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TONY NICHOLAS ALTOBELLI

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AN EMPIRICAL INVESTIGATION OF CORPORATE STOCK REPURCHASES

By

Tony Nicholas Altobelli

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ABSTRACT

AN EMPIRICAL INVESTIGATION OF CORPORATE STOCK REPURCHASES

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This dissertation examines several aspects of open market stock repurchase programs and the corporate choice between stock repurchases and cash dividends as mechanisms for distributing cash to shareholders.

When corporations publicly announce the initiation of open market repurchase programs, their stock prices typically increase by about 2.2%. I find a strong positive correlation between announcement returns and book-to-market equity ratios. To the extent that high book-to-market equity ratios proxy for undervaluation, this result is consistent with undervaluation as a motivation for open market buybacks. Conversely, I find no consistent evidence supporting the free cash flow hypothesis as a motivation.

Boards of directors authorize billions of dollars in open market stock buybacks each year, but little is known about how many shares are actually repurchased. I examine the repurchase behavior of firms that announce open market buyback programs and find that between 50% and 60% of programs are completed over the subsequent year. There is considerable variability in repurchase behavior across firms. While about 10% of firms repurchase no shares, several buy back considerably more than their original

authorizations. As a result, the mean repurchase exceeds the mean authorization.

In analyzing the factors influencing repurchase behavior, I find a strong inverse relation between prior and current quarter returns and quarterly repurchases, consistent with undervaluation as a motivation for open market programs. I also find that actual repurchases are positively associated with the size of the authorization, free cash flow, and prior repurchase activity.

The decision to distribute cash to shareholders by repurchasing stock versus paying cash dividends is heavily influenced by the volatility of the firm's stock price. I find a strong positive correlation between stock return volatility and the proportion of total cash payouts in the form of repurchases. In addition, the repurchase proportion is positively related to the size of the total distribution and negatively related to firm size.

Lastly, I find that the stock price reactions to quarterly earnings announcements following open market repurchase announcements are smaller than those preceding repurchase announcements, suggesting that positive information about future earnings is released at repurchase announcements. However, I find no evidence that actual repurchases convey information about future earnings.

I dedicate this dissertation and all the time and effort put forth to my mom and dad, the two most wonderful people in the world. My mom never had the opportunity to attend college, but I know she would have excelled. My dad's words of advice enabled me to keep the important things in perspective.

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CHAPTER 1

Introduction

Each year corporations distribute large sums of cash to shareholders via stock repurchase programs. Since the mid 1970's, the proportion of total cash payouts to shareholders (cash dividends plus repurchases) in the form of stock repurchases has increased substantially. In 1977, repurchases comprised only 9.5% of total cash distributions to shareholders for firms in the Standard and Poor's Industrial index.[1] Since then, share repurchases have become a much larger component of corporate payouts. The ratio of repurchases to total distributions reached 44.6% by 1987, and was 32.4% in 1994, despite a narrowing differential between capital gain and dividend tax rates since the 1970's.

Stock buybacks take the form of open market (OM) repurchase programs, fixed-price or dutch auction self-tender offers, and privately negotiated repurchases. OM share repurchase programs are the most popular. Using a keyword search of the Dow Jones News Retrieval (DJNR)

[1] These computations include only those stocks in the index with repurchase data available in the particular year, typically around 90% of the total.

Database, I identified over 5000 OM stock repurchase announcements over the 1984-1992 period. A similar DJNR keyword search over the 1985-1994 period revealed only 264 self-tender offer repurchases.

Billions of dollars in OM share repurchases are authorized each year, but little is known about how many shares are actually repurchased or what factors influence repurchase activity. This lack of knowledge can be partially attributable to the complexities involved in tracing actual repurchases. Boards typically authorize a maximum repurchase amount but leave the final repurchase decision to the discretion of managers. They can carry out the repurchase program over several months or even years, and are under no legal obligation to repurchase any shares at all. Furthermore, firms seldom publicly announce the completion of a repurchase program. The flexibility to repurchase shares at opportune times perhaps accounts for the popularity of OM repurchase programs relative to alternative methods for buying back shares.

Even though firms overwhelmingly choose to repurchase stock through open market transactions, much of the theoretical and empirical research to date has focused on the less popular method, tender offer repurchases. Recently, however, academic research has turned its attention to OM share repurchases. Vermaelen (1981) and Comment and Jarrell (1991) document positive stock price reactions to OM repurchase announcements and conjecture that

investors interpret these announcements as *signals* of better than expected firm performance. Netter and Mitchell (1989) examine OM share repurchases following the stock market crash in 1987. Bartov (1991) finds some evidence that OM repurchase announcements convey positive information about future earnings. And most recently, Ikenberry, Lakonishok and Vermaelen (1995) document a stock price drift effect over a four year period following OM stock repurchase announcements.

Nonetheless, there are many unanswered questions about OM repurchase programs and much of the evidence pertaining to signaling theory is far from conclusive. Of most importance is our lack of understanding actual repurchase behavior of firms announcing OM programs. Much of the previous research on OM repurchases was conducted without regard to whether the programs were actually carried out.[2] Secondly, the increased popularity of share repurchases relative to dividends as a method for distributing cash to shareholders has motivated theoretical research analyzing the choice between the two methods (Ofer and Thakor (1987), Williams (1988), Brennan and Thakor (1990), and Chowdhry and Nanda (1994)), but the empirical predictions of these models have not been successfully tested. The empirical evidence pertaining to the signaling hypothesis of OM repurchase

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[2] One exception is Netter and Mitchell (1989) who examine changes in shares outstanding following the stock market crash of 1987 for firms announcing an OM repurchase program shortly after the crash.

announcements is also incomplete. For example, Ikenberry, et al. (1995) conjecture that undervaluation is the likely motivation for OM repurchase programs for firms having high book-to-market equity ratios, but they find no significant relation between book-to-market equity ratio and the announcement return. In addition, Bartov (1991) finds some evidence that OM repurchase announcements convey information about subsequent earnings, but his evidence is mixed and only marginally significant.

This dissertation is an empirical examination of corporate stock repurchases and aims to bridge the gaps in the literature described above. It consists of four separate essays, three focusing solely on OM stock repurchase programs and another considering the tradeoff between cash dividends and repurchases, where repurchases can take any form.

Chapter 2 consists of the first essay which examines the stock price behavior surrounding OM stock repurchase announcements. Consistent with results of other researchers, I show that on average there is about a 2.2% abnormal return at the announcement. More importantly, I examine two hypotheses offering potential explanations for the positive stock price reaction to the announcements. One is the undervaluation hypothesis first suggested by Vermaelen (1981) and the other is Jensen's (1986) agency cost of free cash flow hypothesis.

Chapter 3 presents the second essay which quantifies the actual repurchase activity of firms announcing OM stock repurchase programs. The goal is to determine whether firms on average follow through with their repurchase programs and to determine the percentage of firms that complete their initial authorization over a one year horizon following the announcement. Through cross-sectional regression analyses, I also examine the factors which influence repurchase activity across firms.

The third essay, Chapter 4, is an empirical analysis examining the choice between two alternative cash distribution mechanisms, share repurchases and cash dividends. Share repurchases in this analysis are not limited to OM programs. Several recent theoretical models have analyzed the choice between dividends and share repurchases, but the empirical predictions generated by these models have not yet been tested. This essay attempts to fill that void.

The final essay, Chapter 5, examines whether OM stock repurchase announcements signal positive information about future earnings. Prior evidence on this topic presented by Bartov (1991) is somewhat inconclusive. Using a larger sample than Bartov and a different methodology, I re-examine whether information about future earnings is released at OM share repurchase announcements. In addition, I test to see if the actual repurchase of shares conveys positive information about subsequent earnings.

Chapter 6 summarizes the contribution this dissertation has made to the finance literature and reviews the main results of the aforementioned essays. It also presents a brief description of promising related topics for future research.

CHAPTER 2

Open Market Stock Repurchase Announcement Returns: Undervaluation and Free Cash Flow Hypotheses

2.1 Introduction

Corporations distribute large sums of cash to shareholders through stock repurchases. As stated earlier, the ratio of dollars spent on stock repurchases to total dollars spent on cash dividends plus stock repurchases for firms in the Standard and Poor's Industrial index has increased from about 9% in the mid 1970's to over 32% by the mid 1990's. This growth in stock buybacks has been accompanied by research examining the effects of share repurchase announcements on stock prices. Empirical research has documented positive stock price reactions to announcements of self-tender offer repurchases (Masulis (1980), Dann (1981), Vermaelen (1981), and Comment and Jarrell (1991)) and OM repurchase programs (Vermaelen (1981), Netter and Mitchell (1989), Comment and Jarrell (1991), and Ikenberry et al. (1995)).

The positive market response to OM repurchase announcements is generally interpreted as a signal that management believes their stock is undervalued. In fact, one of the most popular reasons for OM repurchase programs

cited by managers is that they believe their stock is underpriced (Baker, Gallagher and Morgan (1981), and Wansley, Lane and Sarkar (1989)).

Another possible explanation for the positive stock price reaction to repurchase announcements is the reduction of agency costs associated with free cash flow (Jensen (1986)). Agency costs of free cash flow arise when managers invest in internal projects earning less than the investors' required rate of return. Jensen (1986) shows that this agency cost is most important in organizations with large cash flows but without attractive investment opportunities. He suggests that value maximizing managers of these firms act in the shareholders' interests by distributing the excess cash through dividend payments or stock repurchases rather than wasting it on negative net present value projects or organizational inefficiencies. The market subsequently responds favorably to the managers' decision to distribute the cash.

This chapter of my dissertation examines the stock price reaction to announcements of OM stock repurchase programs, and attempts to determine whether the data support the undervaluation hypothesis and/or the agency cost of free cash flow theory.

2.2 Announcement Returns and the Undervaluation Hypothesis

As noted above, several researchers have found that announcements of OM stock repurchase programs on average are

greeted with positive stock price reactions. This positive market response to announcements is generally interpreted as a signal that management believes their stock is undervalued.

Several possible explanations motivating repurchases have been suggested by the literature, including capital structure adjustment, substitution for cash dividends, signaling, excess cash distribution, takeover defense, and bondholder wealth expropriation. Nonetheless, signaling undervaluation is likely to be an important factor motivating OM stock buybacks for firms having high book-to-market equity ratios. Ikenberry et al. (1995) conjecture that high book-to-market firms announcing OM repurchases tend to be undervalued. They examine the long term performance of firms announcing OM repurchase programs over a four year period following the announcements and compare it to the performance of carefully constructed benchmark portfolios. They form ten size-based portfolios using all firms on the New York Stock Exchange and American Stock Exchange and also carried on Compustat. The ten size deciles are then sorted on the basis of book-to-market equity ratios to form five quintiles within each size decile, resulting in 50 benchmark portfolios. Assuming annual rebalancing, they compute buy-and-hold returns for equal-weighted portfolios of each book-to-market quintile of announcing firms for four years following the announcement. Four year buy-and-hold abnormal returns are computed by

taking the difference between the compounded return to the equally weighted portfolios of repurchase firms and the compounded return to the respective benchmark portfolios. The portfolio consisting of repurchasing firms ranked in the highest book-to-market quintile earns four year buy-and-hold returns 45.3 percent higher than its respective size and book-to-market benchmark portfolio. However, abnormal returns to repurchasing firm portfolios decline steadily going from the highest book-to-market quintile to the lowest. In fact, the abnormal return for repurchasing firms ranked in the lowest book-to-market quintile is negative. They conclude that repurchase announcements by high book-to-market firms are likely to be motivated by undervaluation. But surprisingly, they find that a firm's book-to-market quintile rank is not related to the announcement return. They hypothesize that for high book-to-market firms, the market under-reacts to the announcement, ignoring much of the information conveyed, and prices adjust slowly over the long term.

I examine whether undervaluation, as measured by the book-to-market equity ratio, explains announcement returns for my sample of OM repurchases. If OM repurchases are motivated by undervaluation, then firms with high book-to-market equity ratios should elicit larger stock price reactions to the announcement.

Although Ikenberry et al. (1995) find no relation between book-to-market ratios and announcement returns,

several differences in the samples and test procedures between their study and mine warrants a second examination. For example, Ikenberry et al. identify OM programs using the Wall Street Journal index and include New York Stock Exchange, American Stock Exchange, and NASDAQ traded stocks, while I use a keyword search of the Dow Jones News Retrieval service and exclude NASDAQ firms. Their sample consists of 1239 announcements over 1980-1990 and mine has 1022 over 1984-1992. They omit all announcements made during the fourth quarter of 1987 following the stock market crash, while I include those firms. As discussed later, I limit my sample to firms that authorize at least four percent of their outstanding shares for repurchase, while they place no such restrictions on their sample. Finally, Ikenberry et al. categorize firms into book-to-market equity quintiles and use each firm's quintile ranking as an explanatory variable in the regressions, while I use the actual book-to-market equity ratio for each firm.

Another possible undervaluation measure is past return. Rosenberg, Reid, and Lanstein (1985) show that past returns can predict future returns based on a "specific-return-reversal" strategy. The strategy buys stocks having negative specific returns in the prior month and short sells stocks having positive specific returns. They find that the specific returns reverse themselves in the next month, producing abnormal returns. They conclude that, for their sample, market prices were inefficient.

Comment and Jarrell (1991) find that firms announcing OM stock repurchases typically under-perform the market over the 40-day period leading up to the announcement and the market reacts more positively to the announcement the greater the prior under-performance. Based on these findings, they hypothesize that OM repurchase announcements are credible signals of undervaluation.

In this section, I examine whether two measures of undervaluation, the prior 40-day market-adjusted return and book-to-market equity ratio, explain the cross-sectional variation in announcement returns for my sample. In sum, the undervaluation hypothesis predicts a positive relation between the announcement return and book-to-market equity ratio and a negative relation with the prior market-adjusted return.

2.2.1 Data and Sample Selection

A keyword search of the Dow Jones News Retrieval (DJNR) service is used to identify firms announcing OM stock repurchases between January 1, 1984 and December 31, 1992. A total of 5901 announcements were originally identified. I restrict the sample to firms with data available on the Center for Research in Security Prices (CRSP) daily NYSE/AMEX returns tape and the Compustat quarterly industrial or research tapes, leaving 2039 observations. In order to focus attention on repurchase programs with the most information content, I omit firms that announce a

planned repurchase of less than 4 percent of their outstanding shares, leaving 1284 observations in the sample. Comment and Jarrell (1991) find that larger programs have more information content than smaller programs. For each announcement, I record the percentage of outstanding shares authorized for repurchase, the announcement date, and any supplementary information contained in the DJNR story.[3] Announcements made after the market close are recorded as occurring on the next trading day.

Summary statistics for the final sample of OM authorizations are shown in Table 1. The mean percentage of shares authorized for repurchase is 8.5% while the median is 7.0%, and the distribution is fairly uniform over the 9-year sample period. Note that there are 69 announcements that do not specify the number of shares to be repurchased. Table 2 shows the distribution of the number of OM repurchase announcements across firms. There are 747 different firms in the sample and 439 of these authorize a single repurchase program throughout the sample period. The remainder make

[3] If the planned repurchase is stated in terms of shares, a percentage is calculated based on the number of shares outstanding at the end of the prior quarter as reported in the S&P Daily Stock Price Record. If the authorized repurchase is stated in terms of market value, that amount is converted to shares by dividing by the stock price four days prior to the announcement. Then a percentage of outstanding shares is calculated based on the number of shares outstanding at the end of the prior quarter. Supplementary information includes the reason for the repurchase, the method of financing, whether a previous program existed and had been completed, and the presence of any confounding events mentioned in the story.

two or more announcements to repurchase at least 4 percent of their outstanding shares.

2.2.2 Variable Computations

Return data are obtained from the CRSP Daily Returns tape. The announcement returns are calculated by cumulating the abnormal returns on the day of the announcement and the previous trading day. The abnormal returns are based on the one-factor market model using the CRSP value-weighted index as a proxy for the market. The market model is estimated over 350 days centered on the OM repurchase announcement date, excluding the two-day announcement period. This estimation period is chosen to control for possible shifts in the parameters as implied by the results of recent empirical research. For example, Comment and Jarrell (1991) document a downward price drift over the 40 days prior to OM repurchase announcements while Ikenberry et al. (1995) document long-term abnormal returns subsequent to OM repurchase announcements.

For robustness tests, announcement abnormal returns are also calculated over other windows and using different benchmarks for the market. Market-adjusted returns are computed over 2-day (-1,0), 3-day (-1,+1) and 5-day (-2,+2) windows using both the CRSP value- and equal-weighted indexes as proxies for the market. Market-adjusted returns are computed by taking the difference between the compounded return on the stock and the compounded return on the market

index. Total and market-adjusted returns are also computed from 42 to 3 days prior to the OM repurchase announcement.[4]

Table 3 presents summary statistics for the abnormal returns at OM repurchase announcements and the 40-day period prior to the announcement. Consistent with prior research, the mean and median two-day announcement abnormal return computed from the market model is 2.2% and 1.8%, respectively. The table also shows that market-adjusted abnormal returns are similar when computed over various windows using both equal- and value-weighted CRSP indexes as market proxies. All the mean returns presented in the table are significantly different from zero at the 1% level. The mean market-adjusted return over the 40-days prior to the announcement is -4.5% and -4.3% when the market is approximated by the CRSP equal- and value-weighted indexes, respectively. These negative abnormal returns are comparable to the findings of Comment and Jarrell (1991) and indicate that firms typically under-perform the market prior to announcing OM stock repurchases.

The book-to-market equity ratio is computed for each firm at the end of the fiscal quarter preceding the announcement by dividing the book value of equity by the market value of equity.

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[4] Consistent with Ikenberry, Lakonishok, and Vermaelen (1995), I also calculate returns prior to the announcement over an 18 day period, measured from 20 to 3 days before the announcement.

The regression analysis controls for two other variables that previous research has shown to be important factors in explaining abnormal returns at OM repurchase announcements. The first is the percent of outstanding shares authorized for repurchase. Vermaelen (1981), Comment and Jarrell (1991), Ikenberry et al. (1995) as well as others have shown that the announcement return is increasing in the percent of shares sought in the announcement. The percent authorized for each firm is taken directly from the DJNR story. The other control variable is firm size. Ikenberry et al. (1995) find that announcement returns are inversely related to the firm's size decile rank. There is typically more asymmetric information between managers and external market participants for smaller firms, so announcements by small firms elicit larger price reactions. I use the natural log of market value of equity at the end of the fiscal quarter prior to the announcement as my measure of firm size.

When I require data to be available for all variables, including the free cash flow variables to be described later, the sample is reduced to 1022 total observations.

2.2.3 Empirical Results

Table 4 compares the mean announcement abnormal returns for firms with relatively high versus low book-to-market equity ratios. The mean return for each group is the 2-day cumulative abnormal return based on the one-factor market

model. The data show that the mean announcement return is greater for firms having relatively high book-to-market equity ratios versus those having relatively low ratios.

The top half of the table compares the mean abnormal returns for firms having book-to-market equity ratios below the median ratio of all firms in the sample with firms having ratios above the median. The mean abnormal return for firms with book-to-market ratios below the median is 1.4% compared to 2.9% for those above the median, both significantly different from zero at the 1% level. The mean difference of 1.5% is significant at the 1% level. The bottom of the table compares the 256 firms having book-to-market ratios in the lowest quartile with the 256 firms in the upper quartile. As expected, the difference in returns is even more dramatic. The lowest quartile has a mean abnormal return of only 0.9%, but is still significant at the 1% level. The upper quartile mean return is 3.7% and is highly significant. The difference in the means of 2.8% is also significant at the 1% level. To the extent that high book-to-market equity ratios proxy for undervaluation, these results support the undervaluation hypothesis.

I test the undervaluation hypothesis more thoroughly using a cross-sectional regression analysis relating announcement returns to book-to-market equity ratios.

Table 5 presents the results from a regression analysis explaining abnormal returns at OM repurchase announcements. The dependent variable in each model is the two-day

cumulative abnormal return based on the one-factor market model with the CRSP value weighted index used as a proxy for the market. The model in the first column is estimated using ordinary least squares (OLS) and t-statistics are shown in parentheses below the coefficient estimates. Since White's (1980) test detects the presence of heteroskedasticity in the regression error terms, t-statistics are computed using White consistent standard errors.

Coefficient estimates from the OLS regression are consistent with results from prior research and with the notion that OM repurchase announcements are signals of undervaluation. The percent of outstanding shares authorized for repurchase is positively related to the announcement return and firm size is negatively related to the announcement return, both significant at the 1% level. The market-adjusted return over the 40-days leading up to the announcement is inversely related to the announcement return and highly significant. This is consistent with the findings of Comment and Jarrell (1991) and supports the undervaluation theory. That is, the greater the under-performance relative to the market in the period just prior to the announcement, the larger is the stock price reaction to the announcement. The most interesting new result is that the book-to-market equity ratio has a positive impact on the announcement return. Its coefficient of 2.607 is significant at the 1% level. To the extent that high book-

to-market equity ratios proxy for undervaluation, this result provides further support for the undervaluation hypothesis. The book-to-market effect found here is contrary to the results of Ikenberry et al. (1995) indicating book-to-market equity quintile rank is insignificant in explaining announcement returns for their sample of OM repurchases.

The second column of Table 5 estimates the same model using weighted least squares (WLS), with the weights equal to the inverse of the standard deviation of the market model residual. Using White's (1980) technique, I test for the presence of heteroskedasticity in the WLS residuals. The chi-square test statistic is 16.0 with a corresponding p-value of 0.313, which fails to reject the null hypothesis that the WLS residuals are homoskedastic. Therefore, reported t-statistics associated with WLS regressions are not adjusted using White standard errors as in the OLS regressions.

Coefficient estimates using WLS are very similar to the OLS regression, except the coefficient on book-to-market equity ratio declines in magnitude and significance. Its coefficient is reduced to 0.936 and its t-statistic declines from 4.304 to 2.333, still significant at the 5% level. In addition, the overall fit of the model is worse using WLS. The adjusted R^2 is 8.10% for the OLS regression while only 3.99% for WLS.

To ensure that the book-to-market effect is not merely picking up a time trend in book-to-market ratios due to the pronounced upward trend in stock prices over the 9-year sample period, I re-estimate the regressions using a standardized book-to-market equity ratio. Each firm's book-to-market ratio is divided by the mean book-to-market ratio for the S&P 500, measured June 30 in the year of the announcement. Likewise, firm size is standardized by the mean market value of equity for the S&P 500. Coefficient estimates for these regressions are presented in Column 3 using OLS and Column 4 using WLS with very similar results when book-to-market and firm size are unstandardized in Columns 1 and 2.

As a robustness check, I re-estimate the model using six different measures of announcement abnormal returns. Market-adjusted returns are computed over 2-day, 3-day, and 5-day windows surrounding the announcement by taking the difference between the compounded return on the stock and the compounded return on the market over these periods. The market is proxied by both the CRSP equal- and value-weighted indexes. The models are all estimated using OLS with White (1980) corrected standard errors.

Table 6 shows that the results remain qualitatively unchanged when using these alternative measures of announcement returns as the dependent variable. The first three columns use the CRSP equal-weighted index as a proxy for the market, while the last three use the value-weighted

index. Coefficient estimates for the percent authorized are positive and significant when explaining market-adjusted announcement returns measured over the 2-day period, but become statistically insignificant when announcement returns are measured over 3-day and 5-day periods for either choice of the market proxy. The relation between firm size and announcement returns is negative and significant at the 5% level when the dependent variable is measured over 2-day and 3-day periods for either choice of the market proxy, but becomes insignificant when announcement returns are measured over 5-day windows. Consistent with earlier findings, the positive association between announcement returns and book-to-market equity ratio is significant at the 1% level and the inverse relation with the prior 40-day market-adjusted return remains highly significant in all regressions. For each announcement window there is a slightly better fit to the model when the value-weighted index is used as the market proxy.

Overall, the results support the undervaluation hypothesis. The evidence presented shows that, controlling for firm size and the percent of shares authorized, the stock price reaction to OM repurchase announcements is larger the greater the under-performance of the stock relative to the market prior to the announcement and the higher the book-to-market equity ratio. To the extent that prior abnormal returns and book-to-market equity ratios serve as proxies for undervaluation, the results imply that

undervalued firms elicit larger stock price reactions to OM repurchase announcements. These results are robust to the choices of alternative announcement windows and proxies for the market in computing the announcement abnormal return.

2.3 Announcement Returns and the Free Cash Flow (FCF) Hypothesis

An alternative interpretation for the positive relation between book-to-market equity ratio and the announcement return is the mitigation of agency costs associated with firms having large cash flows but poor investment opportunities (Jensen (1986)). In theory, firms with poor investment opportunities should have high book-to-market equity ratios.[5] Thus, firms with high book-to-market equity ratios coupled with excess cash might reduce agency costs associated with free cash flow by repurchasing stock. The FCF theory suggests a larger stock price reaction to repurchase announcements for firms having high book-to-market equity ratios and free cash flow, as the market responds favorably to management's decision to pay the cash to shareholders rather than waste it on negative net present value projects.

Several researchers have empirically tested Jensen's (1986) free cash flow theory as it relates to takeovers

[5] Studies by Smith and Watts (1992), Gaver and Gaver (1993), and Barclay and Smith (1995) use market-to-book value of assets to proxy for the firm's investment opportunity set.

(Lang, Stulz and Walkling (1991), and Hanson (1992)), going private transactions (Lehn and Poulsen (1989)), dividend announcements (Lang and Litzenberger (1989)), and tender offer stock repurchases and special dividends (Howe, He and Kao (1992)). This section of my dissertation extends the literature by examining the free cash flow theory in the context of open market stock repurchases. In analyzing the free cash flow hypothesis, I introduce several variables to proxy for free cash flow and see if they help explain the abnormal returns associated with OM stock repurchase announcements.

2.3.1 Variable Computations

In order to test the free cash flow hypothesis, several measures of cash flow are computed using Compustat data. My base measure of cash flow is that used by Lehn and Poulsen (1989) and Lang et al. (1991), calculated as operating income before depreciation minus interest expense, taxes, preferred dividends, and common stock dividends measured over the fiscal year prior to the OM repurchase announcement. I standardize the free cash flow variable by the book value of total assets, book value of equity, and book value of debt plus book value of equity measured at the end of the previous fiscal year.

Another measure of cash flow is based on operating income. It is computed as operating income before depreciation minus depreciation and amortization measured

over the fiscal year prior to the announcement divided by the book value of total assets at the end of the fiscal year before the announcement. This is similar to the profitability measure return on assets.

I also compute a measure of liquidity, or accumulated cash flow, since excess cash on hand is also available to distribute to shareholders. Accumulated cash flow is computed as the ratio of cash plus marketable securities to the book value of total assets at the end of the fiscal year prior to the announcement.

Leverage may also be related to the announcement return. Jensen's (1986) theory suggests that the agency problem of free cash flow is less severe for firms with debt in their capital structure since the debt contract forces managers to distribute cash to debtholders, leaving little cash to waste on unprofitable projects. My measure of leverage is the book value of long term debt divided by the book value of long term debt plus the book value of equity calculated at the end of the fiscal year preceding the announcement.

The FCF theory predicts that announcement returns should be positively associated with book-to-market equity ratios and measures of free cash flow, and inversely related to leverage.

2.3.2 Empirical Results

I begin analyzing the FCF theory by dividing the sample into four subgroups, each containing firms classified as being either high book-to-market/high FCF firms, high book-to-market/low FCF firms, low book-to-market/high FCF firms, or low book-to-market/low FCF firms. Firms assigned to the high book-to-market/high FCF group are those with book-to-market equity ratios greater than the median book-to-market ratio and FCF greater than the median FCF. Those assigned to the low book-to-market/high FCF group are firms with book-to-market equity ratios less than the median book-to-market ratio and FCF greater than the median FCF. The other subgroups are defined similarly.

Table 7 compares the mean abnormal returns for each of these groups. Data in rows of the table compare high versus low book-to-market firms while data in columns compare high versus low FCF firms. Going across the first row, the mean return for the 195 firms in the low book-to-market/low FCF group is 1.2%, and the mean return for the 316 firms in the high book-to-market/low FCF group is 3.3%, both significantly different from zero at the 1% level. In the second row, the mean abnormal return for the low book-to-market/high FCF group is 1.5% and that of the high book-to-market/high FCF group is 2.4%. Consistent with the FCF hypothesis (as well as the undervaluation hypothesis), the difference in the mean return for high book-to-market/low FCF firms versus low book-to-market/low FCF firms is 2.1%

and significant at the 1% level. The difference in the mean return for high book-to-market/high FCF firms versus low book-to-market/high FCF firms is 0.9% and marginally significant.

There is less support for the FCF hypothesis when comparing high FCF firms with low FCF firms. In the first column, the difference in the mean return for the high FCF/low book-to-market and low FCF/low book-to-market is only 0.3% and insignificantly different from zero. Data in the second column are inconsistent with the FCF hypothesis; that is, the high FCF/high book-to-market firms actually have a lower abnormal return than the low FCF/high book-to-market firms.

Based on the theory of agency costs of free cash flow, one would expect that the difference in announcement returns should be most pronounced when comparing firms having high FCF and poor investment opportunities with those having abundant investment opportunities but low FCF. In the bottom right-hand corner of Table 7 the mean difference in the return between the high FCF/high book-to-market group and low FCF/low book-to-market group is 1.2% and marginally significant. This provides some support for the FCF hypothesis, although overall the evidence presented thus far is rather weak.

In Table 8 I perform a similar matrix analysis of the FCF hypothesis by substituting a measure of excess cash on hand, or liquidity, for the FCF variable. Excess cash on

hand is defined as cash plus marketable securities divided by book value of total assets at the end of the fiscal year prior to the announcement. The results are qualitatively similar to those presented in Table 7. The mean difference in returns between high book-to-market/low cash and low book-to-market/low cash is 1.3% and between high book-to-market/high cash and low book-to-market/high cash is 1.8%, both significant at the 1% level. The mean difference in returns between high cash and low cash firms shown in the columns are not significantly different from zero. However, the mean difference between the high cash/high book-to-market firms and the low cash/low book-to-market firms, the most applicable scenario for the FCF theory, is 2.0% and significant at the 1% level.

Thus far the evidence presented in support of the FCF hypothesis is marginal at best. Further tests of the FCF theory using a cross-sectional regression analysis are presented below.

Table 9 presents OLS regressions testing the FCF hypothesis, with each model having a single FCF variable in addition to the variables used in the base regressions in Tables 5 and 6. The dependent variable in each model is the 2-day abnormal return based on the one-factor market model. T-statistics are in parentheses under the coefficient estimates and are based on standard errors corrected for heteroskedasticity using White's (1980) technique. The table shows that adding any one FCF variable has no effect

on the magnitude or significance of the coefficient estimates of all variables tested under the undervaluation hypothesis. For each model, the announcement return is positively related to the percent authorized and inversely related to the prior 40-day market-adjusted return and firm size, each being highly significant. Consistent with the FCF hypothesis, book-to-market equity ratio is positively associated with the announcement return and significant at the 1% level in each model. The first three columns of the table present the coefficient estimates for the free cash flow variable defined as operating income before depreciation minus interest expense, taxes, preferred dividends, and common stock dividends, each standardized differently. In Model 1 the coefficient estimate on free cash flow standardized by total assets is positive as predicted by the FCF theory but insignificantly different from zero. In Model 2 the coefficient estimate on free cash flow standardized by book value of equity is negative and insignificant. Model 3 standardizes FCF by the sum of book value of debt and book value of equity, and its coefficient is positive but, again, insignificant. Model 4 uses operating income divided by total assets as a measure of cash flow and its coefficient is positive but also insignificant. Model 5 tests whether high liquidity firms as evidenced by having excess cash on hand obtain larger stock price reactions to the OM repurchase announcements. Contrary to the FCF theory, the coefficient estimate on the

liquidity variable, cash plus marketable securities divided by total assets, is negative but insignificant. The FCF hypothesis predicts an inverse relation between the announcement return and leverage. The last column shows that the debt ratio, long term debt divided by long term debt plus book value of equity, is positively related to the announcement return, but insignificant. In sum, none of the free cash flow variables presented in Table 9 support the FCF hypothesis.

In Table 10 both the liquidity variable and a FCF variable are added to the regression simultaneously, in addition to the base variables, as a further test of the FCF hypothesis. The results remain unchanged from those presented in Table 9 when only a single FCF variable was added to the base regression. Coefficient estimates on FCF divided by total assets, book value of equity, and book value of debt plus book value of equity, and operating income divided by total assets are nearly identical to those presented in Table 9 and are insignificant. The coefficient on cash and marketable securities divided by total assets, my measure of liquidity, varies in sign depending on which FCF variable is in the regression but is insignificantly different from zero in each model.

Table 11 repeats the regressions presented in Table 9, where only a single FCF variable is added to the base regression, but uses WLS instead of OLS to estimate the parameters. The weights in each model are equal to the

inverse of the standard deviation of the market model residual. The results from these regressions provide marginal support for the FCF hypothesis, although the overall results are mixed. In each model coefficient estimates for the base variables remain similar to those estimated using WLS in Table 5. The percent authorized and book-to-market ratio are positively related to announcement returns while firm size and the prior 40-day market-adjusted return are inversely related, with all coefficients highly significant.

In Model 1, the coefficient on FCF standardized by total assets is 4.808. Its t-statistic of 2.355 is marginally significant. This is consistent with the FCF hypothesis. Firms with poor investment opportunities as proxied by high book-to-market equity ratios and having large free cash flow mitigate agency costs by distributing the excess cash to shareholders instead of wasting it on unprofitable projects and the market responds positively to the repurchase announcement. However, in Model 2 the coefficient on FCF normalized by book value of equity is negative and insignificant. In Model 3, FCF divided by the sum of book value of debt and book value of equity is positively and significantly related to the announcement return. Its coefficient of 2.972 has a t-statistic of 2.356. When operating income divided by total assets is used as the cash flow variable its coefficient is positive, as predicted by the FCF theory, and marginally significant

too. Cash and marketable securities divided by total assets is positively related to the announcement return but its coefficient is not significant as shown in Model 5. In Model 6, the coefficient estimate on the debt ratio is negative, as predicted, but not significantly differently from zero.

Table 12 uses WLS to estimate the regressions when the liquidity variable is included in the model along with a FCF variable, similar to the OLS regressions presented in Table 10. The results are similar to those presented in Table 11 when only a single FCF variable is added to the WLS regression. In Model 1 the coefficient on FCF divided total assets is positive and significant at the 1% level while the coefficient on cash plus marketable securities divided by total assets is positive, as predicted, but insignificant. In model 2 FCF standardized by the book value of equity is inversely related to the announcement return but not significant, and the liquidity variable is insignificantly different from zero. Models 3 and 4 show that FCF divided by book value of debt plus book value of equity and operating income divided by total assets are positively and significantly related to announcement returns, while the liquidity variable remains insignificant in each regression. Combining the liquidity variable with the FCF variables does not improve the overall fit of the model.

Although the results presented thus far have not provided consistent support for the FCF hypothesis, another

test might shed further insight on the theory. As previously mentioned, the FCF theory is most applicable to firms having high free cash flow coupled with poor investment opportunities. This suggests that the positive association between book-to-market equity ratios and announcement returns should be more pronounced for firms with the highest level of free cash flow. In order to test this presumption, I compute two slope dummy variables on the book-to-market ratio for 1) firms whose FCF divided by total assets is greater than the median FCF for all firms in the sample, and 2) firms whose cash and marketable securities standardized by total assets is greater than the median value. The predicted sign on both slope dummy variables is positive since firms with the highest free cash flow or excess cash on hand coupled with a high book-to-market ratio are most susceptible to agency costs.

Table 13 presents the results using OLS to estimate the regression parameters with t-statistics based on White (1980) standard errors in parentheses below the coefficient estimates. The slope dummy variable is based on the FCF measure for Models 1 and 2, and the liquidity measure for Models 3 and 4. Model 1 shows that the base variables are unaffected when this interaction term is added to the regression. As before, the book-to-market equity ratio is positively and significantly related to the announcement return. However, the coefficient on the slope dummy variable is negative but insignificant, indicating that the

announcement return is no more sensitive to book-to-market equity ratios for high FCF firms than for low FCF firms. Model 2 drops the book-to-market equity ratio from the regression, and the coefficient on the slope dummy variable is insignificantly different from zero, indicating that the book-to-market equity ratio is unrelated to the announcement return for high FCF firms. This evidence is contrary to the predictions of the FCF hypothesis. Note also that the estimated coefficient on firm size nearly doubles in both magnitude and significance when book-to-market ratio is dropped from the regression, although it is probably biased due to the omission of book-to-market from the equation. In addition, the regression R-squared drops from 8.04% to 5.54%.

Model 3 in Table 13 shows that the coefficient estimate on the slope dummy variable based on liquidity is also insignificantly different from zero, indicating that the announcement return is no more sensitive to book-to-market equity ratios for high liquidity firms than for low liquidity firms. Model 4 drops the book-to-market equity ratio and the coefficient on the slope dummy is positive and significant, indicating that the announcement return is positively related to book-to-market equity ratios for high liquidity firms.

Table 14 uses WLS to estimate the coefficients for the regressions containing the slope dummy variables, with similar results to those in Table 13. In Model 1, the slope

dummy coefficient based on the FCF variable is positive but not significantly different from zero when book-to-market ratio is in the equation, and it remains insignificant when book-to-market ratio is dropped from the regression in Model 2. In Model 3 the coefficient on book-to-market is positive and significant as before, but the coefficient on the slope dummy for firms with the highest liquidity is insignificant. Model 4 shows that the coefficient on the slope dummy remains insignificant when book-to-market equity ratio is dropped from the regression.

I repeated all regressions shown in Tables 4 through 14 using a standardized measure of book-to-market equity ratio as described earlier to be sure that the pronounced upward trend in stock prices over the 9-year sample period is not influencing the coefficient estimates on the book-to-market equity ratio. Since all tests using the standardized book-to-market ratio produced very similar results, I have omitted them from the tables and discussion.

In sum, the data do not provide consistent support for the free cash flow hypothesis. When OLS is used to estimate the models none of the free cash flow variables are significant. When WLS is used, FCF standardized by either total assets or book value of debt plus book value of equity is marginally significant in explaining announcement returns. However, when FCF is standardized by book value of equity, the sign on its estimated coefficient is opposite to that predicted by the theory and is insignificant.

Operating income divided by total assets is positively related to the announcement return but is only marginally significant. Estimated coefficients on the liquidity and leverage variables are never significantly different from zero. The book-to-market equity ratio is positively related to the announcement return and is significant in all regressions.

2.4 Summary

In this chapter of my dissertation, I examine the behavior of stock prices at the time corporations announce the initiation of OM stock repurchase programs. On average, the market responds positively to the announcements. The mean abnormal return computed over the day of the announcement and the previous trading day for a sample of 1022 firms is 2.2%. This is consistent with the findings of previous research.

Through a cross-sectional regression analysis, I examine the factors explaining the positive announcement returns. Overall, the results support the undervaluation hypothesis. Controlling for firm size and the percent of outstanding shares authorized to be purchased, the stock price reaction to announcements is larger the greater the under-performance of the stock relative to the market prior to the announcement and the higher the book-to-market equity ratio. To the extent that prior abnormal returns and book-to-market equity ratios serve as proxies for undervaluation,

the results imply that undervalued firms elicit larger stock price reactions to OM repurchase announcements. This is consistent with the generally accepted notion put forth by other researchers that the positive stock price reaction to OM repurchase announcements is the market's response to a signal from managers that believe their stock may be undervalued.

The results do not provide any consistent support for the free cash flow hypothesis, however. Jensen (1986) shows that agency costs of free cash flow arise when managers invest in internal projects earning less than the investors' required rate of return, and that this cost is most important in organizations with large cash flows but poor investment opportunities. He suggests managers can mitigate the costs associated with free cash flow by distributing the excess cash through dividend payments or stock repurchases rather than wasting it on negative net present value projects. The theory predicts a positive market reaction to managers' decision to distribute the cash as agency costs are eliminated.

Several measures of free cash flow, liquidity, and leverage are computed to see if they help explain the announcement abnormal return as suggested by the free cash flow theory. Unfortunately, these tests fail to provide consistent support for the free cash flow hypothesis.

CHAPTER 3

An Analysis of Repurchase Behavior in Open Market Stock Buyback Programs

3.1 Introduction

Stock repurchases are an increasingly popular mechanism for distributing cash to shareholders. The number and size of repurchase programs have increased substantially since the mid 1970's (Bagwell and Shoven (1989)), with approximately $65 billion in buybacks announced in 1994.[6] Stock buybacks take the form of privately negotiated transactions, dutch-auction or fixed price self-tender offers, and open market (OM) repurchases, with OM programs the most common. Ikenberry, Lakonishok, and Vermaelen (1995) report that 90 percent of the dollar value of all buybacks announced between 1985 and 1993 were OM programs.

Although boards of directors authorize billions of dollars in OM programs each year, little is known about how many shares are actually repurchased. Boards typically authorize a maximum repurchase amount but leave the repurchase decision to the discretion of managers. Managers, subject to regulatory constraints, can implement a

[6] Reported in the *Wall Street Journal*, March 7, 1995, with data provided by Securities Data Company.

program over several months or even years. Moreover, they are under no legal obligation to repurchase any shares at all.

This paper analyzes the repurchase behavior of firms that announce OM buyback programs.[7] We first compare authorizations with actual shares repurchased over a one year horizon following the announcement. Depending on whether the announcement quarter is included in the calculations, we find that between 50-60% of programs are completed over the subsequent year. When we exclude firms that announce another OM program or tender offer within the year, the completion rate is around 40-50%. While around 10% of firms fail to repurchase any shares, a large percentage buy back substantially more shares than originally authorized.

We next consider the factors influencing actual repurchases over time and across firms. Since managers often cite undervaluation as a motivation for repurchasing stock (Baker, Gallagher and Morgan (1981), and Wansley, Lane and Sarkar (1989)), we use several valuation measures to explain repurchase behavior, including past and contemporaneous stock returns, earnings-to-price, and book-to-price ratios. Since repurchases involve an expenditure of cash, we analyze whether repurchases are related to the

[7] After the first draft of this paper was completed, we became aware of another paper which addresses many of the same issues by Stephens and Weisbach (1996).

firm's liquidity, leverage, and free cash flow. In addition, we examine whether buyback behavior is related to past repurchases in the same program. Our key finding is that actual repurchases are opportunistic; quarterly repurchases are negatively related to past and current stock returns, and positively related to the amount of free cash flow available for repurchases in the quarter.

The next section of the paper describes the data. We compare authorizations with actual repurchases in Section 3.3. Section 3.4 examines the factors influencing repurchase behavior, and Section 3.5 concludes.

3.2 Data

A keyword search of the Dow Jones News Retrieval (DJNR) service is used to identify firms announcing OM stock repurchases between January 1, 1984 and December 31, 1992. A total of 5901 announcements were originally identified. We restrict the sample to firms with data available on the Center for Research in Security Prices (CRSP) daily NYSE/AMEX returns tape, leaving 2309 observations. For each announcement, we record the percentage of outstanding shares authorized for repurchase, the announcement date, and any supplementary information contained in the DJNR story.[8]

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[8] If the planned repurchase is stated in terms of shares, a percentage is calculated based on the number of shares outstanding at the end of the prior quarter as reported in the S&P Daily Stock Price Record. If the authorized repurchase is stated in terms of market value, that amount is converted to shares by dividing by the stock price four days prior to

Announcements made after the market close are recorded as occurring on the next trading day.

Data for common stock repurchases is obtained from the Compustat Industrial and Research files. Our repurchase measure is derived from Compustat item #93, *Purchase of Common and Preferred Stock* (PCPS), from the cash flow statement. PCPS is defined as the dollar expenditure for purchase of common and preferred stock during the fiscal quarter. If preferred stock on the balance sheet (Compustat item #55) remains unchanged or increases from the previous quarter, we set common stock purchased equal to PCPS. If preferred stock decreases from the previous quarter, we assume the entire decrease represents purchases at book value, and set common stock purchased equal to PCPS less the decline in preferred. When the decrease in preferred stock is larger than PCPS, common stock purchased is set equal to zero.[9] If preferred stock is unavailable or purchases and sales of stock are combined on Compustat, we exclude that firm.

This calculation of common stock purchases is subject to error in two situations. When a company is both

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the announcement. Then a percentage of outstanding shares is calculated based on the number of shares outstanding at the end of the prior quarter. Supplementary information includes the reason for the repurchase, the method of financing, whether a previous program existed and had been completed, and the presence of any confounding events mentioned in the story.

[9] The decline in preferred exceeds PCPS in less than 2% of quarters in our final sample, and could result from conversions of preferred into common, as discussed in the text below.

repurchasing and issuing preferred within the same quarter, we overstate actual common stock purchases by the minimum of preferred repurchases and sales. Conversely, when convertible preferred is converted to common, we understate common stock purchases because preferred stock on the balance sheet declines but PCPS is unaffected (since there is no cash outlay). More than 88% of the fiscal quarters in our sample experience no changes in preferred and so are free from these potential inaccuracies.[10] As a robustness check, we repeat all of our tests using a subsample of firms with no preferred stock outstanding in any quarter in the test period.

We estimate the number of shares repurchased in a quarter by dividing dollar repurchases by the average stock price for the quarter, computed by equally weighting monthly average prices. The monthly average price is calculated by averaging the beginning and end of month prices. To the extent that managers are able to buy stock at below average prices, we will understate the actual number of shares purchased. Our qualitative results did not change when computing the average price as the average of the beginning and end of quarter price, or when using a monthly trading volume weighted average price.

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[10] Excepting the perverse and extremely unlikely case where purchases or conversions of preferred are exactly equal to sales of preferred.

In previous papers, Shoven (1986) and Ackert and Smith (1993) estimate monthly stock repurchases as the decline in the number of common shares outstanding for the month. If shares increase from the previous month, repurchases are set to zero. This method understates actual repurchases by the amount of shares issued in months where repurchases exceed issues, and by the amount of shares repurchased in months where issues exceed repurchases. As we show in Table 16, the number of shares repurchased in our sample vastly exceeds the cumulative decrease in common shares outstanding, so significant numbers of shares are being issued. This suggests that estimating repurchases using declines in shares will underestimate actual repurchases by a substantial margin.

Actual shares repurchased are computed through four fiscal quarters following the announcement quarter. Because we don't know the exact timing of repurchases in the announcement quarter relative to the announcement date, we present data both including and excluding the announcement quarter. Since the typical OM repurchase authorization provides managers considerable flexibility in the timing of repurchases, extending the time frame would result in more repurchases and hence more completed programs. Nonetheless, to see whether programs are completed in a timely fashion, we limit the time horizon to one year.[11] We eliminate firms

[11] Firms rarely announce the completion or cancellation of a program without simultaneously authorizing additional

that have OM authorizations in the previous 15 months to avoid double-counting the same repurchased shares in two different programs. When a sample firm makes a self-tender offer or extends, expands, or reauthorizes an OM program within 15 months following an announcement, we mark that observation and analyze those firms separately in our tests. Tender offer announcements are obtained from the list provided by Comment and Jarrell (1991) for 1984-89 and from our own DJNR search for 1990-1993. Fourteen sample firms make subsequent tender offers, 247 make a second OM announcement, and 5 firms do both.

Summary statistics for the 1005 OM repurchase announcements in our full sample are shown in Table 15.[12] There are 222 announcements in the sample in 1987, 192 in 1990, and between 64 and 113 in each of the other years. The mean percentage of shares authorized for repurchase is 6.69% while the median is 5.30%. The total market value of equity authorized for repurchase exceeds $116 billion.

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buybacks, so there is no good way to estimate a typical time horizon for OM programs from past data.

[12] There are three observations in our data that are discarded as outliers. One firm more than doubled its number of shares outstanding in the test period, and two others issued large numbers of shares and later repurchased more shares than were outstanding before the announcement. We repeated all of our tests before dropping these three observations without any qualitative changes in our findings. Results before removing the outliers are available on request.

3.3 Comparing Shares Authorized With Actual Repurchases

Panel A of Table 16 presents cumulative repurchase data through four quarters for the full sample, the subsample with no preferred stock outstanding, and the subsample with no subsequent OM announcements or tender offers. Data is provided both including and excluding the announcement quarter. The first column illustrates the authorized repurchase as a percentage of shares outstanding before the announcement. The next four columns present actual repurchases as a percentage of shares outstanding and as a percentage of shares authorized. The last two columns present cumulative percentage changes in shares outstanding, computed directly from common shares data on Compustat.

For the full sample, the mean repurchase is 8.82% of shares outstanding over quarters 1-4, exceeding the mean authorization of 6.69%. Clearly, this indicates some firms end up repurchasing substantially more shares than originally authorized. The median cumulative repurchase over quarters 1-4 is 5.40%, very close to the median authorization of 5.30%. Hence, over the four quarters following the announcement, the typical number of shares repurchased closely matches the typical number of shares authorized. Expressed as a percent of shares authorized, the mean and median repurchase over quarters 1-4 are 191.45% and 98.57% respectively.

The (split-adjusted) change in shares outstanding data in the last column includes the effects of repurchases,

exchange offers, and share issues. In addition to rights and underwritten seasoned offers, companies issue shares through the exercise of executive stock options, ESOP plans, and conversions of convertible debt and preferred stock. The mean decrease in shares outstanding is less than 20% of the mean repurchase, so a considerable number of shares are issued by our sample firms.

Mean and median repurchases for the no preferred sample are 8.33% and 5.07% respectively, comparable to the full sample results. This indicates that the assumptions required to separate purchases of preferred from common using Compustat data do not significantly affect the results.

As expected, actual repurchases relative to authorizations are smaller for the 749 firms for which we could not identify a subsequent OM announcement or tender offer. The median repurchase through quarters 1-4 and 0-4 are 4.11% and 5.78% respectively, both below the median authorization of 5.80%.

Panel B of Table 16 presents mean and median repurchases for the full sample on a quarter-by-quarter basis. Firms tend to purchase more shares in quarter 1 than in quarter 0, with median repurchases declining in later quarters.

A breakdown of the distribution of program completions appears in Panel C.[13] In the full sample, 57.8% and 49.3% of programs are completed measuring repurchases including and excluding the announcement quarter respectively. Around one-third of programs are less than 50% complete after a year, and around 10% of firms do not repurchase any shares. Programs authorizing purchases of less than 5% of outstanding shares are more likely to be completed than larger programs. Completion rates for firms without a subsequent announcement are around 40-50%, somewhat less than for the full sample.

To summarize, more than half of the 1005 OM repurchase programs in our full sample are completed over the year following the announcement. There is considerable variation in repurchase behavior across programs; about 10% of firms do not repurchase any shares, yet enough firms exceed their original authorizations so that the mean repurchase over the year exceeds the mean authorization. Shares outstanding typically decrease in the year following the announcement, but the decrease is less than 20% of the number of shares

[13] Since we require each observation in Table 16 to have complete repurchase data for four quarters following the announcement, our results are subject to a survivorship bias. Firms that are acquired, delisted, or have missing data on Compustat may exhibit different repurchase behavior than other firms. Those firms delisted on account of financial distress are unlikely to have repurchased many shares. To check for a bias, we compute cumulative repurchases for all firms with data available through quarters 1, 2, and 3. Results are virtually identical to those reported in Table 16, so we do not believe survivorship meaningfully affects our conclusions.

repurchased. The next section of the paper attempts to explain what factors contribute to the variation in firms' repurchase behavior.

3.4 Explaining Share Repurchases

3.4.1 The Statistical Model

In the absence of a theory which suggests a specific functional form, we posit a linear relation between shares repurchased and a number of explanatory variables. The dependent variable in each model is quarterly share repurchases expressed as a percentage of shares outstanding before the announcement. Since repurchases are bounded below at zero, following Stephens and Weisbach (1996), we use a maximum-likelihood Tobit procedure for estimation. We use the same sample as in Section 3.3, 1005 programs with complete share repurchase data over the four quarters following the announcement quarter. Data is pooled over quarters 1 through 4 for the 1005 programs, yielding a maximum of 4020 quarterly observations. We now describe the rationale for each of the explanatory variables we use.

Repurchases in the prior quarter are included in each model. Models without this variable exhibit severe positive residual autocorrelation in the least squares regressions used in the first stage of the Tobit procedure. We also include cumulative shares purchased from the announcement quarter through the beginning of the prior quarter to account for any tendency for firms that have already

purchased considerable numbers of shares to refrain from more purchases in later quarters.

The percentage of shares authorized for repurchase is included in each model. The larger the percent of shares authorized, the more shares are likely to be purchased. Each model has intercept dummies for each of the four fiscal quarters because firms tend to purchase more shares in earlier rather than later quarters. To see whether firms announcing programs following the market crash of 1987 tended to repurchase more or fewer shares than other programs, we include an intercept dummy for announcements in the fourth quarter of 1987 in each model. Netter and Mitchell (1989) find that over the six months ending March 31, 1988, shares declined for only 41% of NYSE/AMEX firms announcing OM programs in the two weeks after the crash, so we expect the dummy to be negative.

Managers often cite "undervaluation" as a motivation for stock buybacks in surveys (Baker, Gallagher and Morgan (1981), and Wansley, Lane and Sarkar (1989)). Comment and Jarrell (1991) find that abnormal stock returns tend to be negative over the 40 trading days preceding OM program announcements. To the extent that past stock returns are a proxy for the difference between the market price and management's own valuation, we expect an inverse relation between quarterly repurchases and past stock returns. We use the raw stock return from CRSP over the prior fiscal quarter as our measure of past returns. Current quarter

stock returns could also proxy for undervaluation, so we include that variable as well in the models.[14]

Another commonly-used valuation measure is the book-to-price ratio B/P, computed using the book and market values of equity at the beginning of each quarter. Ikenberry et al. (1995) find that high book-to-price firms earn abnormal returns of 45.3 percent over the four years following OM repurchase announcements, while low book-to-price firms do not earn abnormal returns. They conclude that high book-to-price firms announcing OM repurchases are likely to be motivated by undervaluation. If managers regard B/P as a indicator of undervaluation, we expect a positive association between repurchases and B/P. In addition to B/P, we use the earnings-to-price ratio (E/P) as a valuation measure, computed using the most recent 12-months earnings per share and the stock price at the beginning of the quarter.

All else equal, firms with considerable excess cash on hand have a greater capability to repurchase shares than less liquid firms. Our proxy for excess cash is cash plus marketable securities dividend by total assets at the

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[14] SEC Rule 10b-18 defines several "safe-harbor" conditions under which a repurchase transaction is exempt from prosecution under market manipulation regulations (see Black (1991)). One condition is that firms must not buy at a price above the last sale price or the bid price, whichever is higher. This rule encourages firms to purchase shares in a passive manner, buying with limit orders or with market orders as prices are falling. To the extent that firms attempt to satisfy this condition, we expect an inverse relation between repurchases and the current quarter return.

beginning of the quarter. Similarly, firms with low leverage have a greater capacity to finance buybacks externally. We use the total debt to total assets ratio at the beginning of the quarter as our measure of debt capacity.[15] Finally, firms with high levels of free cash flow (FCF), defined as cash flow from operations minus capital expenditures and cash dividends, are most able to distribute cash without resorting to external financing. Several different free cash flow definitions gave similar qualitative results, but we define the level of free cash flow as FCF in the corresponding quarter of the previous year (quarter t-4), and the change in FCF as the difference between FCF in quarter t and t-4. Both are standardized by total assets at the beginning of quarter t.[16] Unfortunately, since FCF data is unavailable on Compustat prior to 1987 and is often missing for smaller firms, our sample size for models using this variable is significantly reduced.

3.4.2 Empirical Results for Share Repurchases

Coefficient estimates from our quarterly share repurchase models are presented in Tables 17 and 18. The first column of Table 17 presents results for the full

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[15] We are grateful to the second anonymous referee for suggesting using cash on hand and the debt ratio as measures of the capacity of the firm to follow through with announced repurchases.

[16] We thank the first anonymous referee for suggesting the use of free cash flow in the model instead of earnings.

sample assuming the residual standard deviation is constant. In the second column, we model the residual standard deviation σ_ε as:

$$\sigma_\varepsilon = \sigma\exp(\alpha'\mathbf{X}) \qquad (3.1)$$

where α is a coefficient vector and $\mathbf{X}$ is our set of explanatory variables. A χ^2 likelihood ratio test easily rejects the hypothesis that $\alpha=0$ at the 1% level, so all subsequent models are estimated using (3.1) to correct for heteroskedasticity.

Examining the coefficient estimates in the second column, the percent authorized is positive as expected and marginally significant. Coefficients on both the prior and current quarter returns are negative and significant. The coefficient of -0.020 on the current quarter return indicates that for each additional 10% decline in the stock price over the quarter, an additional 0.20 percent of outstanding shares are repurchased on average.

The inverse relation between repurchases and prior and current quarter returns provides an explanation for the wide variation in repurchase behavior illustrated in Table 16. In the event a manager's private information is reflected in an increased stock price in the months following the announcement, repurchasing stock is no longer in

shareholders' interest because the stock is no longer undervalued, a point raised by Netter and Mitchell (1989). Hence, we should not expect all managers to repurchase their entire authorization. Our evidence is consistent with Netter and Mitchell's finding that post-announcement abnormal returns for OTC firms that did not repurchase shares following the 1987 crash were higher than for repurchasing firms.

Prior quarter repurchases provide substantial explanatory power, with a t-statistic of more than thirty. Firms actively buying back shares in one quarter tend to continue buying shares in the next quarter. The coefficient on cumulative repurchases before the prior quarter is positive but insignificantly different from zero, suggesting that controlling for prior quarter repurchases, firms do not cut back on purchases if they have already bought numerous shares in the program.

The dummy for announcements made in the fourth quarter of 1987 is negative and significant, indicating firms announcing programs around the market crash were less likely to follow through with their announced programs than firms announcing at other times. Estimates of the quarterly intercept dummies decline uniformly from the first to fourth quarter in all models.

Tobit results for the no preferred and no subsequent announcement subsamples appear in the last two columns of Table 17. Coefficient estimates on percent authorized are

higher for both subsamples than for the full sample, and the quarterly dummies are lower as expected for firms not making subsequent announcements, but no important qualitative differences emerge.

Table 18 presents results including B/P and E/P ratios, liquidity, debt capacity, and free cash flow as explanatory variables. Coefficient estimates on the intercept dummies are not reported to save space, but are very similar to those in Table 17. Results in the first column for the B/P and E/P valuation measures are decidedly mixed. The coefficient on B/P is negative and insignificant, while the E/P coefficient is positive and significant. These findings do not provide much support for the theory that firms with low stock prices relative to accounting fundamentals are more aggressive in buying back shares.

The second column drops B/P and E/P and includes the cash and debt ratios of the firm. The coefficient on the cash/total assets ratio is insignificant, but the coefficient on the debt ratio is negative as predicted and significant. The third column includes the two free cash flow variables, measuring the level and trend in free cash flow for the firm. Both FCF variables have positive coefficients, and both are highly significant. Firms generating considerable levels of cash in excess of their capital expenditure requirements are more active in buying back shares than other firms, all else equal.

Before concluding, it is interesting to see if cumulative repurchases measured over quarters 1 through 4 are influenced by the same factors explaining quarterly repurchases. Our cash and debt ratio variables are computed as of the beginning of quarter 1. We compute a single return variable, the cumulative return over quarters 1 through 4. Free cash flow is cumulated over the four quarters and standardized by total assets at the beginning of quarter 1.

Results are presented in Table 19 for the full sample with and without including the free cash flow variable, and for the no subsequent announcements subsample. Percent authorized is positive and significant in each column. The contemporaneous cumulative stock return is negative and marginally significant for the full sample, and is somewhat more negative and significant in the regressions where FCF data is available. Neither the debt ratio nor FCF are significant in explaining cumulative repurchases. Coefficient estimates for the no subsequent announcement sample in the third column are very similar to those for the full sample.

3.5 Summary and Conclusions

This paper analyzes actual stock repurchases by firms that announce open market buyback programs. We first compare shares authorized with actual repurchases for 1005 programs. We find that between 50-60% of programs are

completed over the ensuing year, depending on whether the announcement quarter is included in the calculations. After excluding firms that announce another OM program or tender offer, the completion rate is around 40-50%. Had we tracked repurchases beyond one year, even more programs would have been completed. There is considerable variability in repurchase behavior across firms. While about 10% of firms end up purchasing no shares, many others buy back considerably more than their original authorizations. As a result, the mean repurchase over the four quarters exceeds the mean authorization. Firms in our sample actively issue shares over the same horizon, so the average decrease in shares outstanding is less than 20% of repurchases.

When we examine the factors influencing quarterly repurchases, we find that larger authorizations result in more shares repurchased, and firms actively buying back shares in one quarter tend to continue buying shares in the next quarter. We find no consistent evidence that the relation of stock price to fundamentals, as proxied by book-to-price and earnings-to-price ratios, provides explanatory power. Repurchases are positively and significantly related to the level and trend in the free cash flow of the firm, and negatively related to the debt ratio, but appear unrelated to the amount of cash on hand. Results for the no preferred and no subsequent announcements subsamples are similar to those for the full sample, so our conclusions are

robust to the assumptions required to separate preferred and common stock purchases using Compustat data, and to whether or not a particular program is expanded or reauthorized.

Our most important finding is that actual repurchase behavior is opportunistic, consistent with undervaluation as a motivation for open market programs. There are strong inverse relations between prior and current quarter returns and repurchases, suggesting that managers accelerate purchases if their private information is not quickly reflected in the stock price following the announcement.

CHAPTER 4

An Empirical Analysis of Alternative Cash Distribution Mechanisms: Share Repurchases Versus Dividends

4.1 Introduction

Corporate cash distribution policies have long intrigued academics. In their classic article, Miller and Modigliani (1961) prove distribution policy is irrelevant in the absence of personal taxes and transaction costs, holding real investment constant. Subsequent research analyzed how various market imperfections can influence dividend policy. Bhattacharya (1979) and Miller and Rock (1985) show that when managers have an informational advantage over outside shareholders, paying dividends can be optimal even if this creates a tax liability for stockholders or requires the firm to relinquish attractive investment opportunities. John and Kalay (1982) show that dividend policy can be used to resolve conflicts between stockholders and bondholders, and Easterbrook (1984) argues that dividend payments mitigate the agency costs created by the separation of ownership and control. DeAngelo (1991) shows that equilibrium between consumption and investment requires that some firms will make taxable payouts even if cash retention allows for complete tax avoidance.

While these theories convincingly explain why firms distribute cash to stockholders despite costs of doing so, they do not specifically address the choice between the two primary distribution mechanisms, dividends and share repurchases. Through the mid 1970's, cash dividends constituted an overwhelming fraction of total distributions, despite personal tax rates on dividends in excess of 70% for some investors. Black (1976) argues that since investors are taxed only on their capital gain in a stock repurchase, and often at a favorable tax rate, it is puzzling why firms pay dividends at all. In 1977, the year following publication of Black's paper, repurchases comprised only 9.5% of total cash distributions to shareholders (cash dividends plus repurchases)[17] for firms in the Standard and Poor's Industrial index.[18] Since then, share repurchases have become a much larger component of corporate payouts. The ratio of repurchases to total distributions reached 44.6% by 1987, and was 32.4% in 1994, despite a narrowing differential between capital gain and dividend tax rates since the 1970's (also see Bagwell and Shoven (1989)). These data suggest that payout policies have become more sophisticated over time, with managers structuring distributions to best suit their particular needs.

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[17] Cash payments to target shareholders in takeovers are also important, but our focus is on payouts to the firm's own shareholders and not to shareholders of other firms.

[18] These computations include only those stocks in the index with repurchase data available in the particular year, typically around 90% of the total.

The recent growth in repurchase activity has spurred considerable theoretical research into the relative costs and benefits of dividends and repurchases. Ofer and Thakor (1987) and Williams (1988) demonstrate that dividends and repurchases can play different roles in signaling equilibria when managers are better informed than outside investors. Brennan and Thakor (1990) present a model in which differentially informed outside shareholders have disparate preferences for dividends and repurchases depending on the size of the distribution and the degree of information asymmetry in the market. Chowdhry and Nanda (1994) develop a theory in which it can be optimal to distribute cash through dividends, despite their personal tax disadvantage, unless the stock becomes sufficiently undervalued in the market. Ikenberry and Vermaelen (1995) argue that open market buyback programs provide the firm with the option to purchase stock when it is undervalued; repurchases will be emphasized relative to dividends for firms with a high variance in the difference between stock price and fundamental value.

This paper empirically investigates the tradeoff between dividends and repurchases as mechanisms for distributing cash. The empirical predictions of the theoretical models cited in the previous paragraph form the basis for our tests. In addition, to link our work with the empirical dividend payout ratio literature (Kalay (1981), Rozeff (1982), Hansen, Kumar, and Shome (1994), and Eckbo

and Verma (1994)), we examine whether several of the factors explaining cross-sectional variation in dividend payouts, including earnings variability, growth, the number of shareholders, and beta, also explain the choice between dividends and repurchases.

Our focus in this paper is on the long-run distribution policies of firms. We do not attempt to use firm characteristics to predict when a self-tender offer will occur, or forecast the short-term determinants of repurchase activity (Bagwell and Shoven (1987), Stephens and Weisbach (1996)).[19] Rather, we examine how firm-specific factors suggested by theory explain the division of total payouts between dividends and repurchases over five year periods for broad cross-sections of companies.

To summarize our results, we find that controlling for industry classification, there is a strong positive association between stock price volatility and the proportion of payouts in the form of repurchases. To the extent that volatility proxies for the degree of information asymmetry between managers and outside investors, this result supports the theories of Ofer and Thakor (1987), Chowdhry and Nanda (1994) and Ikenberry and Vermaelen (1995) that firms with high probabilities of becoming undervalued will emphasize repurchases over dividends. Firms are more

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[19] Jolls (1995) finds that executive compensation in the form of stock options is a significant explanatory variable in predicting repurchase activity. See also Lambert, Lanen, and Larcker (1989).

likely to distribute cash in the form of repurchases the smaller their market capitalization, and the larger the size of their total distributions over the sample period. There is an interaction between firm size and volatility in distribution policy, with the sensitivity of the repurchase proportion to volatility decreasing in firm size. Firms that make a tender offer within the sample period distribute more cash in total than firms that repurchase without making a tender offer, which in turn distribute more cash than firms that only pay dividends, consistent with the Brennan and Thakor (1990) model. Surprisingly, none of the theoretical predictions regarding either insider or institutional stockholdings and the repurchase proportion are supported by the data. After controlling for firm size, volatility, and the size of distributions, none of the four variables from the dividend payout literature provide consistent marginal explanatory power.

The next section of the paper describes the theoretical developments in the literature in greater detail, and presents the major empirical predictions of each model that we test. Section 4.3 describes the data and sample selection criteria, and Section 4.4 presents the methodology and empirical results. The final section offers a brief summary and conclusion.

4.2 The Theory of Alternative Distribution Mechanisms

Ofer and Thakor (1987) present a signaling model to explain the relative stock price responses to announcements of dividend and tender offer repurchase distributions. In their model, dividends and capital gains are taxed equally. Managers hold shares and have a salary tied to the current stock price, so have an incentive to signal when their stock is undervalued. Both dividends and repurchases are costly because replacing distributed cash entails underwriting or other external financing costs. Because managers are risk averse and precommit not to trade their own shares around the time of the tender offer, repurchases involve an additional cost, the manager's increased risk exposure from owning a greater percentage of the firm. Since tender offers entail a higher cost to managers for each dollar distributed, they elicit a larger stock price response than dividends.

The Ofer and Thakor model has two main cross-sectional implications for distribution policy. First, tender offers should represent a relatively large fraction of cash distributions for firms with large insider holdings. The more shares held by managers, the stronger is the signal created by a tender offer repurchase, reducing the size of the (costly) distribution necessary to produce a signal of a given strength. Second, the higher the probability that a firm becomes significantly undervalued in the market, the higher the proportion of cash distributed in tender offers.

When the firm is only slightly undervalued, the preferred signaling device is dividends, because unlike tender offers, dividends do not require risk-averse managers to hold a larger proportion of the firm.

Williams (1988) develops a signaling model in which dividends are tax disadvantaged relative to capital gains. Managers maximize the welfare of current stockholders. An empirical prediction of the model is that repurchases will be favored over dividends as a signaling device when there is a large tax disadvantage of paying dividends.

Brennan and Thakor (1990) present a model of distribution policy in which outside investors are differentially informed about the true value of the firm and share price is not a perfect aggregator of private information. Dividends are taxed at a higher rate than capital gains in the model. Whenever a repurchase transaction occurs, some shareholders experience a change in their proportional ownership in the firm.[20] These shareholders either run the risk of losses by trading (explicitly or implicitly) with better informed investors, or must incur a fixed cost of becoming informed. Large shareholders have the greatest incentive to become informed, so repurchases tend to produce a transfer of wealth from small to large shareholders. For cash distributions that

[20] If all stockholders tender their shares in a tender offer and repurchases are made pro-rata, the distribution may not qualify for capital gains tax treatment.

are small relative to the market value of the common stock of the company, dividends are likely to be observed, while for larger distributions open market repurchases are more likely, with tender offers used for the largest distributions.

All else equal, the Brennan and Thakor model predicts that firms that make relatively small total distributions over the sample period, normalized by their initial market value of equity, will tend to emphasize dividends rather than repurchases. Another implication is that the greater the degree of information asymmetry in the market, and hence the higher the probability of expropriation with a non-proportional repurchase distribution, the greater the preference for dividends. Finally, the model predicts that dividends will predominate when the personal tax advantage of repurchases is relatively small.

Chowdhry and Nanda (1994) develop a dynamic model of distribution policy which focuses on the tradeoff between dividends and tender offer repurchases.[21] Dividends are costly to individual shareholders because of the personal tax differential, yet accumulating cash is also costly if the corporate tax rate exceeds personal tax rates or managers waste free cash flow (Jensen (1986)). Managers have an informational advantage over outside investors, and

[21] They cite a cost to implementing an open market program as an increase in the bid-ask spread (Barclay and Smith (1988)), but it appears that spreads do not increase over more recent sample periods (see Miller and McConnell (1995)).

act to maximize the present value of after-tax cash flows to holders of the stock as of the end of the period. Since managers act in the interests of stockholders that do not tender their shares in a repurchase, repurchases are costly because they must be made at a premium to the current market price. As a result, firms repurchase shares only when they are undervalued. All else equal, their model predicts that firms with a relatively low cost of carrying cash within the firm will tend to emphasize tender offer repurchases, and firms with a relatively small probability of being undervalued will emphasize dividends.

Ikenberry and Vermaelen (1995) observe that firms adopting an open market repurchase program have an option to repurchase stock at opportune times. When the stock price falls below fundamental value, managers can buy back stock, and refrain from buybacks when market prices exceed fundamental value. They suggest that firms with higher variability in the deviations of price from fundamental value have more valuable repurchase options, and thus should experience higher stock returns in response to an open market program announcement. To capture the value of the repurchase option, firms with higher volatility in the difference between price and fundamental value will tend to distribute relatively more cash through repurchases than dividends.

Table 20 provides a summary of the key factors in the predictions of the theories described above, the empirical

proxies we employ for each factor, and the predicted sign of the relation between our proxy and the ratio of repurchases to total distributions. As a measure of the tax disadvantage to shareholders of cash dividends, and the tax cost of retaining cash within the firm, we use the proportion of shares held by institutions.[22] Pension and endowment funds are tax-exempt, while corporate shareholders have a tax preference for dividends because of their 70% dividend exclusion. Since performance evaluations of mutual funds in the popular press and academic literature (with the exception of Dickson and Shoven (1993)) almost always use returns before personal taxes, the distribution policy preferences of most mutual funds may not differ from those of tax-exempt institutions. The aggregate amount of total distributions, scaled by the market value of equity, also proxies for the personal tax cost of paying dividends relative to repurchases. To represent the degree of information asymmetry between managers and outside investors or among outside shareholders, we use firm size, total stock return volatility, and residual volatility from the market model. Amihud and Mendelson (1989) show that one indicator of information asymmetry among investors, the bid-ask

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[22] Tax law varied significantly over our sample periods, with a considerable reduction in the relative taxation of dividends following the 1986 Tax Reform Act, followed by increases in dividend taxes passed in 1990 and 1993. The shareholder's option to defer taxes on capital gains makes the effective tax rate on dividends higher than that on capital gains even when statutory rates are equal, as was the case between 1988 and 1990.

spread, exhibits a strong positive correlation with residual volatility and negative correlation with firm size. Freeman (1987) finds that a measure of information asymmetry between managers and outside investors, the sensitivity of stock prices to corporate earnings surprises, is inversely related to firm size. The proportion of shares held by insiders proxies for the signaling efficiency of repurchases and the probability of wastage of free cash flow.

As a linkage to prior empirical work, we also examine whether several of the variables used to explain dividend payout ratios, including earnings variability, growth, the number of shareholders, and beta, are useful in explaining the ratio of repurchases to total distributions. Survey evidence, beginning with the classic study of Lintner (1956), indicates managers are very reluctant to reduce dividends currently paid. Since firms with low earnings variability will be most able to avoid dividend cuts without costly reductions in capital spending or external financing, dividend payout is hypothesized to be inversely related to the total riskiness of the earnings of the firm. Kalay (1981) empirically tests this hypothesis with mixed results.

Agency costs between managers and outside stockholders (Jensen and Meckling (1976) and Easterbrook (1984)) motivated a number of empirical examinations of dividend payout ratios (Rozeff (1982), Hansen, Kumar, and Shome (1994), and Eckbo and Verma (1994)). Paying dividends increases the likelihood that external financing will be

required in the future, prompting scrutiny of managers by underwriters and financial analysts. Dividends are less valuable as a monitoring device: (1) the higher is the firm's growth rate, because rapidly growing firms already face regular requirements to obtain external capital, (2) the higher are managers own stockholdings, which reduces the scope for manager-stockholder conflicts, and (3) the more concentrated the ownership of the corporation, and thus the greater the extent of direct monitoring. While Easterbrook (1984) suggests that repurchases and dividends should be perfect substitutes in this function, dividends tend to be more predictable than repurchases over time, and thus could be more effective as a monitoring device. Rozeff (1982) finds that the payout ratio is decreasing in the firm's growth rate and insider holdings, and increasing in the log of the number of shareholders. Rozeff (1982) also uses beta as a risk measure and finds that beta and the payout ratio are negatively related.

4.3 Data

4.3.1 Sample Selection Criteria

Our primary data source is Compustat PC Plus. Two five-year sample periods are analyzed, fiscal years 1990-94 and 1985-89. All computations using monthly data are aligned with the fiscal years for each particular firm. For example, for a firm in the 1990-94 sample with a November fiscal year-end, its standard deviation is estimated over

December 1989-November 1994. All data are adjusted for stock splits and stock dividends.

Each sample firm is required to distribute some cash through dividends or repurchases over the five fiscal years, and to have complete annual data on Compustat for all variables except insider and institutional shareholdings, which are obtained elsewhere. We believe a five year period is long enough to capture the "permanent" distribution policy of a firm, while not so long as to severely restrict data availability. Our focus is on how distributions are divided between repurchases and dividends, and since repurchases tend to be more sporadic than dividends, using a short time horizon could create a misleading picture of their relative importance. As an example, consider a firm that pays a dividend of $1 in each of the years 1-5 and repurchases $5 worth of stock in year 2 and nothing in other years. The proportion of total distributions in repurchases over the five years is 1/2, but the average annual repurchase proportion is only 1/6.

We require firms to trade on the New York or American Stock Exchange or the NASDAQ national market, eliminating OTC firms trading on pink sheets or the OTC bulletin board. Wholly-owned subsidiaries, companies incorporated in countries other than the U.S., and American Depository Receipts are also eliminated. Repurchase data for banks and savings and loans is generally unavailable on Compustat, so our sample excludes these industries.

Limited partnerships (LPs) and real estate investment trusts (REITs) were dropped from the sample. Internal Revenue Service regulations require LPs and REITs to distribute 95% of their earnings annually to unitholders to avoid corporate income taxes. Fewer than one in ten LPs and REITs on Compustat repurchase any shares over our sample periods, so there is little variation in their distribution policies to explain.

Each firm in the sample must have cumulative net income and income before extraordinary items and discontinued operations of at least one million dollars over the five year period. This screen eliminates firms with little cash available for distribution, and precludes the possibility that our results might be driven by very small firms.

4.3.2 Variable Computations

Our measure of common stock repurchases is derived from *Purchase of Common and Preferred Stock* (PCPS) on Compustat, obtained from the cash flow statement. PCPS is defined as the dollar expenditure for purchase of common and preferred stock during the fiscal year. If preferred stock on the balance sheet remains unchanged from the previous year, we set common stock purchased equal to PCPS. If preferred stock increases from the previous year, we assume the entire increase represents sales of new preferred, and again set common stock purchased equal to PCPS. If preferred stock

decreases from the previous year, we assume the entire decrease represents purchases at book value, and set common stock purchased equal to PCPS less the decline in preferred. When the decrease in preferred stock is larger than PCPS, common stock purchased is set equal to zero. If preferred stock is unavailable or purchases and sales of stock are combined, we exclude that observation.

This calculation of common stock purchases is subject to error in two situations. When a company is both repurchasing and issuing preferred within the same year, we overstate actual common stock purchases by the minimum of preferred repurchases and sales. Conversely, when convertible preferred is converted to common, we understate common stock purchases because preferred stock on the balance sheet declines but PCPS is unaffected (since there is no cash outlay). As a robustness check, we repeated all of our tests using a subsample of firms with no changes in preferred stock in any year in the sample period, and found no substantive differences in the results.

The dependent variable in most of our tests is the proportion of total distributions in the form of repurchases. This variable is defined as total repurchases over the five year sample period divided by total repurchases plus total common stock cash dividends over the five year period.

The annualized standard deviation of monthly stock returns is estimated over the 60 months comprising the 5

fiscal years for each firm using the extreme-value method developed by Parkinson (1980):

$$\sigma_{HL} = \left[\frac{1}{5} \sum_{t=1}^{60} (.3607) \ln\left(\frac{High_t}{Low_t} \right)^2 \right]^{\frac{1}{2}} \qquad (4.1)$$

where $High_t$ and Low_t are the high and low (split-adjusted) prices for the month.[23] The traditional close-to-close return standard deviation, beta, and the residual standard deviation from the market model are computed over the same 60 month period.

Firm size is defined as the market value of equity at the beginning of the sample period. Since the distribution of firm size is highly right-skewed, we use its natural log in the tests. The total size of distributions is defined as the sum of all repurchases and dividends over the five years divided by the market value of equity at the beginning of the period.

We measure earnings predictability by the R-squared from regressing net income against time over the fiscal years 1989-94 and 1984-89 respectively for the two samples. Our proxy for growth is the least-squares growth rate of annual sales over the sample period, expressed in decimals.

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[23] Garman and Klass (1980) demonstrate analytically that σ_{HL}^2 is more than five times more efficient than the monthly close-to-close variance.

The number of shareholders at the beginning of the sample period is obtained from Compustat.

To control for inter-industry differences in the proportions of dividends and repurchases, we assign firms to one of thirteen two-digit SIC code groups, with roughly comparable numbers of firms in each group:

01-19	Raw materials, construction
20-27	Food, apparel, paper
28-30	Chemicals, petroleum, rubber
31-34	Stone, glass, metals
35	Machinery
36	Electrical equipment
37-39	Transportation equipment, instruments
40-48	Transportation, communications
49	Utilities
50-59	Trade
60-69	Finance, insurance, real estate
70-79	Services
80-89	Health, other services

Our full samples include 1520 and 1208 firms for the 1990-94 and 1985-89 periods respectively.

Institutional ownership data are obtained from Standard and Poor's Stock Guide. Institutions are defined to include pension funds, insurance companies, college endowments and mutual funds. The variable we use is the percentage of common stock held by institutional investors as of the beginning of the sample period. There are a total of 1295 and 1030 observations with data available for this variable for the 1990-94 and 1985-89 periods respectively.

The percentage of voting stock owned by insiders is collected at the beginning of each sample period from the

Value Line Investment Survey.[24] If there are two classes of common stock, and one class elects a majority of the board of directors, we use insider ownership of that class as our measure. If ownership data are provided for two classes of stock with different voting rights, we compute the total voting power of insiders using a weighted average. We omit those rare cases (less than 10) in which the inside owner is a corporation or trust and thus has a different tax situation than individual inside owners. Data are available for 608 and 474 firms respectively for the 1990-94 and 1985-89 periods.

4.3.3 Summary Statistics

Figure 1 illustrates the distribution of the ratio of repurchases to total distributions for each of the two samples. The two most frequent ratios are one (no dividends), with 205 and 367 observations in 1985-89 and 1990-94 respectively, and zero (no repurchases), with 204 and 280 observations. For those firms distributing both dividends and repurchases, dividends generally represent the larger proportion of the total.

Table 21 presents summary statistics. In both the 1985-89 and 1990-94 samples, the mean and median repurchase ratio exceed 40% and 30% respectively, indicating repurchases comprise a significant fraction of total

[24] Insider holdings data are generally unavailable on Value Line for utilities.

distributions. Average firm size is significantly higher and distribution size significantly lower in the later period, both reflecting the increase in stock valuations (both absolutely and relative to earnings) between 1985 and 1990. Average institutional shareholdings also increased substantially between 1985 and 1990.

Table 22 contains a correlation matrix of the repurchase ratio and the explanatory variables. Correlations for the 1985-89 and 1990-94 samples are presented above and below the diagonal respectively. The repurchase ratio is positively correlated with stock return volatility and sales growth, and negatively correlated with firm size and the number of shareholders. Firm size is negatively associated with volatility and insider holdings, and positively associated with institutional holdings and the number of shareholders. Volatility is negatively correlated with distribution size and institutional holdings, and positively correlated with insider holdings. Insider holdings and distribution size are negatively correlated, consistent with the negative association between insider holdings and the dividend payout ratio first documented by Rozeff (1982).

4.4 Methodology and Empirical Results

4.4.1 Full Sample Tests

This section presents our main empirical tests and results. We posit that the ratio of repurchases to total

distributions (repurchases plus cash dividends) for firm i is linearly related to our explanatory variables. Our initial regression includes the three variables from Table 20 for which we have complete data for the full sample:

$$\frac{\text{Repurchases}}{\text{TotalDistributions}_i} = \beta_0 + \beta_1 \text{LN(FirmSize)}_i + \beta_2 \text{Volatility}_i + \beta_3 \text{DistributionSize}_i + \varepsilon_i \qquad (4.2)$$

The first column of each panel of Table 23 presents coefficient estimates using ordinary least squares from (4.2) for the two periods, using σ_{HL} as the volatility measure.[25] White (1980) chi-square tests reject the hypothesis of homoskedasticity in each sample, so t-statistics are computed using robust standard errors. The three variables in (4.2) explain approximately 25% of the variation in the repurchase ratio in the 1990-94 period, and about 20% in the earlier period. In each period, coefficient estimates on firm size are negative and significant, indicating larger firms emphasize dividends relative to repurchases, and coefficients on return

[25] Since our dependent variable is bounded between zero and one, a Tobit estimation procedure might be appropriate. However, as evidenced by the distribution of the repurchase proportion in Figure 1, the dependent variable does not conform to the assumed normal distribution for the Tobit model. The residuals from ordinary least squares estimation of (4.2) exhibited no evidence of skewness, and thinner tails than a normal distribution (the kurtosis statistics for the OLS models including the SIC dummies for 1990-94 and 1985-89 are -.778 and -.675 respectively). Thus, we believe our reported statistical significance levels are conservative.

volatility are positive and highly significant, indicating firms with greater volatility emphasize repurchases relative to dividends. Coefficients on the size of the distribution are positive but insignificant.

The second column of each panel adds twelve industry dummy variables, with the health and other services classification (SIC 80-89) as the intercept. In each period, industry dummies for utilities and three manufacturing groups covering two-digit SIC codes 20-34 are negative and significant, indicating these industries emphasize dividends relative to repurchases all else equal. To test the significance of the SIC intercept dummies as a group, we use a chi-square test. The test statistics are 60.0 and 119.4 for the 1990-94 and 1985-89 samples respectively, each significant at the 1% level. This indicates there is a significant industry component in the choice between dividends and repurchases, controlling for risk, firm size, and the size of the distribution. Adding the industry dummies has the effect of slightly decreasing the coefficient on volatility and increasing the coefficient on distribution size, so that the latter is statistically significant in the 1985-89 period.

The third column in Table 23 presents generalized least squares estimates, where the residual variance $Var(\varepsilon_i)$ is modeled as:

$$Var(\varepsilon_i) = s^2 exp(\alpha' \mathbf{x}_i) \qquad (4.3)$$

where s^2 is a constant, α is a vector of coefficients, and $\mathbf{x}_i$ includes the same explanatory variables as in (4.2), except for the industry dummies.[26] In estimating (4.3), we find that $Var(\varepsilon_i)$ is increasing in the standard deviation of the return, decreasing in firm size, and decreasing in the size of the distribution. Coefficients using estimated GLS are very similar to those using OLS, with small declines in significance levels for firm size and volatility. Since estimated GLS does not provide a meaningful improvement in model fit over OLS, we use OLS in subsequent tables, using robust standard errors to compute t-statistics.

We re-estimated each of our models using the close-to-close monthly volatility and the residual standard deviation from the market model in place of σ_{HL}. Results are qualitatively the same throughout, though using σ_{HL} yields the best fit. We also repeated our tests excluding the 34 and 54 firms with one or more tender offers in the 1990-94 and 1985-89 samples, again with very similar results.[27]

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[26] Including the industry dummies in the residual variance estimation did not improve the fit of the model.

[27] When firms announce a tender offer, there is an immediate and substantial stock price reaction, on the order of 8-10% over a 5-day period (Comment and Jarrell (1991)). With a large price movement in the month of a tender offer announcement, the volatility estimate for that month could be large. Thus, the price volatility induced by the tender offer announcement could induce a positive association between volatility and the repurchase proportion.

To the extent that stock return volatility and firm size proxy for the degree of information asymmetry between managers and outside investors, the results in Table 23 support the theories of Ofer and Thakor (1987), Chowdhry and Nanda (1994) and Ikenberry and Vermaelen (1995) that firms with high probabilities of becoming undervalued will emphasize repurchases over dividends. If volatility and firm size proxy for information asymmetry among outside investors, the results are not consistent with the Brennan and Thakor (1990) model, which predicts dividends will be emphasized when there is significant risk of large losses by explicitly or implicitly trading with better informed investors during a share repurchase.

Table 24 presents additional tests. First, we examine whether the R-squared from the market model provides marginal explanatory power. Ikenberry and Vermaelen (1995) hypothesize that R-squared is inversely related to the variability in the difference between market price and fundamental value. Based on this argument, we expect to find an inverse relation between R-squared and the repurchase proportion. We obtain mixed results. The coefficient on R-squared is negative and significant in the 1985-89 period, but is indistinguishable from zero in the 1990-94 period.

We next test the ability of four variables from the dividend payout ratio literature, the log of the number of shareholders, beta, sales growth, and net income

predictability, to explain the repurchase proportion. The model in the second column of each panel of Table 24 includes the four dividend payout variables by themselves, and we find that the coefficient on the number of shareholders is significantly negative and the coefficient on sales growth significantly positive. These results are consistent with the empirical findings for dividend payouts in Rozeff (1982) and Hansen, Kumar, and Shome (1994). Results are mixed for beta and net income predictability. Each variable is of the predicted sign and significant in the 1985-89 period, but insignificant in 1990-94.

When all variables are included in the regressions in the third column of each panel, none of the four dividend payout variables are consistently significant and of the predicted sign. When firm size is included in the model, the number of shareholders is no longer significant. The relation between beta and the repurchase ratio becomes negative and insignificant when standard deviation is in the model. In the 1990-94 sample, coefficients on sales growth are positive and marginally significant. However, coefficient estimates are insignificant in the earlier sample. Coefficients on income predictability are negative and significant in the 1985-89 period, consistent with the idea that stable earnings enables firms to maintain high dividends. Yet, this relation does not hold up in the later sample.

4.4.2 Institutional and Insider Holdings

Table 25 examines the relation between institutional and insider ownership and the repurchase ratio. Because ownership data is often unavailable from Standard and Poor's Stock Guide and Value Line for smaller companies, we have fewer observations in our regressions in Table 25 than in Tables 23 and 24. The first column of each panel includes only institutional holdings along with the variables from Table 23. In each period, the coefficient on institutional holdings is positive and significant, contrary to the prediction of the personal tax hypothesis.[28] Since tax-exempt or corporate institutions face no dividend tax penalty, we would expect firms with large institutional holdings to emphasize dividends relative to repurchases. While not consistent with the personal tax hypothesis, this result supports the idea that high institutional ownership is a substitute for the payment of regular dividends in controlling manager/stockholder agency costs. High concentration of ownership by institutions leads to better monitoring of management, reducing the need for a periodic payout in the form of dividends.

In the second column, we drop institutional holdings from the model and add insider holdings. In each period, the estimated coefficient is negative and insignificantly

[28] Abrutyn and Turner (1990) report survey results that indicate most CEO's are unaware of the personal tax situations of their shareholders.

different than zero. This finding does not provide support for extant theories; with greater insider ownership, the signaling effectiveness of a tender offer repurchase is enhanced (Ofer and Thakor (1987)), and the benefits of dividends in controlling manager-shareholder agency costs decline (Chowdhry and Nanda (1994)). It is important to note, however, that these theories focus on the choice between self-tender offers and dividends. Our data includes all forms of repurchases, including self-tender, privately negotiated, and open market repurchases.

The third column includes both institutional and insider ownership variables. There is little change in the insider holdings coefficients. In the 1990-94 sample, the institutional holdings variable is no longer significantly positive, though it increases in magnitude and significance in the 1985-89 sample.

Our insider holdings results stand in sharp contrast to those of Eckbo and Verma (1994) for dividend payout ratios. Using a sample of Canadian firms in which managers tend to own large amounts of voting stock, they find that cash dividends decrease as the voting power of managers increases, and that only 10 of 63 firms in which managers had absolute voting control paid any cash dividends at all. We find no relation between insider holdings and the repurchase ratio. Furthermore, for the total of 90 observations in which insiders owned 50% or more of the voting stock in either sample, 82 paid some cash dividends

over the five-year period. Our sample excludes firms that make no cash distributions to their shareholders over the five year period, so it is possible or even likely that firms with high insider ownership tend to refrain from distributions of any kind. Nonetheless, for those firms headed by managers with dominant ownership positions that distribute some cash, there is no evidence that dividends are either favored or disfavored.[29]

The overall fit of the model declines substantially when the sample is limited to firms with insider holdings data on Value Line. In addition, for these subsamples, the coefficient on volatility is insignificant in 1985-89, and the coefficient on firm size is insignificant in 1990-94. Since Value Line is more likely to cover larger than smaller firms, the former result suggests that there may be an interaction between firm size and return standard deviation in distribution policy. Median firm sizes of the 608 and 474 firms in the 1990-94 and 1985-89 insider holdings samples are $555 and $451 million respectively, each more than three times the medians for the full sample. The next section tests for a link between firm size and the sensitivity of the repurchase proportion to volatility.

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[29] One possible explanation for the difference between our results and Eckbo and Verma is that the capital gains tax differential has generally been smaller in the U.S. than in Canada.

4.4.3 The Interaction Between Firm Size and the Sensitivity of the Repurchase Ratio to Volatility

Table 26 includes the product of volatility and the log of firm size as an explanatory variable. A significant coefficient on this variable suggests that the sensitivity of the repurchase proportion to volatility is related to firm size.[30] We estimate the model in each period for the full sample, the institutional holdings sample, and the institutional and insider holdings sample.

Coefficients on the product term are negative and generally significant, indicating that the positive association between the repurchase proportion and volatility is stronger for smaller firms than for larger firms. Moving from the first to third column in each panel, the estimated coefficient increases in magnitude, suggesting this interaction is more pronounced as firm size increases.

The theoretical justification for including standard deviation as an explanatory variable is based on asymmetric information between managers and outside stockholders (Ofer and Thakor (1987), Chowdhry and Nanda (1994) and Ikenberry and Vermaelen (1995)). For the largest firms, the degree of information asymmetry may be very small, given the number of security analysts following these firms. Thus, the asymmetric information or pricing error component of total

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[30] Or, equivalently, that there is an interaction between volatility and the sensitivity of the repurchase proportion to firm size.

risk is likely to be minimal for the largest firms. If so, there should be less sensitivity of the repurchase proportion to standard deviation for large firms.

4.4.4 Distribution Size and Payout Mechanism - Tests of the Brennan and Thakor Model

This section tests an implication of the Brennan and Thakor (1990) model concerning the relation between the size of a proposed distribution and the choice between a self-tender offer, open market repurchase, or a dividend. When a firm has a very large amount of cash to be distributed, measured relative to the market value of equity, their model predicts that a tender offer repurchase is generally preferred. Open market repurchases tend to be least-cost for more moderately sized distributions. Dividends are used for the smallest payouts, where the personal tax penalty of dividends is low relative to investors' costs of becoming informed. While Brennan and Thakor analyze a single distribution decision, how best to distribute a given lump sum of cash to shareholders, we examine whether its qualitative predictions hold for total distributions over five-year periods. In each sample period, we divide firms into three groups. Firms in the first group make a least one self-tender offer over the five year interval. Firms in the second repurchase some shares but do not make a self-tender offer. Firms in the third group do not repurchase any shares, distributing cash only through dividends.

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Brennan and Thakor's model is supported if firms in the first group make larger total distributions than firms in the second group, and firms in the second group make larger distributions than firms in the third group.

For the 1990-1994 period, we collect tender offer announcements from a search of the Dow Jones News Retrieval service. For the 1985-89 period, we use the list of self-tender offers provided in Comment and Jarrell (1991). There are a total of 34 and 54 firms with one or more tender offers in the 1990-94 and 1985-89 samples respectively.

Table 27 presents statistics for total cash distributions, scaled by the initial market value of equity, for each of the three groups. In each period, total cash distributions for firms that make self-tender offers are much larger than for firms that repurchase shares but do not make a self-tender offer. Total distributions are smallest for the group paying cash dividends but not repurchasing any shares. Pairwise differences in the means for the three groups are statistically significant at the usual levels. These data provide strong support for the relation between distribution size and choice of mechanism predicted by the Brennan and Thakor (1990) model.

4.5 Summary and Conclusions

The use of share repurchases as a cash distribution mechanism has grown considerably in the past two decades. This paper empirically examines the predictions of several

recent theoretical models analyzing the choice between dividends and share repurchases as mechanisms for distributing cash.

We obtain several new results. Our main finding is that there is a strong positive relation between stock price volatility and the proportion of payouts in the form of repurchases. If volatility proxies for the degree of information asymmetry between managers and outside investors, this result supports the theories of Ofer and Thakor (1987), Chowdhry and Nanda (1994) and Ikenberry and Vermaelen (1995) that firms with high probabilities of becoming undervalued will emphasize repurchases over dividends. Firm size is another proxy for information asymmetry, and consistent with the theory, smaller firms are more likely to distribute cash in the form of repurchases than larger firms. We also find that there is an interaction between firm size and volatility in distribution policy, with the sensitivity of the repurchase proportion to volatility decreasing in firm size.

There is a relatively weak but positive relation between the repurchase ratio and the size of total distributions over the sample period, controlling for industry classification, volatility, and firm size. Firms that make a tender offer within the sample period distribute more cash in total than firms that repurchase without making a tender offer, who in turn distribute more cash than firms

that only pay dividends, consistent with the Brennan and Thakor (1990) model.

To link our work with the empirical dividend payout ratio literature, we examine whether several of the factors explaining cross-sectional variation in dividend payouts, including earnings variability, growth, the number of shareholders, and beta, also explain the choice between dividends and repurchases. After controlling for firm size, volatility, and the size of distributions, none of these variables provide consistent marginal explanatory power.

There is a positive and generally significant relation between the repurchase ratio and institutional ownership, inconsistent with the theory that the tax positions of shareholders drives the choice of payout mechanism. Insider holdings and the repurchase ratio appear unrelated. Existing theories anticipate a positive association between the two, but their focus is on the choice between self-tender offers and dividends. Our data includes all forms of repurchases, including self-tender, privately negotiated, and open market repurchases.

CHAPTER 5

Open Market Stock Repurchase Programs As Signals Of Future Earnings

5.1 Introduction

This chapter examines whether announcements of open market (OM) stock repurchase programs convey positive information about future earnings. The information hypothesis is based on several theoretical signaling models. For example, Miller and Rock (1985) show that, given investment, a higher unexpected net dividend signals higher than expected current as well as future earnings. In the context of their model, repurchasing shares corresponds to a "net dividend" paid to shareholders and signals higher earnings. This chapter also investigates whether the cash flows resulting from actual quarterly share repurchases provide the market with additional information about subsequent earnings.

The information hypothesis has been successfully tested for tender offer repurchases. Vermaelen (1981) finds that repurchases via tender offer are followed by abnormal increases in earnings per share. Dann, Masulis, and Mayers (1991) also find positive earnings surprises following tender offer repurchases. In terms of OM share repurchases,

the empirical evidence is less convincing. Bartov (1991) finds some evidence that OM repurchase announcements convey information about future earnings. However, his results are weak and somewhat ambiguous. For example, during the year of the repurchase announcement, announcing firms have higher unexpected annual earnings relative to a control sample of non-announcing firms, but statistical significance is only marginal. Furthermore, unexpected earnings during the following year are negative, falling below the earnings of the control sample.

This chapter of my dissertation re-examines whether OM share repurchase programs signal positive information about future earnings. The goal is to provide empirical evidence which bolsters support for the information hypothesis. My study differs from Bartov's (1991) in a number of ways. For example, my sample consists of 842 OM repurchase announcements whereas Bartov's consists of only 185. In addition, following the procedure of Dann et al. (1991), I calculate earnings response coefficients in periods surrounding the announcement. I also investigate whether the actual repurchase of shares conveys additional information not released at the announcement.

5.2 Data

5.2.1 Sample Selection

A keyword search of the Dow Jones News Retrieval (DJNR) service is used to identify firms announcing OM stock

repurchases between January 1, 1984 and December 31, 1992. A total of 5901 announcements were originally identified. I restrict the sample to firms having data available on the Center for Research in Security Prices (CRSP) daily NYSE/AMEX returns tape and the Compustat quarterly industrial or research tapes, leaving 2039 observations. In order to focus attention on repurchase programs with the most information content, I omit firms that announce a planned repurchase of less than 4 percent of their outstanding shares, leaving 1284 observations in the sample. Comment and Jarrell (1991) find that larger programs have more information content than smaller programs. For each announcement, I record the percentage of outstanding shares authorized for repurchase, the announcement date, and any supplementary information contained in the DJNR story.[31] Announcements made after the market close are recorded as occurring on the next trading day.

Since most of the tests examine earnings behavior over several quarters following OM repurchase announcements, multiple announcements by the same firm could adversely

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[31] If the planned repurchase is stated in terms of shares, a percentage is calculated based on the number of shares outstanding at the end of the prior quarter as reported in the S&P Daily Stock Price Record. If the authorized repurchase is stated in terms of market value, that amount is converted to shares by dividing by the stock price four days prior to the announcement. Then a percentage of outstanding shares is calculated based on the number of shares outstanding at the end of the prior quarter. Supplementary information includes the reason for the repurchase, the method of financing, whether a previous program existed and had been completed, and the presence of any confounding events mentioned in the story.

affect the results. Therefore, I require a minimum of four quarters between two announcements by the same firm and conduct most tests over the four fiscal quarters following each announcement. This procedure reduces the size of the final sample to 842 observations.

5.2.2 Earnings and Earnings Forecast Errors

The source for quarterly earnings data is the Compustat industrial and research files. For each OM repurchase announcement, quarterly earnings are collected over thirty-seven consecutive fiscal quarters, beginning twenty-eight quarters prior to the repurchase announcement and ending eight quarters after. The fiscal quarter containing the repurchase announcement, quarter 0, is included in the time-series of earnings. Collecting twenty-eight quarters of data prior to the announcement is necessary in order to build an adequate time-series model of earnings, which is used to forecast future earnings.

Two measures of earnings are used throughout the analysis. The first is earnings per share (EPS), primary and excluding extra-ordinary items (item #19), and the second measure is operating income (EBIT), calculated by adding interest expense (item #22) to pre-tax income (item #23). EPS data are adjusted for stock splits and stock dividends using the Compustat cumulative adjustment factor. Earnings data reported as either semi-annual or annual earnings in lieu of quarterly earnings are coded as missing.

EBIT is also coded as missing if interest expense has a Compustat "combined figure" code.

Earnings announcement dates are obtained from the Compustat file for thirteen consecutive fiscal quarters, beginning four quarters before the repurchase announcement date and ending eight quarters after. Earnings forecast errors are estimated for each of the these fiscal quarters using the procedure outlined by Bernard and Thomas (1989). Earnings forecasts are based on the Foster (1977) model, which assumes that quarterly earnings follow a first-order autoregressive process in seasonal differences. A maximum of 24 observations are used to estimate the parameters of the model. An earnings forecast is established for each firm that has at least 10 consecutive quarters of data available. When fewer than 16 consecutive quarters of data is available, a seasonal random walk with trend model is used. Standardized forecast errors are calculated by taking the difference between actual and forecasted earnings, and then dividing by 1) the market value at the end of the quarter prior to the OM repurchase announcement; and 2) the standard deviation of forecast errors over the estimation period.[32]

Table 28 presents a summary of EPS forecast errors standardized by both price and the standard deviation of

[32] Since EPS is adjusted for stock splits or stock dividends, price is also adjusted for stock splits and stock dividends before standardizing the EPS forecast errors.

forecast errors over the estimation period. Table 29 presents EBIT forecast errors standardized by market value of equity and the standard deviation of forecast errors over the estimation period.

5.2.3 Abnormal Returns at OM Repurchase Announcements and Earnings Announcements

Two-day cumulative abnormal returns are calculated for 13 earnings announcement dates and the OM repurchase announcement date. The earnings announcement dates correspond to the 13 consecutive fiscal quarters that begin four fiscal quarters prior to the repurchase announcement, include quarter 0, and end with the eighth quarter following the announcement. Each two-day period (-1,0) consists of the announcement day and the previous trading day.

The two-day cumulative abnormal returns are based on the one-factor market model with the CRSP value-weighted index used as a proxy for the market. As a check for robustness, market-adjusted returns using both the CRSP equal- and value-weighted indexes as market proxies are also calculated for each two-day announcement period.

I estimate the market model over three separate periods in order to control for possible shifts in the model's parameters as is implied by the results of recent empirical research. Comment and Jarrell (1991) document a downward price drift over the 40 days prior to OM repurchase announcements while Ikenberry, Lakonishok, and Vermaelen

(1995) document long-term abnormal returns subsequent to OM repurchase announcements. In addition, Bartov (1991) finds a statistically significant decline in systematic risk following OM repurchase announcements.

A pre-repurchase estimation period, which spans the 350 consecutive trading days beginning two days before the OM announcement, is used to calculate cumulative abnormal returns for earnings announcements preceding the OM repurchase announcement. A post-repurchase estimation period, which consists of 350 days beginning one day after the OM announcement, is used to calculate cumulative abnormal returns for earnings announcements subsequent to the repurchase announcement. The third estimation period covers the 350 days centered on the OM repurchase announcement and is used for calculating the two-day cumulative abnormal return at the repurchase announcement. A minimum of 100 days of return data must be available to estimate the market model in each estimation period. Each firm in the sample meets this criterion for the centered and post-repurchase estimation periods, but 36 fail to meet it for the pre-repurchase period. In these cases, market model parameters estimated from the post-repurchase period are used. For the pre- and post-repurchase periods, dates that coincide with any two-day earnings announcement date are omitted from the estimation process. I also exclude the two-day window at the repurchase announcement in the centered estimation period.

Earnings announcement dates that coincide with the two-day repurchase announcement event are regarded as confounding events and omitted from the tests. Since earnings announcement dates lag their respective fiscal quarter, earnings dates for the quarter immediately preceding the repurchase announcement occur after the repurchase announcement date for 142 observations. Market model parameters estimated from the post-repurchase period are used to calculate the cumulative abnormal return for those particular earnings announcements. I also assign a special code to identify these cases. Announcement abnormal returns are also coded as missing if there is no return data available on either the event day or previous day. In addition, three firms in the sample have no return data on the CRSP tape and are assigned missing value codes at each event date.

5.2.4 Measuring Actual Share Repurchases

My measure of common stock repurchases is derived from Compustat item #93, *Purchase of Common and Preferred Stock* (PCPS), from the cash flow statement. PCPS is defined as the dollar expenditure for purchase of common and preferred stock during the fiscal quarter. If preferred stock on the balance sheet (Compustat item #55) remains unchanged from the previous quarter, I set common stock purchased equal to PCPS. If preferred stock increases from the previous

quarter, I assume the entire increase represents sales of new preferred, and again set common stock purchased equal to PCPS. If preferred stock decreases from the previous quarter, I assume the entire decrease represents purchases at book value, and set common stock purchased equal to PCPS less the decline in preferred. When the decrease in preferred stock is larger than PCPS, common stock purchased is set equal to zero.[33] If preferred stock is unavailable or purchases and sales of stock are combined on Compustat, I exclude that quarterly observation.

This calculation of common stock purchases is subject to error in two situations. When a company is both repurchasing and issuing preferred within the same quarter, I overstate actual common stock purchases by the minimum of preferred repurchases and sales. Conversely, when convertible preferred is converted to common, I understate common stock purchases because preferred stock on the balance sheet declines but PCPS is unaffected (since there is no cash outlay). Over 88% of the fiscal quarters in the sample experience no changes in preferred and so are free from these potential inaccuracies.[34]

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[33] The decline in preferred exceeds PCPS in 61 out of 3,368 quarters in our final sample, and could result from conversions of preferred into common, as discussed in the text below.

[34] Excepting the perverse and extremely unlikely case where purchases or conversions of preferred are exactly equal to sales of preferred.

Finally, I estimate the number of shares repurchased in a quarter by dividing dollar repurchases by the average of the beginning and ending stock prices for the quarter. To the extent that managers are able to buy stock at below average prices, I will understate the actual number of shares purchased.

5.3 Methodology and Empirical Results

5.3.1 Explaining Future Earnings Forecast Errors With OM Stock Repurchase Announcement Abnormal Returns

If the announcement for the initiation of an OM repurchase program signals positive information to the market about future earnings prospects, then the size of the signal, proxied by the announcement abnormal return, should be positively related to the size of future earnings forecast errors, which are based on a time-series model of past earnings.

Hypothesis #1:

Null Hypothesis:

On average, there is no systematic relationship between OM repurchase announcement abnormal returns and future earnings forecast errors.

Alternative Hypothesis:

On average, there is a positive relationship between OM repurchase announcement abnormal returns and future earnings forecast errors.

The following model is estimated to test this hypothesis.

$$fe_j = \beta_0 + \beta_1 \, \mathrm{AROM}_j + \varepsilon_j$$

The dependent variable, fe_j, is the earnings forecast error for firm j following the repurchase announcement, and is based on a univariate time-series model of earnings as described earlier. The regression is estimated using forecast errors based on both EPS and EBIT. Separate regressions are estimated for each quarterly forecast error for quarters 0 through 3. $AROM_j$ is the two-day cumulative abnormal return measured over the announcement day and previous day, expressed in decimal form. It is based on the one-factor market model using the CRSP value-weighted index as the market proxy. Finding a positive coefficient on the AROM variable would be consistent with the hypothesis that OM repurchase announcements signal positive information about future earnings.

Table 30 presents the coefficient estimates from the ordinary least squares (OLS) regressions with t-statistics shown in parentheses based on White (1980) standard errors. In the upper half of the table, the dependent variable in each column is the EPS forecast error for quarters 0 through 3 standardized by the stock price at the end of the fiscal quarter prior to the repurchase announcement. In the first column, the repurchase announcement abnormal return is positively related to the EPS forecast error in quarter 0, as predicted, but is insignificantly different from zero. In quarter 1, the coefficient on the announcement return switches to negative and is also insignificant. The

coefficient estimate for the announcement return is positive for quarter 2 and negative for quarter 3, both insignificantly different from zero. In the bottom of the table the EPS forecast error is standardized by the standard deviation of forecast errors over the estimation period. As shown, none of the coefficient estimates for the repurchase announcement abnormal return are significantly related to future EPS forecast errors in quarters 0 through 3.

Table 31 presents similar results when the earnings forecast errors are based on EBIT. The upper half of the table standardizes forecast errors by the market value of equity at the end of the quarter preceding the repurchase announcement while the bottom of the table standardizes by the standard deviation of forecast errors over the estimation period. As shown in the table none of the coefficient estimates for the abnormal return at the repurchase announcement are significantly different from zero.

In sum, the evidence presented here does not support the hypothesis that announcements of OM stock repurchase programs signal positive information about future earnings. None of the coefficient estimates relating repurchase announcement abnormal returns to future earnings forecast errors are statistically significant, regardless of which measure of earnings is used.

5.3.2 Testing the Information Hypothesis Using Earnings Response Coefficients

A second method of assessing whether OM stock repurchase announcements convey information about future earnings is based on earnings response coefficients. I follow the general procedure outlined by Dann, Masulis, and Mayers (1991) and Healy and Palepu (1988). This methodology examines stock price reactions to earnings announcements in periods preceding and following OM repurchase announcements. If OM repurchase announcements convey positive information about future earnings, investors revise their expectations of earnings upwards and thus reduce their forecast errors. Earnings forecasts based on a univariate time-series model do not reflect this additional information, however. This implies that the relation between stock price reactions to earnings announcements and corresponding time-series earnings forecast errors will be attenuated in the post repurchase announcement period if investors believe that OM repurchase announcements release positive information about subsequent earnings.

To test for an attenuation effect, I estimate pooled cross-sectional time-series regressions of earnings announcement abnormal returns, AR_{jt}, against standardized earnings forecast errors, fe_{jt}. The OLS regression model is specified below.

$$AR_{jt} = \beta_0 + \beta_1 fe_{jt} + \gamma_1 (D1_t * fe_{jt}) + \gamma_2 (D2_t * fe_{jt}) + \varepsilon_{jt}$$

The two-day earnings announcement abnormal returns are based on the one-factor market model using the CRSP value-weighted index as the market proxy. The EPS forecast errors are standardized by the closing price at the end of the fiscal quarter preceding the OM repurchase announcement. The regressions consist of four quarters of announced earnings for each repurchase event, including the two immediately preceding the repurchase announcement, quarters -2 and -1, and the two following, quarters 0 and 1. Since earnings announcements lag the quarter to which they pertain, some announcements for quarter -1 occur after the repurchase announcement. For these cases, post-repurchase earnings announcement returns and corresponding forecast errors are taken from quarters -1 and 0 while the two pre-repurchase abnormal returns and forecast errors are taken from quarters -3 and -2. Although the earnings actually occur prior to the repurchase announcement, information about firm value that they convey is not revealed until announced sometime after the OM repurchase announcement. The OM repurchase announcement can signal information about previous earnings not yet released, and therefore, less information is obtained when the earnings are announced later. When the earnings announcement period for quarter -1 coincides with that of the OM repurchase announcement, post-repurchase earnings announcement returns and corresponding forecast errors are taken from quarters 0 and 1 while the two

pre-repurchase abnormal returns and forecast errors are taken from quarters -3 and -2.

The model employs two slope dummy variables on each individual quarterly earnings forecast error. Dummy variable $D1_t$ is equal to 1 if the forecast error pertains to the first earnings announcement following the repurchase announcement and 0 otherwise. Similarly, dummy $D2_t$ equals 1 for the second forecast error following the repurchase announcement and 0 otherwise. Finding a significant negative parameter, γ_1 or γ_2, on a dummy variable is consistent with the market using the repurchase announcement to update its earnings forecast.

I begin with the sample of 842 OM repurchase announcements described earlier since this sample requires a minimum of four quarters between two announcements by the same firm. This helps to ensure that a particular earnings announcement which follows one repurchase announcement but also precedes another by the same firm is not included as part of the sample. This leaves one possible scenario for an overlapping earnings announcement. In twelve cases, a quarter 1 post-repurchase earnings announcement is also a quarter -3 pre-repurchase earnings announcement for a subsequent repurchase event by the same firm. When this occurs, I drop the second repurchase event from the sample, leaving 830 firm observations. This generates a maximum of

3320 pooled cross-sectional time-series observations if all returns and forecast errors are available for each firm.

Hypothesis #2:

Null Hypothesis:

There is no change in the price response to earnings forecast errors following OM repurchase announcements than to those preceding OM repurchase announcements.

Alternative Hypothesis:

There is a smaller price response to earnings forecast errors following OM repurchase announcements than to those preceding OM repurchase announcements.

Coefficient estimates from the ordinary least squares regression are presented in Table 32 with t-statistics shown in parentheses and calculated from White (1980) standard errors. The results are consistent with the information signaling hypothesis. The earnings announcement abnormal return is positively and significantly related to the corresponding EPS forecast error, but this correlation is strongest in the period prior to the OM repurchase announcement. The coefficient estimates for both slope dummy variables are negative and significant at the 1% level, indicating smaller stock price reactions to earnings announcements following OM share repurchase announcements. The slope dummy coefficient of -17.202 for the first post-repurchase earnings announcement almost completely offsets the coefficient on the pre-repurchase earnings announcements of 20.118. The attenuation effect persists through the second quarter, though less pronounced, as evidenced by the

negative and significant slope dummy coefficient of -13.988 for the second post-repurchase earnings announcement. When slope dummies are assigned to each of the four forecast errors, coefficient estimates for both pre-repurchase announcements are positive and highly significant, the coefficient for the first post-repurchase announcement is 2.916 (20.118-17.202) and is insignificantly different from zero, and the coefficient on the second post-repurchase announcement is 6.130 (20.118-13.988) and is significantly greater than zero.

This result shows that, consistent with the information signaling hypothesis, the unconditional earnings forecast (based on the univariate time-series model of earnings) is on average downward biased. That is, the market conditions its forecast of future earnings on positive information released at the OM repurchase announcement, enabling it to reduce its forecast error. This effect persists for at least two consecutive quarterly earnings announcements following the repurchase announcement.

5.3.3 Actual Share Repurchases as Signals of Future Earnings

In this section, I investigate whether a relationship exists between shares repurchased and future earnings forecast errors. Managers' private information may not be fully revealed until the shares are actually repurchased. The actual purchase of stock requires a cash outflow, which

makes the signal credible (Asquith and Mullins (1986)). Thus, I examine whether future earnings increase only for firms that follow through with the repurchase, or if earnings tend to increase for all announcing firms. If the actual repurchase of shares signals better than expected future earnings, then the amount of shares repurchased should be positively related to future earnings forecast errors.

Hypothesis #3:

Null Hypothesis:

Controlling for the cumulative abnormal return following OM repurchase announcements, there is no systematic relationship between shares repurchased and future earnings forecast errors.

Alternative Hypothesis:

Controlling for the cumulative abnormal return following OM repurchase announcements, there is a positive relationship between shares repurchased and future earnings forecast errors.

Hypothesis #3 is tested by estimating the following OLS regression model.

$$fe_j = \beta_0 + \beta_1 (ASR_j) + \beta_2 (CAR_j) + \varepsilon_j$$

The dependent variable, fe_j is the earnings forecast error for firm j following the OM repurchase announcement. It is based on a univariate time-series model of past earnings and is calculated as described earlier. To ensure that the relationship between shares repurchased and

earnings forecast errors is not solely a mechanical one, resulting from a reduction in shares outstanding, the tests are conducted using forecast errors based on operating income (EBIT) as well as EPS. Separate regressions are estimated for each of the four fiscal quarters following the announcement. Actual shares repurchased, ASR_j, are measured over the fiscal quarter corresponding to the earnings forecast error. The regression controls for the cumulative abnormal return, CAR_j, measured from the day preceding the repurchase announcement through the end of the fiscal quarter associated with the forecast error. It is calculated using the Sharpe-Lintner Capital Asset Pricing Model (CAPM).[35] Finding a significant positive coefficient on the ASR variable would support the hypothesis that actual repurchases signal positive information about future earnings.

Table 33 presents the coefficient estimates when the dependent variable is EPS standardized by the stock price at the end of the fiscal quarter preceding the announcement. T-statistics are shown in parentheses and are computed from

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[35] Daily stock returns in excess of the risk-free rate are regressed against daily excess market returns, which are proxied by the CRSP value-weighted index. The estimate of the intercept term from this regression is the average "daily" abnormal return over the period. This is multiplied by the number of days in the period to obtain the CAPM cumulative abnormal return. The daily risk-free rate is estimated as the geometric mean of the total return on the 30-day U.S. Treasury Bill assuming there are 21 trading days in each month. Treasury Bill data are taken from the Encorr database. Market-adjusted returns are also computed in order to check the robustness of the results.

White (1980) standard errors. In the first column, the coefficient estimate for actual shares repurchased in quarter 1 is positive and marginally significant, indicating that the actual repurchase of shares in quarter 1 is associated with a larger EPS forecast error. The coefficient on the cumulative abnormal return is also positive and marginally significant. In the second column, actual shares repurchased in quarter 2 is also positively and significantly related to the corresponding EPS forecast error. Contrary to the hypothesis however, the relationship between shares repurchased and respective EPS forecast errors is negative in quarters 3 and 4. Although the data for the first two quarters seemingly support the hypothesis, it is not convincing since the correlation observed might simply reflect the mechanical relationship between shares repurchased and EPS while having no economic meaning. That is, the increase in EPS may result from a reduction in shares outstanding rather than an increase in earnings.

Table 34 shows that the coefficient estimates for actual shares repurchased are insignificant in all quarters when EPS forecast errors are standardized by the standard deviation of forecast errors over the estimation period. In the first three columns, actual shares repurchased in quarters 1, 2, and 3 are positively related to their respective EPS forecast errors, but the relationships are not statistically significant. Contrary to the hypothesis, the sign on actual shares repurchased in quarter 4 is

negative, although not significantly different from zero. The cumulative abnormal return is positively related to the earnings forecast error, but is significant only in the third quarter. The R-squared statistics indicate that the model explains less than 1% of the total variation in the forecast errors for each quarter. The data presented thus far do not provide consistent support for the hypothesis that the actual repurchase of shares signals positive information about future earnings.

I also estimate the models using earnings forecast errors derived from operating income, EBIT, since this measure is not mechanically affected by a reduction in shares outstanding like EPS. Nonetheless, the results do not support the hypothesis that the actual repurchase of shares signals information about future earnings. Tables 35 and 36 present the coefficient estimates when EBIT is standardized by the market value of equity at the end of the fiscal quarter preceding the announcement and the standard deviation of forecast errors over the estimation period, respectively. Depending on the quarter examined, the coefficient estimates on shares repurchased frequently switch sign, while none are statistically significant.

In sum, the evidence fails to provide consistent support for the hypothesis that the actual purchase of shares signals better than expected future earnings. Data for the first two quarters following the repurchase announcement provide weak support for the theory, but only

when the forecast error is based on EPS standardized by the stock price. Results based on EPS may be misleading since EPS is mechanically affected by a reduction in shares outstanding. There is no significant relation when EPS forecast errors are standardized by the standard deviation of forecast errors measured over the estimation period or when EBIT is used as the measure for earnings.

5.4 Relation Between Earnings, Actual Share Repurchases and the Stock Price Drift Effect

5.4.1 Background

Although repurchases may be interpreted as signaling devices, Ikenberry, Lakonishok, and Vermaelen (1995) claim that for some firms the signal conveyed by OM share repurchase announcements is largely ignored. They conjecture that the market is skeptical of the claims of undervaluation and that prices adjust slowly over time. Examining long-run performance following OM repurchase announcements during the 1980 to 1990 period, they find the average abnormal four-year buy-and-hold return measured after the initial announcement is 12.1 percent. For firms having the highest book-to-market equity ratios, the average abnormal return is 45.3 percent. They refer to this phenomenon as the "under-reaction" hypothesis.

The final two tests presented below attempt to explain the price drift following OM stock repurchase announcements as documented by Ikenberry et al. (1995). The first

examines average abnormal returns surrounding earnings announcements following OM repurchase announcements. The second examines whether the actual repurchase of shares provides any explanatory power.

5.4.2 Earnings Announcement Abnormal Returns Following Repurchase Announcements

I attempt to relate the price drift documented by Ikenberry et al. (1995) to the stock price behavior surrounding earnings announcements that follow OM repurchase announcements. One possible explanation is that if investors are under-reacting to the repurchase announcement, perhaps they are pleasantly surprised when earnings are announced later. If so, the average abnormal stock return at earnings announcements following OM repurchase announcements should be positive.

Hypothesis #4:

Null Hypothesis:

The average abnormal return surrounding earnings announcements subsequent to OM repurchase announcements is not significantly different than zero.

Alternative Hypothesis:

The average abnormal return surrounding earnings announcements subsequent to OM repurchase announcements is significantly positive, indicating under-reaction to the repurchase announcement.

In order to test this hypothesis, I examine the statistical significance of average abnormal returns

surrounding five consecutive quarterly earnings announcements following OM repurchase announcements. Of the 693 earnings announcements pertaining to earnings for the quarter preceding the repurchase announcement, 142 occur after the repurchase announcement and are included in the tests. The remaining observations are taken from earnings announcements for quarters 0 through 3. Since my sample requires a minimum of only four quarters between two announcements by the same firm, earnings beyond the third quarter are not included. Earnings announcement abnormal returns are calculated over the two-days encompassing the announcement day and the previous day. The one-factor market model employing the CRSP value-weighted index as the market proxy is used to compute the abnormal returns, which are then averaged across all observations.

The results presented in Table 37 do not support the under-reaction hypothesis. In the first column, the mean and median abnormal returns for the 142 announcements with earnings occurring before the repurchase announcement are 0.69% and 0.01%, respectively. The standard deviation of abnormal returns is 6.28%. The t-statistic of only 1.303 indicates that the mean abnormal return is insignificantly different from zero. In the second column, the mean abnormal return for quarter 0 earnings announcements is 0.11%, which is also insignificant. Contrary to the prediction, the mean abnormal return for quarter 1 earnings announcements is -0.34% and is statistically significant.

Earnings announcement abnormal returns for quarters 2 and 3 are 0.04% and -0.08%, both statistically insignificant. Although not reported in the table, I find very similar results when using market-adjusted returns with both the CRSP value- and equal-weighted indexes as the market proxy. The evidence presented fails to support the hypothesis that investors, under-reacting to OM repurchase announcements, are pleasantly surprised when earnings are subsequently announced.

5.4.3 Actual Share Repurchases as an Explanation for the Price Drift

There is also a possibility that the actual repurchase of shares helps explain the stock price drift following OM repurchase announcements documented by Ikenberry, et al. (1995). To test this hypothesis, I examine the relationship between quarterly share repurchases and stock price reactions to subsequent earnings announcements. To be consistent with the under-reaction theory, I hypothesize that following intervals where the firm is repurchasing shares there is a stronger stock price reaction to earnings announcements.

Hypothesis #5:

Null Hypothesis:

Controlling for EBIT forecast errors, there is no systematic relationship between the stock price reaction to earnings announcements and shares repurchased in the interval prior to the earnings announcement.

Alternative Hypothesis:

Controlling for EBIT forecast errors, there is a positive relationship between the stock price reaction to earnings announcements and shares repurchased in the interval prior to the earnings announcement.

The following model is estimated using OLS to test this hypothesis.

$$AR_j = \beta_0 + \beta_1 ASR_j + \beta_2 fe_j + \varepsilon_j$$

The dependent variable, AR_j, is the two-day earnings announcement abnormal return for stock j. Actual shares repurchased, ASR_j, are measured over the same fiscal quarter which earnings are recorded. In addition, since earnings announcements lag the quarter to which the earnings are recorded, I estimate the regressions using shares repurchased in the quarter subsequent to the one in which earnings are recorded. The model controls for the corresponding earnings forecast error, fe_j, which is based on operating income (EBIT) and is standardized by the standard deviation of the forecast errors over the estimation period. Separate regressions are estimated for each of the four fiscal quarters following the announcement as well as quarter 0. Finding a significant positive coefficient on the ASR variable would indicate that announcing firms following through with the repurchase are greeted with larger returns at subsequent earnings announcements.

Table 38 presents the coefficient estimates of the OLS regressions with t-statistics in parentheses computed from White (1980) standard errors. In the first column, actual shares repurchased in quarter 0 is positively related to the quarter 0 earnings announcement abnormal return, but the association is not statistically significant. As expected, the coefficient on the earnings forecast error is positive and significant. Coefficient estimates in the second column for quarter 1 are very similar to quarter 0, with no significant association between quarterly shares repurchased and the market's reaction to the next earnings announcement. In the third column, the coefficient on actual shares repurchased in quarter 2 is positive and marginally significant, indicating a stronger stock price reaction to second quarter earnings announcements the more shares actually repurchased during the quarter. Interestingly, the coefficient on the earnings forecast error for quarter 2 becomes insignificant. In quarter 3, there is also a positive and significant relation between shares repurchased during the quarter and the next earnings announcement abnormal return. However, as shown in the fifth column, the relation between shares repurchased in quarter 4 and the subsequent earnings announcement abnormal return is negative, and marginally significant. Taken as a whole, the results presented in Table 38 are somewhat mixed and fail to provide consistent support for the hypothesis.

Table 39 presents the coefficient estimates when the actual repurchase of shares is measured in the quarter subsequent to the quarter that the earnings forecast error pertains. The logic here is that earnings are usually announced during the subsequent quarter, and occasionally the lag even extends into the second subsequent quarter. This enables the market participants to observe shares repurchased in the subsequent quarter and infer information about the previous quarter's earnings yet to be announced. However, the results fail to support this hypothesis. As shown, coefficient estimates on actual shares repurchased in the subsequent quarter are all insignificantly different from zero for all four quarters following the repurchase announcement. The earnings forecast error is generally positively and significantly related to the earnings announcement abnormal return as expected.

Although not reported in either table, I also estimate the coefficients when the data are pooled over quarters 0 through 4. In these regressions, the coefficient estimate for actual shares repurchased is insignificantly different from zero, while the coefficient for the earnings forecast error is positive and highly significant.

Overall, the evidence does not provide consistent support for the hypothesis that the actual repurchase of shares helps explain the stock price drift documented by Ikenberry, et al. (1995). At best, the results are mixed. There is marginal evidence that following repurchases in the

second and third fiscal quarters after the repurchase announcement there is stronger stock price reactions to the earnings announcements. However, this association does not exist for quarters 0 and 1, which ex ante seem to be the most likely quarters to exhibit such a relation. In addition, the relation becomes negative in the fourth fiscal quarter.

5.5 Summary

In this chapter, I examine whether announcements of OM stock repurchase programs signal positive information about subsequent earnings. In addition, I test to see if actual share repurchases convey any information about future earnings. I compute both EBIT and EPS forecast errors using the Foster (1977) model, which assumes that quarterly earnings follow a first-order autoregressive process in seasonal differences. Several cross-sectional regressions are estimated to test the information signaling hypothesis. Overall, the results do not provide consistent support for the information hypothesis.

Earnings response coefficients are computed following the procedure of Dann, Masulis and Mayers (1991) and Healy and Palepu (1989). These tests provide the strongest evidence in support of the information signaling hypothesis. There is a significant reduction in the stock price response to quarterly earnings announcements following OM share repurchase announcements compared to those preceding

repurchase announcements. This result indicates that the unconditional earnings forecast, based on a univariate time-series model of earnings, is on average downward biased. That is, the market conditions its forecast of future earnings on positive information released at the OM repurchase announcement, enabling it to reduce its earnings forecast error.

On average announcements of OM stock repurchase programs are greeted with positive stock price reactions. The information hypothesis presumes that this price reaction is the market's response to a signal by managers that future earnings will be higher than anticipated. Thus, the information hypothesis predicts a positive association between OM repurchase announcement abnormal returns and subsequent earnings forecast errors, which are derived from a time-series model of past earnings. Contrary to this prediction, I find no significant relation between OM repurchase announcement returns and any of the four subsequent earnings forecast errors, regardless of whether earnings are measured using EPS or EBIT.

I also examine whether actual share repurchases signal positive information about future earnings. Shares repurchased during the first two quarters following the announcement are positively and significantly related to corresponding EPS forecast errors, which are standardized by price. However, this result by itself is not convincing since changes in shares outstanding mechanically influence

EPS. In addition, this relation does not exist for the two subsequent fiscal quarters nor when EPS forecast errors for any quarter are standardized by the standard deviation of forecast errors measured over the estimation period. When earnings are measured using EBIT there is no significant relation between quarterly share repurchases and future earnings forecast errors, providing further evidence against the hypothesis.

Finally, the data do not help explain the "under-reaction" hypothesis and/or the stock price drift following OM stock repurchase announcements as documented by Ikenberry, Lakonishok and Vermaelen (1995). If investors are underreacting to the OM repurchase announcement, as suggested by Ikenberry et al., perhaps they are pleasantly surprised when earnings are announced later. This hypothesis predicts on average a positive abnormal return surrounding earnings announcements following repurchase announcements. However, the results indicate that none of the abnormal returns associated with any of the first five earnings announcements following repurchase announcements are statistically significantly greater than zero. The data also fail to support the hypothesis that actual share repurchases help explain the price drift following OM repurchase announcements. I find no consistent evidence of a correlation between quarterly share repurchases and abnormal returns at subsequent quarterly earnings announcements.

CHAPTER 6

Summary

Open market stock repurchase programs have become popular mechanisms through which companies distribute cash to their shareholders. Each year boards of directors authorize managers to repurchase billions of dollars of common stock in open market transactions. When these programs are publicly announced, the stock price increases in value by about 2.2% on average.

This dissertation has revealed that the stock price reaction to OM repurchase announcements is larger the higher a firm's book-to-market equity ratio. To the extent that high book-to-market equity ratios proxy for undervaluation, this result is consistent with the undervaluation hypothesis. That is, firms likely to be undervalued as evidenced by having high book-to-market equity ratios elicit larger stock price reactions to OM repurchase announcements.

I find no consistent support for the competing hypothesis that the positive stock price reaction to the announcement reflects the incremental value associated with the firm's action to mitigate agency costs associated with free cash flow.

A significant contribution this research makes to the finance literature is that it sets forth a technique for measuring common stock repurchases using Compustat data. Using this method, I track actual share repurchases over a one year horizon following OM repurchase announcements for a sample of 1005 programs. Depending on whether the announcement quarter is included in the calculations, between 50% and 60% of programs are completed over this time period.

There is considerable variability in repurchase behavior across firms. While about 10% of firms end up purchasing no shares, many others buy back considerably more than their original authorizations. As a result, the mean repurchase over the four quarters exceeds the mean authorization.

I also examine the factors influencing quarterly share repurchases. I find that larger authorizations result in more shares repurchased, firms actively buying back shares in one quarter tend to continue buying shares in the next quarter, firms having high levels and positive trends in free cash flow repurchase more shares, and firms with relatively low debt ratios buy back more shares.

A significant finding is that actual repurchase behavior is opportunistic, consistent with undervaluation as a motivation for open market programs. There are strong inverse relations between prior and current quarter returns and repurchases, suggesting that managers accelerate

purchases if their private information is not quickly reflected in the stock price following the announcement.

I also empirically examine the choice between dividends and share repurchases as mechanisms for distributing cash to shareholders. The most important result from this analysis is finding a strong positive association between stock return volatility and the proportion of total cash payouts taking the form of repurchases. This is consistent with recent theoretical models suggesting that firms with high probabilities of becoming undervalued will emphasize repurchases over dividends. In addition, the repurchase proportion is decreasing in firm size, and increasing in the size of total distributions.

I present some evidence providing partial support for the hypothesis that announcements of OM stock repurchase programs signal positive information about subsequent earnings. There is a significant reduction in the stock price response to quarterly earnings announcements following OM share repurchase announcements compared to those preceding repurchase announcements. This result indicates that unconditional earnings forecasts, based on a univariate time-series model of past earnings, is on average downward biased. That is, the market conditions its forecast of future earnings on positive information released at the repurchase announcement, enabling it to reduce its earnings forecast error.

While this dissertation has made a significant contribution to our understanding of corporate stock repurchases as summarized above, it also generates some promising ideas for future research. A possible extension of the study on the choice between repurchases and dividends is to test the theoretical predictions over shorter time periods. For example, examining the repurchase ratio on a year-to-year basis would provide information about the *opportunistic* behavior of firms, as opposed to their long-term distribution policies.

It would be beneficial to expand the sample size for the institutional and insider holdings data. As mentioned earlier, these samples are much smaller than the full sample because institutional holdings data from S&P's Stock Guide and insider holdings data from Value Line are limited to the largest firms. The insider holdings sample could be supplemented with data obtained from individual proxy statements. Perhaps a larger sample would produce results that support the theoretical predictions concerning institutional and insider holdings. In addition, this might help untangle the interaction effect between firm size and return standard deviation in explaining the repurchase proportion.

One could also examine completion rates over periods beyond one year following the announcement. This will almost certainly increase the proportion of programs that

are completed, although it will inevitably reduce the sample size.

Tests regarding the positive association between book-to-market equity ratios and OM repurchase announcement abnormal returns could also be extended to include announcements of tender offer repurchases.

Finally, another possible area that might be fruitful is to see if future returns can be predicted based on stock repurchase activity. Such an analysis might help explain the stock price drift following OM repurchase announcements documented by Ikenberry, Lakonishok and Vermaelen (1995).

APPENDICES

APPENDIX A

APPENDIX A - TABLES

Table 1

Summary Statistics for Open Market Stock Repurchase Program Announcements

Year	N	Mean % of Shares Authorized	Median % of Shares Authorized	Min. % Authorized	Max. % Authorized	Dollars Authorized (Billions)	Amount Authorized Not Stated
1984	97	7.61	5.90	4.00	22.70	10.520	7
1985	106	8.47	7.10	4.00	26.60	10.848	3
1986	95	9.14	6.55	4.00	23.40	13.802	9
1987	294	8.79	7.50	4.00	27.80	44.448	15
1988	122	8.63	7.50	4.00	27.00	19.638	5
1989	143	9.02	7.10	4.00	26.80	16.641	10
1990	235	7.94	7.00	4.00	26.00	22.183	5
1991	81	8.17	6.55	4.10	27.50	6.356	7
1992	111	8.56	6.50	4.00	41.10	19.495	8
1984 - 1992	1284	8.49	7.00	4.00	41.10	163.931	69

Table 2

Distribution of the Number of Open Market Stock Repurchase Programs Across Firms

Number of Firms	OM Repurchase Programs Per Firm	Total Number of OM Repurchase Programs
439	1	439
175	2	350
76	3	228
35	4	140
12	5	60
6	6	36
2	7	14
1	8	8
1	9	9
747		1,284

Table 3

Abnormal Returns at Open Market Stock Repurchase Announcements

Measure of Abnormal Return	Mean	Median	Min.	Max.
2-Day (-1,0) Market Model Abnormal Return	0.022	0.018	-0.276	0.418
2-Day (-1,0) Market-Adjusted Return (Market = Equal-Weighted Index)	0.024	0.018	-0.271	0.437
2-Day (-1,0) Market-Adjusted Return (Market = Value-Weighted Index)	0.021	0.017	-0.275	0.436
3-Day (-1,1) Market-Adjusted Return (Market = Equal-Weighted Index)	0.026	0.019	-0.271	0.502
3-Day (-1,1) Market-Adjusted Return (Market = Value-Weighted Index)	0.023	0.017	-0.275	0.508
5-Day (-2,2) Market-Adjusted Return (Market = Equal-Weighted Index)	0.022	0.019	-0.298	0.450
5-Day (-2,2) Market-Adjusted Return (Market = Value-Weighted Index)	0.018	0.017	-0.307	0.455
40-Day (-42,-3) Total Return	-0.068	-0.052	-0.568	0.907
40-Day (-42,-3) Market-Adjusted Return (Market = Equal-Weighted Index)	-0.045	-0.042	-0.538	0.883
40-Day (-42,-3) Market-Adjusted Return (Market = Value-Weighted Index)	-0.043	-0.043	-0.492	0.875

The market model abnormal return is computed using the one-factor market model with the CRSP value weighted index as the market proxy. Market adjusted returns are computed by taking the difference between the compounded return on the stock and the compounded return on the market index over the specified window. The sample consists of 1022 observations. All mean abnormal returns in the table are statistically significantly different from zero at the 1% level.

Table 4

Announcement Abnormal Returns for Low Versus High Book-to-Market Equity Firms

	Book-to-Market Below the Median (N = 511)	Book-to-Market Above the Median (N = 511)	Mean Difference
Mean Abnormal Return	0.014	0.029	0.015
T-statistic	(7.000)	(9.667)	(4.319)

	Book-to-Market in Lower Quartile (N = 256)	Book-to-Market in Upper Quartile (N = 256)	Mean Difference
Mean Abnormal Return	0.009	0.037	0.028
T-statistic	(3.000)	(9.250)	(5.399)

Announcement returns are 2-day (-1,0) cumulative abnormal returns computed using the one-factor market model with the CRSP value-weighted index as the market proxy.

Table 5

Explaining Abnormal Returns at OM Stock Repurchase Announcements

	Book/Market and Firm Size Unstandardized		Book/Market and Firm Size Standardized	
Explanatory Variables	OLS	WLS	OLS	WLS
Intercept	1.075 (1.053)	1.565 (2.161)	-1.262 (-2.851)	-0.135 (-0.405)
Percent Authorized	0.098 (2.401)	0.097 (3.396)	0.096 (2.317)	0.099 (3.432)
Ln(Firm Size)	-0.299 (-2.649)	-0.219 (-2.906)	-0.277 (-2.465)	-0.201 (-2.680)
Prior 40-day Market-Adjusted Return	-0.052 (-3.102)	-0.061 (-5.013)	-0.050 (-2.993)	-0.061 (-4.944)
Book/Market Ratio	2.607 (4.304)	0.936 (2.333)	1.464 (3.994)	0.463 (1.954)
Adjusted R^2	8.10%	3.99%	7.63%	3.58%

Ordinary least squares (OLS) and weighted least squares (WLS) regressions explaining the 2-day cumulative abnormal return at OM repurchase announcements. The announcement return is computed using the one-factor market model with the CRSP value-weighted index as the market proxy. T-statistics for the OLS regressions are computed using White (1980) standard errors and are shown in parentheses. The weights used in the WLS regressions are the inverse of the standard deviation of the market model residual. Each model is estimated using 1022 observations. The models in columns 3 and 4 standardize the book/market and firm size variables by the mean book/market and mean firm size of the S&P 500, measured June 30 in the year of the announcement, to account for the upward trend in stock prices over the 9-year sample period.

Table 6

OLS Regressions with Alternative Measures of Announcement Abnormal Returns

	Equal-Weighted Index			Value-Weighted Index		
Explanatory Variables	2-Day (-1,0)	3-Day (-1,+1)	5-Day (-2,+2)	2-Day (-1,0)	3-Day (-1,+1)	5-Day (-2,+2)
Intercept	1.265	1.321	0.267	0.709	0.733	-0.357
	(1.237)	(0.983)	(0.188)	(0.672)	(0.530)	(-0.243)
Percent Authorized	0.107	0.059	0.037	0.090	0.034	0.019
	(2.641)	(1.319)	(0.687)	(2.157)	(0.717)	(0.340)
Ln(Firm Size)	-0.262	-0.289	-0.171	-0.249	-0.283	-0.188
	(-2.265)	(-2.245)	(-1.209)	(-2.119)	(-2.119)	(-1.266)
Prior 40-day Market-Adjusted Return	-0.046	-0.049	-0.060	-0.046	-0.047	-0.053
	(-2.777)	(-2.429)	(-3.132)	(-2.682)	(-2.301)	(-2.803)
Book/Market Ratio	2.254	3.319	3.370	2.743	3.970	4.085
	(3.593)	(3.036)	(3.224)	(4.355)	(3.679)	(3.946)
Adjusted R^2	6.36%	7.51%	5.22%	6.96%	8.59%	6.11%

OLS regressions using market-adjusted announcement returns as the dependent variable. Market-adjusted returns are computed by taking the difference between the compounded return on the stock and the compounded return on the market index. The first 3 columns employ the CRSP equal-weighted index at the market proxy while the last 3 columns use the CRSP value-weighted index. Abnormal returns are calculated over 2-day, 3-day, and 5-day periods surrounding 1022 OM repurchase announcements. T-statistics are shown in parentheses and are computed from White (1980) standard errors.

Table 7

Mean Announcement Abnormal Returns for Firms Grouped
Based on Book-to-Market Equity Ratios and Free Cash Flow Measures

	Low B/M	High B/M	Mean Difference (High B/M - Low B/M)
Low FCF			
Abnormal Return	0.012	0.033	0.021
T-statistic	(3.000)	(11.000)	(3.979)
Observations	195	316	
High FCF			
Abnormal Return	0.015	0.024	0.009
T-statistic	(5.000)	(8.000)	(1.962)
Observations	316	195	
Mean Difference (High FCF - Low FCF)	0.003 (0.596)	-0.009 (-1.853)	0.012* (2.272)

* Mean difference for (High B/M, High FCF - Low B/M, Low FCF) groups.

FCF is defined as operating income before depreciation minus interest expense, taxes, preferred dividends, and common stock dividends divided by book value of total assets at the end of the fiscal year prior to the announcement. The High FCF group contains firms having FCF above the median FCF while the Low FCF group contains firms below the median FCF.

B/M is defined as the book value of equity divided by the market value of equity at the end of the fiscal quarter prior to the announcement. The High B/M group contains firms having B/M ratios above the median B/M ratio while the Low B/M group contains firms below the median B/M ratio.

T-statistics are in parentheses.

The number of observations in each group is noted below the t-statistic.

Table 8

Mean Announcement Abnormal Returns for Firms Grouped
Based on Book-to-Market Equity Ratios and Cash on Hand Measures

	Low B/M	High B/M	Mean Difference (High B/M - Low B/M)
Low Cash			
Abnormal Return	0.013	0.026	0.013
T-statistic	(3.250)	(8.667)	(2.719)
Observations	250	261	
High Cash			
Abnormal Return	0.015	0.033	0.018
T-statistic	(5.000)	(8.250)	(3.588)
Observations	261	250	
Mean Difference (High Cash - Low Cash)	0.002 (0.418)	0.007 (1.395)	0.020* (3.885)

* Mean difference for (High B/M, High Cash - Low B/M, Low Cash) groups.

Cash is defined as cash plus marketable securities divided by book value of total assets at the end of the fiscal year prior to the announcement. The High Cash group contains firms with Cash above the median level of Cash while the Low Cash group contains firms below the median level of Cash.

B/M is defined as the book value of equity divided by the market value of equity at the end of the fiscal quarter prior to the announcement. The High B/M group contains firms having B/M ratios above the median B/M ratio while the Low B/M group contains firms below the median B/M ratio.

T-statistics are in parentheses.

The number of observations in each group is noted below the t-statistic.

Table 9

OLS Regressions Explaining Announcement Returns with a Single Free Cash Flow Variable

Explanatory Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	0.673	1.301	0.661	0.578	1.128	1.204
	(0.608)	(1.259)	(0.616)	(0.469)	(1.034)	(1.036)
Percent Authorized	0.101	0.096	0.101	0.100	0.098	0.098
	(2.477)	(2.343)	(2.483)	(2.462)	(2.401)	(2.386)
Ln(Firm Size)	-0.299	-0.287	-0.306	-0.299	-0.303	-0.300
	(-2.651)	(-2.571)	(-2.718)	(-2.644)	(-2.565)	(-2.637)
Prior 40-day Market-Adjusted Return	-0.051	-0.052	-0.051	-0.052	-0.052	-0.052
	(-3.054)	(-3.144)	(-3.043)	(-3.084)	(-3.105)	(-3.101)
Book/Market	2.796	2.507	2.810	2.871	2.600	2.601
	(4.393)	(4.107)	(4.479)	(4.024)	(4.287)	(4.266)
Free Cash Flow / Total Assets	3.464					
	(1.006)					
Free Cash Flow / Equity		-1.342				
		(-1.185)				
Free Cash Flow / Debt + Equity			2.586			
			(1.204)			
Operating Income / Total Assets				2.618		
				(0.793)		
Cash and Mkt. Securities / Total Assets					-0.203	
					(-0.138)	
Debt Ratio						0.219
						(0.239)
Adjusted R^2	8.14%	8.39%	8.20%	8.12%	8.01%	8.01%

The dependent variable in each model is the the 2-day cumulative abnormal return based on the one-factor market model and is expressed in percent. Models are estimated using OLS and t-statistics are in parentheses based on White (1980) standard errors.

Table 10

OLS Regressions Explaining Announcement Returns with Multiple Free Cash Flow Variables

Explanatory Variables	Model 1	Model 2	Model 3	Model 4
Intercept	0.656	1.435	0.652	0.608
	(0.535)	(1.276)	(0.556)	(0.461)
Percent Authorized	0.101	0.096	0.101	0.100
	(2.476)	(2.345)	(2.481)	(2.460)
Ln(Firm Size)	-0.298	-0.296	-0.306	-0.301
	(-2.510)	(-2.536)	(-2.594)	(-2.538)
Prior 40-day Market-Adjusted Return	-0.051	-0.052	-0.051	-0.052
	(-3.060)	(-3.139)	(-3.050)	(-3.089)
Book/Market	2.799	2.488	2.811	2.866
	(4.347)	(4.058)	(4.447)	(3.990)
Free Cash Flow / Total Assets	3.484			
	(0.977)			
Free Cash Flow / Equity		-1.368		
		(-1.197)		
Free Cash Flow / Debt + Equity			2.591	
			(1.184)	
Operating Income / Total Assets				2.605
				(0.785)
Cash and Mkt. Securities / Total Assets	0.057	-0.498	0.033	-0.109
	(0.037)	(-0.332)	(0.022)	(-0.074)
Adjusted R^2	8.05%	8.31%	8.11%	8.03%

The dependent variable in each model is the the 2-day cumulative abnormal return based on the one-factor market model and is expressed in percent. Models are estimated using OLS and t-statistics are in parentheses based on White (1980) standard errors.

Table 11

WLS Regressions Explaining Announcement Returns with a Single Free Cash Flow Variable

Explanatory Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	0.950	1.654	1.035	0.551	1.444	1.603
	(1.237)	(2.260)	(1.368)	(0.656)	(1.910)	(2.195)
Percent Authorized	0.098	0.097	0.098	0.098	0.097	0.097
	(3.418)	(3.399)	(3.420)	(3.431)	(3.377)	(3.393)
Ln(Firm Size)	-0.214	-0.217	-0.223	-0.207	-0.210	-0.216
	(-2.838)	(-2.877)	(-2.959)	(-2.749)	(-2.710)	(-2.841)
Prior 40-day Market-Adjusted Return	-0.059	-0.062	-0.059	-0.060	-0.061	-0.061
	(-4.817)	(-5.077)	(-4.819)	(-4.908)	(-5.007)	(-5.026)
Book/Market	1.271	0.885	1.243	1.504	0.938	0.955
	(2.991)	(2.181)	(2.952)	(3.224)	(2.337)	(2.365)
Free Cash Flow / Total Assets	4.808					
	(2.355)					
Free Cash Flow / Equity		-0.418				
		(-0.858)				
Free Cash Flow / Debt + Equity			2.972			
			(2.356)			
Operating Income / Total Assets				4.621		
				(2.372)		
Cash and Mkt. Securities / Total Assets					0.570	
					(0.566)	
Debt Ratio						-0.257
						(-0.421)
Adjusted R^2	4.42%	3.97%	4.42%	4.43%	3.93%	3.92%

The dependent variable in each model is the 2-day cumulative abnormal return based on the one-factor market model and is expressed in percent. Models are estimated using WLS with the weights equal to the inverse of the standard deviation of the market model residual. T-statistics are shown in parentheses, although White (1980) standard errors are not necessary.

Table 12

WLS Regressions Explaining Announcement Returns with Multiple Free Cash Flow Variables

Explanatory Variables	Model 1	Model 2	Model 3	Model 4
Intercept	0.624	1.547	0.776	0.407
	(0.762)	(2.016)	(0.971)	(0.468)
Percent Authorized	0.097	0.097	0.097	0.098
	(3.383)	(3.382)	(3.390)	(3.410)
Ln(Firm Size)	-0.193	-0.209	-0.206	-0.196
	(-2.494)	(-2.706)	(-2.668)	(-2.541)
Prior 40-day Market	-0.058	-0.062	-0.059	-0.060
Adjusted Return	(-4.784)	(-5.064)	(-4.795)	(-4.900)
Book/Market	1.314	0.890	1.270	1.510
	(3.082)	(2.192)	(3.011)	(3.237)
Free Cash Flow / Total Assets	5.373			
	(2.559)			
Free Cash Flow / Equity		-0.390		
		(-0.796)		
Free Cash Flow / Debt + Equity			3.199	
			(2.496)	
Operating Income / Total Assets				4.657
				(2.389)
Cash and Mkt. Securities / Total Assets	1.188	0.474	1.021	0.639
	(1.151)	(0.468)	(1.001)	(0.636)
Adjusted R^2	4.45%	3.89%	4.42%	4.37%

The dependent variable in each model is the 2-day cumulative abnormal return based on the one-factor market model and is expressed in percent. Models are estimated using WLS with the weights equal to the inverse of the standard deviation of the market model residual. T-statistics are shown in parentheses, although White (1980) standard errors are not necessary.

Table 13

OLS Regressions Explaining Announcement Returns Using Slope Dummies on the Book/Market Ratio for High FCF and High Cash-on-Hand Firms

Explanatory Variables	Model 1	Model 2	Model 3	Model 4
Intercept	1.120	4.176	0.966	3.187
	(1.095)	(4.598)	(0.943)	(3.563)
Percent Authorized	0.098	0.119	0.099	0.115
	(2.403)	(2.912)	(2.416)	(2.828)
Ln(Firm Size)	-0.297	-0.526	-0.282	-0.429
	(-2.641)	(-4.718)	(-2.475)	(-3.914)
Prior 40-day Market-Adjusted Return	-0.052	-0.045	-0.051	-0.045
	(-3.090)	(-2.642)	(-3.058)	(-2.662)
Book/Market	2.649		2.355	
	(4.329)		(3.897)	
Book/Market * Slope Dummy For High FCF Firms[a]	-0.288	0.028		
	(-0.633)	(0.062)		
Book/Market * Slope Dummy For High liquidity Firms[b]			0.508	1.238
			(1.083)	(2.496)
Adjusted R^2	8.04%	5.54%	8.14%	6.47%

The dependent variable in each model is the 2-day cumulative abnormal return based on the one-factor market model and is expressed in percent. Models are estimated using OLS and t-statistics shown in parentheses are computed from White (1980) standard errors. Models include slope dummies on book/market for firms with FCF or cash greater than the median FCF or cash , respectively.

[a] Slope dummy = 1 for firms with Free Cash Flow/Total Assets greater than the median Free Cash Flow/Total Assets for all firms in the sample, and 0 otherwise.

[b] Slope dummy = 1 for firms with (Cash + Marketable Securities)/Total Assets greater than the median (Cash + Marketable Securities)/Total Assets for all firms in the sample, and 0 otherwise.

Table 14

WLS Regressions Explaining Announcement Returns Using Slope Dummies on the Book/Market Ratio for High FCF and High Cash-on-Hand Firms

Explanatory Variables	Model 1	Model 2	Model 3	Model 4
Intercept	1.559	2.476	1.511	2.266
	(2.151)	(4.138)	(2.066)	(3.584)
Percent Authorized	0.097	0.104	0.098	0.105
	(3.375)	(3.658)	(3.403)	(3.683)
Ln(Firm Size)	-0.221	-0.279	-0.212	-0.254
	(-2.924)	(-3.917)	(-2.774)	(-3.440)
Prior 40-day Market-Adjusted Return	-0.061	-0.060	-0.061	-0.059
	(-5.009)	(-4.881)	(-4.988)	(-4.858)
Book/Market	0.908		0.864	
	(2.230)		(2.049)	
Book/Market * Slope Dummy For High FCF Firms[a]	0.140	0.264		
	(0.417)	(0.797)		
Book/Market * Slope Dummy For High Liquidity Firms[b]			0.183	0.389
			(0.558)	(1.244)
Adjusted R^2	3.91%	3.54%	3.93%	3.63%

The dependent variable in each model is the 2-day cumulative abnormal return based on the one-factor market model and is expressed in percent. Models are estimated using WLS with the weights equal to the inverse of the standard deviation of the market model residual. Models include slope dummies on book/market for firms with FCF or cash greater than the median FCF or cash , respectively. T-statistics are shown in parentheses.

[a] Slope dummy = 1 for firms with Free Cash Flow/Total Assets greater than the median Free Cash Flow/Total Assets for all firms in the sample, and 0 otherwise.

[b] Slope dummy = 1 for firms with (Cash + Marketable Securities)/Total Assets greater than the median (Cash + Marketable Securities)/Total Assets for all firms in the sample, and 0 otherwise.

Table 15

Summary Statistics for Open Market Stock Repurchase Program Announcements

Year	N	Mean % of Shares Authorized	Median % of Shares Authorized	Min. % Authorized	Max. % Authorized	Dollars Authorized (Billions)
1984	105	5.43	4.30	0.60	22.70	7.029
1985	75	6.88	5.60	0.40	26.60	4.394
1986	69	7.42	5.40	0.41	23.40	11.162
1987	222	7.41	6.05	0.20	27.40	31.174
1988	65	6.86	5.80	0.37	20.70	9.824
1989	100	6.92	5.00	0.50	26.10	12.110
1990	192	6.49	5.80	0.30	20.00	15.715
1991	64	5.81	4.80	0.38	21.00	8.447
1992	113	6.45	4.80	0.31	41.10	16.303
1984-1992	1,005	6.69	5.30	0.20	41.10	116.158

Table 16

Actual Share Repurchases Following Open Market Announcements

A. Cumulative Shares Repurchased Through Four Quarters Following the Announcement

	Authorized Repurchase as % of Shares Outstanding	Actual Repurchase as % of Shares Outstanding		Actual Repurchase as % of Authorized		% Change in Shares Outstanding	
		Qtr 1-4	Qtr 0-4	Qtr 1-4	Qtr 0-4	Qtr 1-4	Qtr 0-4
Full Sample (n=1005)							
Mean	6.69	8.82	11.07	191.45	236.92	-1.35	-2.14
Median	5.30	5.40	7.17	98.57	133.56	-0.74	-1.67
Std. Deviation	4.85	11.41	13.56	444.33	492.71	6.87	8.62
No Preferred Stock (n=775)							
Mean	6.70	8.33	10.29	169.48	208.06	-1.46	-2.33
Median	5.30	5.07	6.94	94.14	128.45	-0.83	-1.65
Std. Deviation	4.86	10.64	12.07	248.20	281.01	6.30	7.89
No Subsequent Announcements (n=749)							
Mean	7.24	7.12	9.30	138.69	179.17	-0.27	-1.07
Median	5.80	4.11	5.78	70.63	94.49	-0.23	-1.08
Std. Deviation	5.01	9.27	11.73	449.76	496.92	6.43	8.03

Table 16 (cont'd)

B. Shares Repurchased in Individual Fiscal Quarters (Full Sample, n=1005)

	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4
As % of Shares Outstanding					
Mean	2.25	2.37	2.31	2.24	1.91
Median	0.76	1.02	0.86	0.62	0.40
As % of Shares Authorized					
Mean	45.47	48.39	50.96	51.81	40.29
Median	14.82	20.26	17.53	12.16	8.26

C. Distribution of Program Completions

		% of Program Completions		% of Programs Less Than 50% Complete		% of Programs With Zero Repurchases	
	Total	Qtr 1-4	Qtr 0-4	Qtr 1-4	Qtr 0-4	Qtr 1-4	Qtr 0-4
Full Sample	1005	49.3	57.8	34.3	26.3	9.9	6.7
Authorization ≤ 5%	481	58.8	66.7	27.9	21.2	10.4	6.9
Authorization > 5%	524	40.5	49.6	40.3	30.9	9.4	6.5
No Subsequent Announcements	749	39.8	48.6	41.7	32.3	12.1	8.4
Authorization ≤ 5%	313	47.3	55.6	36.1	28.1	14.4	9.9
Authorization > 5%	436	34.4	43.6	45.6	35.3	10.6	7.3

Table 17

Explaining Actual Shares Repurchased Following Open Market Repurchase Authorizations

Explanatory Variables	Constant σ_ε Full Sample	Full Sample	No Preferred	No Subsequent Announcements
Percent Authorized	0.070	0.023	0.032	0.045
	(4.907)	(1.828)	(2.778)	(4.274)
Prior Quarter Return	-0.027	-0.012	-0.011	-0.009
in Percent	(-7.316)	(-4.625)	(-4.381)	(-3.555)
Current Quarter Return	-0.043	-0.020	-0.019	-0.017
in Percent	(-11.152)	(-8.086)	(-7.455)	(-6.356)
Prior Quarter Repurchase	0.466	0.803	0.836	0.761
	(28.382)	(32.309)	(30.238)	(26.237)
Cumulative Repurchases	0.048	0.013	0.015	0.006
Before Prior Quarter	(4.494)	(1.731)	(2.101)	(1.097)
1987 Crash Dummy	-0.649	-0.353	-0.194	-0.219
	(-3.468)	(-2.286)	(-1.315)	(-1.739)
Quarter 1 Intercept Dummy	0.498	0.465	0.354	0.147
	(2.939)	(3.451)	(2.529)	(1.058)
Quarter 2 Intercept Dummy	0.311	0.170	0.053	-0.176
	(1.831)	(1.133)	(0.366)	(-1.167)
Quarter 3 Intercept Dummy	-0.126	-0.132	-0.222	-0.416
	(-0.733)	(-1.091)	(-1.898)	(-3.303)
Quarter 4 Intercept Dummy	-0.664	-0.321	-0.462	-0.627
	(-3.705)	(-2.546)	(-3.708)	(-4.767)
No. of Quarterly Observations	3998	3998	3084	2978

The dependent variable in each model is quarterly share repurchases as a percent of shares outstanding before the announcement. Models are estimated using the maximum-likelihood Tobit procedure with pooled data over fiscal quarters 1 through 4 following the announcement. T-statistics are in parentheses below the coefficient estimates. The Constant σ_ε model in the first column assumes a constant residual standard deviation. All other models estimate residual standard deviation as a function of the explanatory variables. The No Preferred sample includes firms with no preferred stock outstanding in any quarter through quarter 4. The No Subsequent Announcements sample includes firms that do not announce a self-tender offer or another OM program through quarter 4.

Table 18

Explaining Actual Shares Repurchased Following Open Market Authorizations

Explanatory Variables	Full Sample	Full Sample	Full Sample	No Subsequent Announcements
Percent Authorized	0.031	0.033	0.035	0.044
	(2.391)	(2.393)	(2.570)	(3.614)
Prior Quarter Return in Percent	-0.013	-0.011	-0.014	-0.011
	(-4.864)	(-3.891)	(-6.103)	(-4.919)
Current Quarter Return in Percent	-0.020	-0.021	-0.016	-0.016
	(-7.527)	(-7.387)	(-7.074)	(-6.977)
Prior Quarter Repurchase	0.790	0.748	0.679	0.727
	(30.910)	(28.593)	(20.246)	(20.174)
Cumulative Repurchases Before Prior Quarter	0.013	0.013	0.024	0.004
	(1.723)	(1.594)	(1.837)	(0.884)
Book/Price	-0.233			
	(-1.763)			
Earnings/Price	0.810			
	(2.461)			
Cash/Total Assets		0.099	-0.270	-0.631
		(0.202)	(-0.545)	(-1.428)
Total Debt/Total Assets		-0.963	-0.977	-0.762
		(-2.431)	(-2.597)	(-2.027)
Level of Free Cash Flow / Total Assets			4.897	5.067
			(5.626)	(5.612)
Change in Free Cash Flow / Total Assets			3.838	3.358
			(5.113)	(3.887)
Number of Quarterly Observations	3878	3531	1640	1323

The dependent variable in each model is quarterly share repurchases as a percent of shares outstanding before the announcement. Models are estimated using the maximum-likelihood Tobit procedure with pooled data over fiscal quarters 1 through 4 following the announcement. All models estimate residual standard deviation as a function of the explanatory variables. T-statistics are in parentheses below the coefficient estimates. The No Subsequent Announcements sample includes firms that do not announce a self-tender offer or another OM program through quarter 4.

Table 19

Explaining Cumulative Actual Shares Repurchased Following Open Market Authorizations

Explanatory Variables	Full Sample	Full Sample	No Subsequent Announcements
Constant	3.754	2.764	2.889
	(3.047)	(2.280)	(2.885)
Percent Authorized	0.554	0.732	0.666
	(5.073)	(5.826)	(5.539)
Cumulative Return	-0.022	-0.032	-0.026
Over Qtrs 1-4 in Percent	(-1.918)	(-2.981)	(-2.990)
Cash/Total Assets	6.579	6.651	-0.387
	(1.442)	(1.295)	(-0.120)
Total Debt/Total Assets	2.424	0.079	-2.698
	(0.655)	(0.021)	(-0.846)
Cumulative Free Cash Flow		0.556	-1.414
Over Qtrs 1-4/Total Assets		(0.297)	(-0.793)
1987 Crash Dummy	-2.538	2.265	-2.100
	(-1.762)	(0.480)	(-1.546)
Number of Observations	897	479	379

The dependent variable in each model is cumulative share repurchases over quarters 1 through 4 as a percent of shares outstanding before the announcement. Models are estimated using the maximum-likelihood Tobit procedure. All models estimate residual standard deviation as a function of the explanatory variables. T-statistics are in parentheses below the coefficient estimates. The No Subsequent Announcements sample includes firms that do not announce a self-tender offer or another OM program through quarter 4.

Table 20

Summary of Model Predictions

Model	Factor	Empirical Proxies	Predicted Relation with Ratio of Repurchases to Total Distributions
Williams Chowdhry and Nanda Brennan and Thakor	Personal Tax Disadvantage of Dividends	Institutional Shareholdings Size of Distributions	Negative Positive
Ofer and Thakor Chowdhry and Nanda Ikenberry and Vermaelen	Information Asymmetry Between Managers and Outside Investors	Stock Return Volatility (Total or Residual) Firm Size	Positive Negative
Brennan and Thakor	Information Asymmetry Among Outside Shareholders	Stock Return Volatility (Total or Residual) Firm Size	Negative Positive
Ofer and Thakor	Signaling Effectiveness	Insider Shareholdings	Positive
Chowdhry and Nanda	Agency Costs of Retaining Cash	Insider Shareholdings	Positive

Table 21

Summary Statistics

	1990-1994 Sample (N=1520)			1985-1989 Sample (N=1208)		
	Mean	Median	Std Dev	Mean	Median	Std Dev
Dividends/Net Income	.452	.270	.989	.405	.278	.641
Repurchases/Net Income	.255	.087	.955	.323	.111	.688
Total Distributions/Net Income	.706	.464	1.381	.728	.508	.981
Repurchases/Total Distributions	.424	.308	.397	.414	.321	.372
Firm Size ($Millions)	1267	171	4105	685	129	1631
Return Standard Deviation	.353	.321	.146	.337	.320	.106
Distribution Size	.222	.179	.219	.362	.276	.361
Beta	.923	.904	.579	.962	.989	.362
Net Income Predictability (R^2)	.416	.375	.327	.471	.434	.333
Sales Growth Rate	.100	.071	.134	.113	.097	.142
Number of Shareholders	19,423	2,169	105,606	22,805	3,200	108,050
Institutional Holdings (N=1295,1030)	.367	.353	.213	.293	.265	.205
Insider Holdings (N=608,474)	.185	.102	.207	.180	.110	.189

Repurchase, dividend, and net income data are sums over each five year sample period. Total distributions equals the sum of repurchases and cash dividends, and distribution size is the ratio of total distributions to firm size. Standard deviation, beta, net income predictability, and the sales growth rate are estimated within each sample period, while firm size, the number of shareholders, and institutional and insider shareholdings are computed at the beginning of each period.

Table 22

Simple Correlations Among the Repurchase Proportion and the Explanatory Variables

	Repurchases Total	Log of Firm Size	Standard Deviation	Distribution Size	Beta	Net Income Predictability	Sales Growth	LN(Number Shrholders)	Institutional Holdings	Insider Holdings
Repurchases/Total		*-.220*	*.429*	*-.012*	*.222*	*-.093*	*.166*	*-.218*	*-.004*	*-.053*
LN(Firm Size)	-.336		*-.306*	*.109*	*.114*	*.087*	*-.168*	*.785*	*.635*	*-.302*
Standard Deviation	.498	-.554		*-.167*	*.564*	*-.008*	*.296*	*-.339*	*-.104*	*.088*
Distribution Size	-.063	.081	-.171		*-.145*	*-.007*	*-.117*	*.254*	*.071*	*-.254*
Beta	.120	.165	.292	-.056		*.102*	*.236*	*-.101*	*.220*	*.088*
Net Income Predictability	.068	-.112	.082	.023	.063		*.214*	*-.008*	*.047*	*.083*
Sales Growth Rate	.222	-.233	.310	-.012	.162	.273		*-.259*	*-.039*	*.138*
LN(Number Shareholders)	-.279	.753	-.461	.159	-.039	-.152	-.242		*.371*	*-.493*
Institutional Holdings	-.080	.580	-.284	.061	.252	-.103	-.155	.344		*-.352*
Insider Holdings	-.001	-.263	.190	-.181	.063	.139	.111	-.434	-.400	

Correlations for the 1990-94 sample lie below the diagonal, and correlations for the 1985-89 sample lie above the diagonal in italics.

Table 23

Explaining the Ratio of Repurchases to Total Cash Distributions

	1990-1994 Sample (N=1520)			1985-1989 Sample (N=1208)		
	OLS	OLS	GLS	OLS	OLS	GLS
Constant	0.070	0.217	0.212	0.011	0.248	0.235
	(1.291)	(2.707)	(2.486)	(0.178)	(2.763)	(2.473)
LN(Firm Size)	-0.017	-0.017	-0.017	-0.021	-0.022	-0.022
	(-3.164)	(-3.232)	(-2.942)	(-3.660)	(-4.024)	(-3.744)
Return Standard Deviation	1.232	1.068	1.072	1.430	1.124	1.137
	(15.541)	(12.525)	(11.739)	(12.540)	(9.384)	(8.850)
Distribution Size	0.039	0.061	0.072	0.069	0.109	0.119
	(0.871)	(1.375)	(1.587)	(1.527)	(2.239)	(2.246)
SIC Code Dummies	No	Yes	Yes	No	Yes	Yes
Adjusted R^2	0.252	0.274	0.260	0.195	0.246	0.232

The dependent variable in each model is the ratio of dollar share repurchases to repurchases plus cash dividends over the five fiscal year period. Firm size equals the market value of equity at the beginning of the period, return standard deviation is estimated using the Parkinson (1980) extreme-value method with monthly data, and distribution size is defined as total distributions over the sample period divided by the beginning market value of equity. T-statistics in parentheses use White's (1980) consistent standard errors. In the models in the second and third columns, there are twelve intercept dummies for SIC code groupings, with the intercept representing the services (two-digit SIC 80-89) industry. The model in the third column is estimated using generalized least squares assuming the residual variance is proportional to an exponential function of the explanatory variables (excluding the SIC dummies).

Table 24

Explaining the Ratio of Repurchases to Total Cash Distributions

	1990-1994 Sample (N=1520)			1985-1989 Sample (N=1208)		
Constant	0.216	0.849	0.168	0.258	0.722	0.208
	(2.691)	(10.414)	(1.896)	(2.860)	(7.330)	(2.081)
LN(Firm Size)	-0.017		-0.017	-0.013		-0.027
	(-2.659)		(-1.976)	(-1.827)		(-2.492)
Return Standard Deviation	1.069		1.054	1.101		1.179
	(12.530)		(10.834)	(9.128)		(8.155)
Market Model R-Squared	-0.010			-0.172		
	(-0.114)			(-2.099)		
Distribution Size	0.061		0.056	0.108		0.101
	(1.376)		(1.252)	(2.214)		(1.998)
LN(Number of Shareholders)		-0.039	0.007		-0.023	0.014
		(-6.611)	(0.729)		(-3.584)	(1.227)
Beta		0.022	-0.019		0.096	-0.049
		(1.161)	(-1.003)		(2.829)	(-1.252)
Sales Growth		0.429	0.203		0.232	0.122
		(5.455)	(2.549)		(2.657)	(1.404)
Net Income Predictability (R^2)		-0.010	0.003		-0.126	-0.087
		(-0.337)	(0.104)		(-4.191)	(-3.019)
Adjusted R^2	0.273	0.163	0.276	0.248	0.162	0.252

The dependent variable in each model is the ratio of dollar share repurchases to repurchases plus cash dividends over the five fiscal year period. The number of shareholders is measured at the beginning of each period. Beta and the market model R-squared are estimated using monthly returns, sales growth equals the compound growth rate of annual sales, and net income predictability is the R-squared of a regression of annual net income against time, all estimated within each sample period. All models are estimated using ordinary least squares with T-statistics in parentheses using White's (1980) consistent standard errors. All models include twelve intercept dummies for SIC code groupings, with the intercept representing the services (two-digit SIC 80-89) industry.

Table 25

Explaining the Ratio of Repurchases to Total Cash Distributions:
Institutional and Insider Holdings

	1990-1994 Sample			1985-1989 Sample		
Constant	0.125	0.233	0.275	0.311	0.562	0.564
	(1.416)	(1.622)	(1.847)	(2.992)	(3.282)	(3.324)
LN(Firm Size)	-0.019	0.005	0.002	-0.032	-0.022	-0.040
	(-2.772)	(0.489)	(0.254)	(-3.844)	(-1.912)	(-3.149)
Return Std. Deviation	1.181	1.302	1.201	1.034	0.162	0.097
	(12.551)	(7.033)	(6.262)	(7.148)	(0.736)	(0.438)
Distribution Size	0.114	0.337	0.310	0.159	0.232	0.265
	(2.547)	(3.715)	(3.437)	(3.030)	(3.104)	(3.503)
Institutional Holdings	0.139		0.014	0.137		0.246
	(2.489)		(0.156)	(2.020)		(2.775)
Insider Holdings		-0.064	-0.053		-0.075	0.005
		(-0.885)	(-0.696)		(-0.877)	(0.056)
Adjusted R^2	0.265	0.195	0.181	0.229	0.141	0.162
Number of Observations	1295	608	594	1030	474	447

The dependent variable in each model is the ratio of dollar share repurchases to repurchases plus cash dividends over the five fiscal year period. Institutional and insider shareholdings are defined as the fraction of voting stock held by the respective group. All models are estimated using ordinary least squares with T-statistics in parentheses using White's (1980) consistent standard errors. All models include twelve intercept dummies for SIC code groupings, with the intercept representing the services (two-digit SIC 80-89) industry.

Table 26

Explaining the Ratio of Repurchases to Total Cash Distributions:
The Interaction Between LN(Firm Size) and Return Standard Deviation

	1990-1994 Sample			1985-1989 Sample		
Constant	0.180	-0.050	-0.318	-0.007	-0.042	-0.324
	(1.958)	(-0.520)	(-1.332)	(-0.064)	(-0.276)	(-0.959)
LN(Firm Size)	-0.008	0.015	0.093	0.037	0.040	0.113
	(-0.748)	(1.305)	(3.252)	(2.292)	(1.763)	(2.257)
Return Std. Deviation	1.173	1.685	3.011	1.861	2.066	2.725
	(7.600)	(9.367)	(4.865)	(7.954)	(5.468)	(2.776)
LN(Firm Size)*Std.Dev.	-0.028	-0.117	-0.320	-0.180	-0.225	-0.474
	(-0.849)	(-2.911)	(-3.030)	(-3.494)	(-3.012)	(-2.929)
Distribution Size	0.056	0.102	0.296	0.110	0.165	0.291
	(1.256)	(2.291)	(3.320)	(2.241)	(3.257)	(4.289)
Institutional Holdings		0.161	0.054		0.149	0.276
		(2.855)	(0.621)		(2.195)	(3.096)
Insider Holdings			-0.019			0.045
			(-0.256)			(0.544)
Adjusted R^2	0.273	0.269	0.198	0.253	0.238	0.190
Number of Observations	1520	1295	594	1208	1030	447

The dependent variable in each model is the ratio of dollar share repurchases to repurchases plus cash dividends over the five fiscal year period. All models are estimated using ordinary least squares with T-statistics in parentheses using White's (1980) consistent standard errors. All models include twelve intercept dummies for SIC code groupings, with the intercept representing the services (two-digit SIC 80-89) industry.

Table 27

Total Distributions as a Fraction of Beginning of Period Market Value of Equity for Firms Grouped on Distribution Method

Distribution Method	Number of Firms	Median	Mean	Std. Error of the Mean
1990-94 Sample:				
One or More Tender Offers	34	.397	.513	.076
Repurchases, But No Tender Offers	1209	.190	.227	.006
Dividends Only	277	.134	.164	.008
1985-89 Sample:				
One or More Tender Offers	54	.651	.722	.060
Repurchases, But No Tender Offers	950	.291	.367	.012
Dividends Only	204	.181	.242	.015

Table 28

Quarterly EPS Forecast Errors Surrounding
OM Stock Repurchase Announcements

EPS Forecast Error Standardized by Price

Qtr	N	Mean	Median	Std. Dev.	T-statistic
-4	778	-0.00019	0.00006	0.06706	-0.08048
-3	786	-0.00268	0.00037	0.09549	-0.78793
-2	788	-0.00100	-0.00015	0.04570	-0.61350
-1	795	-0.00230	-0.00033	0.05154	-1.25765
0	797	-0.00200	-0.00050	0.04931	-1.14763
1	804	-0.00140	0.00031	0.07930	-0.50095
2	809	0.00287	-0.00027	0.06575	1.23991
3	814	0.00199	-0.00003	0.05472	1.03982
4	817	0.00057	0.00015	0.07361	0.21963
5	821	0.00092	0.00003	0.08770	0.30151
6	819	0.00288	0.00047	0.06575	1.25424
7	804	0.00121	0.00040	0.06040	0.56927
8	781	0.00053	-0.00013	0.07538	0.19818

Table 28 (cont'd)

EPS Forecast Error Standardized by Standard Deviation

Qtr	N	Mean	Median	Std. Dev.	T-statistic
-4	778	-0.10118	0.01260	2.20682	-1.27886
-3	786	0.05718	0.08263	2.81174	0.57013
-2	788	-0.23476	-0.02182	4.07069	-1.61889
-1	795	-0.31689	-0.03685	3.57399	-2.50001
0	797	-0.29341	-0.08329	2.84549	-2.91103
1	804	-0.22119	0.04000	2.89704	-2.16486
2	809	-0.18501	-0.02214	2.91832	-1.80319
3	814	0.08723	-0.00656	2.61724	0.95086
4	817	-0.01687	0.01986	2.91310	-0.16553
5	821	-0.25708	0.00143	2.97138	-2.47903
6	819	-0.03524	0.04858	2.28595	-0.44118
7	804	-0.22859	0.02826	2.99644	-2.16309
8	781	-0.38665	-0.01085	3.29338	-3.28094

Table 29

Quarterly EBIT Forecast Errors Surrounding
OM Stock Repurchase Announcements

EBIT Forecast Error Standardized by Market Value of Equity

Qtr	N	Mean	Median	Std. Dev.	T-statistic
-4	522	-0.00563	-0.00028	0.07993	-1.61028
-3	544	-0.00399	-0.00018	0.12528	-0.74279
-2	557	0.00011	-0.00071	0.06393	0.04093
-1	579	-0.00446	-0.00093	0.06021	-1.78274
0	593	-0.00027	-0.00081	0.06682	-0.09960
1	613	-0.00503	-0.00139	0.08839	-1.40758
2	622	0.00075	-0.00146	0.07606	0.24550
3	630	0.00181	-0.00021	0.06920	0.65744
4	633	-0.00014	-0.00009	0.08924	-0.04084
5	638	0.00342	0.00018	0.10350	0.83509
6	628	0.00201	0.00039	0.07134	0.70675
7	613	0.00232	0.00023	0.08678	0.66285
8	602	0.00053	-0.00010	0.10374	0.12465

Table 29 (cont'd)

EBIT Forecast Error Standardized by Standard Deviation

Qtr	N	Mean	Median	Std. Dev.	T-statistic
-4	522	-0.20274	-0.06441	2.21418	-2.09198
-3	544	-0.05164	-0.02163	2.65917	-0.45296
-2	557	-0.23687	-0.08100	1.86030	-3.00510
-1	579	-0.36826	-0.09761	2.79498	-3.17040
0	593	-0.26505	-0.08816	2.59059	-2.49149
1	613	-0.23960	-0.08998	2.35536	-2.51858
2	622	-0.29502	-0.11924	2.37787	-3.09427
3	630	-0.03026	-0.02038	2.25212	-0.33725
4	633	-0.06124	-0.01182	2.52083	-0.61121
5	638	-0.17060	0.01553	2.56766	-1.67823
6	628	0.02218	0.02731	2.00397	0.27733
7	613	-0.26508	0.01661	3.18166	-2.06276
8	602	-0.36018	-0.00463	2.96595	-2.97956

Table 30

Explaining Future EPS Forecast Errors with
OM Share Repurchase Announcement Abnormal Returns

	Dependent Variable: EPS Forecast Error Divided by Stock Price			
Explanatory Variables	Qtr 0	Qtr 1	Qtr 2	Qtr 3
Intercept	-0.0024	0.0002	0.0005	0.0024
	(-1.289)	(0.112)	(0.246)	(1.340)
Abnormal Return at OM	0.0137	-0.0726	0.1027	-0.0204
Repurchase Announcement	(0.313)	(-0.743)	(1.501)	(-0.428)
Adjusted R-Squared	-.10%	.15%	.69%	-.07%
No. of Observations	795	802	807	812

	Dependent Variable: EPS Forecast Error Divided by Standard Deviation			
Explanatory Variables	Qtr 0	Qtr 1	Qtr 2	Qtr 3
Intercept	-0.324	-0.265	-0.209	0.117
	(-2.804)	(-2.324)	(-1.759)	(1.159)
Abnormal Return at OM	1.057	1.745	0.884	-1.383
Repurchase Announcement	(0.552)	(1.123)	(0.546)	(-0.964)
Adjusted R-Squared	-.08%	.00%	-.09%	-.03%
No. of Observations	795	802	807	812

Coefficients are estimated using ordinary least squares and t-statistics shown in parentheses are computed from White (1980) standard errors. Separate regressions are estimated for each of four fiscal quarters following the repurchase announcement including quarter 0. The OM announcement abnormal return is stated in decimal form.

Table 31

Explaining Future EBIT Forecast Errors with
OM Share Repurchase Announcement Abnormal Returns

	Dependent Variable: EBIT Forecast Error Divided by Market Value of Equity			
Explanatory Variables	Qtr 0	Qtr 1	Qtr 2	Qtr 3
Intercept	-0.0014	-0.0023	-0.0017	0.0015
	(-0.500)	(-0.835)	(-0.658)	(0.557)
Abnormal Return at OM	0.0549	-0.1338	0.1182	0.0132
Repurchase Announcement	(0.781)	(-1.043)	(1.230)	(0.183)
Adjusted R-Squared	.04%	.55%	.61%	-.15%
No. of Observations	593	613	622	630

	Dependent Variable: EBIT Forecast Error Divided by Standard Deviation			
Explanatory Variables	Qtr 0	Qtr 1	Qtr 2	Qtr 3
Intercept	-0.293	-0.272	-0.293	0.001
	(-2.423)	(-2.587)	(-2.831)	(0.015)
Abnormal Return at OM	1.335	1.567	-0.102	-1.488
Repurchase Announcement	(0.679)	(0.920)	(-0.057)	(-0.911)
Adjusted R-Squared	-.09%	-.03%	-.16%	-.02%
No. of Observations	593	613	622	630

Coefficients are estimated using ordinary least squares and t-statistics shown in parentheses are computed from White (1980) standard errors. Separate regressions are estimated for each of four fiscal quarters following the repurchase announcement including quarter 0. The OM announcement abnormal return is stated in decimal form.

Table 32

The Relation Between Abnormal Returns at Earnings Announcements and EPS Forecast Errors for Four Quarters Surrounding OM Share Repurchase Announcements

The model:

$$AR_{jt} = \beta_0 + \beta_1 fe_{jt} + \gamma_1 (D1_t * fe_{jt}) + \gamma_2 (D2_t * fe_{jt}) + \varepsilon_{jt}$$

j = 1, ... , 830 firms
t = 1, 2, 3, 4 earnings announcements for each firm; two immediately preceding and two immediately following the OM repurchase announcement

Coefficient Estimates				
β_0	β_1	γ_1	γ_2	Adjusted R^2
-0.147	20.118	-17.202	-13.988	2.03%
(-1.851)	(4.578)	(-3.115)	(-2.825)	

Coefficients are estimated using pooled cross-sectional time-series ordinary least squares regressions. The dependent variable, AR_{jt}, is the 2-day abnormal return at quarterly earnings annoucement t for firm j and is computed based on the one-factor market model. fe_{jt} is the EPS forecast error in quarter t for firm j, standardized by the stock price at the end of the fiscal quarter preceding the repurchase announcement. $D1_t$ is a slope dummy variable which takes a value of 1 if the earnings forecast error is the first one subsequent to the repurchase announcement and 0 otherwise. Similarly, $D2_t$ is a slope dummy variable assigned a value of 1 for the second earnings forecast error following the repurchase announcement and 0 otherwise. T-statistics are in parentheses based on White (1980) standard errors. Total useful number of observations is 3048.

Table 33

Explaining EPS Forecast Errors with Actual Shares Repurchased

Explanatory Variables	Qtr 1	Qtr 2	Qtr 3	Qtr4
Intercept	-0.00397	0.00057	0.00209	0.00297
	(-1.230)	(0.193)	(0.877)	(0.756)
Quarterly Shares Repurchased	0.00052	0.00065	-0.00027	-0.00092
	(1.793)	(2.020)	(-0.417)	(-0.415)
Cumulative Abnormal Return	0.01936	0.00749	0.01031	-0.00567
	(1.792)	(0.561)	(1.239)	(-0.610)
R-Squared	.04%	.03%	.16%	.06%
No. of Observations	803	808	813	816

The dependent variable is quarterly EPS forecast errors standardized by the stock price at the end of the fiscal quarter preceding the repurchase announcement. Coefficients are estimated using OLS and t-statistics shown in parentheses are computed from White (1980) standard errors. Separate regressions are estimated for each of four fiscal quarters following the OM stock repurchase announcement.

Table 34

Explaining EPS Forecast Errors with Actual Shares Repurchased

Explanatory Variables	Qtr 1	Qtr 2	Qtr 3	Qtr4
Intercept	-0.28756 (-2.309)	-0.29788 (-2.545)	0.02028 (0.195)	-0.02468 (-0.145)
Quarterly Shares Repurchased	0.00030 (0.017)	0.02471 (1.559)	0.00292 (0.102)	-0.01003 (-0.376)
Cumulative Abnormal Return	1.22773 (1.971)	0.73960 (1.545)	0.96817 (3.727)	0.41805 (0.639)
R-Squared	.35%	.24%	.92%	.02%
No. of Observations	803	808	813	816

The dependent variable is quarterly EPS forecast errors standardized by the standard deviation of forecast errors over the estimation period. Coefficients are estimated using OLS and t-statistics shown in parentheses are computed from White (1980) standard errors. Separate regressions are estimated for each of four fiscal quarters following the OM stock repurchase announcement.

Table 35

Explaining EBIT Forecast Errors with Actual Shares Repurchased

Explanatory Variables	Qtr 1	Qtr 2	Qtr 3	Qtr4
Intercept	-0.00840	-0.00024	0.00143	0.00087
	(-1.954)	(-0.058)	(0.430)	(0.176)
Quarterly Shares Repurchased	0.00058	0.00017	-0.00038	-0.00034
	(1.315)	(0.397)	(-0.615)	(-0.145)
Cumulative Abnormal Return	0.03409	0.00987	0.02092	-0.00381
	(1.729)	(0.519)	(1.593)	(-0.264)
R-Squared	.21%	-.22%	.60%	-.28%
No. of Observations	613	622	630	633

The dependent variable is quarterly EBIT forecast errors standardized by market value of equity at the end of the fiscal quarter preceding the announcement. Coefficients are estimated using OLS and t-statistics shown in parentheses are computed from White (1980) standard errors. Separate regressions are estimated for each of four fiscal quarters following the OM stock repurchase announcement.

Table 36

Explaining EBIT Forecast Errors with Actual Shares Repurchased

Explanatory Variables	Qtr 1	Qtr 2	Qtr 3	Qtr4
Intercept	-0.31600 (-2.733)	-0.34304 (-3.293)	-0.01736 (-0.155)	-0.10048 (-0.645)
Quarterly Shares Repurchased	0.00676 (0.528)	-0.00044 (-0.021)	-0.02333 (-0.884)	0.00014 (0.006)
Cumulative Abnormal Return	1.12457 (1.933)	0.92712 (2.209)	0.72287 (2.646)	0.52310 (0.901)
R-Squared	.37%	.53%	.96%	.14%
No. of Observations	613	622	630	633

The dependent variable is quarterly EBIT forecast errors standardized by the standard deviation of forecast errors over the estimation period. Coefficients are estimated using OLS and t-statistics shown in parentheses are computed from White (1980) standard errors. Separate regressions are estimated for each of four fiscal quarters following the OM stock repurchase announcement.

Table 37

Earnings Announcement Abnormal Returns For Five Consecutive Quarters Following OM Repurchase Announcements

	Qtr -1 Earnings announcements that occur after the OM announcement	Qtr 0	Qtr 1	Qtr2	Qtr 3
Mean	0.69%	0.11%	-0.34%	0.04%	-0.08%
Median	0.01%	0.03%	-0.26%	-0.10%	-0.08%
Minimum	-15.49%	-30.65%	-19.43%	-22.32%	-52.79%
Maximum	55.38%	26.85%	19.15%	38.78%	22.62%
Std. Dev.	6.28%	4.33%	3.87%	4.26%	4.92%
No. of Observations	142	827	819	820	815
T-statistic	1.303	0.730	-2.502	0.293	-0.476

Earnings announcement abnormal returns are calculated over the two-days encompassing the announcement day and the previous trading day. The one-factor market model employing the CRSP value-weighted index as the market proxy is used to compute the abnormal returns. The t-statisitc tests whether the mean abnormal return is significantly different from zero.

Table 38

The Relation Between Earnings Announcement Abnormal Returns and Actual Shares Repurchased in the Concurrent Fiscal Quarter

Explanatory Variables	Qtr 0	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Intercept	0.134	-0.319	-0.194	-0.257	0.379
	(0.695)	(-1.948)	(-1.114)	(-1.192)	(1.910)
Shares Repurchased in the Concurrent Quarter	0.029	0.018	0.058	0.092	-0.090
	(0.787)	(0.793)	(2.086)	(2.386)	(-1.768)
Quarterly EBIT Forecast Error Standardized by Sigma	0.141	0.153	0.033	0.334	0.283
	(2.296)	(1.807)	(0.294)	(2.943)	(3.425)
R-Squared	.71%	.72%	.24%	2.44%	3.46%
No. of Observations	572	599	607	614	606

The dependent variable in each model is the 2-day abnormal return at quarterly earnings announcements measured in percent. It is calculated using the one-factor market model with the CRSP value weighted index used at the market proxy. Coefficients are estimated using OLS with t-statistics in parentheses computed from White (1980) standard errors. The regression is carried out separately for five quarters following the OM announcement, including quarter 0.

Table 39

The Relation Between Earnings Announcement Abnormal Returns and Actual Shares Repurchased in the Subsequent Fiscal Quarter

Explanatory Variables	Qtr 0	Qtr 1	Qtr 2	Qtr 3
Intercept	0.190	-0.439	-0.049	-0.063
	(1.028)	(-2.454)	(-0.293)	(-0.259)
Shares Repurchased in the	0.019	0.064	0.006	0.021
Subsequent Quarter	(0.631)	(1.488)	(0.215)	(0.441)
Quarterly EBIT Forecast Error	0.151	0.152	0.032	0.319
Standardized by Sigma	(2.394)	(1.797)	(0.278)	(2.861)
R-Squared	.68%	1.18%	-.29%	1.67%
No. of Observations	585	599	607	614

The dependent variable in each model is the 2-day abnormal return at quarterly earnings announcements measured in percent. It is calculated using the one-factor market model with the CRSP value weighted index used at the market proxy. Coefficients are estimated using OLS with t-statistics in parentheses computed from White (1980) standard errors. The regression is carried out separately for four quarters following the OM announcement, including quarter 0.

APPENDIX B

APPENDIX B

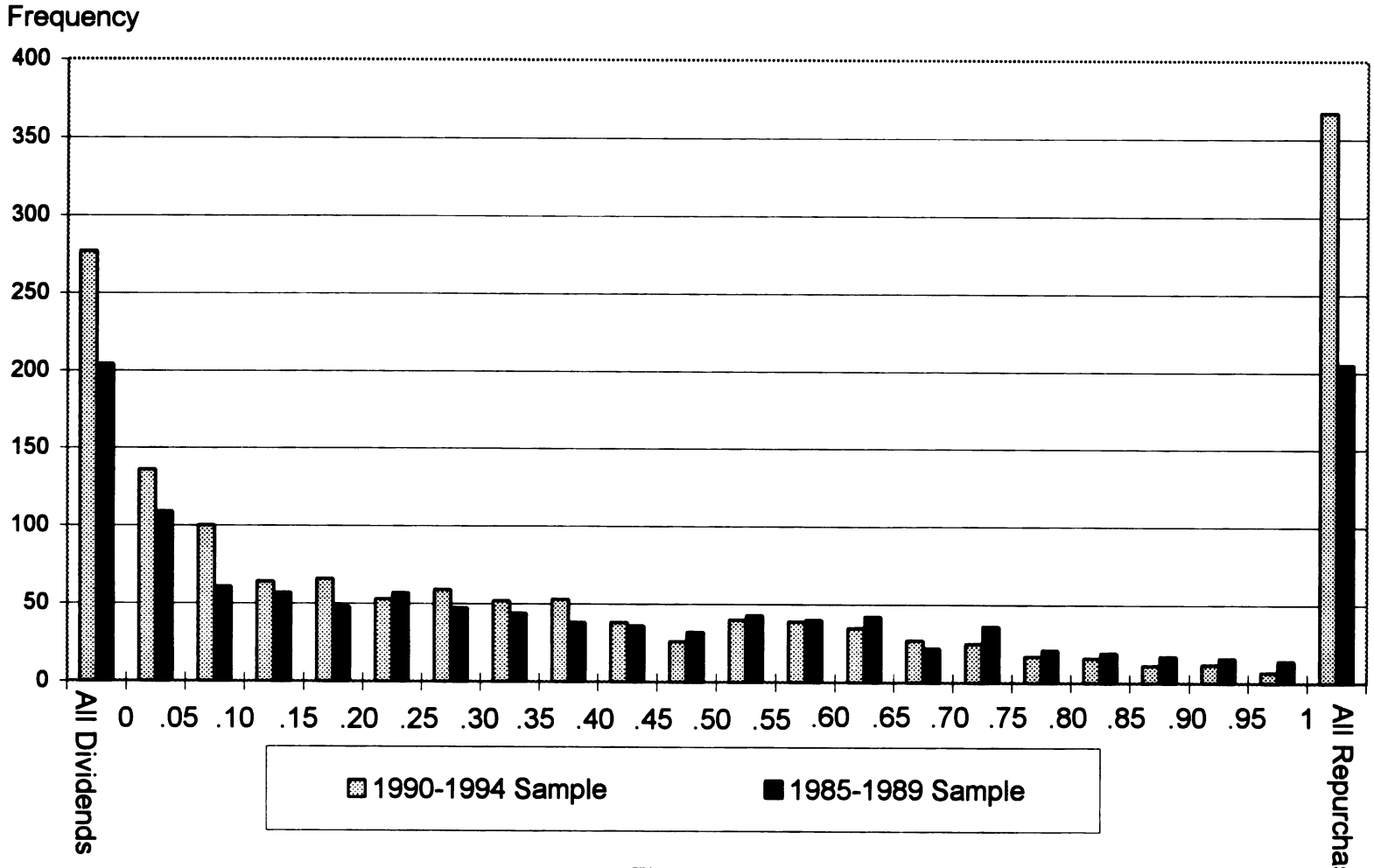

Figure 1
Distribution of the Ratio of Repurchases to Total Distributions

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