

Stock Repurchases: A Multivariate Analysis of Repurchasing Firms

Prasad V. Medury

Eastern Kentucky University

Linda E. Bowyer

University of Toledo

Venkat Srinivasan*

Northeastern University

Abstract

Stock repurchases were on the increase in the 1980s for a variety of reasons. Financial researchers have established that repurchases significantly affect the wealth of participating and nonparticipating shareholders. This raises three interesting research issues: Are repurchasing firms different from nonrepurchasing firms in terms of their financial and operating characteristics? Is repurchase activity predictable? Are firms using the open market or tender offer modes of repurchase significantly different from nonrepurchasing firms? and What motivates firms to repurchase using the open market mode or a tender offer? This study analyzes the above three issues using a comprehensive sample of 283 repurchase programs between 1983 and 1986. Multiple discriminant analysis (MDA) is used as the classification methodology in the paper.

Introduction

In recent times, share repurchases have increased for a variety of reasons, including their use as an antitakeover tool (Merrill Lynch, 1984). Repurchase of common stock, a noncash dividend distribution to stockholders that is taxed differently from cash dividends, is an adjustment of the firm's financing mix, ownership structure, and composition of the firm's assets. Corporations may repurchase their own shares in one of four ways: open market repurchases; tender offers; private transactions; and negotiated exchanges. Open market repurchases

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account for the bulk of all repurchases during the four year period from January 1983 to December 1986.¹

The open market mode of repurchase, which is similar to purchases of stock made by any investor in the market, generally involves a gradual buyback of shares over a long time period. Though open market repurchases occur more frequently than any other mode of repurchase, they usually involve a smaller number of shares than do tender offers. In comparison, firms indicate the magnitude, number, and value of shares to be repurchased in a tender offer over a usually short time period. The required public disclosure of information is greater for tender offers than for open market repurchases. Tender offers are significant corporate events because they are perceived by capital markets as an informational signal of the firm's future earnings prospects. Additionally, because tender offers are larger, research shows that the effect of a tender offer is likely to be more pronounced than for an open market repurchase.

The majority of academic research on stock repurchases has focused on the impact of the repurchase on the wealth of common stockholders (See Davidson and Garrison, 1989; Elton and Gruber, 1968; McDonald and Soderstrom, 1986; Vermaelen, 1981; Wansley and Fayez, 1986; Woods and Brigham, 1966; Young, 1969.) Research examining the effects of tender offers has shown significant wealth gains for the majority of stockholders (i.e., Vermaelen, 1981) found an average wealth gain of 15.7 percent and also observed that only 10.7 percent of all tender offers experienced wealth losses). Although several hypotheses have been proposed as possible motivations for stock repurchases, there is a scarcity of research focusing on the characteristics of firms repurchasing their own shares and at the same time attempting to predict repurchase activity. Thus, new research in this area is both timely and meaningful.

Given the recent substantial rise in repurchase announcements and the variety of reasons cited to motivate stock repurchases, this study examines the following issues: Are stock repurchasing firms significantly different from nonrepurchasing firms in terms of their financial characteristics? Can such differences be used to predict repurchase activity? Can the repurchase mode be used to predict repurchase activity and which repurchasing firms are most likely to use either mode of repurchase? Which hypothesis regarding repurchases best motivates repurchase behavior?

This study focuses on the above issues through the use of a large sample of the set of all firms with announced repurchase programs between 1983 and 1986. To avoid any sample bias due to changes introduced by the Tax Reform Act of

¹Open market repurchases account for approximately 64 percent of all repurchase programs announced between January 1983 and December 1986.

1986² and the stock market crash of 1987, the study only includes all nonregulated stock repurchases between January 1983 and December 1986.

This study is an improvement over the current literature in several respects. First, this paper uses a comprehensive sample of repurchasers to develop the descriptive models. Second, the findings are refined further by focusing on the two most important modes of repurchase activity (i.e., open market purchases and tender offers). Third, this study attempts to link the empirical results with certain hypotheses that explain the motivation underlying repurchase activity.

Review of Prior Literature

Studies focusing on the returns realized by security holders of firms repurchasing their own shares include Woods and Brigham (1966), Elton and Gruber (1968), Stewart (1976), Masulis (1980), Dann (1981), Vermaelen (1981), Wansley and Fayez (1986), and Davidson and Garrison (1989).³ Most of these studies find, on average, a positive wealth effect for stockholders of repurchasing firms. Recently, Asquith and Mullins (1986) found support for the information signalling hypothesis as a possible motivation for stock repurchases. To the authors' knowledge, only Young (1969) and Norgaard and Norgaard (1974b) have studied the financial and operating characteristics of repurchasing versus nonrepurchasing firms. Young (1969) compares the characteristics of repurchasing and nonrepurchasing firms and shows that liquidity (as measured by conventional financial ratios) is not a major factor in repurchasing decisions. Generally, firms repurchase to increase corporate leverage and undertake major capitalization changes. Young also shows that repurchasing firms, relative to nonrepurchasing firms, experience poor or declining performance, slower growth in dividends, lower price-earnings multiples, and inferior stock price performance.

Norgaard and Norgaard (1974b) (NN) conduct a more rigorous analysis of the characteristics of repurchasing and nonrepurchasing firms. They test the null hypothesis that the financial characteristics of repurchasing firms differ significantly from those of nonrepurchasing firms through the use of data extracted from monthly reports on repurchase activity by NYSE from January to September 1973. NN selected 15 independent variables, including five ratios

²Previously (i.e., prior to 1987), long-term capital gains were taxed at the lower of 28 percent or the applicable marginal tax rate for the concerned firm. The Tax Reform Act of 1986 eliminated this preferential tax treatment.

³Research focusing on the effect of targeted share repurchases on the interest of nonparticipating shareholders offers mixed evidence (Bradley and Wakeman, 1983, and Klein and Rosenfeld, 1988).

based on stock prices, that are hypothesized to represent the financial and operating conditions of each firm in their sample. NN use multiple discriminant analysis (MDA) to discriminate between repurchasers and nonrepurchasers. The results indicate that repurchasers have depressed stock prices, inferior operating results, higher financial risk, and higher ratios of working capital to net worth. Thus, some of NN's results corroborate the findings of Young.⁴

More recently, researchers have focused on deriving a formal theory to explain firm repurchasing behavior. Ofer and Thakor (1986) present a theory of stock price responses to tender offer repurchases and dividends. They develop a signalling model to explain a number of stylized facts about tender offer repurchases and dividends. Their results show that, under all circumstances, both dividends and stock repurchases are employed equally as communication devices. McDonald and Soderstrom (1986) examine the considerations that lead firms to change their dividend payouts or issue/repurchase shares and relate their results to existing theoretical work. Their results show that corporate dividends and share repurchase decisions are broadly consistent with Myer's (1974) financial pecking order theory. Barclay and Smith (1988) examine the costs associated with the different forms of distributions to shareholders—cash dividends versus the various modes of stock repurchase. Through examination of bid-ask spreads after repurchase announcements, they present evidence that open market repurchase programs provide managers with opportunities to use inside information to benefit themselves at the stockholders' expense. Out-of-pocket expenses also vary among the different modes of repurchase. Tender offers are the most expensive and the more likely mode of repurchase for a larger distribution. Bagwell and Shoven (1988) examined the theoretical rationale for nondividend cash payments to stockholders: share repurchase programs or cash mergers. They also used an econometric model to examine what type of firms engage in mergers or share repurchases and if the characteristics of the firms engaged in cash mergers differ from those that repurchase their stock.

Using seven financial ratios and three dummy variables, Bagwell and Shoven (1988) established the relevance of the free cash flow hypothesis in explaining share repurchases. The ratio of market to book values of equity and the ratio of operating income before depreciation to total assets were the

⁴The NN study has been criticized on several grounds. Dyl and White (1974) argue that because NN selected matching nonrepurchasing firms at random, differences between repurchasers and nonrepurchasers may be explained in terms of industry characteristics, by multicollinearity among the independent variables, and by the use of the estimation sample to validate the models developed. Some of these criticisms subsequently have been refuted by NN (1974b), and the criticism of multicollinear independent variables is not a relevant issue in MDA. See, for example, Altman, Avery, Eisenbeis, and Sinkey (1981).

significant explanatory variables. Bagwell and Shoven also concluded that the clientele hypothesis was consistent with repurchases and acquisitions.

This study attempts to relate the following hypotheses to explain stock repurchasing behavior: the leverage (adjustment) hypothesis, the free cash flow hypothesis, the clientele (i.e., tax-induced clientele) hypothesis, and the antitakeover hypothesis.

Data, Variables and Methodology

Data Collection and Variable Selection

All announced stock repurchase programs from January 1983 to December 1986 were obtained from Merrill Lynch Capital Markets, Securities Research Division. The initial sample was screened to eliminate all firms not listed in the industrial file of S&P's Compustat database and to eliminate duplications (i.e., firms with multiple announcements from 1983 to 1986) and firms with missing financial data. Additionally, firms with negative price-earnings ratios and extremely small financial values for various balance sheet accounts were eliminated. The final test sample consisted of 283 repurchasing firms.⁵ The distribution of the sample by year and mode of repurchase are provided in Table 1A.

Open market repurchases account for 63.25 percent of all repurchases, followed by the private transactions made with 26.15 percent of all repurchases. Twenty-three tender offers and seven negotiated exchanges account for the remaining 10.60 percent of all repurchases. Table 1B provides details of the distribution of the sample by repurchase program size. About 20 percent of all repurchases involved between 100,000 to 250,000 shares, compared to about 35 percent with a range of 250,000 to 1,000,000 shares. Although the majority (54.50 percent) of all open market repurchases are distributed evenly in the 100,000 to 1,000,000 share range, more than 60 percent of all tender offer repurchases involved greater than 1,000,000 shares. Only 14.51 percent of all tender offers involved less than 500,000 shares, compared to 45.02 percent of all open market repurchases. Hence, Table 1B precipitates the conclusion that tender offers, on average, involve a significantly larger number of shares than open market repurchases.

⁵The pooling of data from different time periods can be argued to lead to some estimation problems (Altman *et al.*, 1981). The pooling has been performed to develop a reasonable sample size so the resulting estimations could be interpreted with a greater degree of reliability.

A matching sample of nonrepurchasing firms was selected from the same four digit SIC industry groupings.⁶ The use of the same four digit SIC industry groupings minimizes any industry or sample selection biases.⁷ Nonrepurchasing firms were screened to remove any firms that had repurchased from 1980 to 1986 and that also had announced any repurchase programs between January and September 1987. Further, firms with missing financial data or with negative values were eliminated. The final matching sample consisted of 577 nonrepurchasing firms.

For each firm in the test and control samples, 14 variables representing corporate financial strength and operating conditions were selected (Table 2). These variables were selected based on a review of several studies that have attempted to identify variables that reflect financial characteristics in general (i.e., NN 1974b; Young, 1969; Pinches and Mingo, 1973; and Martin and Scott, 1980). The variables are hypothesized to reflect five broad dimensions of financial strength: market evaluation and expectations, liquidity and asset structure, operating characteristics, capital structure and indebtedness, and size and scale of operations. Market evaluation and expectations are represented by the ratio of the book to market value of common equity (BVMV), dividend yield (DY), and the price-earnings multiple (PE). Liquidity and asset structure are reflected through the current ratio (CR), quick ratio (QR), and the ratio of cash to total assets (CTA). The rate of return on total assets (RTA) reflects profitability. Capital structure and indebtedness are represented by the ratio of debt to equity (DE), ratio of long-term debt to equity (LTDE), ratio of debt to total assets (DTA), and ratio of long-term debt to total assets (LTDTA). Finally, size and scale of operations are represented by total assets (TA), net sales revenue (SALES), and the number of common shares outstanding (SHARE).

The four measures of financial leverage (DE, LTDE, DTA, AND LTDTA) are used to test the leverage adjustment hypothesis. Share repurchase is viewed as a method used to adjust the firm's financial leverage. This allows repurchasing firms to benefit from the tax advantages of debt financing. The four ratios are

⁶The matching sample consists of all firms not repurchasing their own shares and falling in the same four digit SIC industry groupings (and for the same time periods) as firms repurchasing stock by any mode. Thus, the matching sample represents the universe of nonrepurchasers subject to the same time period and industry constraints. This eliminated the necessity to weight the observations during estimation (i.e., consistency requires that a test sample including all repurchases reported be matched with a control sample representing all nonrepurchasing firms).

⁷Various other criteria, i.e. size, may be considered in selecting matching firms in the control sample. Such a process, however, will induce limitations on the generalizability of the results.

used to examine the adjustment of both long-term and short-term debt of repurchasers relative to their equity levels and total assets. RTA and BVMV are used to test the free cash flow hypothesis. As used by Bagwell and Shoven (1988), RTA (defined as earnings before depreciation scaled by total assets) is a cash flow ratio that is used to test the hypothesis that managers of firms that have substantial uncommitted cash flows may choose repurchase rather than investments. BVMV, a ratio of book to market price, is used to test the implication of the free cash flow hypothesis that repurchasing firms have few or poor investment opportunities.

DY and PE are used to test the clientele hypothesis. Investors can be classified into groups or clienteles based on their preference for dividends. High dividend yield firms are preferred by tax-exempt organizations, such as endowments and pension funds, while firms with low dividend yield but high earnings multipliers are preferred by investors in high tax brackets.

Finally, the liquidity and scale variables are used to test the use of repurchase as an antitakeover strategy. Firms that are the subject of takeover attempts may seek to distribute cash through stock repurchases rather than through dividends.

Methodology

MDA has been used as the classification methodology to develop predictive models of stock repurchase activity. Although MDA shares many weaknesses with other parametric and nonparametric methodologies, some of the weaknesses are unique to MDA and have to be overcome as best allowed by the same data for the results to be valid.⁸ In particular, for the optimal properties of MDA to be valid, it is necessary that the independent variables be multivariate normally distributed and that the group covariance matrices be homogeneous.

In this study, the assumption of multivariate normality is examined by testing the null hypothesis that the independent variables are univariate normal.⁹ The null hypothesis that each of the independent variables are univariate normal is rejected for all the variables. After extensive examination of all possible transformations, the transformed variables (listed in Table 2) are found to be univariate normal. Because the transformations may change the interrelationships

⁸The problems in applying MDA to financial data are well documented. See, for example, Altman *et al.* (1981).

⁹It is recognized that even if all the variables are univariate normal, the data as a whole may not be multivariate normal. By transforming the variables to univariate normality, however, the data as a whole will be at least approximately multivariate normal.

among the variables and also may affect the relative positions of the observations in the groups, models also were developed based on the untransformed data.

The equality of group covariance matrices was tested using a likelihood ratio test.¹⁰ If the test statistics were significant, the within group covariance matrix was used in the discriminant procedure (i.e., the quadratic classification rule).¹¹ If the test statistic was not significant, the pooled covariance matrix was used (i.e., the linear classification rule).

For the interpretation of the MDA results to be robust, a valid cross-validation procedure needs to be employed. In this study, the bootstrap method is used as a cross-validation procedure. The bootstrap is a computer-intensive technique of statistical inference that is especially appropriate when the data violate the distributional assumptions required by the statistical procedure used.¹² The bootstrap may be regarded as an extension of the more conventional jack-knife (Lachenbruch, 1967) and other resampling schemes. The procedure employed in this study is a modified form of the procedure suggested by Chatterjee and Chatterjee (1983).

For the purpose of this study, due to computer and logistic constraints, 16 replications are run for each model developed. For each replication, the total sample is split randomly (without replacement) into estimation and holdout samples. The classification results reported in this study are the average cross-validated values from estimation and validation. Bootstrapping is likely to offset the biases that may result from the data violating some of the distributional assumptions of MDA.

Results

Results of the univariate and multivariate analysis of the data for stock repurchasers and nonrepurchasers are presented below.

¹⁰The test statistic is approximately chi-square distributed. SAS is used to test the null hypothesis.

¹¹Johnson and Wichern (1982) and Huberty (1984) indicate that the quadratic classification rule is appropriate if the assumption of multivariate normality holds, but the assumption of homogeneous group covariance matrices is violated seriously.

¹²For a more detailed technical description of the bootstrap procedure, see Chatterjee and Chatterjee (1983).

Group Means

The means of the untransformed variables for the four groups of nonrepurchasers, repurchasers, open market repurchasers, tender offer repurchasers and the respective t-statistics are presented in Table 3.¹³ Relative to the nonrepurchasing group, the repurchasing group is characterized by lower financial leverage (i.e., lower levels of DE, LTDE, DTA, and LTDTA), higher return on total assets, lower levels of liquidity (measured by CR, QR, and CTA), lower market prices of common stock (i.e., higher levels of BVMV) and lower price-earnings multiples but higher dividend yields, and larger scale (i.e., higher levels of TA, SALES, and SHARE). The repurchasing group appears to use lower levels of debt but higher levels of common equity, a phenomenon that helps to explain the group's lower financial leverage, lower market price of common stock and price-earnings ratios, and higher dividend yield compared to the nonrepurchasing group.

The above results are similar to those of Young (1969) and NN (1974b). Lower financial leverage and lower price-earnings multiples for repurchasers were reported by Young, while NN report lower market prices of common equity for repurchasers. Table 3 clearly indicates lower financial risk and lower liquidity for repurchasers, however, a result not found in the Young or NN studies. Compared to all other groups, the tender offer group of repurchasers exhibits a unique set of characteristics. This group has the lowest levels of financial leverage as measured by DE and LTDE, but also has the highest levels of financial leverage as measured by DTA and LTDTA. Further, tender offer repurchasers have the highest RTA for all firms, repurchasers and nonrepurchasers. The group of tender offer repurchasers also is characterized by the lowest levels of liquidity and the smallest size for all four groups. This group also has the lowest level of BVMV and the highest earnings multiplier of all the groups, leading to a conclusion that tender offer repurchasers already have high market values of common stock. With the highest RTA for all groups, tender offer repurchasers are very profitable. Unlike open market repurchasers, tender offer repurchasers do not appear to have undervalued outstanding common stock in the capital market. Table 3 indicates that although open market repurchasers are similar to the total group of repurchasers, tender offer repurchasers are unique. Finally, open market repurchasers and tender offer repurchasers appear to differ. When compared to the latter group, the former group is substantially larger in scale (i.e., SHARE, TA, and SALES), has higher levels of liquidity (measured by CR, QR, and CTA) but

¹³The t-statistics tested the null hypothesis that the variable means for two groups are equal. In each case, an F-test was conducted to test the null hypothesis that the group variances for independent variables are equal.

lower profitability (i.e., RTA) and lower market prices of common stock (i.e., higher BVMV). Tender offer repurchasers have significantly lower dividend yields and higher earnings multipliers, compared to open market repurchasers. Finally, open market repurchasers appear to use more financial leverage (i.e., higher DE and LTDE) compared to tender offer repurchasers.

Multiple Discriminant Analysis

Multiple discriminant models (MDMs) are developed, using the bootstrap procedure, for the following contrasts: repurchasers (R) versus nonrepurchasers (N), open market repurchasers (O) versus nonrepurchasers (N), and tender offer repurchasers (T) versus nonrepurchasers (N). MDMs are developed for both original and transformed data sets.

The null hypothesis of equal group centroids is rejected at the 0.01 level of significance for all contrasts. Additional models are developed using the quadratic classification rule because the null hypothesis of equal group covariance matrices is rejected at the 0.01 level for both the original and transformed data for all three contrasts.

Repurchasers (R) Versus Nonrepurchasers (N)

The untransformed sample consists of 283 R and 577 N, while the transformed sample consists of 238 R and 377 N. Details of model development and validation are given in Table 4. For the untransformed sample, the overall correct classification rate,¹⁴ during estimation, is 66.37 percent with a standard deviation of 3.17 percent. During validation, the overall correct classification rate and its standard deviation decline to 61.63 percent and 2.22 percent, respectively. During validation, the repurchasing and nonrepurchasing groups correctly are classified at 62.00 percent and 61.42 percent, respectively. All standard deviations are less than 5 percent during estimation and validation.

The corresponding overall correct classification rates for the transformed sample are 75.00 percent during estimation and 66.24 percent during validation. The group classification accuracies during validation are 71.20 percent for repurchasers and 62.90 percent for nonrepurchasers. Although the transformed sample yields better classification accuracies, the corresponding standard deviations for the distributions of accuracies exceed 5.00 percent (i.e., the distributions are more volatile).

¹⁴This study uses the term *overall correct classification rate* to represent the average cross-validated value for the model, i.e., average rate for the 16 bootstrap replications.

A Z-statistic test is used to determine whether the various classification rates yielded by the models during validation are significantly better than the accuracy obtained from a naive model using chance.¹⁵ Overall classification rates and individual group accuracies yielded by both models during validation have significant Z-statistics at the 0.01 level.¹⁶ Next, the relative significance of the transformed variables entering (i.e., forward selection criterion) or being removed (i.e., backward selection criterion) from the discriminant process are analyzed using a stepwise discriminant procedure. DY and RTA are the two most significant transformed variables entering or being removed from the discriminant process at the 0.01 level. In addition, TA and SHARE are significant at the 0.01 level, while BVMV, CR, QR, CTA, and DE are significant at the 0.05 level.¹⁷

The above analysis was performed using proportional *a priori* probabilities. Because the true rate of occurrence of repurchases in the universe of firms is unknown, classification accuracies are reestimated for both models using a wide range of *a priori* probabilities (i.e., from 0.10 to 0.90). Results indicate that the

¹⁵The null hypothesis that the classification rates obtained from the various models are significantly better than the accuracy obtainable by a naive model is tested using the following Z-statistic:

$$Z = (\gamma - \pi_a) / \sqrt{[\pi_a(1 - \pi_a)/n]}$$

where:

- Z = the normal deviate;
- γ = the proportion of the holdout sample correctly classified by the discriminant model;
- π_a = the proportion of the holdout sample expected to be correctly classified by chance

$$\sum_{i=1}^g \pi_i^2$$

where:

- g = the total number of groups and is the proportional probability for group i; and
- n = the sample size.

¹⁶Details of the Z-statistics will be provided by the authors upon request.

¹⁷For the sake of brevity, this paper does not provide all the results of stepwise discrimination (i.e., F-statistics, partial R-squares). Results will be provided by the authors upon request.

classification accuracies are not significantly sensitive to changes in *a priori* probabilities.

Open Market Repurchasers (O) Versus Nonrepurchasers (N)

There are 179 open market repurchasers and 577 nonrepurchasers in the original sample, compared to 153 O and 377 N in the transformed sample. Table 5 provides the classification rates for the untransformed and transformed models. The untransformed model yields overall correct classification rates of 72.84 percent during estimation and 71.82 percent during validation. During holdout, the group accuracies are 81.01 percent for open market repurchasers and 69.26 percent for nonrepurchasers. All distributions have standard deviations of less than 5 percent.

The transformed model yields marginally less significant accuracies of 71.91 percent during estimation and 66.92 percent during validation. Holdout group rates are 70.83 percent for open market repurchasers and 65.45 percent for nonrepurchasers. Standard deviations for various distributions exceed 5.00 percent during validation. All classification rates, overall and group, for both models have significant Z-statistics at the 0.01 level.

The use of the forward and backward selection criteria yield DY and RTA to be the significant variables for the transformed sample. Further, SALES (at the 0.10 level) and BVMV (at the 0.05 level) enter significant, while BVMV, LTDTA, QR and CTA (at the 0.05 level) and LTDE (at the 0.10 level) are removed significant.

Tender Offer Repurchasers (T) Versus Nonrepurchasers (N)

Models are developed using an original sample consisting of 23 tender offer repurchasers and 577 nonrepurchasers and a transformed sample consisting of 17 T and 377 N. Details of model development and validation are given in Table 6. The untransformed model yields overall correct classification rates of 92.65 percent during estimation and 67.67 percent during validation. Both overall accuracies have significant Z-statistics at the 0.01 level. Further, the group accuracies during validation are 73.33 percent for tender offer repurchasers and 67.37 percent for nonrepurchasers. Both accuracies are significantly better than the accuracy obtained from a naive model. Finally, all the untransformed distributions have standard deviations less than 5.00 percent.

In contrast, the validation accuracies for the transformed model are higher, and the corresponding standard deviations (except from the nonrepurchasing group) are less than 5.00 percent. Overall correct classification rates for the transformed model are 92.42 percent during estimation and 75.77 percent during

holdout. The group accuracies during validation are 82.76 percent for tender offer repurchasers and 74.75 percent for nonrepurchasers. All the reported accuracies have significant Z-statistics.

The significance of the transformed variables is determined by the use of the forward and backward selection criteria. While DY and PE enter significant at the 0.10 level, SHARE and TA are removed significant at the 0.05 level.

Open Market (O) Versus Tender Offer (T) Repurchasers

To highlight the use of the two most important modes of repurchases, 153 transformed open market repurchasers are compared with 17 tender offer repurchasers. Stepwise discrimination shows that SHARE (at the 0.05 level) and TA and PE (at the 0.10 level) enter significant, while SHARE (at the 0.05 level) and PE (at the 0.10 level) are removed significant.

Significance and Conclusions

Repurchasing firms are characterized by lower financial leverage, higher profitability, lower liquidity, larger scale of operations, higher dividend yields, but lower market prices of common stock and lower earnings multiples when compared to nonrepurchasing firms. Further, DY, RTA, TA, SHARE, BVMV, CR, QR, CTA, and DE are the most significant transformed variables entering or being removed from the discriminant process, indicating that repurchasing firms are significantly different from nonrepurchasing firms in terms of their higher dividend yields, higher profitability, larger scale of operations, lower market prices of common stock, lower liquidity, and lower financial leverage.

Higher profitability (RTA) and lower market prices versus book prices of common stock favor the use of the free cash flow hypothesis as a motivation to explain repurchasing activity. Repurchasing firms have significantly higher operating earnings and, therefore, higher uncommitted cash flows. They also have poorer investment opportunities (a higher level of BVMV is a proxy for limited internal investments) when compared to nonrepurchasing firms. Thus, managers of repurchasing firms prefer stock repurchases as an alternative to investments.

The results provide some support for the leverage adjustment hypothesis. Because repurchasing firms use less debt compared to nonrepurchasing firms, the former group may be using stock repurchase to adjust their financial leverage. Substituting debt for equity, through stock repurchases financed by debt, can increase returns by providing additional tax shelters.

Regarding the clientele hypothesis, repurchasing firms with their higher dividend yields and lower price-earnings ratios should be more attractive to tax-

exempt or low tax bracket investors. Stock repurchase, on the other hand, should appeal to high tax bracket investors. The results do not support the clientele hypothesis as a possible motivation. Finally, repurchasing firms are much larger in size and scale of operations and also have less liquidity relative to nonrepurchasing firms; the results do not provide any evidence supporting the antitakeover hypothesis.

Although open market repurchasers exhibit consistently similar characteristics to the total group of repurchasers (which *a priori* should be valid, given that open market repurchasers account for more than 60 percent of all repurchases), tender offer repurchasers exhibit a different set of characteristics.

DY RTA, SALES, BVMV, LTDTA, QR, CTA, and LTDE are the significant variables that differentiate open market repurchasers from nonrepurchasers. The results provide support for the leverage adjustment hypothesis and the free cash flow hypothesis. Higher profitability and lower market values of common stock indicate that open market repurchasers have more operating cash flows but limited internal investment opportunities; thus, open market repurchasers, as suggested by the free cash flow hypothesis, prefer stock repurchases to investments.

Because open market repurchasers have lower levels of financial leverage relative to nonrepurchasers, stock repurchase allows for improvement in financial leverage, a motive suggested by the leverage adjustment hypothesis. Higher dividend yield, lower earnings multiples, larger size, and lower liquidity do not support the clientele or antitakeover hypotheses.

In contrast, tender offer repurchasers are characterized by the highest market prices of equity, highest earnings multiples, highest profitability, smallest size and scale of operations, and lowest liquidity compared to all other firms repurchasing (via other modes) and those not repurchasing. Further, tender offer firms have lower dividend yields compared to other repurchasers, coupled with the highest financial leverage measured by DE and LTDE, compared to all other firms in the sample.¹⁸ DY, PE, SHARE, and TA are the significant variables differentiating tender offer repurchasers from nonrepurchasers. SHARE, TA, and PE differentiate tender offer repurchasers from open market repurchasers.

The results provide the largest supporting evidence for the clientele hypothesis as a motivation for tender offer repurchasers. Firms using the tender offer mode have the highest earnings multipliers (among all firms) and the lowest dividend yield among all repurchasers. Such firms should be more attractive to higher tax bracket investors who would favor noncash dividend payments, such as stock repurchases. Although tender offer repurchasers have the

¹⁸Higher market values of common equity explain why tender offer firms have higher DTA and LTDTA ratios but lower DE and LTDE ratios.

highest return on total assets, they also have the highest market prices of common stock. These results do not provide conclusive evidence in favor of the free cash flow hypothesis. Tender offer firms have higher debt ratios (measured relative to total assets, rather than equity) than all other repurchasers and nonrepurchasers. This finding does not support the leverage adjustment hypothesis. Finally, the tender offer firms have the lowest liquidity, but they are also the smallest in size among all firms; hence, the antitakeover hypothesis may not be applicable for tender offer firms. Thus, repurchasing firms use the tender offer mode to service their investor clientele, while the open market mode of repurchase is motivated best by the leverage adjustment hypothesis and the free cash flow hypothesis.

The models developed and validated indicate that stock repurchase activity is predictable, with the models having significant classification accuracies during holdout. Using the modes of repurchase improves the classification accuracies of the models developed and validated.

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Table 1A
Distribution of Share Repurchases
(by year and mode)

Year	Open Market Total	Tender Purchases	Private Offers	Negotiated Transactions	Exchanges
1983	39	23	4	12	-
1984	88	63	6	18	1
1985	87	49	5	29	4
1986	62	44	8	15	2
Total	283	179	23	74	7

Table 1B
Percentage Distribution of Share Repurchases
(by size of repurchase)

No. of Shares (%)	Open Market Total (%)	Tender Purchases (%)	Private Offers (%)	Negotiated Transactions (%)	Exchanges
0-49,999	2.36	2.92	-	1.39	-
50,000-99,999	5.01	4.71	-	8.63	-
100,000-249,999	19.34	21.76	8.06	16.91	-
250,000-499,999	16.79	15.63	6.45	22.76	5.00
500,000-999,999	17.82	17.11	24.19	20.84	-
1,000,000-2,499,999	21.32	23.02	20.97	16.55	25.00
2,500,000-4,999,999	7.02	7.42	8.06	6.55	10.00
≥ 5,000,000	10.34	7.43	32.27	6.37	60.00

Table 2
Details of Independent Variables Used in the Study (14)

No. Variable	Abbreviation	Transformation
1. Ratio of total debt to common equity	DE	(DE) ^{0.10}
2. Ratio of long-term debt to common equity	LTDE	(LTDE) ^{0.10}
3. Ratio of total debt to total assets	DTA	(DTA) ^{0.60}
4. Ratio of long-term debt to total assets	LTDTA	(LTDTA) ^{0.50}
5. Return on total assets	RTA	(RTA) ^{0.30}
6. Current ratio	CR	log (CR)
7. Quick ratio	QR	(QR) ^{0.10}
8. Ratio of cash to total assets	CTA	(CTA) ^{0.20}
9. Ratio of book value to market value of common stock	BVMV	log (BVMV)
10. Dividend yield	DY	1/log (DY)
11. Price-earnings ratio	PE	1/log (PE)
12. Total number of common shares outstanding	SHARE	log (SHARE)
13. Total assets	TA	log (TA)
14. Net sales revenue	SALES	log (SALES)

Table 3
Univariate Statistics for the Untransformed Variables

	Nonrepurchasers	Repurchasers	T1	Open Market Repurchasers	T2	Tender Offer Repurchasers	T3	T4
DE	1.2562	0.8570	-1.8805***	0.9014	-1.3869	0.7917	-2.0861**	.4668
LTDE	1.0533	0.6979	-1.8106***	0.7368	-1.3531	0.6221	-2.1410**	.5575
DTA	0.2435	0.2184	-2.5349*	0.2094	-3.0319*	0.2471	0.1128	-1.3305
LTDTA	0.1965	0.1730	-2.5533*	0.1650	-3.0017*	0.1978	0.0438	-1.2584
RTA	0.1159	0.1265	2.3744**	0.1264	2.0539**	0.1275	0.8204	-0.0851
CR	2.3909	2.1579	-2.5847*	2.1628	-2.2881**	1.9423	-2.1479**	1.0176
QR	1.5558	1.3064	-3.4881*	1.3173	-2.9913*	1.1909	-2.8929*	1.0057
CTA	0.1025	0.0873	-2.1415**	0.0904	-1.4839	0.0715	-1.8888***	0.9744
BVMV	0.6048	0.6121	0.1834	0.6079	0.0739	0.6031	-0.0238	0.0728

Table 3 (continued)
Univariate Statistics for the Untransformed Variables

	Nonrepurchasers		Repurchasers		T1	Open Market Repurchasers	T2	Tender Offer Repurchasers	T3	T4
DY	0.0176	0.0274	7.6789*	0.0281	6.9173*	0.0249	1.9170***	0.8685		
PE	45.4225	27.6797	-2.5735*	26.6073	-2.7836*	51.7745	0.2090	-1.6523***		
SHARE	39.3397	41.3302	0.3540	44.6426	0.7492	26.6045	-1.9069***	2.1712**		
TA	2066.6716	2685.5329	1.2612	2842.4305	1.4295	1725.5855	-0.6653	1.7410***		
SALES	2161.8564	3322.6726	1.8958***	3470.1545	1.8435***	2043.7133	-0.2215	1.6651***		

* significant at 0.01 level

** significant at 0.05 level

*** significant at 0.10 level

T1: T-statistic for the null hypothesis that variable means for the two groups of repurchasers and nonrepurchasers are equal
T2: T-statistic for the null hypothesis that variable means for the two groups of open market repurchasers and nonrepurchasers are equal

T3: T-statistic for the null hypothesis that variable means for the two groups of tender offer repurchasers and nonrepurchasers are equal

T4: T-statistic for the null hypothesis that variable means for the two groups of open market repurchasers and tender offer repurchasers are equal.

Table 4
Multiple Discriminant Models
Classifying Repurchasers (R) Versus Nonrepurchasers (N)

Original Data (283 R vs. 577 N)

Group	Estimation		Holdout	
	R	N	R	N
R	70.68* (2.83)	29.32	62.00* (3.11)	38.00
N	35.48	64.52* (4.22)	38.58	61.42* (3.04)
Rate		66.37 (3.17)		61.63* (2.22)

Transformed Data (238 R vs. 377 N)

Group	Estimation		Holdout	
	R	N	R	N
R	77.88* (11.49)	22.12	71.20* (6.88)	28.80
N	26.30	73.30* (12.93)	37.10	62.90* (6.91)
Rate		75.00* (7.61)		66.24* (6.31)

Rate means the overall correct classification accuracy

All numbers within parentheses represent standard deviations

All numbers are given in percent format

*Z-statistics are significant at 0.01 level

Table 5
Multiple Discriminant Models
Classifying Open Market Repurchasers (O) Versus Nonrepurchasers (N)

Original Data (179 O vs. 577 N)

Group	Estimation		Holdout	
	O	N	O	N
O	85.00* (4.91)	15.00	81.01* (3.41)	19.99
N	31.29	68.71* (3.33)	30.74	69.26* (4.11)
Rate		72.84* (3.27)		71.82* (2.51)

Transformed Data (153 O vs. 377 N)

Group	Estimation		Holdout	
	O	N	O	N
O	87.65* (11.52)	12.35	70.83* (5.72)	29.17
N	34.95	65.05* (6.97)	34.55	65.45* (8.12)
Rate		71.91* (3.01)		66.92* (6.13)

Rate means the overall correct classification accuracy

All numbers within parentheses represent standard deviations

All numbers are given in percent format

*Z-statistics are significant at 0.01 level

Table 6
Multiple Discriminant Models
Classifying Tender Offer Repurchasers (T) Versus Nonrepurchasers (N)

Original Data (23 T vs. 577 N)

Group	Estimation		Holdout	
	T	N	T	N
T	100.00* (2.34)	-	73.33* (3.11)	26.67
N	7.74	92.26* (2.41)	32.63	67.37* (4.82)
Rate		92.65* (2.29)		67.67* (3.69)

Transformed Data (17 T vs. 377 N)

Group	Estimation		Holdout	
	T	N	T	N
T	93.75* (1.26)	6.25	82.76*** (2.67)	17.24
N	10.06	89.94* (1.91)	25.25	74.75* (6.13)
Rate		92.42* (1.78)		75.77* (4.91)

Rate means the overall correct classification accuracy

All numbers within parentheses represent standard deviations

All numbers are given in percent format

* Z-statistics are significant at 0.01 level

** Z-statistics are significant at 0.05 level

*** Z-statistics are significant at 0.10 level

