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Do Firms Undertake Self-Tender Offers to Optimize Capital Structure?*

I. Introduction

Companies occasionally announce that they undertake self-tender offers to optimize their capital structure. For example, in January 1997, James M. Usdan, president and chief executive officer of RehabCare Group, stated that "the use of cash and borrowing to fund the tender offer will result in a more efficient capital structure for the company" (*Business Wire,* January 31, 1997). Further, the announcement of Insilco Corporation's self-tender offer in July 1997 stated that the company "expects the share repurchase to enhance shareholder value by . . . giving the company a capital structure in which the company's average after-tax cost of capital is reduced" (Newswire, July 11, 1997).

Previous empirical studies report a stock price reaction of 8%–18% to self-tender offer announcements (Masulis 1980; Dann 1981; Vermaelen 1981; Comment and Jarrell 1991). Further, Dann, Masulis, and Mayers (1991), Hertzel and Jain (1991), Lie and McConnell (1998), and Nohel and Tarhan (1998) document increases in future earnings. Consequently, self-tender offers are typically perceived as signaling insider information about firms' earnings prospects. Less attention has been focused on the notion that

This study investigates capital structure around 286 self-tender offers from 1980 to 1997. Firms that undertake self-tender offers generally have debt ratios below their predicted levels before the offers. The debt ratios following nondefensive self-tender offers are close to predicted levels, while the ratios following defensive self-tender offers are above predicted levels. Further, 20% and 43% of the debt ratings are downgraded following nondefensive and defensive self-tender offers, respectively. Finally, the increases in debt ratios around the offers are negatively related to the difference from the predicted debt ratio before the offers.

self-tender offers are used to move capital structure toward the optimal level. Masulis (1980) and Vermaelen (1981) document that the announcement period returns are higher when self-tender offers are mostly debt financed. Assuming that the debt ratios increase more if the offers are financed by new debt instead of cash, these results support the view that self-tender offers are perceived as more favorable when they result in large debt ratio increases. Further interpretation of these results is difficult, however, as it is unclear whether the preannouncement debt ratios were below the optimal levels and whether the type of financing is correlated with other variables that affect either the magnitude of the debt ratio increase or the announcement period returns. More recently, Dittmar (2000) documents that firms that repurchase shares have lower debt ratios than industry peers. To the extent that the industry norm proxies for the optimal ratio, Dittmar's (2000) results offer some evidence that debt ratios are lower than optimal before self-tender offers.

I investigate whether companies use self-tender offers to alter their capital structure using a sample of 286 offers that were announced from 1980 to 1997. To do so, I examine the debt ratios of the firms around the offers, compare these with predicted debt ratios, and relate the preoffer deviations of debt ratios from predictions both to changes in debt ratios resulting from the offers and to the abnormal stock returns around the announcements. Throughout the study, I distinguish between self-tender offers that appear to be undertaken to defend against takeovers and other self-tender offers. This distinction is important, as nondefensive self-tender offers may be undertaken to reach an optimal debt ratio, while defensive self-tender offers may be undertaken to reach a debt ratio that reduces the probability that the firm will be acquired. However, to effectively deter takeovers, the debt ratio may have to be higher than optimal as predicted by the static trade-off model, in which tax benefits are traded off against financial distress costs (Israel 1991; Novaes and Zingales 1995; Billett 1996; Zwiebel 1996). Thus, both defensive and nondefensive self-tender offers may have capital structure motivations, yet the observed effect on capital structure likely differs. Failure to separate the two types of offers could therefore yield deceptive results.

I also attempt to control for other motivations for self-tender offers, including disbursing cash and buying undervalued equity. I recognize, however, that different motivations may be intertwined. For example, while the conventional view of undervaluation arises from information asymmetry between insiders and the capital market, a firm can also be undervalued if it is underlevered in the sense that its value would be higher if it were to increase its leverage.

The debt ratios for the sample firms that undertake nondefensive self-tender offers tend to decline during the year preceding the offers. Further, the preoffer debt ratios are significantly lower than predicted debt ratios based on various firm characteristics. The debt ratios increase during the years around the offers, such that postevent debt ratios are, on average, similar to predicted debt ratios. These results suggest that firms undertaking nondefensive self-tender offers

have debt ratios below the optimal level and that the offers bring the ratios to a more optimal level.

The debt ratios for firms that undertake defensive self-tender offers differ from the above pattern. These ratios are lower than predicted debt ratios given their characteristics prior to the offers, but the difference is not statistically significant. Further, the debt ratios increase dramatically around the offers, such that the postevent ratios are higher than predicted debt ratios for several years thereafter. Hence, managers appear to increase the debt ratio beyond the optimal level when faced with an external threat in an effort to entrench the firm, which is consistent with the predictions in Harris and Raviv (1988), Stulz (1988), Novaes and Zingales (1995), and Zwiebel (1996). Such an interpretation is also consistent with the lower stock price reaction that accompanies defensive self-tender offers.[1]

An examination of debt ratings before and after the self-tender offers reveals a pattern that is roughly consistent with that for the debt ratios. In particular, the median debt rating is A− both before and after nondefensive self-tender offers but drops from BBB+ before to BBB after defensive self-tender offers. Further, 20% and 43% of the debt ratings are downgraded following nondefensive and defensive self-tender offers, respectively. The weak ratings following defensive self-tender offers conform with the results in Billett (1996), who documents that risky debt is the most effective takeover deterrent.

Using the self-tender offer sample in combination with a control sample that is matched on industry and size, I examine the determinants of the decision to undertake a self-tender offer in a multivariate framework. I find that firm size, market-to-book ratio, cash level, cash flow, and debt ratio all affect the decision to undertake nondefensive self-tender offers in expected manners. Further, firm size, market-to-book ratio, and debt ratio affect the decision to undertake defensive self-tender offers in similar ways. Consequently, the observed low debt ratios before the offers appear to be an important motivator for both types of self-tender offers and are not merely the result of a spurious relation with some other triggering factors, such as cash levels.

Next, I study the determinants of the changes in debt ratios resulting from the self-tender offers. The results show that firms with the lowest debt ratios relative to predicted levels increase their debt ratios the most around nondefensive self-tender offers, providing further evidence that firms use such offers to optimize their debt ratios. Consistent with earlier results, defensive self-tender offers trigger larger debt ratio increases than nondefensive offers, apparently because defensive offers represent larger repurchases. However, firms' cash levels or cash flows do not affect debt ratio changes. Thus, there is no evidence to suggest that the results are a residual effect of a cash management program. Moreover, the extent to which the equity is undervalued

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1. An alternative reason for the lower stock price reaction accompanying defensive self-tender offers is that the stock price has increased already before the announcement of such offers as a result of prior takeover activity.

preceding the announcement does not positively affect debt ratio changes, which is inconsistent with the notion that managers employ debt ratio changes to convey information about the true value of the firm.

Finally, I relate the abnormal stock returns around self-tender offer announcements to deviations of preoffer debt ratios from predicted ratios. Firms with debt ratios lower than predicted levels should benefit the most from self-tender offers, so I expect a negative relation between announcement period returns and debt ratio deviations. However, I fail to find a statistically significant relation for either self-tender offer type, and conjecture that the lack of a negative relation is attributable to an offsetting signaling effect. In particular, firms with high debt ratios that announce self-tender offers may signal that they can carry more debt than public information would predict or may face a higher signaling cost of conveying that the firm is undervalued, giving rise to a positive relation between announcement period returns and debt ratio deviations.

The remainder of the paper proceeds as follows. Section II reviews the literature. Section III describes the sample. Section IV presents empirical results. Section V concludes.

II. Review of the Literature

A. Capital Structure

Since Modigliani and Miller (1958) first proposed that capital structure is irrelevant, the theory of capital structure has been studied extensively. A common view is that there exists some optimal debt level that balances the benefits of debt, such as tax deductibility of interest payments and reduction of free cash flows, against the costs of debt, such as bankruptcy costs and underinvestment resulting from debt overhang (Bradley, Jarrell, and Kim 1984; Myers 1984). Myers labels this view the static trade-off theory of capital structure. Alternatively, the pecking order theory posits that, because of asymmetric information and signaling problems, firms prefer internal funds, then new debt, and finally new equity (Myers 1984; Myers and Majluf 1984). This theory predicts that firms' actual debt ratios may deviate from their optimal ratios, since "changes in debt ratios are driven by the need for external funds, not by any attempt to reach an optimal capital structure" (Shyam-Sunder and Myers 1999, p. 221).

Many studies, including Marsh (1982), Bradley et al. (1984), Kim and Sorensen (1986), Titman and Wessels (1988), MacKie-Mason (1990), Berger, Ofek, and Yermack (1997), and Graham, Lemmon, and Schallheim (1998), have investigated the empirical determinants of capital structure. The major findings are that fixed assets and marginal tax rates positively affect debt ratios, while profitability and investment opportunities negatively affect debt ratios. These findings have been interpreted to be consistent with both the static trade-off and pecking order theories of capital structure.

B. Self-Tender Offers and Capital Structure

Regardless of how self-tender offers are financed, they alter firms' capital structure. This raises the possibility that firms use self-tender offers as mechanisms to optimize their capital structure. There is, however, limited empirical evidence on the effect of self-tender offers on firms' capital structure.

Masulis (1980) and Vermaelen (1981) document that the announcement period returns are slightly higher when self-tender offers are mostly debt financed. Masulis reports that the average announcement period returns for offers with more than 50% debt financing is 21.9%, while the average announcement return for offers with less than 50% debt financing is 17.1%. Similarly, Vermaelen reports that the average abnormal returns to tendering and nontendering shareholders are 23.6% and 17.8% for debt and cash-financed self-tender offers, respectively. Since the debt ratio tends to increase more if the offers are financed by new debt instead of existing cash, the results suggest that the increase in firm value accompanying self-tender offer announcements is positively related to the debt ratio increase resulting from the offers. However, there is no indication that the difference in announcement period returns is statistically significant, and neither Masulis nor Vermaelen control for other variables, such as tender premia, that affect the returns. Moreover, the magnitude of the increase in debt ratio depends not only on financing but also on the size of the share repurchase. Finally, it is uncertain whether firms that undertake self-tender offers have debt ratios below their optimal levels. Hence, the results documented by Masulis and Vermaelen should be interpreted cautiously.

Dittmar (2000) examines characteristics of firms that repurchase stock in an effort to test various hypotheses for why firms repurchase stock. As a part of her analysis, Dittmar documents that repurchasing firms tend to have low leverage relative to nonrepurchasing firms and that the magnitude of share repurchases decreases with leverage. She interprets this as evidence that firms repurchase shares to alter their leverage ratios. However, Dittmar does not distinguish between the different means of repurchasing stock (open market repurchases, targeted repurchases, and self-tender offers). Moreover, because of the broad scope of her paper, Dittmar stops short of examining the leverage hypothesis more closely. All considered, it is still largely an unanswered question whether firms use self-tender offers to move their capital structure toward an optimal level.

C. Self-Tender Offers as Defensive Mechanisms

The literature offers at least five reasons why self-tender offers may defend against takeover attempts. First, Bagnoli, Gordon, and Lipman (1989) argue that share repurchases represent a favorable signal about the firm's value, thereby persuading stockholders not to tender to an outside bidder. Second, Bagwell (1991) argues that if shareholders possess heterogeneous valuations, that is, the supply curve of shares is upward sloping, only shareholders with

low valuations will tender in a self-tender offer. Therefore, the new equilibrium will be further up the supply curve. Since the average remaining shareholder has a higher reservation price, the cost of a future takeover attempt is increased. Third, Harris and Raviv (1988) and Stulz (1988) show that managers can increase their fractional holdings by repurchasing shares, thereby making a takeover more difficult. Fourth, Sinha (1991) argues that the debt increase associated with share repurchases reduces managers' allocation of corporate resources for perquisite consumption, thereby raising firm value and making the firm a less attractive target. Finally, Israel (1991), Novaes and Zingales (1995), and Zwiebel (1996) develop models in which managers use debt to reduce the threat of a hostile takeover. Consequently, a self-tender offer, by increasing the firm's leverage, may reduce the probability of a takeover.[2]

Several studies provide evidence in support of theories that repurchases are effective defensive mechanisms. Dann and DeAngelo (1988) study different types of defensive restructurings and find that the bidder did not acquire control after any of the eight defensive stock repurchases in the sample. Further, Denis (1990) reports that target firms that implement defensive payout plans, such as stock repurchases, tend to remain independent. Other studies provide indirect evidence. For instance, Palepu (1986) and Billett (1996) show that firms with high leverage are less likely to be takeover targets.

III.   Sample

I identified announcements of self-tender offers in the *Wall Street Journal* (*WSJ*) and the *Dow Jones News Retrieval* (*DJNR*) service from 1980 through 1997. Self-tender offers were excluded if they were (1) open only for preferred or special common stock; (2) open only to holders of odd lots; (3) part of a merger, liquidation,or going private transaction; or (4) conducted by a closed-end investment company. This search process yielded 338 observations. Since the capital structure may be fundamentally different for financial firms than for other firms, I also excluded 52 firms whose Standard Industrial Classification (SIC) code begins with the digit six. The final sample consists of 286 self-tender offers made by 260 different firms.[3]

The introduction reports a couple of statements suggesting that the self-tender offers were undertaken to improve the capital structure. However, the stated motivations are generally both ambiguous and generic, making it hard to determine the underlying motivations. The following excerpts from companies' *Offer to Purchase* illustrate this:

2. In related studies, Berger et al. (1997) report that entrenched managers tend to avoid debt, Garvey and Hanka (1999) report that impediments to takeovers induce firms to lower their debt ratios, and Safieddine and Titman (1999) report that firms that increase leverage following unsuccessful takeover attempts reduce the probability of future takeovers.

3. The average (median) number of fiscal years between self-tender offers made by the same firm is 3.3 (2.0). Removing observations that are close together does not qualitatively affect the results.

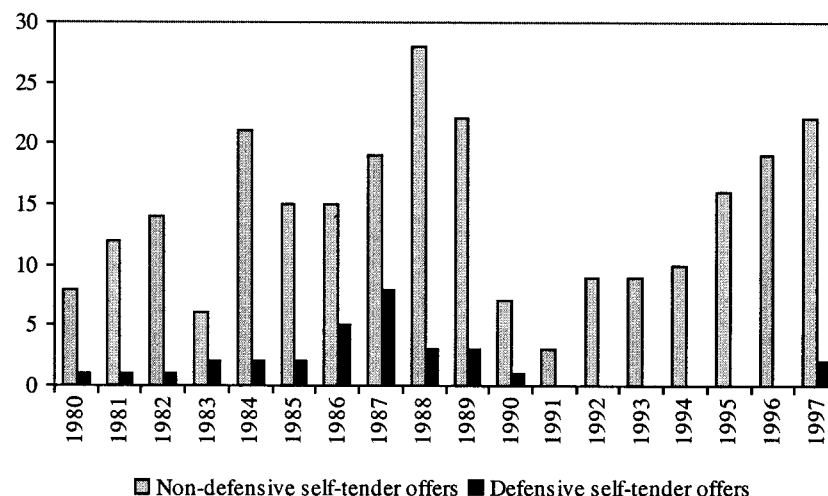Non-defensive self-tender offers ■ Defensive self-tender offers

FIG. 1.—Year-by-year distribution of the sample of nondefensive and defensive self-tender offers.

The company is making the offer because the board of directors believes that, given the company's business, assets and prospects, and the current market price of the shares, the purchase of shares pursuant to the offer is an attractive investment for the company. (Circus Circus Enterprises, 1988)

The company believes, given the company's business, assets and prospects and current market price of its shares, that the purchase of its shares at this time represents an attractive investment opportunity that will benefit the company. (Ralston Purina Company, 1990)

The company believes that the purchase of its shares at this time represents an attractive investment opportunity that will benefit the company and its stockholders. (Transamerica Corporation, 1994)

One possible motivation for self-tender offers is to defend against hostile takeovers. I define a self-tender offer to be defensive either if the company stated that the motivation for the offer was to deter a takeover or if there was takeover activity during the 3 months prior to the announcement. Thirty-one offers, or almost 11%, were classified as defensive. These offers are studied separately in much of the empirical analysis.[4]

Figure 1 shows the distribution of the sample over the sample period. While at least three self-tender offers occurred in each of the years, the frequency of offers peaked in the late 1980s and again in the late 1990s. Most of the defensive offers took place during the 1980s, with a peak in 1987.

4. Of course, even the self-tender offers classified as nondefensive in this study may be defensive in the sense that they may be used to deter potential future takeover attempts. Hence, the basic motivation for both types of self-tender offer may be to maintain control.

TABLE 1   **Descriptive Statistics**

	Nondefensive Self-Tender Offers (n = 255)		Defensive Self-Tender Offers (n = 31)		p-Values for Differences	
	Mean	Median	Mean	Median	Mean	Median
Market value of equity	1,141	232	1,319	651	.677	.014
Index-adjusted market value of equity	3.962	.609	4.617	2.449	.639	.001
Book value of assets	1,499	309	2,224	864	.238	.001
Market-to-book ratio	1.375	1.222	1.163	1.111	.054	.453
Cash level	.122	.070	.087	.057	.189	.568
Cash flow	.077	.078	.064	.061	.264	.019
Fraction of shares sought	.189	.167	.316	.293	.000	.000
Actual tender premium	.163	.147	.166	.146	.906	.861
Maximum tender premium	.180	.160	.179	.146	.979	.184
Undervaluation based on EBITDA multiple	.158	.120	.024	.084	.118	.478
Undervaluation based on asset multiple	.047	.009	.068	.039	.740	.684
Undervaluation based on sales multiple	.249	.023	.370	.203	.545	.020
Undervaluation based on RIM	−.105	−.243	−.071	−.133	.841	.135
Announcement period return	.094	.078	.004	.007	.000	.000

NOTE.—Descriptive statistics for the samples of 255 nondefensive and 31 defensive self-tender offers announced between 1980 and 1997. Market value of equity is the market value of equity in millions of dollars 5 days prior to the announcement date. Index-adjusted market value of equity is the market value of equity divided by the level of the S&P 500 Index on the same day. Market-to-book ratio is the market value of total assets scaled by book value of total assets. Cash level is cash and cash equivalents scaled by book value of total assets. Cash flow is operating income before depreciation minus interest expense, taxes, and dividends scaled by book value of total assets. Undervaluation is calculated as $(\hat{V}_t - V_t)/V_t$. For undervaluation based on EBITDA (earnings before interest, taxes, depreciation, and amortization) multiple, V_t is the market value of assets (market value of equity plus book value of liabilities) and $\hat{V}_t$ is the estimated market value of assets based on the median ratio of market value of assets to EBITDA for companies with similar size and industry classification code. For undervaluation based on asset multiple, V_t is the market value of assets and $\hat{V}_t$ is the estimated market value of assets based on the median ratio of market value of assets to book value of assets for companies with similar size and industry classification code. For undervaluation based on sales multiple, V_t is the market value of assets and $\hat{V}_t$ is the estimated market value of assets based on the median ratio of market value of assets to sales for companies with similar size and industry classification code. For undervaluation based on RIM (residual income model), V_t is the preannouncement market value of equity and $\hat{V}_t$ is the estimated market value of equity based on the residual income model. Fraction of shares sought is the number of shares sought scaled by the number of outstanding shares prior to the offer. Actual tender premium is the premium paid over the closing price 5 days prior to the announcement. Maximum tender premium is the maximum premium paid over the closing price 5 days prior to the announcement. (In fixed-price self-tender offers, the actual tender premium equals the maximum tender premium.) Announcement period return is the abnormal return from 1 day before to 1 day after the announcement. Financial data are taken from the end of the fiscal year preceding the announcement. The median test is used to test whether the samples have been drawn from populations with equal medians.

Table 1 shows the descriptive statistics for the sample. Firms that undertake self-tender offers for defensive purposes tend to be somewhat larger than the other sample firms. The median levels of market value of equity, index-adjusted market value of equity, and book value of assets are all significantly larger for defensive firms than for nondefensive firms. In contrast, the mean and median market-to-book value of assets, cash level scaled by assets, and cash flow scaled by assets are all larger for nondefensive firms than for

defensive firms. However, only the median cash flow is statistically different for the two samples at the 0.05 significance level.

The mean (median) fraction of outstanding shares sought in nondefensive self-tender offers is 18.9% (16.7%). This is similar to previous studies. For example, Dann (1981) and Comment and Jarrell (1991) report a mean (median) of 15.3% (12.6%) and 17.3% (15.0%), respectively. The fraction is significantly larger, however, for defensive self-tender offers, with a mean (median) of 31.6% (29.3%). Nevertheless, the mean (median) tender premium paid over the preannouncement price is similar for nondefensive and defensive self-tender offers at 16.3% (14.7%) and 16.6% (14.6%), respectively. This compares to a mean (median) of 22.5% (19.4%) reported in Dann (1981) and 16.8% (14.1%) reported in Comment and Jarrell (1991). The tender premium may not be higher for defensive offers because the price has already been bid up by potential acquirers at the time of the announcement. Since the actual tender premium is not known at the time of the announcement if the self-tender offer takes the form of a Dutch auction, I also report the maximum tender premium.[5] This premium is the same as the actual premium in fixed price self-tender offers but is often higher than the actual premium in Dutch auction self-tender offers. The mean (median) maximum tender premium is 18.0% (16.0%) for nondefensive self-tender offers and 17.9% (14.6%) for defensive self-tender offers.

The table further presents four measures of undervaluation that are used in subsequent parts of this study. I estimate the extent of undervaluation as

$$\hat{U}_t = \frac{\hat{V}_t - V_t}{V_t}. \tag{1}$$

In the first estimate of undervaluation, "undervaluation based on EBITDA (earnings before interest, taxes, depreciation, and amortization)" V_t is the preannouncement market value of assets (market value of common equity plus book value of preferred stock and liabilities) and $\hat{V}_t$ is the estimated market value of assets. Following Kaplan and Ruback (1995) and Gilson, Hotchkiss, and Ruback (2000), the market value of assets is estimated using the value-to-EBITDA multiple for similar firms. In particular, I identify firms with the same three-digit SIC code and assets between 10% and 1000% of those of the sample firms. If fewer than five firms satisfy the industry and size criteria, I first relax the industry criterion to the same two-digit SIC code, and then to the same one-digit SIC code. Next, I estimate the value for each sample firm by multiplying the EBITDA for the sample firm by the median value-to-EBITDA for the comparison firms. (Note that the sample firm and comparison firms must have positive EBITDA to use this approach.) My

5. In a Dutch auction self-tender offer, a range of prices is given within which shareholders can tender their shares. This contrasts with a fixed-price self-tender offer in which a single price is given. See Comment and Jarrell (1991), Bagwell (1992), and Persons (1994) for further discussion.

second and third measures of undervaluation, "undervaluation based on asset multiple" and "undervaluation based on sales multiple," are similar to my first measure, except that the market values are estimated using median asset and sales multiples, respectively, of comparison firms (similar to Berger and Ofek 1995).

In the fourth estimate of undervaluation, "undervaluation based on RIM," V_t is the preannouncement market value of equity and $\hat{V}_t$ is the estimated value of equity based on the residual income model (RIM). Similar to Frankel and Lee (1998), Lee, Myers, and Swaminathan (1999), and D'Mello and Shroff (2000), the equity value is estimated as

$$\hat{V}_t = B_t + \frac{NI_{t+1} - r_e \times B_t}{(1 + r_e)} + \frac{NI_{t+2} - r_e \times B_{t+1}}{(1 + r_e)^2} + TV, \qquad (2)$$

where t is the end of the fiscal year immediately preceding the self-tender offer, B_t is book value of equity, NI_t is net income, and r_e is the cost of equity calculated using the Capital Asset Pricing Model (CAPM).[6] The terminal value (TV) is estimated as

$$TV = \frac{[(NI_{t+3} - r_e \times B_{t+2}) + (NI_{t+4} - r_e \times B_{t+3})]/2}{(1 + r_e)^2 \, r_e}. \qquad (3)$$

The average net income for years $t + 3$ and $t + 4$ is used to estimate TV to mitigate the effect of extreme earnings. If net income is unavailable for year $t + 4$, TV is based on net income only for year $t + 3$. As in Penman and Sougiannis (1998) and D'Mello and Shroff (2000), TV is restricted to be nonnegative.

The estimated undervaluation measures are subject to criticism along several dimensions. First, the undervaluation is estimated at the end of the fiscal year preceding the self-tender offer. In cases in which the self-tender offer announcement is made late in the year, the magnitude of the undervaluation may have changed considerably between the time of the estimate and the time of the self-tender offer decision. Second, if the sample firms are fundamentally different from other firms in their respective industries, the multiple approaches are likely to yield biased value estimates. Third, the estimate of the fundamental equity value based on the RIM implicitly assumes that insiders have perfect foresight of future net income. Of course, the realized net income is likely to deviate from insiders' expectations. Fourth, because the equity value estimate is based on a finite horizon, it will not capture the value of future

6. D'Mello and Shroff (2000) show that the procedure used to calculate the cost of equity has little effect on the results, and most of their results are based on the CAPM. To implement the CAPM, I estimate the beta using the firms' stock returns and the returns on the Center for Research in Security Prices (CSRP) daily equally weighted index over the 250 trading days, ending 10 days before the announcement. Further, I use the intermediate-term government bond yield as a proxy for the risk-free rate and the historical spread between the return on the S&P 500 and the intermediate-term bond yield from 1926 until the announcement month as a proxy for the market risk premium.

growth opportunities. Indeed, past empirical studies suggest that estimates based on the RIM are understated, giving the appearance of overvaluation by the market. (See Myers [1999] for further discussion of bias associated with the RIM.) Conversely, the evidence in Berger and Ofek (1995, table 2) for single-segment firms and Alford (1992, n. 7) suggests that the multiple approaches generally yield little bias. Finally, the information for the multiple-based approaches is based entirely on information in the public domain at the time of the issue (though this is not the case for the input for the RIM), and proponents of market efficiency will therefore argue that deviations from values based on multiples cannot possibly reflect actual under- or overvaluation. Indeed, if the values based on multiples contain information beyond what is already embedded in prevailing market values, trading strategies based on valuation by multiples should perform better than appropriate benchmarks in the long run.

Taken together, I recognize that my measures of undervaluation are imperfect and may not capture the asymmetric information between insiders and the market. An alternative interpretation of the undervaluation measures (at least those based on multiples) is that they reflect the unrealized value of the corporations. Such unrealized value may be unleashed if the corporations are acquired or undertake some restructuring.[7] In that sense, the undervaluation measures may reflect the need for restructuring.

The undervaluation measures based on the multiple approaches suggest that both defensive and nondefensive firms are undervalued, while the undervaluation measure based on the RIM suggests that both sets of firms are overvalued. These contrasting results are likely caused by inherent biases and limitations of the valuation approaches as discussed above. Indeed, for a sample of control firms (see sample construction in Sec. IVC), the overvaluation based on the RIM is even more notable relative to the multiple approaches, suggesting that we should be careful when interpreting the absolute values based on the RIM. Neither measure reveals any statistical difference between the two sets of firms, however.

I employ a conventional event-study methodology to compute abnormal returns. The market model is estimated over the 250 trading days ending 10 days before the announcement, using the Center for Research in Security Prices (CRSP) daily equally weighted index as a proxy for the market index. The announcement dates are obtained from the *WSJ* or *DJNR* services. The announcement period is defined as the period from the day before through the day after the announcement date, while the announcement period return is defined as the cumulative abnormal return over the 3-day announcement period. The mean (median) announcement period return is 9.4% (7.8%) for nondefensive self-tender offers and 0.4% (0.7%) for defensive self-tender

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7. Potential examples of this include RJR Nabisco before it was acquired by Kholberg Kravis Roberts and Company in 1988 and USX Corporation before it created a tracking stock for its steel business in 1991.

offers. This is substantially smaller than the mean announcement period return of roughly 15%–18% reported in studies using samples from the 1960s and 1970s (Masulis 1980; Dann 1981; Vermaelen 1981; Dann et al. 1991) but similar to mean returns of roughly 8% reported in studies using samples from the 1980s (Comment and Jarrell 1991; Howe, He, and Kao 1992).

IV.   Empirical Results

A.   Debt Ratios

If firms use self-tender offers to optimize their capital structure, their debt ratios should be lower than their respective optimal ratios before the event and should increase toward the optimal ratios as a result of the event. In this section, I test these predictions.

Table 2 reports total debt (long-term debt plus debt in current liabilities) scaled by the sum of total debt, the liquidating value of preferred stock, and the market value of common stock for firms that undertake nondefensive (panel A) and defensive (panel B) self-tender offers.[8] Both types of firms exhibit decreases in the debt ratio during the years preceding the announcements, although the mean and median decreases are only statistically significant for the firms that undertake nondefensive self-tender offers, presumably because the sample size is larger. These results suggest that the debt ratios of the sample firms have drifted away from their historical levels, such that the debt ratios may be lower than optimal at the time of the announcement.

From the year before to the year after the transactions, there are significant increases in debt ratios for both types of firms. However, the mean (median) increase of 0.131 (0.119) for firms that conduct defensive self-tender offers is more dramatic than the mean (median) increase of 0.055 (0.023) for the other firms. A caveat is in order here. The results on the changes in debt reported in table 2, as well as some later analysis on the determinants of debt ratio changes, are based on sample firms with available data before and after the self-tender offers, thus giving rise to survivorship bias. It is difficult to assess how this bias may affect the results. For example, 12 of the firms that conducted defensive self-tender offers were nevertheless delisted as a result of a merger within a couple of years of the self-tender offer announcement. Because acquisitions affect the capital structure (Ghosh and Jain 2000), it is impossible to infer what the debt ratio of the acquired firm would have been in the absence of the acquisition.

To assess the magnitude of the debt ratios I need a basis for comparison. I develop a benchmark as follows: first, I regress the debt ratio of the universe of nonfinancial Compustat firms against several variables used in past studies of debt determinants (Titman and Wessels 1988; Berger et al. 1997; Graham et al. 1998). These variables include the natural logarithm of market value of

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8. Using other measures of debt, such as long-term debt or total liabilities, reveals results similar to those reported in this study.

TABLE 2   **Debt Ratios around Self-Tender Offers**

Year:	Levels							Changes		
	−3	−2	−1	0	1	2	3	−3 to −1	−1 to 1	1 to 3
A. Nondefensive self-tender offers:										
Unadjusted:										
Mean	.277	.262	.244	.281	.298	.304	.304	−.032*	.055**	.008
Median	.248	.220	.220	.252	.271	.278	.276	−.025**	.023**	−.008
Number of observations	238	249	250	249	227	190	166	238	225	164
Deviation from prediction:										
Mean	.001	−.012	−.034**	.004	.016	.018	.018	−.035**	.050**	.009
Median	−.030	−.039*	−.059**	−.015	−.019	−.012	−.023	−.026**	.037**	−.009
Number of observations	233	246	249	246	226	188	163	234	225	162
B. Defensive self-tender offers:										
Unadjusted:										
Mean	.310	.313	.294	.457	.434	.479	.487	−.022	.131**	.019
Median	.299	.304	.288	.433	.421	.559	.453	−.052	.119*	.035
Number of observations	29	30	30	24	20	18	17	29	19	17
Deviation from prediction:										
Mean	.017	.017	−.012	.134**	.097*	.143**	.139**	−.035	.102*	.005
Median	.012	−.016	−.019	.119**	.077*	.202*	.198*	−.047	.083**	−.006
Number of observations	29	30	30	24	20	18	17	29	19	17

NOTE.—Mean and median levels and changes of total debt (long-term debt plus debt in current liabilities) are scaled by the sum of total debt, the liquidating value of preferred stock, and the market value of common stock in the years around announcements of self-tender offers. Year zero is defined as the fiscal year of the announcement. The *t*-tests and Wilcoxon signed rank tests are used to test the hypotheses that the means and medians, respectively, are equal to zero. Deviation from prediction is the difference between the actual and predicted debt ratios. (All unadjusted mean and median levels are significantly different from zero at the .01 level for both types of self-tender offers.)

* Significantly different from zero at the .05 level.

** Significantly different from zero at the .01 level.

assets; the market value of assets scaled by book value of assets; net property, plant and equipment scaled by book value of assets; operating income scaled by book value of assets; research and development (R&D) expenses scaled by book value of assets; capital expenditures scaled by book value of assets; a dummy variable for utility firms; and marginal tax rate before financing effects as defined in Graham (1996a, 1996b).[9] I do this for every year from 1980 to 1998, which is the period for which I have complete data. The regression results, which are reported in table 3, show that the ratio of market-to-book value of assets, operating income, R&D expenses, and capital expenditures negatively affect debt ratios in each year, while net property, plant and equipment, and the utility dummy positively affect debt ratios in each year. Additionally, the natural logarithm of assets and the prefinancing marginal tax rate positively affect debt ratios in most years.[10]

Next, I estimate the predicted debt ratios for each of the sample firms from 3 years before to 3 years after the announcement year.[11] These predicted ratios serve as my benchmark. Admittedly, this benchmark will not accurately measure a firm's optimal debt ratio. One problem is that the firms on which the regression model is based may systematically choose suboptimal debt ratios. Another problem is that the regression model captures effects related to both the static and pecking-order theories of capital structure (Shyam-Sunder and Myers 1999). Ideally, the model should only capture the static theory effects, since the pecking-order theory suggests that the debt ratio may deviate substantially from the optimum under the static theory. I nevertheless consider the predicted debt ratios to be reasonable proxies for the optimal ratios, and I interpret them accordingly.

Table 2 reports the deviation of the sample firms' debt ratios from the predicted ratios. For firms that undertake nondefensive self-tender offers, the mean and median deviations are significantly negative during the year before the announcement but statistically insignificant afterward. For firms that undertake defensive self-tender offers, the mean and median deviations are statistically insignificant during the year before the announcement but significantly positive afterward. Hence, it appears that—with the exception of firms that undertake defensive self-tender offers—the sample firms exhibit debt ratios below their optima at the time of the announcement and also that the offers serve to optimize capital structure. The defensive self-tender offers, on the contrary, move the debt ratios above the optimal levels.

9. Following Opler et al. (1999), I assume that firms that do not report R&D expenses have no such expenses.

10. As an alternative specification, I also included dummy variables for two-digit SIC codes to capture industry effects that may not already be captured in the other independent variables, but this did not qualitatively change the results in this study.

11. For firm-years that lack information on the marginal tax rates (which is primarily a problem during the couple of years prior to 1980), I estimate the regressions using investment tax credits scaled by assets instead, which is a tax measure employed by, e.g., Titman and Wessels (1988) and Berger et al. (1997). The exclusion of these observations does not materially affect the results.

I also estimated the correlation coefficients between the absolute deviation from predicted debt ratios during the preannouncement year and the four undervaluation measures. If the undervaluation measures serve as proxies for the need to restructure, I would expect that firms with the greatest absolute deviations from the debt ratios are most undervalued. Broadly consistent with this conjecture, the correlation coefficients are about 0.2 (*p*-values < .01) for the undervaluation measures based on the RIM and the asset multiple but slightly negative and statistically insignificant for the other undervaluation measures based on the sales and EBITDA multiples.

In a contemporaneous study, Ghosh and Jain (2000) examine the debt ratios around corporate mergers. Using a similar methodology to estimate predicted debt ratios, they find that both target and acquiring firms have excess debt capacity during the premerger years. Further, like the self-tender offers, the mergers result in a higher debt ratio. Thus, mergers may be perceived as an alternative transaction to optimize capital structure. However, as emphasized by Ghosh and Jain, mergers (unlike self-tender offers) can increase debt capacity, and the observed increase in debt ratios around mergers may be attributable to this increased debt capacity rather than utilization of unused debt capacity.

Overall, the results are consistent with Harris and Raviv (1988), Stulz (1988), Novaes and Zingales (1995), and Zwiebel (1996), who suggest that managers may increase the debt ratio beyond the optimum to deter a takeover. They are also partially consistent with Sinha (1991), who argues that managers will increase the debt ratio when faced with a takeover threat. However, in his model, the debt ratio is lower than optimum even after the increase, as the value of equity is assumed to be strictly increasing in the debt ratio.

B. Debt Ratings

To complement the examination of debt ratios, I examine the Standard and Poor's debt ratings for sample firms for which I could obtain debt ratings before and after the offers from *Standard & Poor's Bond Guides*. The debt rating before a self-tender offer is defined as the rating in the bond guide for the announcement month (which is updated through the last business day of the prior month), while the debt rating after a self-tender offer expiration is defined as the rating in the bond guide dated 3 months after the expiration so as to ensure that the rating company has updated its rating to reflect the effect of the self-tender offer. I have debt ratings before and after the self-tender offers for a total of 88 of the sample firms (74 for nondefensive self-tender offer firms and 14 for defensive self-tender offer firms).

Table 4 reports the debt rating results. The median debt rating is A− both before and after nondefensive self-tender offers, while the median debt rating drops from BBB+ before defensive self-tender offers to BBB afterward. Further, 20.3% of the debt ratings are downgraded after nondefensive self-tender offers, while 42.9% of the debt ratings are downgraded after defensive

TABLE 3   Debt Regressions for the Population of Compustat Firms

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Intercept	.369	.456	.348	.235	.303	.356	.307	.289	.297	.325
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Natural logarithm of market value of assets	−.003	−.001	−.001	−.002	.003	.005	.004	.005	.013	.010
	(.152)	(.582)	(.622)	(.318)	(.097)	(.013)	(.041)	(.007)	(.000)	(.000)
Market-to-book ratio of assets	−.031	−.079	−.058	−.027	−.054	−.058	−.032	−.027	−.028	−.036
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Property, plant, and equipment scaled by assets	.302	.243	.255	.313	.300	.242	.233	.173	.128	.118
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Operating income scaled by assets	−.676	−.562	−.472	−.422	−.467	−.269	−.175	−.243	−.215	−.246
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Research and development expenses scaled by assets	−1.124	−.978	−.935	−.675	−.694	−.539	−.411	−.586	−.578	−.443
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Capital expenditures scaled by assets	−.482	−.321	−.235	−.412	−.413	−.214	−.281	−.247	−.332	−.343
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Utility dummy (SIC between 4,900 and 4,939)	.026	.055	.064	.073	.017	.041	.041	.046	.063	.036
	(.153)	(.004)	(.001)	(.000)	(.343)	(.020)	(.033)	(.031)	(.003)	(.103)
Tax rate	.168	.079	.144	.162	.144	−.080	−.055	.106	−.001	.004
	(.000)	(.077)	(.001)	(.000)	(.000)	(.009)	(.074)	(.005)	(.974)	(.929)
Adjusted R^2	.319	.289	.268	.238	.247	.250	.175	.138	.141	.144
Number of observations	3,371	3,645	3,713	3,754	3,876	3,813	3,771	3,981	3,944	3,801

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Intercept	.381	.268	.222	.215	.226	.252	.239	.255	.230
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Natural logarithm of market value of assets	.011	.001	.006	.009	.009	−.001	.001	.004	.004
	(.000)	(.665)	(.000)	(.000)	(.000)	(.477)	(.321)	(.002)	(.019)
Market-to-book ratio of assets	−.057	−.014	−.024	−.028	−.044	−.018	−.013	−.030	−.021
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Property, plant, and equipment scaled by assets	.139	.246	.257	.256	.223	.225	.263	.258	.301
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Operating income scaled by assets	−.269	−.284	−.226	−.181	−.208	−.282	−.090	−.124	−.110
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Research and development expenses scaled by assets	−.526	−.579	−.479	−.392	−.315	−.558	−.318	−.319	−.248
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Capital expenditures scaled by assets	−.379	−.672	−.566	−.559	−.386	−.248	−.416	−.315	−.190
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Utility dummy (SIC between 4,900 and 4,939)	.007	.016	.021	.044	.067	.061	.072	.041	.013
	(.767)	(.474)	(.287)	(.014)	(.000)	(.002)	(.000)	(.020)	(.510)
Tax rate	.044	.169	.110	−.024	.076	.080	−.097	−.120	−.028
	(.389)	(.000)	(.007)	(.412)	(.009)	(.053)	(.000)	(.000)	(.241)
Adjusted R^2	.157	.173	.208	.243	.240	.218	.167	.218	.185
Number of observations	3,711	3,708	3,813	3,964	4,279	3,351	5,422	5,718	5,459

NOTE.—This table reports regressions of total debt (long-term debt plus debt in current liabilities) scaled by the sum of total debt, the liquidating value of preferred stock, and the market value of common stock against various independent variables. Tax rate is the marginal tax rate before financing effects, as defined in Graham (1996*a*, 1996*b*). Financial firms and firms with book value of assets less than $1 million are excluded (*p*-values are given in parentheses). SIC = Standard Industrial Classification.

TABLE 4   Debt Ratings around Self-Tender Offers

	Nondefensive Self-Tender Offers	Defensive Self-Tender Offers
Number of firms with ratings	74	14
Median debt rating before announcement	A−	BBB+
Median debt rating after expiration	A−	BBB
Fraction downgraded (%)	20.3	42.9
Fraction upgraded (%)	0	0

NOTE.—Debt ratings before self-tender offer announcements and after self-tender offer expirations. The debt ratings are taken from *Standard and Poor's Bond Guides*. The debt rating before a self-tender offer announcement is defined as the rating in the bond guide for the announcement month (which is updated through the last business day of the prior month). The debt rating after a self-tender offer expiration is defined as the rating in the bond guide dated 3 months after the expiration so as to ensure that the rating company has updated its rating to reflect the effect of the self-tender offer.

self-tender offers. No debt ratings are upgraded for either sample. The greater proportion of debt ratings that are downgraded after defensive self-tender offers may reflect that defensive self-tender offers generally represent larger repurchases than nondefensive self-tender offers (see table 1). Alternatively, nondefensive self-tender offers may be more likely than defensive self-tender offers to be interpreted by the rating firm as a favorable signal of the firms' operations.

The debt rating results suggest that, unlike equity holders, debt holders suffer from self-tender offers. Conversely, Dann (1981) finds that the return on publicly traded debt around announcements of self-tender offers is not statistically different from zero. The conflicting results may arise because Dann uses an earlier sample period (1962–76) or because the bonds are traded so infrequently that changes in observed bond prices may not fully capture the true value effect. My results may therefore be interpreted as evidence that a portion of the wealth gain to shareholders is a result of a wealth transfer from debt holders.

Overall, the patterns in the debt ratings are broadly consistent with the debt ratio patterns. Further, the weak ratings following defensive self-tender offers are consistent with both Israel (1991) and Billett (1996). Israel (1991) models the use of debt in the context of takeovers. His model suggests that higher debt ratios reduce the profitability for the acquirer, thereby reducing the probability of an acquisition. The implication is that risky debt will deter takeovers. Similarly, Billett (1996) argues that wealth will be transferred from bidder and target equity holders to holders of any risky debt in the target, such that takeover likelihood decreases in the amount of risky debt. His empirical results support this argument. In particular, the takeover likelihood decreases with the amount of debt, but only if the debt is below investment grade.

C. Determinants of the Choice to Undertake a Self-Tender Offer

The previous results showed that firms that undertake self-tender offers, on average, have unusually low debt ratios. Thus, it appears that the debt ratio is an important determinant of the decision to conduct a self-tender offer. Of

course, it may be that the sample firms have low debt ratios simply because of accumulated cash, as reported in Lie (2000), and that it is the cash level rather than the debt ratio per se that triggers the self-tender offer. Alternatively, the debt ratio may capture an undervaluation effect. In particular, D'Mello and Shroff (2000) find that the common equity of firms that conduct self-tender offers is undervalued relative to estimates based on actual future earnings. If the extent of any undervaluation is cross-sectionally related to debt ratios, a univariate analysis would paint a deceptive picture of the effect of debt ratios on the decision to undertake a self-tender offer.

To test whether the debt ratio affects the self-tender offer choice in a multivariate setting, I run regressions of the probability that a firm announces a self-tender offer using the sample of self-tender offers and a control sample. The control sample consists of equally large firms in the same industry as the original sample firms. In particular, for each original sample firm, I identify firms with the same three-digit SIC code and assets between 10% and 1,000% of the sample firm's assets that did not conduct a self-tender offer during the sample period.[12] Of these firms, I choose as the control firm the one whose assets are closest to that of the self-tender offer firm. If no firms satisfy the industry and size criteria, I relax the industry criterion to the same two-digit SIC code.

Table 5 reports the results. The first six models are probit regressions of the probability that a firm announces a self-tender offer, while the last model is a multinomial logistic regression of the probability that a firm announces either a nondefensive or a defensive self-tender offer. As suggested by the coefficients on firm size and market-to-book ratio, firms that conduct self-tender offers, regardless of whether they are deemed to be defensive, tend to be larger and have lower market-to-book ratios than the control firms.[13] Furthermore, consistent with the univariate statistics in Lie (2000), the self-tender offer firms have significantly larger cash levels and cash flow, although the multinomial regressions suggest that this effect is limited to nondefensive self-tender offers.

Of most interest to this study, the coefficient on the deviation of the debt ratio from the predicted debt ratio is significantly negative in all models and for both types of self-tender offers in the multinomial regression. Further, the

12. Even though the control firms did not conduct a self-tender offer during the sample period, they may have repurchased shares through other means. However, such other repurchases tend to be small. Also, since repurchasing small amounts of shares in the open market is very common, imposing a requirement that the control firms had not repurchased any shares would make it hard to find control firms that are reasonably similar along the size and industry dimensions.

13. It is curious that the results from the multivariate probit regression suggest that larger firms are more likely to conduct self-tender offers given that the control firms were identified on the basis of industry and size. There are two possible reasons for this. First, because firms that undertake self-tender offers are quite large, there are more potential control firms that are slightly smaller than firms that are slightly larger, such that the chosen control firm is more likely to be slightly smaller than the self-tender offer firm. Second, size may be correlated with other independent variables, such that a multivariate analysis will reveal that size affects the likelihood of undertaking a self-tender offer even if univariate statistics fail to capture this effect.

TABLE 5   **Regressions of the Probability That Firms Announce Self-Tender Offers**

	Probit Regressions for All Self-Tender Offers					Multinomial Logistic Regression for Nondefensive and Defensive Self-Tender Offers	
						Nondefensive	Defensive
	5a	5b	5c	5d	5e	5f	5g
Intercept	−.449	−.444	−.444	−.443	−.574	−.790	−2.822
	(.070)	(.101)	(.119)	(.090)	(.050)	(.057)	(.006)
Firm size	.087	.089	.090	.091	.105	.118	.369
	(.009)	(.011)	(.008)	(.007)	(.007)	(.037)	(.002)
Market-to-book ratio	−.350	−.245	−.315	−.322	−.322	−.538	−1.663
	(.000)	(.023)	(.011)	(.002)	(.006)	(.001)	(.007)
Cash level	1.544	1.504	1.383	1.410	1.783	2.618	1.608
	(.001)	(.005)	(.004)	(.004)	(.004)	(.001)	(.421)
Cash flow	3.926	1.742	3.360	3.296	4.319	6.885	4.407
	(.000)	(.246)	(.000)	(.001)	(.000)	(.000)	(.289)
Deviation of debt ratio from prediction	−1.127	−1.083	−1.219	−1.197	−.994	−1.833	−2.541
	(.000)	(.001)	(.000)	(.000)	(.011)	(.000)	(.028)
Undervaluation based on EBITDA multiple		.260					
		(.121)					
Undervaluation based on asset multiple			.058				
			(.797)				
Undervaluation based on sales multiple				.032			
				(.626)			
Undervaluation based on RIM					.194		
					(.113)		
Number of observations	558	522	546	546	398	560	

NOTE.—Regressions of the probability that firms announce a self-tender offer. The sample used for this analysis includes the sample of self-tender offer firms and a sample of control firms with similar size and industry classification code. Firm size is the natural logarithm of total book value of assets in millions of dollars. Market-to-book ratio, cash level, cash flow, undervaluation based on EBITDA multiple, undervaluation based on asset multiple, undervaluation based on sales multiple, and undervaluation based on residual income model (RIM) are all as defined in note to table 1. Deviation of debt ratio from prediction is the difference between the actual and predicted debt ratios. Financial data are taken from the end of the fiscal year preceding the announcement. *p*-values are given in parentheses.

inclusion of the estimated undervaluation has little effect on the results beyond reducing the number of observations and statistical power in the regression. Consequently, the evidence suggests that the debt ratio affects a firm's decision to undertake both nondefensive and defensive self-tender offers, even when controlling for other determinants of the decision. The results are largely consistent with the univariate statistics on debt ratio deviations in table 2. A slight inconsistency is that, while table 2 suggests that the mean and median debt ratios are significantly lower than predicted for firms that undertake nondefensive self-tender offers and insignificantly lower for firms that undertake defensive self-tender offers, the multinomial regression in table 5 suggests that the deviations from the predicted debt ratio are significantly lower than those for control firms for both sets of self-tender offer firms.[14]

The results in this section conform with those reported in Dittmar (2000). Dittmar finds that firms that repurchase shares through self-tender offers or other means have lower industry-adjusted leverage than other firms. Since self-tender offers may be motivated by managers' desire to retain control even if a takeover threat is not imminent, it may also be relevant to compare the determinants of a self-tender offer with those of a takeover. Palepu (1986), Mikkelson and Partch (1989), Comment and Schwert (1995), and Billett (1996) all find that the probability of a takeover decreases with firm size. The effect of other variables, such as debt, is mixed. While Mikkelson and Partch (1989) and Comment and Schwert (1995) find no leverage effect, Palepu (1986) and Billett (1996) report some evidence that leverage negatively affects takeover probability. Thus, while self-tender offer firms tend to be large and firms that are taken over tend to be small, neither type has high leverage.

D. Determinants of Debt Changes and Debt Ratings

The low debt ratios preceding self-tender offers suggest that debt ratio increases would be beneficial. The next natural question is whether firms that would benefit the most from a recapitalization also exhibit the largest debt ratio increases as a result of the self-tender offer. Unfortunately, there is no way to accurately assess the effect that self-tender offers have on debt ratios, as the exact financing of the offers is generally unknown. Even when firms reveal how the offer will be financed, the information conveyed is typically vague. As a proxy for the offers' effect on debt ratios, I use the change in debt ratios from the year preceding the offer announcement (year −1) to the year after the announcement (year 1). This change reflects both the effect of the offer as well as ordinary effects, such as retained earnings during the 2 years.[15] The measure of the benefit from a recapitalization is the deviation of

14. I also ran probit regressions of the probability that a self-tender offer is defensive. The results indicate that this probability increases with firm size and decreases with the market-to-book ratio but is not statistically related to the other variables used in table 5.

15. Indeed, many of the sample firms actually exhibit decreases in their debt ratios over this period, presumably because of noise from other effects on the debt ratios.

the actual debt ratio immediately before the offer from the predicted debt ratio (year −1).

Table 6 reports the results from regressing the change in debt ratios around the self-tender offers against the deviation from the predicted ratio. The last two models (models 6h and 6i) segregate the results for nondefensive and defensive self-tender offers. Models 6a–6g include a defensive dummy variable, and models 6b–6i include the fraction of shares purchased in the self-tender offer as control variables. Furthermore, models 6c–6i include the cash level and cash flow preceding the self-tender offer. Any relation between changes in debt ratios around the offers and deviations from the predicted ratios before the offers may reflect an effort by the firm to manage cash rather than to adjust the debt ratio. For example, a firm may experience a positive cash flow shock that results in a higher cash level, higher market value of assets, and, presumably, lower debt ratio. The larger the cash flow shock (and, hence, the greater the deviation of the firm's debt level from the predicted level), the larger the repurchase and subsequent increase in debt ratio would have to be to maintain even cash levels. If such a cash management effect exists, the cash-level and cash-flow variables should absorb it. Finally, models 6d–6g include the undervaluation measures described earlier. Ross (1977) conjectures that a firm's capital structure conveys information about the firm's true value. It follows that a firm is more likely to increase its debt ratio if the firm's insiders believe that the equity is undervalued by the market. Consequently, the change in debt ratio should be positively related to the extent of undervaluation.

The coefficient on the deviation from predicted debt ratios prior to the offer is between −0.15 and −0.20 and statistically different from zero in models 6a–6h (p-values < .02). While the coefficient is negative also in model 6i (which only includes defensive self-tender offers), the p-value is .117. These results imply that firms with the lowest debt ratios relative to predictions increase their debt ratios the most around the self-tender offers (at least around nondefensive self-tender offers). If the predicted debt ratios are reasonable proxies for the optimal ratios, the results are consistent with the notion that self-tender offers are used to improve the ratios. One might, however, have expected the coefficient to be closer to −1, which would suggest that firms, on average, employ self-tender offers to offset exactly any preoffer deviation from the optimal capital structure. The difference in the coefficient from −1 may result from noise in the optimal capital structure measure or other effects on capital structure from the year before to the year after the offers.

Consistent with the results reported in table 2, the coefficient on the defensive dummy variable is positive and statistically different from zero in model 6a (p-value = .038). Further, the debt ratio changes are positively related to the fraction of shares purchased in all models. Also note that the coefficient on the defensive dummy variable weakens when the fraction of shares purchased is included in the model. This suggests that one reason why defensive self-tender offers result in larger increases in debt ratios is that such

TABLE 6   **Regressions of Debt Ratio Changes around Self-Tender Offers**

	All Self-Tender Offers							Nondefensive	Defensive
	6a	6b	6c	6d	6e	6f	6g	6h	6i
Intercept	.049 (.000)	.008 (.655)	.006 (.823)	.000 (.994)	.016 (.546)	.010 (.690)	−.016 (.560)	.021 (.441)	−.181 (.111)
Defensive	.082 (.038)	.036 (.398)	.037 (.384)	.035 (.416)	.291 (.495)	.038 (.365)	.049 (.257)		
Deviation of debt ratio from prediction	−.177 (.005)	−.179 (.005)	−.190 (.005)	−.185 (.009)	−.162 (.018)	−.190 (.005)	−.159 (.003)	−.173 (.015)	−.333 (.117)
Fraction of shares purchased		.262 (.003)	.273 (.002)	.282 (.003)	.300 (.001)	.289 (.001)	.269 (.003)	.209 (.033)	.550 (.016)
Cash level			−.116 (.180)	−.134 (.148)	−.128 (.136)	−.132 (.124)	−.082 (.412)	−.114 (.195)	−.339 (.480)
Cash flow			.162 (.357)	.310 (.193)	.043 (.816)	.165 (.343)	.222 (.229)	.104 (.561)	1.657 (.082)
Undervaluation based on EBITDA multiple				−.036 (.230)					
Undervaluation based on asset multiple					−.069 (.044)				
Undervaluation based on sales multiple						−.024 (.019)			
Undervaluation based on RIM							−.058 (.001)		
Adjusted R^2	.038	.069	.070	.068	.082	.088	.128	.034	.413
Number of observations	243	242	238	230	238	238	200	220	18

NOTE.—Cross-sectional regression of change in debt ratio is from 1 year before to 1 year after announcements of self-tender offers. Debt ratio is total debt (long-term debt plus debt in current liabilities) scaled by the sum of total debt, the liquidating value of preferred stock, and the market value of common stock. Defensive is an indicator variable that equals one if the self-tender offer is defined as a defensive action. Fraction of shares purchased is the number of shares purchased scaled by the number of outstanding shares prior to the offer. Deviation of debt ratio from prediction is the difference between the actual and predicted debt ratios. Cash level, cash flow, undervaluation based on EBITDA multiple, undervaluation based on asset multiple, undervaluation based on sales multiple, and undervaluation based on residual income model (RIM) are as defined in note to table 1. Financial data are taken from the end of the fiscal year preceding the announcement. Models 6a through 6g are based on the entire sample, while models 6h and 6i are based on nondefensive and defensive self-tender offers, respectively. p-values are given in parentheses.

offers involve more shares. This interpretation is consistent with table 1, which shows that the fraction of shares is significantly higher for defensive self-tender offers than for nondefensive self-tender offers.

There is little evidence that the increase in debt ratio is attributable to a cash management effect. Neither of the coefficients on cash level or cash flow are statistically different from zero. Further, the inclusion of the cash-level and cash-flow variables has no impact on the other coefficients in the regression model. It appears, therefore, that the self-tender offer and the accompanying effect on the debt ratio at least partially reflect a conscious effort to improve the debt ratio rather than just an effort to manage cash levels.

Finally, contrary to the notion that the increase in leverage signals the extent to which the company's stock is undervalued, the coefficients on the undervaluation measures are all negative and statistically significant at the .05 level for all measures except the one based on the EBITDA multiple. A possible interpretation for this result is that firms attempt to leave the debt ratio intact when the self-tender offer is motivated by perceived undervaluation, while firms deliberately increase the debt ratio when the self-tender offer is motivated by a need to recapitalize. In any event, the inclusion of the undervaluation measures in the regression model does not materially affect other coefficients, thus further attesting to the robustness of the negative relation between changes in debt ratio and the preoffer deviations from predicted debt ratios.

As a related matter, I also ran probit regressions of the probability that the debt rating was downgraded from before to after the self-tender offer, using the same control variables as in table 6. The results are reported in table 7. The coefficient on the fraction of shares purchased is positive and statistically different from zero. None of the other coefficients is significantly different from zero. Thus, the probability of downgrading increases with the size of the share repurchase. The results also imply that the greater frequency of downgrading observed in table 4 for defensive self-tender offers is at least partially because of the greater fraction of shares purchased in these transactions relative to nondefensive self-tender offers.

E.   Determinants of Announcement Period Returns

As noted earlier, the mean (median) 3-day announcement period returns are 9.4% (7.8%) and 0.4% (0.7%) for nondefensive and defensive self-tender offers, respectively. The previous results further indicate that firms undertaking self-tender offers exhibit unusually low debt ratios and that the offers increase the ratios toward optimal levels. If the increases in firm value around the self-tender offer announcements reflect the generally favorable effect that the offers have on capital structure, the value increases should be greatest for firms that benefit the most from a recapitalization, that is, those with the largest negative deviations from predicted ratios.

To test this prediction, I regress the announcement period returns against deviations from predicted ratios. I also include several control variables in

TABLE 7   **Regressions of the Probability That Debt Ratings Are Downgraded around Self-Tender Offers**

	7a	7b	7c	7d	7e	7f	7g
Intercept	−.827	−1.337	−1.161	−1.325	−1.113	−1.284	−1.672
	(.000)	(.000)	(.034)	(.016)	(.044)	(.020)	(.023)
Defensive	.562	.466	.466	.492	.576	.787	1.202
	(.155)	(.305)	(.311)	(.295)	(.229)	(.134)	(.060)
Deviation of debt ratio from prediction	−1.335	−1.519	−1.639	−1.602	−1.171	−1.893	−1.222
	(.222)	(.186)	(.232)	(.249)	(.408)	(.188)	(.458)
Fraction of shares purchased		3.164	3.967	4.237	4.252	4.366	5.534
		(.012)	(.006)	(.004)	(.005)	(.005)	(.008)
Cash level			−3.798	−3.744	−4.479	−3.331	−4.472
			(.121)	(.120)	(.077)	(.177)	(.130)
Cash flow			−.123	2.526	−.938	−.385	−1.288
			(.982)	(.665)	(.866)	(.944)	(.831)
Undervaluation based on EBITDA multiple				−.763			
				(.188)			
Undervaluation based on asset multiple					−.902		
					(.235)		
Undervaluation based on sales multiple						−.772	
						(.096)	
Undervaluation based on RIM							−1.195
							(.173)
Number of observations	85	84	84	84	84	84	67

Note.—Probit regressions of the probability that S&P downgraded the debt rating from before the announcement of the self-tender offer to after the expiration of the self-tender offer. Debt ratio, defensive, fraction of shares purchased, and deviation of debt ratio from prediction are as defined in the note to table 6. Cash level, cash flow, undervaluation based on EBITDA multiple, undervaluation based on asset multiple, undervaluation based on sales multiple, undervaluation based on residual income model (RIM) are as defined in the note to table 1. Financial data are taken from the end of the fiscal year preceding the announcement. *p*-values are given in parentheses.

TABLE 8   Regressions of Announcement Returns

	All Self-Tender Offers							Nondefensive	Defensive
	8a	8b	8c	8d	8e	8f	8g	8h	8i
Intercept	.019	−.032	−.005	−.016	−.030	−.058	.026	−.030	−.036
	(.117)	(.625)	(.940)	(.802)	(.650)	(.403)	(.852)	(.645)	(.430)
Dutch auction	.006	.004	.005	.004	.005	−.001	−.005	.003	−.003
	(.504)	(.623)	(.582)	(.657)	(.606)	(.858)	(.696)	(.750)	(.917)
Defensive	−.085	−.085	−.084	−.084	−.085	−.072	−.089		
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)		
Index-adjusted market value of equity	−.001	−.001	−.001	−.001	−.001	−.001	−.001	−.001	−.003
	(.059)	(.045)	(.037)	(.064)	(.053)	(.051)	(.406)	(.077)	(.199)
Fraction of shares sought	−.013	−.018	−.021	−.028	−.018	−.088	.042	−.047	.046
	(.714)	(.626)	(.544)	(.448)	(.620)	(.028)	(.495)	(.234)	(.566)
Maximum tender premium	.436	.435	.416	.427	.435	.425	.607	.488	−.091
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.387)
Deviation of debt ratio from prediction	.013	.031	.031	.018	.030	.008	.085	.156	.055
	(.584)	(.341)	(.338)	(.576)	(.353)	(.828)	(.167)	(.643)	(.578)
Inverse Mill's Ratio		.045	.025	.033	.043	.081	−.027	.040	.047
		(.430)	(.671)	(.558)	(.458)	(.183)	(.820)	(.487)	(.855)

Undervaluation based on EBITDA multiple			.003 (.791)						
Undervaluation based on asset multiple				.020 (.134)					
Undervaluation based on sales multiple					.001 (.734)				
Undervaluation based on RIM						.008 (.233)			
Debt is downgraded							−.001 (.954)		
Adjusted R^2	.456	.452	.456	.454	.455	.476	.537	.460	−.075
Number of observations	278	277	270	277	277	206	85	248	30

NOTE.—Cross-sectional regression of the abnormal stock returns from 1 day before to 1 day after announcements of self-tender offers. Dutch auction is an indicator variable that equals one if the self-tender offer is a Dutch auction. Defensive is an indicator variable that equals one if the self-tender offer is defined as a defensive action. Index-adjusted market value of equity is the market value of equity divided by the level of the S&P 500 Index 5 days prior to the announcement date. Fraction of shares sought, maximum tender premium, undervaluation based on EBITDA multiple, undervaluation based on asset multiple, undervaluation based on sales multiple, and undervaluation based on RIM are all as defined in note to table 1. Deviation of debt ratio from prediction is the difference between the actual and predicted debt ratios. Inverse Mill's Ratio is calculated based on the predicted values of probit regression 5a in table 5. Debt is downgraded is an indicator variable that equals one if the company's debt rating was lowered by S&P from before the announcement of the self-tender offer to after the expiration of the self-tender offer. Financial data are taken from the end of the fiscal year preceding the announcement. Models 8a–8g are based on the entire sample, while models 8h and 8i are based on nondefensive and defensive self-tender offers, respectively. p-values are given in parentheses.

the regression specifications. These variables include dummy variables for self-tender offers that take the form of Dutch auctions and offers that are undertaken for defensive purposes, market value of equity scaled by the level of the Standard and Poor's (S&P) 500 Index, the fraction of shares sought in the offers, the tender premium, the magnitude of undervaluation, and a dummy variable that equals one if the debt is downgraded as a result of the repurchase. Additionally, I include the Inverse Mill's Ratio, which is calculated as $\phi(\alpha)/[1 - \Phi(\alpha)]$, where α is the predicted value from probit regression 5a in table 5, ϕ is the probability density function for the normal distribution, and Φ is the cumulative function for the normal distribution. To the extent that the capital market partially anticipated the announcements, the Inverse Mill's Ratio may capture this anticipation effect.

Table 8 reports the regression results. Models 8a–8g are based on all self-tender offers in my sample, model 8h is based on nondefensive self-tender offers, and model 8i is based on defensive self-tender offers. The announcement period returns are increasing with the tender premium and decreasing with firm size for nondefensive self-tender offers. Further, ceteris paribus, the returns appear to be lower for defensive than for nondefensive self-tender offers. It is also interesting to note that the announcement period returns are not related to subsequent downgrading of the debt.

More important for the purposes of this study, the coefficient on the deviation from predicted debt ratios is statistically indistinguishable from zero at the 0.10 level for both defensive and nondefensive self-tender offers. The insignificant relation between announcement period returns and the deviation from predicted debt ratios first seems at odds with the predicted effect. However, the results may be blurred by an opposing signaling effect. The capital market may interpret self-tender offer announcements by firms with high debt ratios relative to predicted ratios as signals that the firms' ability to carry debt is greater than previously thought. Alternatively, if firms are undervalued, the signaling cost associated with conveying this undervaluation to the capital market via a self-tender offer and, thus, the credibility of the signal, will increase with the preannouncement debt ratios. In either case, if the strength of the signal is not entirely captured by either of the undervaluation measures, a positive relation may exist between deviations from predicted ratios and the stock price reaction.[16]

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16. I also developed a measure of the improvement in debt ratio as a result of the self-tender offer defined as the absolute value of the postevent deviation from the predicted ratio less the preevent deviation from the predicted debt ratio. However, this measure embeds considerable noise, and it captures effects beyond those from the self-tender offer. Further, it is unclear how accurately the capital market can assess the effect that the self-tender offer will have on the debt ratio, as the exact financing and the success of the offer are uncertain at the time of the announcement. Hence, it is not surprising that the relation between the debt improvement measure and announcement period returns is not statistically significant. Finally, I related the change in debt ratio to the announcement returns, as Ghosh and Jain (2000) do in the context of corporate mergers, but again I find no significant relation.

V. Conclusion

Although firms sometimes announce that they undertake self-tender offers to alter their capital structure, this motivation has not been thoroughly examined in prior studies. Using a sample of 286 offers by nonfinancial firms announced from 1980 to 1997, I find that the firms have debt ratios below the predictions before the offers. Firms that undertake nondefensive self-tender offers increase their debt ratios to the predicted levels as a result of the offers, while firms that undertake defensive self-tender offers increase their debt ratios above the predicted levels. The median debt rating is also lower following defensive self-tender offers than following nondefensive self-tender offers. Further, multivariate analyses show that firms' debt ratios negatively affect the probability of a self-tender offer and that the increases in debt ratios are negatively related to the deviation from the predicted ratios before the offers. These relations hold even when controlling for variables that should capture any efforts to undertake self-tender offers to manage firms' cash levels or signal insider information. Collectively, these results are consistent with the notion that firms conduct nondefensive self-tender offers to move debt ratios to more optimal levels and defensive self-tender offers to move debt ratios beyond optimal levels.

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