast, improvement in operating performance and changes in systematic risk, which are not known by the market at the time of the repurchase announcement, are significantly correlated with long-run abnormal returns. Moreover, the actual repurchase magnitude is also significantly correlated with long-run abnormal returns, even after controlling for the improvement in operating performance and changes in systematic risk. This suggests that, consistent with our findings in the previous two sections, actual repurchase magnitude indeed conveys information about firms' valuation.

V. Conclusion

In this paper we investigate the nature of the signal conveyed by open-market share repurchases. We examine the repurchase announcement and the actual repurchase decision separately. Evidence documented in this paper suggests that the real changes associated with share repurchases (i.e., the improvement in firms' operating performance

and the reduction in firms' systematic risk) are correlated only with the actual repurchase magnitude, but not with the announced magnitude. This conclusion even holds for a subsample of firms that actually buy back a significant portion of total shares outstanding.

We further examine the stock returns of repurchasing firms to see whether the signal is being received by investors. We find that the abnormal returns around the announcement dates are positively correlated with the announced magnitude, but not with the actual repurchase magnitude. Further, we find that the long-run abnormal stock returns of repurchasing firms are only correlated with the actual repurchase magnitude, but not with the announced magnitude. The evidence suggests that it is difficult for investors to estimate the actual repurchase magnitude at the repurchase announcement. Consequently, the information associated with the actual repurchase magnitude is revealed gradually and incorporated into the long-run abnormal stock returns rather than the announcement returns.

Neither the signaling hypothesis nor the free cash-flow hypothesis differentiates between announced repurchase magnitude and actual repurchase magnitude from a theoretical perspective. While our results support both of the hypotheses, our study highlights the importance of actual repurchase magnitude from an empirical perspective. Since announced repurchase magnitude has often been used as the most important variable to proxy for the economic motivation of the repurchase program in prior studies, our study has important implications for future research by emphasizing the need to differentiate between announced and actual repurchase magnitudes.

Table I. Distribution of Repurchasing Firms by Calendar Year

This table reports the distribution by calendar year for a sample of firms that announced open-market share repurchase programs over the period 1987 to 2005. To be included in the sample, the observation must satisfy the following criteria: the firm's financial data are available on Compustat and CRSP; the firm discloses the number or the percentage of shares sought over the duration of the share repurchase program; and there is no another repurchase announcement of the same firm over the period between month t-36 and month t+36, where t is the repurchase announcement month. Value is the total market value of the open-market share repurchase programs in billions of dollars. CAR is the cumulative abnormal return over the period between day t-5 and day t+5. Abnormal return is estimated using the market model. PSOUGHT is the number of shares authorized for repurchase scaled by the number of shares outstanding at the time of the announcement. CPACTR is the cumulative value of shares actually repurchased scaled by the total market value of equity at the time of the announcement. CPACTR is measured at the end of fiscal year 0, 1, and 2, respectively. Completion Rate is the ratio of PACTR to PSOUGHT.

Year	# of Obs	Fraction	Value	CAR		PSOUGHT		CPACTR			Median Completion Rate		
				Mean	Median	Mean	Median	Year 0	Year 1	Year 2	Year 0	Year 1	Year 2
1987	5	0.26	3.28	-7.34	-6.68	24.99	9.15	3.18	5.74	5.72	17	43	97
1988	3	0.15	0.18	7.13	5.74	7.35	7.64	5.49	5.39	2.31	72	142	173
1989	4	0.21	0.29	0.25	-0.81	7.23	7.26	1.45	2.2	0.44	19	49	54
1990	6	0.31	0.56	3.6	3.93	5.17	5.65	5.17	1.1	1.68	67	117	209
1991	5	0.26	1.86	9.18	8.42	11.56	10	1.72	3.64	5.84	16	70	96
1992	13	0.67	1.18	-1.56	-0.48	5.48	4.81	1.21	3.33	4.21	19	73	137
1993	27	1.39	2.97	2.37	2.78	8.48	6.22	1.93	4.44	2.88	20	88	118
1994	193	9.92	16.3	1.22	0.89	6.76	5.3	1.97	2.06	1.64	15	39	55
1995	145	7.45	12.8	3.48	2.69	7.42	5.82	2.19	2.62	2.63	22	60	96

1996	150	7.71	14.4	2.16	3.03	7.71	5.6	2.62	2.89	2.79	21	54	85
1997	186	9.56	17.9	1.43	0.92	7.19	5.7	2.73	2.9	1.92	23	63	82
1998	291	14.95	17	0.43	0.19	7.92	5.91	2.8	2.42	3	23	56	79
1999	211	10.84	15.9	4.56	2.52	7.93	6.33	3.21	3.35	1.51	37	74	82
2000	178	9.15	22.4	5.19	4.09	7.49	6.1	2.81	1.57	1.48	29	46	60
2001	80	4.11	12.9	4.55	0.78	6.33	4.92	1.55	1.36	0.69	11	29	35
2002	144	7.4	29.3	8.19	4.53	6.88	5.75	2.12	1.63	1.93	18	32	49
2003	53	2.72	10.8	0.88	1.19	7	6.37	1.9	2.24	3.43	16	43	88
2004	101	5.19	76.9	2.89	2.46	5.8	4.99	2.12	2.73		33	82	
2005	151	7.76	32.9	0.59	0.84	6.3	5.39	3.27	2.77		37	42	
<i>Total</i>	<i>1946</i>	<i>100</i>	<i>142</i>	<i>2.78</i>	<i>1.98</i>	<i>7.25</i>	<i>5.68</i>	<i>2.55</i>	<i>2.46</i>	<i>2.16</i>	<i>23</i>	<i>54</i>	<i>74</i>

Table II. Changes in Operating Performance

This table reports changes in operating performance for a sample of firms that announce open-market share repurchase programs over the period 1987 to 2005. Observations must satisfy the condition that there is no another repurchase announcement of the same firm over the period between month t-36 and t+36. ROA is equal to the operating income between depreciation (Compustat item 13) scaled by the average of beginning- and ending-period book value of total assets (item 6). Change of ROA is equal to ROA of year t minus ROA of year t-1. The adjusted change of ROA is equal to the unadjusted change of ROA of the sample firm minus the change of ROA of a matching firm that closely resemble the sample in industry classification, level of performance in year zero, and market-to-book ratio in year zero. PACTR(1) is the value of shares actually repurchased during fiscal year 1 scaled by the total market value of equity at the time of the announcement. Observations have been Winsorized at the first and the 99th percentiles. The significance levels are based on a two-tailed t-test. *, **, and *** denote levels that are significantly different from zero at the 1 percent, 5 percent, and 10 percent, respectively.

Year 1						
	All Firms		PACTR(1)<1		PACTR(1)>4	
	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted
Mean	-0.013	-0.023	-0.013	-0.018	0.02	-0.007
t-statistic	(-1.48)	(-6.26)***	(-2.38)**	(-4.44)***	(2.67)***	(-1.23)
N	1213	1213	705	705	207	207

Year 2						
	All Firms		PACTR(2)<1		PACTR(2)>4	
	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted
Mean	-0.008	-0.012	-0.013	-0.014	0.017	0
t-statistic	(-1.97)**	(-3.43)***	(-2.31)**	(-2.86)***	(2.11)**	-0.08
N	1212	1212	846	846	165	165

Table III. Analysis of Actual Repurchase Magnitude

This table reports estimates of Tobit regressions relating actual repurchase magnitude to operating performance and other control variables. The dependent variable is actual repurchase magnitude (PACTR(t)) - the value of shares actually repurchased during fiscal year t scaled by the total market value of equity at the time of the announcement. Δ ROA(t) is the adjusted change of ROA for fiscal year t; ROA(t) is the adjusted level of ROA for fiscal year t. ROA is equal to the operating income between depreciation (Compustat item 13) scaled by the average of beginning- and ending-period book value of total assets (item 6). Change of ROA is equal to ROA of year t minus ROA of year t-1. The adjusted change of ROA is equal to the unadjusted change of ROA of the sample firm minus the change of ROA of a matching firm that closely resemble the sample in industry classification, level of performance in year zero, and market-to-book ratio in year zero. CASHFLOW is operating income in year t-1 scaled by total assets. MKBK is market-to-book ratio at the end to year t-1. PAYOUT is cash dividend paid in year t-1 scaled by net income. ASST is total assets at the end of year t-1. RETURN is the past 36-month cumulative stock return measured at the end of year t-1. LEVER is leverage ratio at the end of year t-1, adjusted by industry (2-digit SIC code) median leverage ratio. All variables have been Winsorized at the first and the 99th percentiles. *, **, and *** denote levels that are significantly different from zero at the 1 percent, 5 percent, and 10 percent, respectively. P-values are in parentheses.

	Dependent Variable							
	PACTR(0)	PACTR(1)	PACTR(1)	PACTR(2)	PACTR(0)	PACTR(1)	PACTR(1)	PACTR(2)
Intercept	-0.538	-1.66	-1.78	-5.61	-0.548	-1.65	-1.59	-5.17
	-0.22	(0.00)***	(0.00)***	(0.00)***	-0.21	(0.00)***	(0.01)***	(0.00)***
Δ ROA(1)	3.99	5.54						
	(0.01)***	(0.00)***						
Δ ROA(2)			2.75	8.17				
			(0.12)	(0.00)***				
ROA(1)					4.15	5.33		
					(0.00)***	(0.00)***		
ROA(2)							4.93	8.69
							(0.00)***	(0.00)***
CASHFLOW	6.31	12.6	12.34	20.1	6.24	12.4	11.7	16.92
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***

CASH	1.39 (0.32)	2.44 (0.14)	2.72 (0.10)*	2.06 (0.32)	1.39 (0.33)	2.42 (0.15)	2.78 (0.09)*	1.58 (0.44)
MKBK	-0.258 (0.00)***	-0.276 (0.03)**	-0.241 (0.05)**	0.013 (0.92)	-0.262 (0.00)***	-0.274 (0.03)**	-0.278 (0.02)**	-0.0067 (0.96)
PAYOUT	-0.558 (0.25)	-0.551 (0.4)	-0.463 (0.48)	0.35 (0.92)	-0.557 (0.25)	-0.548 (0.4)	-0.483 (0.46)	0.33 (0.67)
ASST	0.0001 (0.04)**	0 (0.11)	0 (0.10)*	0.0001 (0.00)***	0.0001 (0.04)**	0 (0.11)	0 (0.10)*	0.0002 (0.00)***
RETURN	-0.214 (0.12)	0.142 (0.5)	0.168 (0.43)	0.529 (0.05)**	-0.213 (0.13)	0.14 (0.51)	0.152 (0.46)	0.465 (0.08)*
LEVER	-0.626 (0.62)	-0.474 (0.74)	-0.318 (0.82)	-3.84 (0.02)**	-0.63 (0.62)	-0.456 (0.75)	-0.589 (0.68)	-4.17 (0.02)**
<i>N</i>	785	839	839	870	785	839	839	870
<i>Pseudo-R</i> ²	0.5091	0.4153	0.4143	0.3126	0.5092	0.4152	0.4157	0.313

Table IV. Analysis of Announced Repurchase Magnitude

This table reports estimates of OLS regressions relating announced repurchase magnitude to operating performance and other control variables. The dependent variable is announced repurchase magnitude (PSOUGHT) - the number of shares authorized for repurchase scaled by the number of shares outstanding at the time of the announcement. $\Delta ROA(t)$ is the adjusted change of ROA for fiscal year t ; $ROA(t)$ is the adjusted level of ROA for fiscal year t . ROA is equal to the operating income between depreciation (Compustat item 13) scaled by the average of beginning- and ending-period book value of total assets (item 6). Change of ROA is equal to ROA of year t minus ROA of year $t-1$. The adjusted change of ROA is equal to the unadjusted change of ROA of the sample firm minus the change of ROA of a matching firm that closely resemble the sample in industry classification, level of performance in year zero, and market-to-book ratio in year zero. CASHFLOW is operating income in year $t-1$ scaled by total assets. MKBK is market-to-book ratio at the end to year $t-1$. PAYOUT is cash dividend paid in year $t-1$ scaled by net income. ASST is total assets at the end of year $t-1$. RETURN is the past 36-month cumulative stock return measured at the end of year $t-1$. LEVER is leverage ratio at the end of year $t-1$, adjusted by industry (2-digit SIC code) median leverage ratio. All variables have been Winsorized at the first and the 99th percentiles. *, **, and *** denote levels that are significantly different from zero at the 1 percent, 5 percent, and 10 percent, respectively. Heteroskedasticity of the standard errors has been rejected. P-values are in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	8.39 (0.00)***	8.36 (0.00)***	8.31 (0.00)***	8.41 (0.00)***	10.1 (0.00)***	10.1 (0.00)***	10.1 (0.00)***	10.2 (0.00)***
$\Delta ROA(1)$	1.99 (0.16)				3.94 (0.15)			
$\Delta ROA(2)$		0.459 (0.72)				1.02 (0.7)		
ROA(1)			2 (0.15)				3.804 (0.17)	
ROA(2)				1.39 (0.22)				2.39 (0.26)
CASHFLOW	-0.509 (0.74)	-0.456 (0.77)	-0.549 (0.72)	-0.767 (0.63)	-4.96 (0.16)	-4.85 (0.18)	-5.05 (0.15)	-5.709 (0.12)
CASH	0.86	0.88	0.852	0.92	1.67	1.81	1.66	1.69

	(0.49)	(0.48)	(0.49)	(0.46)	(0.47)	(0.43)	(0.47)	(0.46)
MKBK	-0.338	-0.333	-0.339	-0.337	-0.273	-0.261	-0.274	-0.257
	(0.00)***	(0.00)**	(0.00)***	(0.00)***	(0.14)	(0.16)	(0.14)	(0.17)
PAYOUT	0.239	0.244	0.24	0.235	0.979	1.01	0.981	0.994
	(0.56)	(0.55)	(0.56)	(0.57)	(0.21)	(0.209)	(0.21)	(0.2)
ASST	-0.0000598	-0.0000587	-0.0000599	-0.000059	-0.000107	-0.00108	-0.000107	-0.000108
	(0.02)**	(0.02)**	(0.02)**	(0.02)**	(0.00)***	(0.00)***	(0.00)***	(0.00)***
RETURN	-0.101	-0.11	-0.101	-0.104	-0.24	-0.274	-0.239	-0.274
	(0.41)	(0.37)	(0.41)	(0.54)	(0.31)	(0.25)	(0.31)	(0.25)
LEVER	0.698	0.772	0.698	0.69	1.41	1.59	1.402	1.43
	(0.54)	(0.5)	(0.54)	(0.54)	(0.46)	(0.41)	(0.47)	(0.46)
<i>N</i>	840	840	840	840	335	335	335	335
<i>R</i> ²	0.0379	0.0358	0.0379	0.0373	0.0622	0.0567	0.0618	0.0599

Table V. Changes in Systematic Risk and Announced Repurchase Magnitude

This table reports changes in systematic risk for a sample of firms that announce open-market share repurchase programs over the period 1987 to 2005. Observations must satisfy the condition that there is no another repurchase announcement of the same firm over the period between month t-36 and t+36. Changes in systematic risk are estimated based on CAPM model and Fama and French (1993) Three-Factor model, respectively. $b\Delta_i$ is change in market beta. $s\Delta_i$ is change in SMB beta. $h\Delta_i$ is change in HML beta. CPACTR(2) is the cumulative value of shares actually repurchased measured at the end of fiscal year 2 scaled by the total market value of equity at the time of the announcement. Observations have been Winsorized at the first and the 99th percentiles. The significance levels are based on a two-tailed t-test. *, **, and *** denote levels that are significantly different from zero at the 1 percent, 5 percent, and 10 percent, respectively.

CAPM Model

	All Firms	CPACTR(2)<1	CPACTR(2)>4
	$b\Delta$	$b\Delta$	$b\Delta$
Mean	-0.095	-0.076	-0.154
t-statistic	(-3.66)***	(-1.76)*	(-4.11)***
N	1078	371	471

Fama-French Three-Factor Model

FF	All Firms			CPACTR(2)<1			CPACTR(2)>4		
	b Δ	s Δ	h Δ	b Δ	s Δ	h Δ	b Δ	s Δ	h Δ
Mean	-0.041	-0.122	0.0438	-0.066	-0.014	-0.001	-0.046	-0.171	0.1678
t-statistic	(-1.40)	(-3.45)***	(1.01)	(-1.28)	(-0.23)	(-0.02)	(-1.14)	(-3.21)***	(2.59)**
N	1078	1078	1078	371	371	371	471	471	471

Table VI. Changes in Systematic Risk and Actual Repurchase Magnitude

This table reports estimates of OLS regressions relating changes in systematic risk to actual repurchase magnitude and other control variables. In Panel A, the dependent variable is the change in market beta ($b\Delta$), based on the CAPM model. In Panel B, the dependent variable is the change in market beta ($b\Delta$), or the change in SMB beta ($s\Delta$), or the change in HML beta ($h\Delta$), based on the Fama and French (1993) Three-Factor model. CPACTR(t) is the cumulative value of shares actually repurchased measured at the end of fiscal year five scaled by the total market value of equity at the time of the announcement. b , s , and h are market beta, SMB beta, and HML beta before the repurchase announcement, respectively. MKBK is market-to-book ratio at the end to year $t-1$. PAYOUT is cash dividend paid in year $t-1$ scaled by net income. ASST is total assets at the end of year $t-1$. LEVER is leverage ratio at the end of year $t-1$. All variables have been Winsorized at the first and the 99th percentiles. *, **, and *** denote levels that are significantly different from zero at the 1 percent, 5 percent, and 10 percent, respectively. The standard errors of the coefficients have been adjusted for heteroskedasticity. P-values are in parentheses.

Panel A			
	$b\Delta$	$b\Delta$	$b\Delta$
Intercept	0.471 (0.00)***	0.512 (0.00)***	0.492 (0.00)***
CPACTR(0)	-0.0178 (0.01)***		
CPACTR(1)		-0.0151 (0.00)***	
CPACTR(2)			-0.00803 (0.01)***
b	-0.576 (0.00)***	-0.587 (0.00)***	-0.585 (0.00)***
MKBK	0.0452 (0.00)***	0.0445 (0.00)***	0.0446 (0.00)***
ASST	0.0000021 (0.43)	0.0000026 (0.34)	0.0000026 (0.38)
LEVERAGE	-0.415 (0.00)***	-0.428 (0.00)***	-0.435 (0.00)***
N	875	854	805
R^2	0.3007	0.3125	0.3096

Panel B

	Dependent Variable								
	b Δ	b Δ	b Δ	s Δ	s Δ	s Δ	h Δ	h Δ	h Δ
Intercept	0.64 (0.00)***	0.675 (0.00)***	0.671 (0.00)***	0.612 (0.00)***	0.668 (0.00)***	0.67 (0.00)***	0.586 (0.00)***	0.601 (0.00)***	0.571 (0.00)***
CPACTR(0)	-0.00462 (0.54)			0.017 (0.08)*			-0.0163 (0.16)		
CPACTR(1)		-0.00954 (0.03)**			-0.0169 (0.00)***			0.00819 (0.25)	
CPACTR(2)			-0.00471 (0.13)			-0.0105 (0.00)***			0.00613 (0.2)
b	0.0368 (0.00)***	0.0361 (0.00)***	0.0356 (0.00)***	0.133 (0.00)***	0.126 (0.00)***	0.119 (0.01)***	-0.172 (0.00)***	-0.177 (0.00)***	-0.172 (0.00)***
s	0.0435 (0.19)	0.0431 (0.20)	0.04 (0.25)	-0.855 (0.00)***	-0.852 (0.00)***	-0.859 (0.00)***	-0.108 (0.02)**	-0.115 (0.01)**	-0.113 (0.02)**
h	-0.132 (0.00)***	-0.121 (0.00)***	-0.113 (0.00)***	-0.149 (0.00)***	-0.147 (0.00)***	-0.135 (0.00)***	-0.801 (0.00)***	-0.799 (0.00)***	-0.79 (0.00)***
MKBK	0.0368 (0.00)***	0.0361 (0.00)***	0.0356 (0.00)***	-0.0385 (0.00)***	-0.0415 (0.00)***	-0.0424 (0.00)***	-0.0499 (0.00)***	-0.0503 (0.00)***	-0.0482 (0.00)***
ASST	0.0000046 (0.11)	0.0000052 (0.08)*	0.0000055 (0.07)*	-0.0000254 (0.00)***	-0.0000249 (0.00)***	-0.0000247 (0.00)***	-0.0000098 (0.00)***	-0.00001 (0.00)***	-0.0000091 (0.01)**
LEVERAGE	0.255 (0.07)*	0.209 (0.13)	0.19 (0.16)	0.0746 (0.65)	0.0669 (0.69)	0.0133 (0.93)	1.0576 (0.00)***	1.025 (0.00)***	1.057 (0.00)***
N	875	854	805	875	854	805	875	854	805
R ²	0.3983	0.3964	0.3975	0.5307	0.529	0.5356	0.4476	0.4487	0.4443

Table VII. Changes in Systematic Risk and Announced Repurchase Magnitude (Multivariate Test)

This table reports estimates of OLS regressions relating changes in systematic risk to announced repurchase magnitude and other control variables. In Panel A, the dependent variable is the change in market beta ($b\Delta$), based on the CAPM model. In Panel B, the dependent variable is the change in market beta ($b\Delta$), or the change in SMB beta ($s\Delta$), or the change in HML beta ($h\Delta$), based on the Fama and French (1993) Three-Factor model. $CPACTR(2)>4$ represents those firms which repurchased more than 4% of total equity value over the period between year 0 and year 2. $PSOUGHT$ is the number of shares authorized for repurchase scaled by the number of shares outstanding at the time of the announcement. b , s , and h are market beta, SMB beta, and HML beta before the repurchase announcement, respectively. $MKBK$ is market-to-book ratio at the end to year t-1. $PAYOUT$ is cash dividend paid in year t-1 scaled by net income. $ASST$ is total assets at the end of year t-1. $LEVER$ is leverage ratio at the end of year t-1. All variables have been Winsorized at the first and the 99th percentiles. *, **, and *** denote levels that are significantly different from zero at the 1 percent, 5 percent, and 10 percent, respectively. The standard errors of the coefficients have been adjusted for heteroskedasticity. P-values are in parentheses.

	Entire Sample				CPACTR(2)>4			
	CAPM	Three-Factor			CAPM	Three-Factor		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$b\Delta$	$b\Delta$	$s\Delta$	$h\Delta$	$b\Delta$	$b\Delta$	$s\Delta$	$h\Delta$
Intercept	0.367 (0.00)***	0.55 (0.00)***	0.576 (0.00)***	0.668 (0.00)***	0.318 (0.00)***	0.522 (0.00)***	0.612 (0.00)***	0.669 (0.00)***
PSOUGHT	0.000727 (0.88)	0.00348 (0.5)	-0.00611 (0.26)	-0.0072 (0.31)	0.00195 (0.77)	0.000526 (0.93)	-0.00494 (0.52)	-0.0129 (0.2)
b	-0.564 (0.00)***	-0.703 (0.00)***	0.144 (0.00)***	-0.153 (0.00)***	-0.584 (0.00)***	-0.646 (0.00)***	0.122 (0.09)*	-0.0591 -0.47
s		0.0495 (0.12)	-0.854 (0.00)***	-0.104 (0.01)**		0.0227 (0.61)	-0.878 (0.00)**	-0.0195 (0.72)
h		-0.14 (0.00)***	-0.15 (0.00)***	-0.797 (0.00)***		-0.123 (0.00)***	-0.137 (0.00)***	-0.866 (0.00)***
MKBK	0.0495 (0.00)***	0.0387 (0.00)***	-0.0365 (0.00)***	-0.0529 (0.00)***	0.0422 (0.00)***	0.0323 (0.02)**	-0.0613 (0.00)***	-0.058 (0.00)***
ASST	0.0000015 (0.57)	0.0000056 (0.03)**	-0.0000249 (0.00)*	-0.0000078 (0.01)**	0.0000044 (0.08)*	0.0000042 (0.16)	-0.0000194 (0.00)***	-0.0000085 (0.04)**

LEVERAGE	-0.406 (0.00)***	0.223 (0.09)*	0.0983 (0.53)	0.967 (0.00)***	-0.274 (0.06)*	0.377 (0.04)**	-0.132 (0.54)	1.025 (0.00)***
<i>N</i>	997	997	997	997	449	449	449	449
<i>R</i> ²	0.297	0.3912	0.5322	0.4463	0.3154	0.3636	0.6043	0.4803

Table VIII. Announcement Date Abnormal Return and Repurchase Magnitude

This table reports estimates of OLS regressions relating cumulative abnormal return around the announcement date to repurchase magnitude (announced or actual) and other control variables. The dependent variable is cumulative abnormal return around the announcement date (CAR). CAR is the cumulative abnormal return over the period between day t-5 and day t+5, where t is the repurchase announcement date. Abnormal return is estimated using the market model. $\Delta ROA(0)$ is the change of ROA between year -1 and year 0. $\Delta ROA(3)$ is the change of ROA between year 0 and year 3. ROA is equal to the operating income between depreciation (Compustat item 13) scaled by the average of beginning- and ending-period book value of total assets (item 6). $b\Delta$, $s\Delta$, and $h\Delta$ are change in market beta, SMB beta, and HML beta, respectively, based on Fama and French (1993) Three-Factor model. MKBK is market-to-book ratio at the end to year t-1. ASST is total assets at the end of year -1. CASH is the firm's cash holding at the end of year -1 scaled by total assets. LEVERAGE is the firm's leverage ratio at the end of year -1. CASHxLowMB is the product of CASH and LowMB, which is equal to one if the firm's market-to-book ratio is below 1 and equal to zero if not. All variables have been Winsorized at the first and the 99th percentiles. *, **, and *** denote levels that are significantly different from zero at the 1 percent, 5 percent, and 10 percent, respectively. The standard errors of the coefficients have been adjusted for heteroskedasticity. P-values are in parentheses.

	CAR	CAR	CAR	CAR
Intercept	-0.817	1.39	1.24	0.79
	-0.43	(0.25)	(0.31)	(0.52)
PSOUGHT	0.324			
	(0.00)***			
CPACTR(0)		0.0283		
		(0.87)		
CPACTR(1)			0.0932	
			(0.35)	
CPACTR(2)				0.112
				(0.12)
$\Delta ROA(0)$	8.85	9.27	7.41	7.65
	(0.31)	(0.29)	(0.42)	(0.42)
$\Delta ROA(3)$	2.47	2.07	1.12	-2.67
	(0.6)	(0.66)	(0.8)	(0.56)
$b\Delta$	0.105	0.0726	0.229	0.185
	(0.86)	(0.9)	(0.73)	(0.79)
$s\Delta$	-0.975	-1.12	-0.833	-0.949
	(0.08)*	(0.05)**	(0.16)	(0.11)
$h\Delta$	-0.229	0.161	-0.33	-0.332
	(0.61)	(0.72)	(0.48)	(0.49)
MKBK	-0.238	-0.332	0.241	-0.22
	(0.28)	(0.14)	(0.19)	(0.37)
ASST	0.0000025	-0.0000093	-0.0000104	-0.0000236
	(0.94)	(0.83)	(0.81)	(0.6)

CASH	2.13 (0.63)	2.85 (0.54)	2.509 (0.6)	1.093 (0.82)
LEVERAGE	6.99 (0.08)*	7.54 (0.08)*	7.33 (0.10)*	6.606 (0.14)
CASHxLowMB	27.8 (0.02)**	29.8 (0.02)**	28.4 (0.03)**	28.9 (0.03)**
<i>N</i>	892	788	769	734
<i>R</i> ²	0.05428	0.0446	0.04245	0.04639

Table IX. Long-Run Abnormal Return and Repurchase Magnitude

This table reports estimates of OLS regressions relating long-run abnormal stock return subsequent to repurchase announcement to repurchase magnitude (announced or actual) and other control variables. The dependent variable is long-run abnormal stock return subsequent to repurchase announcement. The long-run abnormal stock return is equal to the cumulative stock return of the sample firm over the 36 month subsequent to the announcement month minus the cumulative stock return of a matching firm over the same period that closely resemble the sample firm in market value of equity and market-to-book ratio. $\Delta ROA(0)$ is the change of ROA between year -1 and year 0. $\Delta ROA(3)$ is the change of ROA between year 0 and year 3. ROA is equal to the operating income between depreciation (Compustat item 13) scaled by the average of beginning- and ending-period book value of total assets (item 6). $b\Delta$, $s\Delta$, and $h\Delta$ are change in market beta, SMB beta, and HML beta, respectively, based on Fama and French (1993) Three-Factor model. MKBK is market-to-book ratio at the end to year t-1. ASST is total assets at the end of year -1. CASH is the firm's cash holding at the end of year -1 scaled by total assets. LEVERAGE is the firm's leverage ratio at the end of year -1. CASHxLowMB is the product of CASH and LowMB, which is equal to one if the firm's market-to-book ratio is below 1 and equal to zero if not. All variables have been Winsorized at the first and the 99th percentiles. *,**, and *** denote levels that are significantly different from zero at the 1 percent, 5 percent, and 10 percent, respectively. Heteroskedasticity of the standard errors has been rejected. P-values are in parentheses.

	Drift	Drift	Drift	Drift
Intercept	0.549 (0.97)	-15.7 (0.43)	-24.7 (0.24)	-18.9 (0.37)
PSOUGHT	1.67 (0.29)			
CPACTR(0)		8.72 (0.00)***		
CPACTR(1)			6.09 (0.00)***	
CPACTR(2)				4.41 (0.00)***
$\Delta ROA(0)$	1.06 (0.34)	0.983 (0.39)	0.931 (0.43)	0.0975 (0.93)
$\Delta ROA(3)$	4.16 (0.00)***	4.18 (0.00)**	4.25 (0.00)***	4.07 (0.00)***
$b\Delta$	8.42 (0.35)	6.84 (0.47)	9.54 (0.33)	9.71 (0.32)
$s\Delta$	17.9 (0.01)***	20.4 (0.00)***	23 (0.00)***	20.7 (0.00)***
$h\Delta$	-14 (0.03)**	-16.5 (0.02)**	-18.9 (0.00)***	-14.3 (0.05)**
MKBK	-0.04 (0.99)	0.858 (0.82)	1.49 (0.71)	0.657 (0.87)
ASST	0.0000833 (0.94)	-0.000365 (0.76)	-0.000546 (0.66)	-0.000721 (0.55)

CASH	43.2 (0.48)	53.1 (0.42)	45.2 (0.5)	16.6 (0.81)
LEVERAGE	17.9 (0.74)	36.7 (0.53)	33.9 (0.57)	17.4 (0.77)
CASHxLowMB	164.2 (0.15)	159.9 (0.18)	160 (0.19)	171.1 (0.16)
<i>N</i>	887	783	764	729
<i>R</i> ²	0.0529	0.0693	0.0748	0.0715

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