Good News and Bad News About Share Repurchases*

George W. Fenn
Milken Institute, 1250 Fourth St., Santa Monica, CA 90401

Nellie Liang
Board of Governors of the Federal Reserve System, Washington, DC 20551

First draft, March 1997, current draft December 1997

Abstract: We estimate the cross-sectional relationship between open market repurchases and accounting data for a large sample of dividend-paying and non-dividend-paying firms over a twelve year period (1984-95). Consistent with the hypothesis that firms use open market repurchases to reduce the agency costs of free cash flow, we find that repurchases are positively related to proxies for free cash flow and negatively related to proxies for marginal financing costs. We also examine the extent to which management stock options influence the choice between open market repurchases and dividend payments. Because the value of management stock options--like any call option--is negatively related to expected future dividend payments, management can increase the value of its stock options by substituting share repurchases for dividend growth. We find evidence that such substitution occurs: for dividend-paying firms, share repurchases are positively related and dividend increases are negatively related to a proxy for management stock options, whereas for non-dividend-paying firms, the relationship between repurchases and options is weak and statistically insignificant.

Correspondence to: George Fenn, Milken Institute, 1250 Fourth St., Santa Monica, CA, 90401, 310-998-2699, **gfenn@milken-inst.org** ; Nellie Liang, Federal Reserve Board, Stop 89, 20th and C Sts., NW, Washington, DC 20551, 202-452-2918, nliang@frb.gov.

* The views expressed in this paper are those of the authors and not necessarily those of the Milken Institute or the Federal Reserve Board. We thank Manju Puri and Stewart Myers for helpful comments, and Kyle Nagel, Mike Pizzi, and Melissa Post for outstanding research assistance.

Good News and Bad News about Share Repurchases

1. Introduction

Corporations currently distribute large amounts of their cash flow to shareholders through stock repurchases. In recent years, funds used to buyback stock have accounted for between 30 and 40 percent of distributions to shareholders made through dividends and repurchases, up substantially from less then 10 percent in the early 1980s. As with dividend announcements, positive stock price effects have been documented at the announcement of a repurchase program and increase in the proportion of shares that are to be bought back (Comment and Jarrell, 1991; Stephens and Weisbach, 1996).

The most popular explanation for stock repurchases is that they are a means by which management can convey, or *signal,* its belief that its firm's stock is undervalued (see e.g. Dann, 1981; Vermaelen, 1981; Asquith and Mullins, 1986; Ikenberry et al. 1995; or Stephens and Weisbach, 1996). However, repurchase models *in which managers have explicit incentives to signal undervaluation*--e.g. Vermaelen (1984) and Ofer and Thakor (1987)--apply only to tender offers, not to open market repurchases that account for more than 90 percent of recent repurchase activity.[1] Signalling equilibriums in these models depend crucially on the assumption that management is not among the selling shareholders. This assumption is satisfied by tender offers but not by open market programs that place no restrictions on sales by insiders.[2]

An alternative explanation for stock repurchases--and one that appears especially well suited to explaining open market repurchases--is related to free cash flow. Free cash flow gives rise to conflicts between shareholders and managers when the latter have incentives to invest in projects beyond those with positive net present value (Jensen, 1986). By returning free cash flow to shareholders, repurchases mitigate these conflicts. Repurchases are an extremely credible means of distributing free cash flow because funds are distributed

---

[1]Such models posit that managers' utility depends, in part, on the current stock price; consequently, managers have the incentive to signal undervaluation and raise their firm's stock price.

[2]Vermaelen's (1984) model further assumes that repurchases occur at a premium to the true value of a firm's shares. This assumption implies that stock prices fall subsequent to repurchases, a pattern that is observed in tender offers (Vermaelen, 1981), but not in open market repurchases where long-term positive excess returns are observed (Ikenberry, Lakonishok, and Vermaelen, 1995).

immediately. Other methods of distributing free cash, such as increasing dividends, involve commitments to make future distributions. Moreover, open market repurchases often are a more flexible and efficient means of distributing free cash flow than major leverage-increasing transactions such as debt-for-equity swaps and leveraged recapitalizations. Chowdhry and Nanda (1994) demonstrate that even when management's motivation for undertaking repurchases is to disgorge free cash flow, and not to signal undervaluation, undervalued firms are more likely to choose repurchases over dividends. Thus, the free cash flow hypothesis is entirely consistent with evidence showing a negative relationship between repurchases and prior stock price changes (Stephens and Weisbach, 1996).

The free cash flow hypothesis implies that firms with high levels of excess cash flow and low marginal financing costs will repurchase more stock. Firms with high levels of excess cash flow are at greater risk of overinvesting, and hence, derive greater benefits from distributing cash to shareholders. Firms with relatively low marginal financing costs can distribute more cash to shareholders knowing that if they must raise external funds in the future--because cash flow is lower than expected or profitable investment opportunities are greater than expected--the funds will be relatively inexpensive.

To test the free cash flow hypothesis, we estimate the cross-sectional relationship between open market repurchases and accounting data for a large sample of dividend-paying and non-dividend-paying firms over a twelve year period (1984-95). Separately analyzing the repurchase behavior of these two samples allows us to gauge the robustness of the free cash flow hypothesis, as well as to test a hypothesis related to stock options described below. Our empirical results provide broad support for the free cash flow hypothesis: for both samples, open market repurchases are positively related to net operating cash flow (a proxy for free cash flow), negatively related to the market-to-book ratio (a proxy for investment opportunities), negatively related to leverage (a proxy for marginal financing costs), and positively related to cash balances and firm size (inverse proxies for marginal financing costs). [3]

---

[3]Bagwell and Shoven (1988) and Dittmar (1995) report results that are similar to ours in certain respects. In an early study that employs two years of data, Bagwell and Shoven (1988) conclude that free cash flow is an important motivation for repurchases, but that ‘habit formation’ is

To shed further light on the motivation for repurchases, we estimate the relationship between dividend increases and accounting data for our sample of dividend-paying firms.[4] Using two different measures of dividend increases--the increase in dividends per share divided by the share price and the increase in dividends per share divided by last period's dividend (the dividend growth rate)--we find that dividend increases are more closely tied to operating income than to free cash flow, market-to-book ratios, leverage, firm size, or cash balances. These results suggest that dividend increases *are not* motivated primarily by the agency costs of free cash flow, a view that the dividend literature, on balance, seems to endorse (Allen and Michaely, 1994). Together, our results for share repurchases and dividend increases suggest that firms do not treat repurchases and dividends as close substitutes.

While one aim of this paper is to shed light on the motivation for repurchases, our other aim is to examine the extent to which management stock options influence the choice between open market share repurchases and dividend payments. In the absence of information and tax effects, stock options give management the incentive to lower dividends and increase repurchases (or retain more cash). Such incentives exist because the value of management stock options--like any call option--are negatively related to expected future dividend payments. In the presence of information or tax effects, management's preference for share repurchases and dividends will also depend on how the market values them. Regardless of the market's valuation, we hypothesize that stock options will furnish management with the incentive to substitute repurchases for dividend growth at the margin.

To investigate the hypothesis that options induce firms to substitute repurchases for dividends, we include a proxy for management stock options in the cross-sectional repurchase

---

also important. In a more recent study that includes data from 1977 to 1993, Dittmar (1995) concludes that a firm's need to distribute funds is an important motivation for repurchases, but she focuses on the increasing tendency of large firms to repurchase stock over time, especially post-1984. Both studies omit certain key variables that we use to test the free cash flow hypothesis, and neither study examines the repurchase behavior of dividend- and non-dividend-paying firms separately, or examines dividend increases as we do. In addition, both studies pool open market repurchases and tender offers together rather than focusing exclusively on open market repurchases.

[4]Smith and Watts (1992) examine the cross-sectional relationship between dividend *levels* and accounting data; we are not aware any previous studies that have examined the relationship between dividend *increases* and accounting data.

and dividend regressions described above. For dividend-paying firms, the hypothesis predicts that repurchases and options are positively related, whereas for non-dividend-paying firms, the hypothesis offers no prediction. Consistent with this hypothesis, we find a positive and statistically highly significant relationship between repurchases and stock options for dividend-paying firms. A one standard deviation increase in our measure of stock options increases expected annual share repurchases by nearly a quarter-percent of the market value of a firm's stock---roughly one-sixth the average annual share repurchases of dividend-paying firms in our sample. Conversely, the relationship between repurchases and options for non-dividend-paying firms, though positive, is weak and statistically insignificant. The substitution hypothesis also predicts a negative relationship between dividend increases and stock options; consistent with this hypothesis, the estimated empirical relationship is negative and generally significant.

There are several alternative explanations for the positive relationship we observe between share repurchases and stock options. Options may increase management's incentive to take value-maximizing actions, including the distribution of free cash flow to shareholders; thus, the positive relationship between share repurchases and options may reflect management's decision to increase total distributions rather than to substitute one form of distribution (repurchases) for another (dividends). Alternatively, firms that issue options might repurchase stock as the options are exercised, either because the exercise proceeds constitute free cash flow or because such firms need shares to issue to those exercising the options. To the extent that repurchases and options are related through either of these channels, we should observe a positive relationship between repurchases and stock options for firms that *do not* pay dividends. The lack of a statistically significant relationship between repurchases and stock options for these firms is inconsistent with the alternative explanations, and thus supports the hypothesis of option-induced substitution of repurchases for dividends.

The effect of management stock options on corporate payout policies has been examined in two previous papers.[5] Lambert, Lanen, and Larcker (1989) show that firms reduce dividends relative to expected dividends following the adoption of executive stock option plans in the 1950s. This finding is consistent with our hypothesis. More recently, Jolls (1996) examines the effect of stock options on a firm's decision to repurchase stock or increase dividends. Although her hypothesis regarding the link between repurchases and options is essentially identical to ours, her empirical approach is quite different.[6] She uses one year of data to estimate a multinomial logit model of a firm's decision to (i) repurchase stock; (ii) increase dividends; (iii) repurchase stock and increase dividends; or (iv) do neither. Her main finding is also consistent with our results: repurchases are more likely when managers hold more stock options.

The motivations for repurchase activity are important. To the extent that repurchases are used to increase the level of cash distributions to shareholders and mitigate agency costs of excess cash flow, firm value is increased. On the other hand, if repurchases are conducted, in part, to maximize the value of employee stock options held by managers, outside shareholders would be better off if firms repurchased less stock and were to instead pay higher dividends. Our results suggest that both factors are at work.

The remainder of this paper is organized as follows. In section 2 we describe our sample and data. In section 3 we the present our main findings and in section 4 we present the results of various robustness checks. Section 5 concludes.

2. Sample and Data Description

To investigate the determinants of open market share repurchases, we construct a panel data set of all nonfinancial firms on *Compustat* during 1984-95 with total assets greater than $50 million in 1994 dollars. We begin our sample in 1984 because of the pickup in repurchase activity that followed the November 1982 SEC ruling defining a "safe harbor" for

---

[5]Stock options can furnish management with incentives to take other actions that benefit themselves at the expense of outside shareholders; see, for example, Yermack (1997).

[6]We were unaware of Jolls' (1996) paper until an earlier draft of this paper was completed.

open market repurchase programs.[7]

To define open market repurchases we start with funds used to retire common and preferred stock from the cash flow statement (*Compustat item A115)*. We then explicitly exclude tender offers using data from Comment and Jarrell (1991) and Securities Data Company.[8] We also exclude what appear to be repurchases of preferred stock using data on *changes* in preferred stock.[9] The repurchase variable used in our empirical analysis is repurchases in year t divided by the market value of a firm's common stock at the end of year t-1.

As noted above, we construct separate samples of dividend-paying and non-dividend-paying firms. Separate samples are used in order to (i) compare the repurchase behavior of dividend-paying and non-dividend-paying firms, and (ii) compare the determinants of repurchases and dividend increases for dividend-paying firms. We define a firm as dividend-paying in year t if it paid dividends in years t and t-1; we require two consecutive years of dividends in order to exclude firms that pay special dividends but do not pay regular dividends. For dividend-paying firms, we define two measures of dividend increases: the increase in dividends per share divided by the share price and the increase in dividends per share divided by last period's dividend (the dividend growth rate).

Tables 1 reports descriptive statistics for repurchases and dividend increases. Our samples include 7,154 dividend-paying firm-years and 6,056 non-dividend-paying firm-years,

---

[7]The safe harbor defined conditions under which firms could repurchase stock without fear of being investigated for price manipulation. Among its most important features are restrictions regarding the price at which a firm can bid for its own stock and the quantity of stock that can be repurchased within a given time period.

[8] We matched 90 tender offers over 1984-95, an average of less than 8 per year. Comment and Jarrell reported over 20 per year during 1984-89; however, some of the offers reported by Comment and Jarrell were made by financial companies or firms with market capitalization below $50 million, firms that are excluded from our sample.

[9]If the change in a company's preferred stock is within 10 percent of its repurchases, we assume that preferred stock was repurchased. We exclude repurchases of preferred stock because the motivation for these repurchases often are quite different than the motivation for repurchases of common stock (for example, a firm may repurchase preferred shares if the required dividend yield exceeds current interest rates).

a total of 13,210 observations, or about 1100 per year. Half of the dividend-paying firms repurchase stock while 30 percent of the non-dividend-paying firms do so. The average repurchase of dividend-paying firms is 1.6 percent of market value while for non-dividend-paying it is 1.2 percent. Perhaps surprisingly, the average repurchase *conditional* on repurchases being nonzero is actually higher for firms that do not pay dividends (3.9 percent) than for those that do (3.2 percent).

Dividend-paying firms increase their dividends in 62 percent of the observations; in the remaining 38 percent, firms either cut their dividends or leave them unchanged. Because dividend decreases are relatively infrequent and likely are undertaken for different reasons than dividend increases, we censor the dividend increase variable from below at zero. Using this censoring procedure, the increase in dividends as a fraction of the share price averages 0.2 percent for our sample, while the dividend growth rate averages 10.7 percent.

2.1 Explanatory Variables

The explanatory variables included in our repurchase regressions and the predicted signs of their coefficients are shown in table 2. Unless noted otherwise, all variables are measured in the year preceding the repurchases.

Conceptually, free cash flow is cash flow in excess of that required to fund all projects that have positive net present values (Jensen, 1986). To represent free cash flow, we use net operating cash flow scaled by assets, as in Kaplan (1989). The free cash flow hypothesis predicts a positive relationship between repurchases and cash flow. We also disaggregate net operating cash flow into its components, operating income before depreciation and capital expenditures. Including specifications in which net operating cash flow is disaggregated into its components allows us to draw sharper distinctions between the determinants of share repurchases and dividend increases. The free cash flow hypothesis implies a positive relationship between repurchases and operating income and a negative relationship between repurchases and capital expenditures.

Because net operating cash flow for a single year is, at best, a very rough measure of free cash flow, we include a measure of investment opportunities. *Ceteris paribus,* free cash flow and investment opportunities should be negatively correlated. The most frequently used measure of investment opportunities is the market-to-book asset ratio (see Lehn, Netter, and

Poulsen, 1989, Opler and Titman, 1993, and others); the free cash flow hypothesis predicts a negative relationship between repurchases and the market-to-book ratio.

To measure marginal financing costs, we use firm size, leverage, and cash. Larger firms are generally regarded as posing less risk of agency problems, and hence, face lower financing costs (Smith and Warner, 1979). Leverage and cash holdings are not purely exogenous characteristics, but are in part choice variables. Nonetheless, it is fairly standard to include leverage as a measure of potential financial distress costs, and hence, external financing costs; cash can be thought of as the opposite of debt since it can be used to repay debt. The free cash flow hypothesis predicts a positive relationship between repurchases and firm size and cash, and a negative relationship between repurchases and leverage.

The hypothesis of option-induced substitution of repurchases for dividends predicts a positive relationship between repurchases and management stock options for dividend-paying firms. For our measure of management stock options, we use common shares reserved for conversion for stock options, convertible securities, and warrants (*Compustat item A40).* This variable has the advantage of being available for a large number of firms throughout our sample period. It has the obvious disadvantage of being a noisy measure of management stock options because it includes (i) shares reserved for non-option purposes, and (ii) shares reserved for options held by non-management employees. In addition, this variable includes options all options that have been authorized under existing stock option programs rather than just those that have been granted.

To ascertain the significance of shares reserved for non-option purposes and options authorized but not yet granted, we compare our *Compustat* variable with data on employee stock options collected directly from the annual statements of about 200 large companies for the last three years of our sample. We find that for this subsample, the *Compustat* variable and employee stock options are highly correlated (see below.) To the extent that employee stock options are highly correlated with management stock options, these results imply that the *Compustat* variable is a reasonable proxy for management stock options.

Finally, we include in our regressions two variables that are included in other repurchase studies: the lagged stock price change and dividend yield. As noted above, a negative relationship between repurchases and lagged stock price changes has been interpreted as evidence of signalling (Dittmar, 1995 and Stephens and Weisbach, 1996). However, Chowdhry and Nanda (1994) demonstrate that it is also consistent with the free cash flow hypothesis. As they demonstrate, this relationship can arise if (i) firms use both repurchases and dividends to distribute free cash, and (ii) undervaluation is one of the factors that influences the firm's choice of distribution methods. More generally, the Chowdhry and Nanda (1994) analysis suggests that the inclusion of lagged price changes may simply constitute a test of whether under- or over-valuation affects a firm's *choice* of distribution methods, independent of the firm's *motives* for undertaking distributions.

Dividend yields have been included as a proxy for a firm's "tax clientele", or the tax rate of a firm's marginal investor. Firms with low dividend yields are hypothesized to appeal to investors with high marginal tax rates, and these firms are hypothesized to rely most heavily on repurchases to distribute cash (Bagwell and Shoven, 1988 and Dittmar, 1995). Again, the inclusion of dividend yields constitutes a test of whether a firm's tax clientele affects its choice of distribution methods rather than a test of the motive for distributions.

Table 3 reports the means and medians of firm characteristics for our sample of dividend-paying and non-dividend-paying firms. For each sample, we report descriptive statistics for the whole sample and for the subsamples of firms that repurchase or do not repurchase stock.

Looking first at the characteristics of the full samples (columns 1 and 4), dividend-paying firms, not surprisingly, are both larger and have greater amounts of operating income than non-dividend-paying firms. Non-dividend-paying firms hold larger amounts of cash and have more stock options outstanding.[10] Turning next to differences between firms that repurchase stock and those that do not, most of the univariate differences are in the direction predicted by the free cash flow hypothesis. For example, in both samples, firms that

---

[10]The average stock returns of the two sets of firms also differ markedly: 7.4 percent for dividend-paying firms versus -4.5 percent for non-dividend-paying firms (there is a similar difference in the medians). However, this difference arises, in part, from our definition of dividend-paying firms. As noted in the text, we define dividend-paying firms to include only those firms that paid dividends in the current and prior year. Thus, non-dividend-paying firms will include firms with regular dividend programs that were forced to suspend dividends for one or more years; these firms will typically have experienced a very large decline in earnings *and* stock price.

repurchase stock have more net free cash, more operating income, less capital expenditures, greater assets, less debt, and more cash than firms that do not repurchase stock. Among dividend-paying firms, shares reserved for conversion--our proxy for management stock options--are also greater for firms that repurchase stock, consistent with the hypothesis of option-induced substitution.

3. Regression Results

Because repurchases are nonnegative, we estimate tobit regression models. Previous studies (Bagwell and Shoven, 1988 and Dittmar, 1995) estimate probit regression models; to do so, these studies define binary repurchase variables equal to 1 when repurchases exceed some critical value (for example, 1 percent of the value of a firm's shares.) As a robustness check, we also estimate probit models; the results are qualitatively similar to those for our tobit models.

3.1 Repurchase Regressions

Table 4 reports the results of estimating repurchase regressions for both dividend- and non-dividend-paying firms. The first column identifies the explanatory variables, the second column indicates the predicted signs of their coefficients, and the next four columns report the marginal effects of a change in the independent variable on repurchases, evaluated at the mean of the independent variables (with associated p-values in parentheses).

The regressions results offer strong support for the free cash flow hypothesis. Specifically, for both subsamples, the coefficient estimates for *each* of the five primary variables used to test the free cash flow hypothesis have the predicted signs and are highly significant (regressions 1 and 3, rows 1 and 4-7). The coefficients for the two samples are generally similar in magnitude, though in several cases they are markedly larger for non-dividend-paying firms. A potential explanation for the larger coefficients for non-dividend-paying firms--that is, for the greater sensitivity of repurchases to the explanatory variables for these firms--is that they distribute excess cash only through repurchases whereas dividend-paying firms may distribute excess cash through repurchases *and* dividends.

In regressions 2 and 4, net operating cash flow is disaggregated into its two components---operating income before depreciation and capital expenditures. Both variables are significant with the expected signs. Previous studies include only operating income in their repurchase regressions (Bagwell and Shoven, 1988; Dittmar, 1995; Stephens and Weisbach, 1996; and Jolls, 1996). As argued in these studies, a positive relationship between repurchases and operating income is consistent with either signalling or free cash flow interpretations of repurchases. The negative relationship between repurchases and capital expenditures is consistent with only the latter.

The regression results in table 4 also offer strong support for the hypothesis that options induce firms to substitute repurchases for dividends. For dividend-paying firms, repurchases are positively related to our proxy for management stock options and the relationship is statistically significant (p-value < 0.01). For non-dividend-paying firms, the relationship, while positive, is much weaker; the coefficient on the proxy for stock options is only about *one-fifth* as large as in the regression for dividend-paying firms, and is statistically insignificant (p-values = 0.19 and 0.16).[11]

The economic interpretation of our results with respect to stock options warrants some discussion because the link between repurchases and stock options has been interpreted differently elsewhere. Specifically, a number of Wall Street analysts have suggested that repurchases are frequently used to accumulate the shares necessary to satisfy a company's employee stock options plan.[12] While we do not fully understand this relationship, it appears that such a relationship should apply to *all* firms, not just to dividend-paying firms. By contrast, the positive relationship between repurchases and stock options that we have described should exist only for dividend-paying firms. In this respect, our evidence is more

---

[11]We also estimated the repurchase regressions using a more restrictive definition of non-dividend paying firms. The more restrictive sample includes only firms that do not pay dividends in *both* the current and previous year. This more conservative definition eliminates from the non-dividend-paying sample firms that generally pay dividends but omitted them in one year. The regression results for this more conservatively defined sample were virtually identical to those reported in table 4, columns (3) and (4). In particular, the coefficient on stock options remained small and statistically insignificant (p-value = 0.34).

[12]See, for example, "Stock Buybacks: Strategy and Tactics", *Salomon Brothers U.S. Financial Strategy*, November 1994, or "U.S. Strategy: Keep a Sharp Eye on the Share Count (Part II)", *Morgan Stanley Equity Research*, April 25, 1996.

conclusive than that of Jolls (1996), who finds a positive relationship between repurchases and management stock options, but does not distinguish between dividend-paying and non-dividend-paying firms in her sample.[13]

An alternative explanation for the positive relationship between repurchases and stock options relates to management incentives. As option holders, management clearly benefits from any steps taken to increase firm value. To the extent that repurchases are value-enhancing, management's incentive to repurchase stock is greater the larger its option holdings. Once again, however, such a link between repurchases and management stock options should exist for all firms, not just dividend-paying firms. Moreover, if increased management incentives account for the positive link between repurchases and stock options, a similar link should exist between repurchases and management share holdings. However, Jolls (1996) finds no relationship between repurchases and restricted stock, an alternative form of stock-based compensation. Similarly, Dittmar (1995) finds no relationship between repurchases and insider stock ownership.

In contrast to the variables used to test the free cash flow and option-induced substitution hypotheses, the final two variables in the repurchase regressions--the percent change in stock price and the dividend yield--enter with the 'wrong' sign and are generally insignificant. As explained above, these variables correspond to factors that potentially affect a firm's choice between repurchases and dividends.

Table 5 reports the economic significance of the statistically significant variables in table 4. These figures are calculated by multiplying the marginal effects reported in table 4 times the standard deviation of the explanatory variables. Using this measure, firm size has the largest effect on the repurchases of dividend-paying firms: A one standard deviation increase in firm size is estimated to increase annual share repurchases by ½ of 1 percent of market value---roughly one-third the mean value of repurchases for the dividend-paying firms

---

[13]In private correspondence, Christine Jolls has told us of some additional results she obtained that bear on this issue. She used data for total employee stock options in addition to her primary data on management stock options. When she included both variables in her regressions, only management stock options were significant. Implicitly, non-management stock options added no additional explanatory power. This evidence provides further support for the substitution hypothesis and is *inconsistent* with the explanation put forth by stock analysts described above.

in our sample (1.58 percent). The propensity of large firms to repurchase stock--especially since 1984--has been emphasized by Dittmar (1995). Although the free cash flow hypothesis predicts a positive relationship between repurchases and firm size through the influence of size on marginal financing costs, firm size may also capture information about free cash flow. In particular, large firms may tend to be mature firms with relatively few growth opportunities and cash flow that often exceeds the profitable level of investment.[14] Firm size is followed in importance by net operating cash flow, our proxy for management stock options, and leverage; a one standard deviation change in these variables is predicted to lead to an increase or decrease in the repurchases of dividend-paying firms equal to approximately a quarter percent of shares outstanding.

For non-dividend-paying firms, the effects of a one standard deviation increase in net operating cash flow, market-to-book assets, and cash are markedly larger than for dividend-paying firms. Conversely, the effect of firm size on repurchases, though still sizable, is less than for dividend-paying firms, and the effect of our proxy for management stock options is both small, and as shown in table 4, statistically insignificant.

3.2 Dividend Regressions

Table 6 reports the results of estimating an analogous set of tobit regressions using increases in dividends per share as the dependent variable. Each of the ten variables included in our repurchase regressions--the seven variables used to test the free cash flow hypothesis, our proxy for management stock options, and two additional variables (percent change in stock price and dividend yield)--are included in these regressions. In addition, we employ two distinct specifications. The first is most directly analogous to the repurchase regression: the dollar increase in dividends per share divided by the share price, which, if the number of shares remains constant, is equal to the increase in dividend payments divided by the market value of the firm. The second form of the regression uses the dividend growth rate. Note that the marginal effects in the second specification are much larger than for the first specification, as the average increase in dividends per share divided by the share price is a mere 0.22

---

[14]Firm size is rarely explicitly used as a proxy for investment opportunities. On the other hand, discussions of free cash flow commonly suggest that "*large*, mature, public companies"face the most severe free cash flow problems. See, for example, Barclay, Smith, and Watts (1995), p.9.

percent (0.0022), whereas the average percentage increase in dividends per share is 10.75 percent (0.1075). As in the repurchase regressions, we include specifications with, alternatively, net operating cash flow (regressions 1 and 3) and its components (regressions 2 and 4).

Turning first to the coefficient on our proxy for management stock options (line 8), in each of the four specifications in table 6 the coefficient is negative, and in three of the four specifications the coefficient is statistically significant at the 0.05 level. These results are consistent with the hypothesis that options give management an incentive to substitute away from dividend increases, similar to findings by Lambert, Lanen, and Larcker (1989) that management reduces dividends relative to expected levels after adopting executive stock option plans. In combination with our results for share repurchases, these results provide strong support for the hypothesis that dividend-paying firms substitute repurchases for dividends.

Turning next to the proxies for free cash flow, net operating cash flow is positively associated with dividend increases, as it is with repurchases; likewise, operating income is positively associated with dividend increases and capital expenditures are negatively associated. However, an interesting distinction between the repurchase and dividend-increase equations is the *relative* importance of the components of net operating cash flow. Whereas for repurchases, the marginal effect of capital expenditures is somewhat larger than the marginal effect of operating income, (see equation 2 in table 4), in the case of dividend increases, the marginal effect of operating income is 3.5 to 4.5 times larger than the marginal effect of capital expenditures. The difference between the relative importance of operating income and capital expenditures on these alternative forms of cash payouts clearly suggest that repurchases are more closely tied to cash flow while dividend increases are more closely tied to earnings.

In marked contrast to the repurchase regressions, the remaining variables used to test the free cash flow hypothesis, with the exception of size, perform relatively poorly. The coefficient on market-to-book is positive in two of the specifications, which, from the perspective of the free cash flow hypothesis, is the ‘wrong’ sign. The same is true of leverage, though its coefficient is generally insignificant. Likewise, the coefficient on cash is insignificant in all but one specification.

Also different from the repurchase regressions are the statistically significant coefficients on the percent change in stock price and the dividend yield. The coefficient estimates for the percent change in stock prices are uniformly positive. This pattern could well reflect the following signalling story: firms increase their dividends to signal higher earnings in the future. The information that firms have is correlated with the information that the market already has and has impounded into the stock price. Thus, (lagged) stock price changes and dividend increases are highly correlated. The explanation for the sign of the coefficients on the dividend yield---positive in specifications that use the change in the dividend per share divided by share price as the dependent variable, and negative in the specifications that use dividend growth as the dependent variable---is even more basic. Firms with low dividend yields (D/P) also tend to have smaller dividend increases relative to their share price (ΔD/P).[15] On the other hand, the negative coefficient on dividend yield in the specification that uses dividend growth as the dependent variable suggests that there is some mean reversion in dividend growth rates.

4. Robustness Checks

In this section we describe the results of three primary types of robustness checks. First, we estimate the repurchase regressions over sub-periods. Second, we investigate the sensitivity of our results to the choice of proxy for management stock options by comparing our results to those obtained for a subsample of firms using actual data on employee stock options. Third, we use our dataset to examine whether stock options influences a non-dividend-paying firm's decision to *initiate* dividend payments, as the theory behind the option-induced substitution hypothesis suggests they should.

4.1 Time periods

Year dummy variables were included in our estimations. While the coefficients for 6 of the 10 dummy variables were insignificant, they generally were positive for the years

---

[15]This will be true, for example, in a simple constant dividend growth model---the larger the growth rate in dividends, the smaller are D/P and (ΔD/P).

before 1991 and negative for the years 1991 and later. To investigate whether our repurchase estimations were sensitive to the time period, we estimate the basic repurchase equation, as specified in (1) in table 4 for two subperiods, 1984-90 and 1991-95. Results for 1984-90 using 3,872 observations were virtually identical to those reported for the entire period.

The results for 1991-95 using 3,276 observations were also similar to results reported for the entire period: Excess cash flow, assets, and stock options remain the most important determinants of repurchases. A small difference is that the coefficient on dividend yield is negative and significant in this subperiod. This estimated coefficient is consistent with the tax clientele hypothesis that firms with low dividend yields appeal to investors with high marginal tax rates who would prefer repurchases to dividends. The tax effect may have become more important after 1990 when the differential between the top marginal capital gains rate and ordinary income rate widened from 0 percent (under the Tax Reform Act of 1986) to between 8 and 12 percent. However, the magnitude of the predicted change in repurchases as a share of market value is fairly small: a one standard deviation decrease in the dividend yield increases repurchases by 0.08 percent of market value.

4.2 Employee stock option data

The measure of stock options that is available from *Compustat* overstates management stock options because it includes (i) options available to all employees, not just management, (ii) all options *authorized* under existing stock option plans, not just those that have been *granted*, and (iii) shares reserved for convertible debt, convertible preferred, and warrants. To investigate the sensitivity of our results to the inclusion of the second and third items, we obtain data on employee stock options for 455 observations during 1993-1995 directly from their annual statements. Comparing these data with our *Compustat* proxy, the ratio of the former to shares outstanding averaged 0.045, considerably smaller than 0.117 measured using the *Compustat* variable for the same set of companies. It's likely that most of the difference between the shares reserved for conversion (the *Compustat* variable) and employee stock options is accounted for by options authorized but not yet granted.[16] The correlations by year

---

[16]Data on stock options for about 700 large companies in 1993-95 indicate that, on average, options authorized under existing stock option grant plans are more than two times the number of

between the two measures are positive and highly significant, ranging between 0.47 and 0.65.

Among dividend-paying firms, we have employee stock option data for 384 companies in 1993-95.[17] We estimate the repurchase equation for this subsample using (a) our proxy for stock options from *Compustat*, and (b) the more direct measure of employee stock options from the annual statements. As shown in table 7--which reports the effect of a one standard deviation change in firm characteristics on repurchases, obtained using coefficient estimates from these regressions--the results for both specifications are qualitatively the same as those obtained for the entire sample of dividend-paying firms. For this subsample, a one standard deviation increase in our *Compustat* proxy for stock options increases repurchases as a percent of market value by 0.20 versus 0.23 reported in table 5. When we substitute a direct measure of employee stock options, the coefficient is more significant and the effect on repurchases is somewhat stronger, 0.26. Similarly, the direct measure is more negative and significant in the dividend equations (not shown). Thus, while a more accurate measure of stock options improves the fit of our equations, the more noisy measure which is available for a much larger number of firms provides very similar results.

4.3 Dividend initiations

Our results suggest that among dividend-paying firms, greater amounts of stock options reduce dividend increases, consistent with the option-induced preference of management for repurchases over dividends. A further test of this hypothesis would examine whether firms without an ongoing dividend program would be more reluctant to initiate a dividend program if they had greater amounts of stock options.

To investigate the relationship between dividend initiations and stock options, we use a more restrictive definition of non-dividend-paying firms, as described in footnote 8 above. Firms defined as non-dividend-paying and not starting a dividend program in the current year

---

options already granted. In addition, data from their annual statements indicate that almost half of these firms do not have any common shares reserved for convertible debt or preferred stock conversions, and for those firms with shares reserved, the number of shares was considerably smaller than shares reserved for stock options.

[17] We have data for only a small group of firms (71 firms) that do not pay dividends, and thus do not report repurchase equations for that group.

include firms that do not pay dividends in *both* the current and previous year. Firms defined as initiating a dividend program in the current year include firms that did not pay dividends in the previous two years, but paid dividends in the current year and the next year as well.

We estimate the probability of starting a dividend program using a probit model; our explanatory variables include those used to test the free cash flow hypothesis, our proxy for management stock options, and the percent change in stock price. Very similar to results reported in table 6, the most significant determinant of starting a program is operating income. The second most significant factor is stock options--firms with greater stock options outstanding are substantially less likely to initiate a dividend program.

5. Conclusions

We argue that distributing free cash flow, not signalling, is the likely motivation for open market share repurchases and provide evidence that strongly supports the free cash flow hypothesis. Comparing our cross-sectional regression results for repurchases with those obtained for dividend increases, we conclude that the latter likely are not motivated primarily by the agency costs of free cash flow and that firms generally do not treat repurchases and dividends as close substitutes. Nonetheless, we do find evidence of the substitution of repurchases for dividends that is related to level of management stock options.

In the two years subsequent to our sample, 1996-97, corporations have repurchased record amounts of stock despite stock valuations that, in the aggregate, are also near record highs. Reconciling these data with a signalling-based story about open market repurchases is difficult. However, earnings growth has been especially strong, providing firms with cash flow that likely exceeds profitable investment opportunities. Thus, firms have returned record amounts of excess cash to shareholders in the form of repurchases. While the good news is that managers use share repurchases to distribute free cash flow to shareholders, the bad news is that they substitute repurchases for dividends in order to increase the value of their stock options.

References

Allen, Franklin and Roni Michaely, 1994, “Dividend Policy,” Working Paper, Rodney L. White Center for Financial Research, The Wharton School, 14-94.

Asquith, P. and David W. Mullins Jr.,1986, “Signalling with Dividends, Stock Repurchases, and Equity Issues,” Financial Management, 15, 27-44.

Bagwell, Laurie and John Shoven, 1988, "Share Repurchases and Acquisitions: An Analysis of Which Firms Participate," in Corporate Takeovers: Causes and Consequences. University of Chicago Press: Chicago, IL 191-213.

Barclay, Michael J., Clifford W. Smith, and Ross L. Watts, 1995, “The Determinants of Corporate Leverage and Dividend Policies,” Journal of Applied Corporate Finance, 7:4, 4-19.

Chowdhry, Bhagwan and Vikram Nanda, 1994, "Repurchase Premia as a Reason for Dividends: A Dynamic Model of Corporate Payout Policies." The Review of Financial Studies, 7, 321-350.

Comment, Robert and Gregg Jarrell, 1991, "The Relative Signalling Power of Dutch-Auction and Fixed Price Self-Tender Offers and Open-Market Share Repurchases." Journal of Finance, 46, 1243-1271.

Dann, Larry, 1981, "Common Stock Repurchases: An Analysis of Returns to Bondholders and Stockholders," Journal of Financial Economics, 9, 113-138.

Dittmar, Amy, 1995, “Stock Repurchase Waves and The Large Firm Effect,” Mimeo, University of North Carolina Kenan-Flagler School.

Ikenberry, David, Joseph Lakonishok, and Theo Vermaelen, 1995, "Market Underreaction to Open Market Share Repurchases." Journal of Financial Economics, 39, 181-208.

Jensen, Michael, 1986, “Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers,” American Economic Review, 76, 323-329.

Jolls, Christine, 1996, “The Role of Incentive Compensation in Explaining the Stock-Repurchase Puzzle,” Mimeo, Harvard Law School.

Kaplan, Steven, 1989, “The Effects of Management Buyouts on Operating Performance and Value,” Journal of Financial Economics, 24, 217-254.

Lambert, Richard A., William N. Lanen, and David F. Larcker, 1989, “Executive Stock Option Plans and Corporate Dividend Policy,” Journal of Financial and Quantitative Analysis, 24, 409-425.

Lehn, Kenneth and Annette Poulsen, 1989, "Free Cash Flow and Stockholder Gains in Going Private Transactions," Journal of Finance, 44, 771-787.

Ofer, Aharon R. and Anjan V. Thakor, 1987, “A Theory of Stock Price Responses to Alternative Corporate Cash Disbursement Methods: Stock Repurchases and Dividends,” Journal of Finance, 42, 365-394.

Opler, Tim and Sheridan Titman, 1993, “The Determinants of Leveraged Buyout Activity: Free Cash Flow vs. Financial Distress Costs,” Journal of Finance, 48, 1985-1999.

Stephens, Clifford and Michael Weisbach, 1996, "Actual Share Reacquisitions in Open-Market Repurchase Programs," working paper, University of Arizona.

Smith, Clifford W. Jr. and Jerold B. Warner, 1979, “On Financial Contracting: An Analysis of Bond Covenants,” Journal of Financial Economics, 7, 117-161.

Smith, Clifford W. Jr. and Ross L. Watts, 1992, “The Investment Opportunity Set and Corporate Financing, Dividend, and Compensation Policies,” Journal of Financial Economics, 32, 263-292.

Vermaelen, Theo, 1981, "Common Stock Repurchases and Market Signalling." Journal of Financial Economics, 9, 149-183.

Vermaelen, Theo, 1984, “Repurchase Tender Offers, Signalling, and Managerial Incentives,” Journal of Financial and Quantitative Analysis, 19, 163-181.

Yermack, David, 1997, "Good Timing: CEO Stock Option Awards and Company News Announcements," Journal of Finance, 52, 449-476.

Table 1
Repurchases and dividend increases of sample firms.

The sample includes nonfinancial firms with assets greater than $50 million in 1994 dollars during 1984-95. Each year, firms are defined as dividend-paying if they pay dividends in the current *and* the preceding year; otherwise they are defined as non-dividend-paying. Repurchases are constructed using funds used to retire common and preferred stock (*Compustat item A115*). Tender offers are excluded explicitly using data from Comment and Jarrell (1991) and Securities Data Company. Funds used to repurchase preferred stock are also excluded. Market value is the market value of common stock. Dividend increases of firms that cut dividends are assigned a value of 0. Repurchases and dividend increases are measured in the current year; market value is measured at the end of the preceding year.

	Dividend-paying firms	Non-dividend paying firms
Number of firms	7154	6056
Repurchases		
Percent of firms that repurchase stock	50.0	29.8
Mean of repurchases / market value		
Unconditional	0.016	0.012
Conditional on repurchases > 0	0.032	0.039
Dividend increases		
Percent of firms that increase dividends	62.2	------
Mean dividend increase / share price	0.002	------
Mean dividend growth[a]	0.107	------

[a] Dividend growth is the increase in dividends in the current year divided by dividends in the preceding year.

Table 2
Hypothesized relationships between repurchases and firm characteristics

Hypothesis	Variable	Proxy for:	Predicted sign
Free cash flow	Net operating cash flow / assets	Free cash flow	+
	Operating income / assets	Free cash flow	+
	Capital expenditures / assets	Free cash flow	-
	Market-to-book assets	Investment opportunities	-
	Log of assets	Financing costs	+
	Debt / assets	Financing costs	-
	Cash / assets	Financing costs	+
Option-induced substitution	Shares reserved for conversion [a] / shares outstanding	Management stock options	+ [b]
Other	Percent change in stock price	Overvaluation	-
	Dividend yield	Shareholder tax clientele	-

[a] Common shares reserved for conversion for stock options, convertible securities, and warrants (*Compustat item A40*).

[b] For dividend-paying firms only.

Table 3
Sample means (medians) of firm characteristics.

The sample includes nonfinancial firms with assets greater than $50 million in 1994 dollars during 1984-95. Each year, firms are defined as dividend-paying if they pay dividends in the current and preceding year; otherwise they are defined as non-dividend-paying. Firm characteristics are measured during the year or at the end of the year preceding the repurchases. Assets are measured at book value. Net operating cash flow is operating income before depreciation (*Compustat item A13)* minus capital expenditures. Market-to-book assets is the market value of assets divided by the book value of assets, where the market value of assets is the book value of assets plus the market value of equity minus the book value of equity. Shares reserved for conversion are common shares reserved for conversion for stock options, convertible securities, and warrants (*Compustat item A40*).

Variable	Dividend-paying firms			Non-dividend-paying firms		
	All	Rep>0	Rep=0	**All**	Rep>0	Rep=0
Net operating cash flow / assets	**-0.004** **(0.010)**	0.005 (0.016)	-0.012 (0.002)	**-0.030** **(0.002)**	-0.004 (0.020)	-0.043 (-0.006)
Operating income / assets	**0.106** **(0.108)**	0.111 (0.113)	0.100 (0.103)	**0.065** **(0.082)**	0.088 (0.094)	0.055 (0.076)
Capital expenditures / assets	**0.084** **(0.069)**	0.079 (0.066)	0.089 (0.072)	**0.088** **(0.060)**	0.082 (0.058)	0.091 (0.061)
Market-to-book assets	**1.54** **(1.30)**	1.59 (1.35)	1.50 (1.27)	**1.60** **(1.29)**	1.57 (1.27)	1.63 (1.30)
Log of assets	**6.33** **(6.10)**	6.56 (6.33)	6.10 (5.89)	**5.17** **(4.94)**	5.34 (5.07)	5.10 (4.89)
Debt / assets	**0.205** **(0.189)**	0.191 (0.177)	0.218 (0.206)	**0.248** **(0.207)**	0.222 (0.178)	0.260 (0.220)
Cash / assets	**0.091** **(0.047)**	0.094 (0.056)	0.087 (0.040)	**0.137** **(0.077)**	0.154 (0.101)	0.129 (0.067)
Shares reserved for conversion / shares outstanding	**0.112** **(0.068)**	0.121 (0.073)	0.103 (0.061)	**0.185** **(0.121)**	0.186 (0.122)	0.184 (0.119)
Percent change in stock price	**0.074** **(0.090)**	0.097 (0.106)	0.053 (0.071)	**-0.045** **(0.000)**	0.008 (0.035)	-0.068 (-.019)
Dividend yield	**0.027** **(0.024)**	0.027 (0.024)	0.027 (0.023)	**----------**	----------	----------
Number of firms	**7154**	3575	3579	**6056**	1802	4254

Table 4
Tobit estimates of the determinants of share repurchases.

The sample includes nonfinancial firms with assets greater than $50 million in 1994 dollars during 1984-95. Firms are defined as dividend-paying if they pay dividends in the current *and* the preceding year. The dependent variable is repurchases of common stock during the current year divided by the market value of common stock at the end of the preceding year. The independent variables are measured during the year (or at the end of the year) preceding the repurchases, except for the change in operating income which is measured during the year of the repurchases. All regressions are estimated with yearly dummies.

The coefficients are marginal effects x 10^2; p-values are in parentheses.

Independent variables	Predicted sign	Dividend-paying firms		Non-dividend-paying firms	
		(1)	(2)	(3)	(4)
1. Net operating cash flow / assets	+	3.75 (0.00)		3.15 (0.00)	
2. Operating income / assets	+		3.10 (0.00)		3.92 (0.00)
3. Capital expenditures / assets	-		-4.80 (0.00)		-2.19 (0.00)
4. Market-to-book assets	-	-0.14 (0.01)	-0.18 (0.00)	-0.38 (0.00)	-0.42 (0.00)
5. Log of assets	+	0.32 (0.00)	0.33 (0.00)	0.26 (0.00)	0.26 (0.00)
6. Debt / assets	-	-1.49 (0.00)	-1.45 (0.00)	-1.02 (0.00)	-0.92 (0.00)
7. Cash / assets	+	0.92 (0.01)	0.77 (0.04)	1.52 (0.00)	1.69 (0.00)
8. Shares reserved for conversion / shares outstanding	+[a]	1.32 (0.00)	1.31 (0.00)	0.26 (0.19)	0.28 (0.16)
9. Percent change in stock price	-	0.17 (0.08)	0.23 (0.03)	0.01 (0.87)	-0.01 (0.95)
10. Dividend yield	-	7.47 (0.09)	1.38 (0.75)		
Number of observations		7148	7148	4723	4723
Mean of dependent variable		0.0158	0.0158	0.0127	0.0127
Log likelihood		2574.6	2579.3	-21.27	-15.72

[a] For dividend-paying firms only

Table 5
The effect of a one standard deviation change in firm characteristics on share repurchases

Entries in this table are obtained by multiplying the marginal effects from equations (1) and (3) in table 4 by the standard deviation of the corresponding variable. They correspond to the predicted change in repurchases as a percentage of market value.

Variable	Dividend-paying firms	Non-dividend-paying firms
Net operating cash flow / assets	0.30***	0.47***
Market-to-book assets	-0.11**	-0.37***
Log of assets	0.50***	0.31***
Debt / assets	-0.22***	-0.23***
Cash / assets	0.11**	0.24***
Shares reserved for conversion / shares outstanding	0.23***	0.06

*** Statistically significant at the 1 percent level.
** Statistically significant at the 5 percent level.

Table 6
Tobit estimates of the determinants of dividend increases

The sample includes nonfinancial firms with assets greater than $50 million in 1994 dollars during 1984-95. Firms are defined as dividend-paying if they pay dividends in the current *and* the preceding year. The dependent variable is measured two ways: as the change in dividends divided by the market value of the firm, and the change in dividend divided by last period's dividends. The independent variables are measured during the year (or at the end of the year) preceding the repurchases, except for the change in operating income which is measured during the year of the repurchases. All regressions are estimated with yearly dummies.

The coefficients are marginal effects x 10^2; p-values are in parentheses.

Independent variables	Dependent variable: Δ (Dividend per share) / share price		Dependent Variable: Δ (Dividend per share) / dividend per share	
	(1)	(2)	(3)	(4)
1. Net operating cash flow / assets	0.807		32.98	
	(0.00)		(0.00)	
2. Operating income / assets		1.388		55.52
		(0.00)		(0.00)
3. Capital expenditures / assets		-0.371		-12.16
		(0.00)		(0.00)
4. Market-to-book assets	0.021	-0.022	1.59	-0.07
	(0.00)	(0.00)	(0.00)	(0.79)
5. Log of assets	0.011	0.011	0.36	0.36
	(0.00)	(0.00)	(0.00)	(0.00)
6. Debt / assets	-0.061	0.008	–0.66	2.05
	(0.03)	(0.76)	(0.60)	(0.11)
7. Cash / assets	0.012	0.054	2.21	4.30
	(0.73)	(0.16)	(0.16)	(0.01)
8. Shares reserved for conversion / shares outstanding	-0.048	-0.030	-3.36	-2.64
	(0.03)	(0.18)	(0.00)	(0.01)
9. Percent change in stock price	0.057	0.058	6.51	6.53
	(0.00)	(0.00)	(0.00)	(0.00)
10. Dividend yield	5.51	4.42	-312.48	-356.56
	(0.00)	(0.00)	(0.00)	(0.00)
Number of observations	7148	7148	7148	7148
Mean of dependent variable	0.0022	0.0022	.1075	0.1075
Log likelihood	-5286.1	-5196.6	-1534.9	-1467.9

Table 7
The effect of a one standard deviation change in firm characteristics on share repurchases estimated using alternative measures of stock options.

Entries in this table are marginal effects multiplied by the standard deviation of the corresponding variable. The marginal effects are obtained by estimating equation (1) in table 4 using 384 observations on companies for which data on employee stock options outstanding are available during 1993-95. Data on employee stock options are obtained from company annual statements. The entries correspond to the predicted change in repurchases as a percentage of market value.

Variable	Dividend-paying firms	
Net operating cash flow / assets	0.53^{**}	0.54^{**}
Market-to-book assets	-0.11	-0.10
Log of assets	0.26^{**}	0.28^{**}
Debt / assets	-0.26^{*}	-0.23^{*}
Cash / assets	0.03	0.04
Shares reserved for conversion / shares outstanding	0.20^{*}	---
Employee stock options outstanding / shares outstanding	---	0.26^{**}

** Statistically significant at the 5 percent level.
* Statistically significant at the 10 percent level.