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THE INFLUENCE OF TAXES AND RISK IN OPEN MARKET STOCK REPURCHASE TRANSACTIONS

By

Joel Jerome Sneed

A Dissertation submitted to the Faculty of the

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As members of the Final Examination Committee, we certify that we have read the dissertation prepared by Joel Jerome Sneed

entitled THE INFLUENCE OF TAXES AND RISK IN OPEN MARKET STOCK REPURCHASE TRANSACTIONS

and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy

Dan Dhaliwal	Feb 27 2001 Date
Ashiq Ali	2/27/01 Date
Kaye Newberry	2-27-01 Date
	Date
	Date

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

Dissertation Director — Date: Feb 27, 2001

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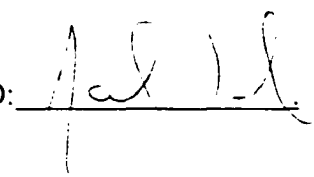
SIGNED: 

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DEDICATION

To my father and mother, Jack & Jackie Sneed, who appreciated the value of a good education.

To my wife, Suzanne Algara, whose patience, moral support and sacrifice helped me persevere and see this through to the end.

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ABSTRACT

This study investigates the impact of taxes and risk on firm's repurchasing decision and the subsequent market reaction to their announcement. I extend the repurchase literature by examining the tax and risk motivations for firms repurchasing their stock and increasing their borrowing, while controlling for the alternative explanations for repurchases. In a stock repurchase, a firm can quickly change the ratio of debt to equity in its capital structure, and, when combined with the positive change in debt, a setting where the firm is altering the balance of its capital structure in two similar directions is revealed. If there are both significant benefits and costs to debt financing, as suggested by trade-off theory, then firms should make financing choices that are related to these factors.

The results revealed that firms increasing their borrowing as part of the repurchase transaction are significantly more under-leveraged, realize greater tax benefits, and have lower default risk than firms that are decreasing their borrowing. These findings are consistent across univariate analysis and multivariate logistic analyses that control for free-cash-flow and signaling explanations. Also, I show that the tax benefits for firms increasing their debt are positively related to the announcement period abnormal returns. Collectively, these results suggest that debt-financed repurchases are being used, in part, to re-balance firms' capital structures, and that the resulting tax benefits have a positive influence on firm value.

CHAPTER 1

TAXES AND RISK IN OPEN MARKET STOCK REPURCHASES

1.1 Introduction

> In the Wall Street Journal (WSJ) on February 18, 1999, May Department Stores announced a $500 million stock repurchase after spending $500 million on repurchasing stock in 1998. But May also issued $350 million in new debt in 1998, in part to fund the repurchase. Rick Escherich, managing director in J.P. Morgan & Co.'s merger and acquisitions group, is quoted as saying that most companies using buybacks are targeting a preferred mix of debt and equity and want a more flexible way to return money to shareholders than a dividend increase (WSJ, February 1999).

The use of stock repurchases for financial restructuring motives, where firms issue debt and use the proceeds to repurchase their stock, has been largely ignored in the literature on repurchase transactions. However, open-market share repurchases are a low-cost mechanism firms may use to realign their capital structure to a preferred mix of debt and equity. Dittmar (1999) provides empirical evidence that the degree to which a firm is under-leveraged is significantly related to its decision to repurchase stock. This study extends existing research on stock repurchases to incorporate the tax and risk considerations associated with capital structure changes resulting from open market repurchases.

Masulis' (1980) finding that the market places a higher value on stock tender-offer repurchases with increased leverage suggests that the tax benefits of debt influence stock prices. However, Masulis does not control for, or investigate, the underlying reasons for stock repurchases beyond capital restructuring. Since Masulis' study, two

competing theories concerning share repurchases have been developed in the literature: the repurchase either signals improved future performance (referred to as signaling, an indication of under-valuation) or it reduces free cash flow. Using proxies for growth opportunities, recent research has differentiated between the signaling and free cash flow theories as explanations of the positive investor reaction to announcements of stock repurchases.

Although the market reacts positively to the announcement of both types of repurchases, recent studies suggest that the free cash flow hypothesis explains the positive reaction for low-growth firms, while providing no support for the signaling hypothesis for high-growth firms (Nohel & Tarhan, 1998; Grullon, 1999). For high-growth firms, evidence shows that repurchasing corporations' systematic risk declines significantly in the years prior to a share repurchase; the risk decline has been suggested as an explanation for their positive announcement period returns (Nohel & Tarhan, 1998). As an alternate explanation, I hypothesize that the positive market reaction is due to tax benefits realized by firms with declining risk that increase borrowing in the repurchase transaction.

I extend the repurchase literature by examining the tax and risk motivations for firms repurchasing their stock and increasing their borrowing, while controlling for the alternative explanations for repurchases. A matched pair design is used to test these motivations, where repurchasing firms are matched on the basis of growth opportunities and lagged operating income characteristics. I hypothesize that firms increasing their borrowing in the repurchase will have greater tax benefits and less risk than both their

matched control firms and firms with a decrease in borrowing. Further, I investigate whether these tax and risk considerations offer differing explanations for the repurchase decision across firms with different growth opportunities.

I hypothesize that firms' capital structure motivations are positively related to their growth prospects and that these tax motivations are positively related to the use of debt within the structure of these transactions – in accordance with the prediction of the tax trade-off theory. These hypotheses are tested using 1,253 open-market repurchases from 1985-1995. Open-market repurchases provide a good context to address the role of these tax hypotheses because repurchases are low-cost transactions that allow firms to realign their debt and equity to a desired target.

The research revealed that firms increasing their borrowing as part of the repurchase transaction are significantly more under-leveraged, realize greater tax benefits, and have lower default risk than firms that are decreasing their borrowing. These findings are consistent across univariate analysis and multivariate logistic analyses that control for free-cash-flow and signaling explanations. Also, I show that the tax benefits for firms increasing their debt are positively related to the announcement period abnormal returns. Collectively, these results suggest that debt-financed repurchases are being used, in part, to re-balance firms' capital structures, and that the resulting tax benefits have a positive influence on firm value.

The dissertation proceeds as follows: First, I review the existing theory and empirical work supporting the three existing alternative explanations for open-market repurchase decisions: capital structure, free cash flow, and signaling. The review shows

that the existing separate research streams must be combined to provide a more complete picture of stock repurchases. Second, I develop the hypotheses. Third, I describe the sample and the research design. Fourth, I present the results and interpretations. Finally, I conclude.

1.2 Stock Repurchase Transactions

The frequency of stock repurchase transactions has increased dramatically over the past twenty years. Expenditures on share repurchase transactions relative to earnings have increased from 4.8% in 1980 to 50.1% in 1998. Furthermore, the total aggregate value of these transactions has grown from $15.4 billion in 1985 to $123 billion in 1999(Grullon & Michaely, 2000). The increasing economic significance of repurchase transactions (primarily open-market repurchases), as an alternative payout mechanism to dividends, has driven the increasing demand for research in this area, as analysts work to understand firms' reasons for repurchasing their shares more than ever before.

1.2.1 Types of Repurchase Transactions

Repurchase transactions fall into two general classes: open-market repurchases and tender-offer repurchases. Open-market repurchases are usually gradual purchases of stock by the firm through the secondary market. Companies are not specifically required to publicly disclose their open-market repurchase activities, but repurchase transactions must comply with the anti-manipulation and anti-fraud provisions of the Securities and Exchange (SEC) Act of 1934. Open-market repurchase transactions are commonly

performed over a lengthy period of time and are generally of a smaller magnitude than tender-offer repurchases.

In 1982, the SEC adopted Rule 10b-18, which provided a safe-harbor for repurchasing firms against the anti-manipulative provisions of the SEC Act of 1934. John Evans, a commissioner with the SEC at that time, was quoted as saying in the Wall Street Journal, November 10, 1982, "This is much-reduced regulation from what we had before." Grullon and Michaely (2000) investigated whether the regulation before this safe-harbor provision deterred firms from repurchasing their shares because of the risk of being charged with illegal market manipulation. They provided evidence showing that firms dramatically increased average annual expenditure on share repurchases from $5.5 billion before Rule 10b-18 to $50.7 billion after Rule 10b-18 was implemented. Further, the trend in open-market repurchase transactions is shown to have increased steadily since 1982, providing more evidence that regulation under the SEC Act of 1934 suppressed firms use of repurchases as a payout mechanism.

In a tender-offer repurchase, the company usually specifies the number of shares it is offering to acquire, the tender-offer price at which it will repurchase the shares, and the period of time during which the offer is in effect. Tender-offers are generally completed within one month of the announcement, and they generally involve the largest repurchases of stock. Empirical research has focused primarily on tender-offer repurchases because, as a product of their impact on a firm's equity, they are the type most likely to provide the strongest sample for testing hypotheses on repurchases.

I focus on open-market repurchases rather than on fixed price self-tender offers for several reasons. First, the costs of open-market market repurchases are much lower than tender-offer repurchases. Myers (1984) states that the out-of-pocket costs of repurchasing shares seems fairly small. Firstly, the scope of tender-offer repurchases was much greater; the median number of shares sought in tender-offer repurchases was 16.6% of shares outstanding, while the median number of shares sought in this open-market sample was 5.6%. Secondly, tender-offers require a premium to be paid on tender shares -- median of 16% according to Comment and Jarrell (1991) -- while open-market shares may be bought over time.

If higher transaction costs are a constraint to a firm's motivation to adjust its capital structure, then open-market repurchases provide a stronger context to study these capital structure theories. Secondly, fixed-price self-tender offers comprise only a small fraction of all share repurchase programs announced by US corporations. According to the sample of announcement from Securities Data Corporation from 1984-1994, more than ninety percent of all share repurchase programs announced were open-market repurchases (Jagannathan, Stephens, & Weisbach, 1997).

1.3 Literature Review

As stated in the introduction, this study is focused mainly on determining whether taxes and risks influence a firm's decision to participate in open-market stock repurchase transactions. The hypotheses developed below are primarily based on predictions developed within the capital structure literature. Therefore, I begin the review with a

discussion of prior research in the area of taxes and capital structure; then I discuss how these capital structure issues have been shown to relate to open-market repurchase transactions; and finally, I address prior research on alternative theories of why firms repurchase their stock.

1.3.1 Capital Structure Theory

Capital structure refers to the relative mix of debt and equity securities issued by a firm. Miller and Modigliani (1958) show that, in perfect markets with no taxes, the value of a firm is independent of its financing choices. When Miller and Modigliani (1963) modify their model to include taxes, they find that the use of debt actually maximizes the firm's value. Debt in the firm's capital structure is shown to increase the value of the firm through the reduction of taxes provided by the interest tax shield on corporate earnings. Miller (1977) challenges this result, contending that the benefits associated with the use of debt are exaggerated. He specifically notes that there is a marginal personal tax disadvantage to the use of debt. This cost results from individual investors paying a higher tax on interest returns relative to equity returns. Including this personal tax disadvantage into the model leads to Miller's conclusion that firms may not benefit from leverage because the tax benefits from the use of debt will be offset by a higher "grossed up" interest rate required by the relevant clientele.

DeAngelo and Masulis (1980) expand the research by showing that the value of debt in a firm's capital structure is a function of firm-specific tax attributes including

non-debt tax shields (depreciation, credits, net operating loss carryforwards) and income. Although the statutory rate of taxes is the same across firms, net taxable income is a stochastic measure, meaning additional interest deductions are less valuable for firms facing a higher probability of non-positive net income (tax exhaustion hypothesis) and/or for firms with large amounts of non-debt tax shields (substitution hypothesis). The primary implications of their model are, for relatively low levels of leverage, that the marginal value of debt is positive because there is a relatively high probability that additional debt can be fully utilized to reduce the firm's tax liabilities and that the corporate tax outweighs the higher personal taxes paid on additional debt. At the same time, for relatively high levels of leverage, the marginal value of debt is negative because the tax shield substitutes imply a relatively high probability that the potential corporate shield from additional debt will be partially or totally lost. Further, it is shown that firms will trade off the advantages of debt against bankruptcy cost; where the net tax advantage of debt is of the same order of magnitude as expected marginal default costs. In summary, the model predicts that optimal capital structure is a tradeoff between the benefits of debt and the costs of debt. Dammon and Senbet (1988) extend DeAngelo and Masulis' (1980) model by allowing investments to vary. They show that if investment credits (ITC) go up, a firm will increase investments, which will raise its income. Thus an increase in non-debt tax shields (ITC) does not automatically imply a decrease in debt. The firm's increases in income will also increase its distance from tax exhaustion.

MacKie-Mason (1990) was the first to empirically test DeAngelo and Masulis' (1980) tax exhaustion theory using an incremental financing decision test. Prior to this

study, tax research had focused on the level of debt, or a cumulative measure of financial policy, to test whether tax status affects financing choice. The results of these studies were mixed. MacKie-Mason (1990), however, shows that the probability of a firm choosing equity over debt is positively influenced by its nearness to tax exhaustion. In testing both the substitution and tax exhaustion hypotheses, Trezevant (1992) studies the influence of the change of the Economic Recovery Tax Act of 1981 (ERTA 81) to firms' non-debt tax shields and their effect on firm's financing decisions, using a time-series analysis. He specifically looks at ERTA provisions that allowed firms to take greater amounts of depreciation and ITCs against their taxable income, thus reducing the tax advantage of their debt deduction (under the substitution hypothesis). His finding supports both the tax exhaustion hypothesis and the substitution hypothesis. Trezevant also finds that these increases in non-debt tax shields were negatively related to changes in debt usage, after controlling for the tax exhaustion effect. Dhaliwal, Trezevant, and Wang (1992) provide further evidence for the substitution effect by showing, for a cross-section of firms, after controlling for the likelihood of tax exhaustion, that non-debt tax shields (ITC) are negatively related to debt usage. The cross-sectional design allows them to jointly examine the substitution effect and the tax exhaustion hypothesis. They extend MacKie-Mason by showing that the substitution effect holds for firms with a substantial probability of tax shield loss even after they reach a debt-to-equity ratio closer to the optimum. Further, their results show that the debt securability effect, if not controlled for, completely dominates the debt and investment-related tax shield substitution effect. Graham (1996) develops a firm-specific marginal tax-rate and studies whether higher-tax

rate firms are more likely to increase debt than lower-tax-rate firms. The marginal tax rate that is simulated by Graham includes measures for both firm-specific forecasted net income and non-debt tax shields. His results indicate that high-tax-rate firms issue more debt than their low-tax-rate counterparts.

Myers (1984) introduces an alternative analysis of corporate borrowing decisions which must be considered within any capital structure analysis; Myers suggests that asymmetrical information leads to a financial hierarchy of preferred financing, called the pecking-order model. The pecking order arises when asymmetrical information problems and other financing costs overwhelm the benefits of optimal leverage under the trade-off model. Myers shows that in order to minimize these costs, firms will follow a pecking order to finance investment first with retained earnings, then with debt, and finally with equity. Under the pecking order, firms do not have leverage targets. This is in contrast to the trade-off model where the costs and benefits of debt push firms towards a leverage target.

Berger, Ofek, and Yermack (1997) and Titman and Wessels (1988) find an inverse relation between profitability and debt ratio. This finding is consistent with Myers' pecking-order model because firms with more internally generated funds require less borrowing. While the trade-off theory would predict the opposite, profitable firms have more money to shield from taxes, leading to higher debt levels. One of the primary purposes of my dissertation is to explore this anomalous behavior. If the benefits and costs of debt financing, predicted under the trade-off theory, are economically significant,

then a stock repurchase accompanied by the use of debt should provide a powerful setting to test the predictions following from the trade-off theory.

1.3.2 Capital Structure Theory and Stock Repurchases

Trade-off theory (DeAngelo and Masulis, 1980) and the pecking-order hypothesis (Donaldson, 1961; Myers, 1984) are two models commonly used to explain a firm's capital structure choices. The trade-off theory suggests that firms select optimal capital structures by trading off the benefits of borrowing as an interest tax shield against the costs of financial distress. This theory predicts that managers increase leverage when they perceive that the risk of financial distress has decreased because of a decline in a firm's business risk or when the tax benefits of debt have increased because of an increase in the firm's marginal tax rate.

If there are both significant benefits and costs to debt financing, as suggested by the trade-off theory, then firms should make financing choices that are related to these factors. However, firms may lag in adjusting to the target ratio since there are costs associated with making adjustments. Myers (1984,p. 585) observes that "the out-of-pocket costs of repurchasing shares seems fairly small. Thus, it is hard to explain why a firm would remain below its target debt level over time; the firm could quickly issue debt and buy back shares."

In a stock repurchase, a firm can quickly change the ratio of debt to equity in its capital structure, and, when combined with the positive change in debt, a setting where the firm is altering the balance of its capital structure in two similar directions is revealed.

Assuming that an optimal leverage ratio exists, firms may use a stock repurchase to achieve this target ratio. A firm is therefore more likely to repurchase stock if its leverage ratio is below its target ratio. Thus, a firm's capital structure will affect its decision to repurchase.

Open-market repurchases far outnumber tender-offer repurchases (ten to one) and may be considered a lower cost transaction.[1] Comment and Jarrell state, "Open-market repurchases are excellent vehicles for paying cash to shareholders but are not the most effective vehicles for signaling significant stock undervaluation" (1991, p. 1245). If higher transaction costs are a constraint to firms' borrowing money to realign their capital structure, then open-market repurchases should provide a strong context to test whether firms use these transactions to adjust their capital structure to a target.

The role of taxes in optimizing capital structure has been explored extensively (Miller & Modigliani, 1963; Miller, 1977; DeAngelo & Masulis, 1980; Trezevant, 1992; and Mackie-Mason, 1990). However, Fama and French state, "Despite the importance of the issue, there is little convincing evidence on how taxes affect the pricing of dividends and debt. ..... To our knowledge, exchange offers (Masulis [1980b]) produce the only evidence that corporate debt may have large tax benefits that increase the firm's value."

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[1] Comment and Jarrell (1991) report that the median number of shares sought in fixed price tender offers was 16.6% of shares outstanding, while the median number of shares sought in this open-market sample was 5.60 %. Further, the authors report that the median premium paid in fixed-price tender offers was 16.0%, while the payment of a premium does not apply in open-market repurchases. Finally, the announcement of an open-market repurchase is only a statement of the firm's intention to repurchase stock, and firms are not required by law to follow through on these announcements. Fixed-price tender offers require firms to specify in advance a purchase price, the number of shares sought, and an expiration date.

(1998, p. 820) The strength of Masulis' study was that exchange offers provide a strong capital structure context in which the production and investment activities of the firm remain relatively constant. Open-market repurchases offer a similar context in my study.

Recent research has shown that tax considerations are important to a firm's incremental financing decisions (Graham, 1996; Mackie-Mason, 1990; Newberry, 1998). This stream of research predicts that firms with high marginal tax rates are more likely to issue debt than firms with low marginal tax rates. Prior to these studies, support for this relationship was inconclusive because most tax shields have a negligible effect on a firm's marginal tax rate (Mackie-Mason, 1990).

Masulis (1980a) uses repurchase tender offers to examine the potential effect of interest tax shields. He documents a greater positive stock price reaction to repurchases funded through debt issuance than to those funded through other means. Masulis' sample spans 1963 to 1978 and includes 199 separate offers. The firms sought to repurchase an average of 16 percent of the outstanding shares. To test the corporate tax shield hypothesis, Masulis' test (control) group was comprised of offers with more than (less than) 50 percent debt financing. The test group had an announcement period return of 21.9 percent, compared to the control sample with 17.1 percent. Based on his findings, Masulis concludes that taxes can have an effect on firm value. In his discussion of Masulis' work, Downes (1980) argues that this interpretation is not very useful since alternative reasons could explain the findings as effectively as the tax-shield hypothesis. Downes states, "Before we will be able to determine the causes of common stock price reactions to tender offers, we will need to be much more rigorous in our specifications of

the relevant theory and the testable hypotheses"(1980, p. 320).

I will expand the existing research by examining whether taxes and risks are associated with a firm's decision to repurchase stock, while controlling for alternative explanations for the repurchase decision. Further, extending the work of Masulis (1980), I will investigate how the capital structure, signaling, and free cash flow theories combine to affect the capital market reaction to stock repurchases. Open-market stock repurchases, because of their low transaction costs and relatively constant production and investment activities, should provide a strong context to examine the predictions of the trade-off theory and provide evidence for whether capital structure changes increase a firm's value.

1.3.3 Information Hypothesis

Until recently, the information-signaling hypothesis has been the most widely accepted explanation for the positive market reaction to stock repurchase announcements (Vermaelen, 1984; Miller and Rock, 1985; Ofer & Thakor, 1987; Constantinides & Grudy 1989; Persons 1985). According to this hypothesis, the announcement is a revelation by management of new information regarding the firm's future prospects. Thus, investors interpret a repurchase announcement as a signal of future and/or current cash flows. In theory, disclosure of this information could either increase or decrease the value of the firm. However, since a repurchase announcement, on average, results in an increase in firm value, the information being signaled appears to be positive. Therefore, firms would be expected to show improvement in operating performance following share

repurchase announcements, and this improvement in performance should be positively related to the market response.

To test whether a tender-offer, share-repurchase announcement predicts an improvement in a firm's concurrent and future earnings, researchers have studied the relationship between the positive announcement period return and various current and future earnings proxies. The findings have shown consistent evidence of transitory increases in performance. However, the evidence is inconclusive as to whether the performance of the firm improves in following years. Vermaelen (1981) and Dann (1981) document a relationship between current earnings information and the stock price behavior of the firm. Dann, Masulis, and Mayers (1991) show that the announcement return is correlated with concurrent and longer window earnings surprises. Hertzel and Jain (1991) find that the positive revisions in analysts' forecasts are correlated with short-term, but not long-term, forecasts.

The findings are less clear for open-market repurchases, which is not surprising since they are smaller in magnitude and occur over longer time periods than tender-offer repurchases. Bartov's (1991) results indicate that announcement returns for open-market repurchases are related to concurrent positive earnings changes and that analysts revise their forecasts upward in the year of the repurchase. Ho, Liu, and Ramanan (1997) found a positive association between announcement returns and a firm's sales growth and accounting profitability in the period prior to the announcement. They conclude that markets use the repurchase announcement as a signal to reinterpret prior accounting information.

As shown in the literature review, the undervaluation hypothesis and the capital structure hypothesis may be associated (that is, trade-off theory predicts more profitable firms will have more money to shield from taxes leading to higher debt levels). This relationship indicates the need to properly control for the undervaluation hypothesis when studying the influence of taxes and risk within repurchases. Using a matched pair design, I attempt to control for association between profitability and capital structure by matching firms on the basis of lagged operating income. Further, within each multivariate model, I have included several proxies for the undervaluation hypothesis: operating income (OPINC), cash flow from operations (CF), and book to market (B/M).

1.3.3.1 Risk Change Hypothesis

Not only does the information provided by the repurchase announcement relate to improvements in the level of earnings, as discussed above, but it might also relate to the riskiness of a firm's future earnings (Masulis, 1983; Myers & Majluf, 1984). The evidence indicates that, overall, repurchase announcements convey information about both earnings and risk changes (Bartov, 1991; Dann et al.,1991; Hertzel and Jain, 1991).

Tender-offer repurchase announcements are accompanied by a decline in risk as measured by equity beta. Dann et al. (1991) provide evidence that the repurchasing firm's market risk declines both before and after the tender offer announcement; they find that the decline in risk was related to reductions in the volatility of operating cash flow (also found by Hertzel and Jain, 1991). Bartov (1991) shows that open-market repurchases are

also followed by declines in risk; however, his test yielded inconclusive results when he attempted to identify which factors best explain this decline in risk.

The tax trade-off theory suggests that firms select optimal capital structures by trading off the tax benefits against the *ex ante* default costs from increased borrowing. The undervaluation theory suggests that the information provided by the announcement may relate to changes in the riskiness of a firm's future earnings. Since the firm's *ex ante* risk is known by the market prior to the repurchase, it will be used to test the predictions of the trade-off theory, while changes in risk concurrent with and following the repurchase may be associated with either explanation. For tender-offer repurchases, Nohel and Tarhan (1998) found that leverage increases significantly for higher growth firms while finding no increase for lower growth firms. Further, consistent with business risk predictions, prior studies of tender-offers find that firms' equity beta, a proxy for the underlying riskiness of firms' assets, declines both in the year of and the years following stock repurchases (Hertzel & Jain, 1991; Bartov, 1991; Dann et al.,1991). Within this study two proxies have been used to measure the default costs of risk: the volatility of operating cash flow and Altman's Z (ALT Z).[2]

1.3.4 Free Cash Flow Hypothesis

The free cash flow hypothesis derives from the agency problem of overinvestment caused by excess cash and limited investment opportunities. Firms with excess cash and

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[2] Volatility of operating cash flows is measured as the standard deviation of operating earnings over the five years prior to the repurchase. A modified version of Altman's

poor investment opportunities incur agency costs if money is not distributed to shareholders. Hence, managers of these firms return cash to shareholders in lieu of investing in unproductive assets (Jensen, 1986). Testing this hypothesis requires knowledge of a firm's investment opportunities. Firms with poor investment opportunities have assets in place that are valued less than their replacement cost; thus, Tobin's q is less than one in low-q firms. A q ratio less than one implies overinvestment. Lang and Litzenberger (1989) test whether the free cash flow hypothesis explains the impact of dividend announcements on stock prices. They test the prediction that those firms with poor investment opportunities (low Tobin's q) have a positive market reaction to a dividend increase because of the reduction in overinvestment. They show that the market displays a stronger positive reaction to dividends of low-q (lower-growth) firms than to those of high-q (higher-growth) firms. Lang and Litzenberger conclude that their findings support the free-cash-flow hypothesis and that the dividend changes signal information about a firm's investment policies.

In the context of repurchases, Nohel and Tarhan (1998) extends the research of Lang and Litzenberger (1989) and Lang, Stulz, and Working (1991), and on the basis of previous studies, use Tobin's q to differentiate between the signaling hypothesis and the free-cash-flow hypothesis as explanations of the market's reaction to the announcement of a stock repurchase. Nohel and Tarhan (1998) find support for the free cash flow hypothesis by comparing the post-repurchase operating cash flow of high-q and low-q firms and relating these cash flow changes to the market's reaction. Their results reveal

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(1968) Z score is used by both Graham et al. (1998) and MacKie-Mason (1990). Debt is

that operating performance following repurchases improves only in low-growth firms and that these gains are generated by a more efficient use of assets and asset sales, rather than by improved growth opportunities. Grullon (1999) also compares the signaling and the free-cash-flow hypotheses using a sample of open-market repurchases and employing market/book as a proxy for growth options. His results are similar to those of Nohel and Tarhan (1998), providing empirical evidence supporting the predictions of the free-cash-flow hypothesis while offering little support for the predictions of the signaling hypothesis.

Nohel and Tarhan (1998) conclude that, "Share repurchases are rarely pure financial transactions designed merely to change the firm's capital structure. Instead the evidence suggests that repurchases are used as part of a corporate restructuring package" (p.208). I extend this line of inquiry, which uses market/book to differentiate between the free-cash-flow and signaling motives. Specifically, I examine whether tax and risk motivations provide a partial explanation for a firm's decision to repurchase and the market's reaction to the repurchase announcement. Further, I show when the firm's method of financing the repurchase, these tax and risk motivations are stronger for the sub sample of firms' which are increasing their borrowing. While Nohel and Tarhan predict that the free cash flow hypothesis should be more related to lower growth firms, their results show that both low- and high-growth firms are engaged in asset sales. Lower growth companies may benefit from increases in financial leverage beyond the capture of tax shields. Specifically, high-interest expense payments mean that a company has less

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not included in this variable because it enters the regression equation separately.

discretionary cash to invest in value-destroying projects. As such, debt serves as a built-in "check" on the free cash flow of lower growth firms. This relationship indicates the need to properly control for the free-cash-flow hypothesis when studying the influence of taxes and risk within repurchases.

My study uses the relative change in borrowing to test the tax and risk motives of the firm while controlling for growth opportunities. As presented in Figure 2, a match pair research design has been employed to control for association between investment opportunities and capital structure incentives by requiring that each repurchase firm be matched with a control firm falling within a similar quintile of growth (as measured by book-to-market). Matching on growth is required to control both alternative explanations for the repurchase decision and its influence on firms' capital structures.

1.4 Testable Implications

1.4.1 Tax and Risk Related Hypotheses

Most repurchases result in changes in the proportion of debt and equity within a firm's capital structure. Although Nohel and Tarhan (1998) suggest that repurchases are primarily financed by borrowing, the literature has not established a clear link between the repurchase decision and the resulting changes in capital structure.[3] I examine whether considerations of tax and risk in capital structure changes influence the way in which repurchases are financed.

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[3] Hertzel and Jain (1991) also find that the total long-term debt of repurchasing firms increases significantly in the year of repurchase.

Specifically I examine the tax and risk motivations for firms which announce that they will repurchase their own stock and that have a concurrent increase in their debt. If a firm's debt ratio is below the target ratio and if corporate interest tax shields have significant positive value, then the debt-for-equity transaction would enable them to reduce taxes while moving the firm closer to its target capital structure. This indicates the need for proxies for a firm's target leverage ratio, tax benefits, and default costs.

To establish a benchmark for these capital structure incentives, I match each repurchasing firm with a paired control firm falling within the same two-digit standard industrial classification (SIC), and having similar levels of performance and growth.[4] These variables have been shown to be important determinants to firms' capital structure (Dittmar, 1999). In order to show the influence that capital structure motivations have within repurchase transactions, I partition the sample by the relative change in debt. I define all comparative variables as the paired difference between the repurchasing (treatment) firm and its matched-pair (control) firm. The change in debt is measured as the relative difference between the repurchasing firm and its matched pair.

There are two reasons why the sample is portioned by the change in debt. First, the tax trade-off theory predicts that the tax benefits of debt should only be significantly positive for the sub-group of firms with a borrowing increase. This is because the relationship between taxes and the market response derives from the additional interest

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[4] I follow Nohel and Tarhan's (1998) approach using a matched-pair control sample to detect changes in performance, free cash flow, and capital structure variables leading up to and following the repurchase announcement. The variables selected (2-digit SIC code,

deductibility of debt, with the increase in the value of the firm equal to the present value of the change in interest payments. Second, stock repurchases combined with a positive change in debt provide a setting where the firm is altering the balance of its capital structure in two similar directions, resulting in the largest increase to a firm's debt ratio. If the repurchase decision, and the subsequent investor reaction to the announcement, can be partially explained by capital structure motivations, then firms with the greatest change to their capital structures should also show the greatest tax and risk motivations. Through partitioning the firms on their borrowing change and comparing across increases and decreases, I provide additional evidence that repurchases are partially motivated by firms'desire to reach a target debt ratio.

If the motivation for stock repurchase transactions is in part to move toward a target debt/equity ratio, then these firms should be relatively underleveraged. Further, if there are significant benefits and costs to debt financing, as suggested by the trade-off theory, then a firm's financing choice should relate to its distance from a target capital structure. The two proxies for the tax advantages of debt are KINK (Graham, 1999), which measures the likelihood that an additional dollar of debt will be deductible by the firm for tax purposes, and AMTR (Graham, 1996), which proxies for the firm's after-

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performance, and growth) as criteria for selecting the matched–pair have been shown to be both significant determinant to firms' capital structure.

financing marginal tax rate. [5] The tax benefits, KINK and AMTR, should therefore be positively related to the use of debt as follows:

> Hypothesis 1 (H1): Firms that increase borrowing in the repurchase are less leveraged in the year prior to the repurchase announcement than both their matched control firms and firms with a decrease in borrowing.

> Hypothesis 2 (H2): Firms that increase borrowing in the repurchase have greater tax benefits in the year prior to the repurchase announcement than both their matched control firms and firms with a decrease in borrowing.

The trade-off theory holds that, as leverage increases, the tax advantages of debt are offset by an increased cost of debt. According to this theory, firms balance the tax benefits of debt against the expected cost of financial distress, so that debt usage is a decreasing function of the probability of default. I use two measures of distress. One is a modified version of Altman's Z-score.[6] The other is the coefficient of variation on annual earnings over the past five years. It is computed as the standard deviation of annual

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[5] This proxy was developed to account for non-debt tax shields, uncertainty in taxable income, net operating loss carry-backs and carry-forwards, the progressive statutory tax code, the alternative minimum tax, and tax credits. The author remarks, "Thus, observing where a firm locates on its benefit function provides evidence about whether the marginal benefit equals marginal costs condition, providing a unique measure of the costs of debt financing."(Graham, 2000)

[6] This modified Altman's (1968) Z score is used by both Graham et al. (1998) and MacKie-Mason (1990). Debt is not included in this variable because it enters the regression equation separately.

earnings before interest, divided by the mean book value of total assets, computed over the past five years (EARNVAR). I predict that firms with the lowest levels of risk as measured by EARNVAR and Altman's Z will be those with the strongest capital structure motivation.[7]

Hypothesis 3 (H3): Firms that increase borrowing in the repurchase have lower financial distress, in the year prior to the repurchase announcement, than both their matched control firms and firms with a decrease in borrowing.

Since there are costs associated with adjustment, firms may show lags in adjusting to the target ratio. During these lags, a firm's capital structure decision may follow the pecking-order rule.[8] If, however, there are significant benefits and costs to debt financing, as suggested by the "trade-off" theory, then firms should make financing choices that realign their capital structure towards a target leverage ratio.

If firms use open-market repurchase transactions to optimize their capital structure consistent with the trade-off theory, the debt ratio should be lower than the optimal ratio before the event (H1) and increase towards the target as a result of the

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[7] This follows from Healy and Palepu's (1990) prediction that firms that expect high and stable profits are likely to borrow more because they can use the interest tax shield. Conversely, firms with high business risk and, hence, more volatile profits are likely to borrow less because additional debt increases the expected cost of financial distress more than the expected benefits.

[8] As noted before, Titman and Wessels (1988) and Berger, Ofek, and Yermack (1997) find an inverse relationship between profitability and debt ratio which seems contrary to the tax trade off theory. Pecking-order theory predicts that the debt ratio is inversely related to profitability, because profitable firms generate more cash flow and are less dependent on debt financing.

event. Further, if firms increasing their borrowings have the greatest capital structure motive, then it is expected that their debt-to-equity ratios are the most likely to be realigning after the repurchase transaction.[9]

> Hypothesis 4 (H4): Firms that increase borrowing in the repurchase show no significant differences in their debt-to-equity ratio in the year of repurchase from those of their matched control firm.

One of Nohel and Tarhan's (1998) principal findings is that operating performance following tender-offer repurchases improves only in low-growth firms (free cash flow) and that these gains are generated by more efficient utilization of assets and asset sales rather than by improved growth opportunities. They state, "Thus, tender-offer repurchases do not appear to be pure financial transactions meant to change the firm's capital structure, but are a part of a restructuring package meant to shrink the assets of the firm" (Nohel & Tarhan, 1998). Grullon (1999) finds similar results for open-market repurchases through looking at the change in operating income in the year following announcements. He reports that firms with low book-to-market (higher-growth) have worse operating performance than firms with high book-to-market (lower-growth). This evidence is inconsistent with higher-growth firms repurchasing for undervaluation purposes, where performance is expected to improve more.

The predictions of both Nohel and Tarhan (1998) and Grullon (1999) follow from

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[9] Both Dittmar (1999) and Opler and Titman (1996) find that firms are significantly underlevered, relative to a target, prior to the repurchase transaction.

the findings of Lang and Litzenberger (1991), that low growth firms may be motivated to distribute excess funds because they have relatively few investment opportunities, while high growth firms must be doing so in order to signal better future performance. Further, if lower growth firms are participating in repurchase transactions to reduce their free cash flow, then additional borrowing will increase the amount of cash needed to distribute within the repurchase, reducing the likelihood of increased borrowing.

These findings lead to my hypothesis that capital structure motivations within repurchase transactions may be stronger for higher growth firms than for lower growth firms.

Hypothesis 5a (H5a): Firms that increase their relative borrowing have greater tax benefits across higher quintiles of growth.

Hypothesis 5b (H5b): Firms that increase their relative borrowing have lower financial distress costs across higher quintiles of growth.

However, certain considerations oppose this expectation. Growth firms are often shown to have high costs associated with debt financing, caused by agency problems such as underinvestment (Myers, 1977). These costs may serve to reduce the amount of debt in a high-growth firm's capital structure, making these firms less likely to increase leverage. Further, lower growth firms with free cash flow problems may increase borrowings as part of a repurchase transaction in order to bond their promise to pay out future cash flows. Thus, debt reduces the agency costs of free cash flow by reducing the cash flow available for spending at the discretion of the manager (Jensen, 1986).

CHAPTER 2 – SAMPLE SELECTION, EMPIRICAL METHOD AND RESULTS

2.1 Introduction

In this chapter, I discuss the development of the final sample of repurchase announcements that were used in this study. I present and discuss the sample selection criteria and procedures and the empirical method followed in my analysis. Then I present the empirical model and define all variables used in the multivariate test. The results are then presented, beginning with descriptive statistics on the set of repurchase announcements studied, followed by descriptive statistics for both the repurchasing firms and their matched pairs. These descriptive statistics are then partitioned by the financing choice of the firm and by quintiles of growth. The empirical results are then shown for single variate regressions, also partitioned by financing choice. Finally, I report multivariate results, including several sensitivity analyses.

2.2 Sample Selection

I begin with an initial sample of all open-market repurchase programs announced during the period 1985 – 1994, as reported by Securities Data Company (SDC). These total 3,715 separate announcements. This is the same sample used by Jagannathan, Stephens and Weisbach (1997). To be included in the sample, each open-market transaction had to meet the following requirements:

1. Each firm had to be listed on either the primary, full coverage, or research Compustat tape;

2. Each company had to be listed on the Center for Research in Security Prices 1998 tapes;

3. The data must include the After Financing Marginal Tax Rate (AMTR) estimated by Graham (1997);

4. The data must include variability of income (EARNVAR); a minimum of four years of operating income and book value of assets data was required to estimate this variable;

5. Observations not meeting the last match criteria performance of +/- 30% were dropped from the sample.

6. The amount sought in the repurchase announcement did not exceed 30% of the outstanding stock.

The first four requirements assure that information for the multivariate tests are available across the entire sample. The fifth criterion provides an upper limit on the principal matching criteria or operating income. With this study's focus on open-market repurchases, the sixth criterion provides an upper bound for the shares sought, as any amount greater than 30% of outstanding shares appears to be a tender-offer repurchase. The final sample consists of 1,264 observations; a descriptive summary is presented in 2.3, "Research Design".

2.3 Research Design

In the research design, I follow Nohel and Tarhan's (1998) approach using a matched-pair control sample to detect changes in performance, free cash flow, and capital structure variables leading up to and following the repurchase announcement.[10] I define all comparative variables as the paired difference between the treatment (repurchasing) firm and its matched pair (control) firm. I scale variables by the lagged market value of assets. This measure is used in order to further control for opportunity costs of assets and for differences in accounting methodology. As an alternative, variables have been scaled by the book value of assets, providing similar results to those reported. Throughout the study, I partition the sample by the relative change in debt in order to show the influence of the capital structure motivation on the firm's financing choice.

To document changes in both the tax and risk motivations, as well as other alternative theories for repurchases, I examine repurchasing firms' year-by-year changes with a focus on median values and non-parametric significance tests. In order to improve the inferences that can be made from these pre- to post-repurchase changes, simple regressions are used to remove any pre-purchase trend of the variable of interest.

For the multivariate analysis, I use a binomial logistic model to analyze both the determinants of the repurchase decision and the financing choice in the year of repurchase. I use a multivariate regression model to determine the influence of the

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[10] Match pair methodology is also used by Bartov (1991) and Dann et. al. (1991), among others. Figure 2 provides a detailed analysis of the match design criteria.

variables on the cumulative abnormal return of the announcement period. These models are presented in greater detail in Section 2.4. Sensitivity analyses are presented in section 2.5.

2.31 Empirical Method: Establishing a Matched-pair Sample

To provide a benchmark for the repurchasing firms, I generate a matched–pair sample of comparison firms. All values are defined as the paired difference between the repurchasing firm and its matched control. As in Nohel and Tarhan (1998), I match firms using a variation of the procedure suggested by Barber and Lyon (1996). This study suggests that test statistics are mis-specified when control firms are not matched on pre-event income performance. Since the treatment is the repurchase announcement, I match each repurchasing firm with a comparison firm that did not repurchase stock in the year prior to the announcement of the repurchasing firm, the event year itself, or the following year.

The matching procedure is designed to select a comparison firm on the basis of the following attributes: book/market quintile, Compustat year, two-digit standard industrial classification code, performance sign (+ or -), and performance in year t-1. All attributes except that for performance are perfectly matched. I use a computerized matching program that considers all possible acceptable combinations before selecting the set with the least difference between case and matched controls (Bergstralh and Kosanke, 1998). The initial restriction on performance is $\pm$ 10% of the repurchasing firm's operating income and is relaxed not to exceed $\pm$ 30%. Firm performance is defined as earnings before interest and taxes, plus depreciation and amortization, to the market

value of assets (OPINC).

2.4 Model, Empirical Proxies and Variable Definitions

2.4.1 Multivariate Models and Dependent Variable Specification

2.4.1.1 Logistic Regression for the Repurchase Decision

I examine the tax and risk motivations for firms announcing that they will repurchase their own stock and have a concurrent increase in their debt, while controlling for the alternative theories for firms' decision to repurchase their stock, using the following binomial logistic model:

$$\Pr(y=1/x)$$

Where: y = 1 if the firm repurchases its stock,

y = 0 if the firm does not repurchase its stock, and

x = vector of alternative explanations for the decision to repurchase stock.

The equation for a firm's decision to repurchase stock is specified below:[11]

$$\Pr(\text{Repurchase}_i) = \alpha_0 + \alpha_1 \text{LnAssets}_i^t + \alpha_2 \text{Debt}_i^{t-1} + \alpha_3 \text{AMTR}_i^{t-1} + \alpha_4 \text{VAR}_i^{t-1} + \alpha_5 \text{BM}_i^t + \alpha_6 \text{Cash}_i^t + \alpha_7 \text{ASALE}_i^t + \alpha_8 \text{ASALE}_i^{t-1} + \alpha_{10} \text{Oper}_i^t + \alpha_{11} \text{OPER}_i^{t-1} + \varepsilon_i \quad (1)$$

For each transaction, i represents the firm and t represents time measured by a firm's fiscal year end; the variables are specified in Section 2.4.1.4.

Within the multivariate model, I have included several proxies to control for alternative explanations (undervaluation, free cash flow, size) for the repurchase decision,

[11] Variables are defined in Figure 1.

including: operating income (OPINC), cash flow from operations (CF), and book-to-market (B/M), asset sales (A.SALES) and size (ln ASSETS). The capital structure proxies included were: leverage ratio (Debt), tax benefits (KINK and AMTR) and default risk (EARNVAR).

2.4.1.2 Logistic Regression for Decision to Finance the Repurchase Through Borrowing

Equation 2, presented below, examines the determinants in the decision to finance the repurchase of stock through borrowing. This model's purpose is to show that increases in relative borrowing are positively related with the firm's tax benefits and negatively related with default costs in the firms' leverage decisions.

Pr (y=1/x)

Where: y = 1 if the firm repurchases stock and has increases in borrowings,

y= 0 if the firm repurchases stock and has decreases in borrowings, and

x= vector of alternative explanations for the decision to repurchase stock and increase borrowing.

The equation for repurchasing firm's decision to increase debt is:[12]

$$Pr(DebtIncrease_i) = \alpha_0 + \alpha_1 LnAssets_i^t + \alpha_2 CAPINT_i^{t-1} + \alpha_3 Debt_i^{t-1} + \alpha_4 AMTR_i^{t-1} + \alpha_5 VAR_i^{t1} + \alpha_6 BM_i^t + \alpha_7 Cash_i^t + \alpha_8 ASALE_i^t + \alpha_9 ASALE_i^{t-1} + \alpha_{10} Oper_i^t + \alpha_{11} OPER_i^{t-1} + \varepsilon_i \quad (2)$$

For each transaction, i represents the firm and t represents time measured by a firm's

fiscal year end; the variables are specified in Section 2.4.1.4. Within the multivariate model, I have included several proxies to control for alternative explanations (undervaluation, free cash flow, size, and capital intensity) for the financing decision, including: operating income (OPINC), cash flow from operations (CF), and book to market (B/M), asset sales (A.SALES) size (ln ASSETS), and capital intensity (CAPINT). The risk and tax proxies included were: leverage ratio (Debt), tax benefits (KINK and AMTR) and default risk (EARNVAR).

2.4.1.3 Multivariate Regression Results for Analyzing the Determinants of Market Reaction to the Stock Repurchase Announcement.

Equation 3, presented below, is a cross-sectional regression analysis to assess the effects that capital structure motivations may have on the market reaction to repurchase announcements while controlling for alternative theories for this response. Tax theory predicts that the marginal tax rate of the firm should only be significantly positive for the sub-group of firms with a borrowing increase. This is because the relationship between taxes and the market response derives from the additional interest deductibility of debt, with the increase in the value of the firm equal to the present value of the change in interest payments.

$$AR = \alpha_0 + \alpha_1 LnAssets_i^t + \alpha_2 Sought_i^t + \alpha_4 AMTR_i^{t-1} + \alpha_5 VAR_i^{t-1} + \alpha_6 BM_i^t + \alpha_7 Cash_i^t + \alpha_8 ASALE_i^t + \alpha_9 ASALE_i^{t-1} + \alpha_{10} Oper_i^t + \alpha_{11} Oper_i^{t-1} + \varepsilon_i \quad (3)$$

CAR is the three-day cumulative abnormal return around the announcement of the

[12] Variables are defined in Figure 1.

repurchase announcement. For each transaction, i represents the firm and t represents time measured by a firm's fiscal year end; the variables are specified in Section 2.4.1.4.

2.4.1.4 Variable Definitions

I define all comparative variables as the paired difference between the treatment (repurchasing) firm and its matched pair (control) firm. I scale variables by the lagged market value of assets. Throughout the study, I partition the sample by the relative change in debt in order to show the influence of the capital structure motivation on the firm's financing choice.

LnAssets= Log of the book value of assets at time t.

MVA= Market Value of Assets: market value of equity plus book value of debt plus preferred stock -cash).

Debt= Leverage Ratio of book long-term debt plus book short-term debt to the lagged market value of assets.

AMTR= Measure of after-financing marginal tax rate: determined by forecasting firm's taxable income streams, then taking into account firm-specific non-debt tax shields (net operating losses, investment tax credit's, etc.).

KINK= The amount of interest deductions, relative to the actual recorded amount of interest, before the marginal benefit of incremental interest would decline.

EARNVAR= Earnings Variability: standard deviation of EBIDT(t)-EBITDT(t-1) divided by total assets over the current and five preceding years (at least four years).

BM= Book-to-Market: End-of-year book value of common assets, divided by end-of-year market value of common equity.

Cash= Cash Flows: earnings before extraordinary Items + depreciation and amortization as a percentage of beginning-of-year market value of assets.

ASALE= Asset Sales: change in book value of assets, less capital expenditures, plus depreciation, as a percentage of beginning book value of assets.

Oper= Return on Assets: operating income before depreciation, interest, and taxes (EBITDA) as a percentage of beginning-of-year market value of assets.

CAPINT= Capital Intensity: ratio of book value of PPE as a percentage of beginning-of-year market value of assets.

Sought= Fraction of shares sought, divided by shares outstanding when repurchase is announced.

2.4.2 Tax and Risk Variables

In a stock repurchase, a firm can quickly change the ratio of debt to equity in its capital structure, and, when combined with the positive change in debt, a setting where the firm is altering the balance of its capital structure in two similar directions is revealed. I partition the sample by the relative change in debt in order to show the increasing significance of the firm's capital structure incentives across the sub sample of firms where these motivations are expected to be the strongest.

If the motivation for stock repurchase transactions (Equations 1 and 2) is in part to move toward a target debt/equity ratio, then these firms should be relatively underleveraged; therefore Debt (-) will be negatively related with the repurchase decision. Further, if there are significant benefits and costs to debt financing, as suggested by the trade-off theory, then a firm's repurchase decision and borrowing choice (Equations 1 and 2) should be positively related to its tax benefits – KINK (+) and AMTR (+) and negatively related to its default risk – EARNVAR (-). For Equation 3, tax

theory predicts that the marginal tax rate (AMTR(+) KINK (+)) of the firm should only be significantly positive for the sub-group of firms with a borrowing increase. This is because the relationship between taxes and the market response derives from the additional interest deductibility of debt, with the increase in the value of the firm equal to the present value of the change in interest payments.

2.4.3. Control Variables

While the primary focus of this paper is to investigate whether tax and risk explanations are important factors in a firm's decision to repurchase its shares and the market's response to the announcement, it is important to control for alternative explanations. Control variables are necessary in order to determine the relative contribution of tax and risk variables within the multivariate models. All multivariate models presented include proxies for the two alternative theories concerning share repurchases which have been well developed in the literature: the repurchase either signals improved future performance (OPER, B/M, CF) or it reduces free cash flow (ASALE, CF). Size (ln ASSETS) is a important control variable for several reasons. First, Ditmar (1999) showed that the size of the firm was the most significant determinant to a firm's likelihood to repurchase shares; this significance illustrates the importance of controlling for firm size in any repurchase study. Second, size has been found to be a significant determinant for the likelihood of a transaction to be debt financed. This may be true because large companies are more diversified and, thus, have more stable cash flow. Third, size proxies for other effects, such as information asymmetry, shown to be

significant correlated with the announcement period returns. Information asymmetry is related with the quality and quantity of pre-announcement information that market participants have about the firm. Larger firms are followed by more investors (i.e., analysts), provide a greater amount of information, and thus are shown to have less information asymmetry than smaller firms. Ho, Liu and Ramanan (1997) find that size is significantly associated with CAR in a sample of repurchase transactions.

Further, included in Equation 2 is CAPINT, a proxy for collaterability of assets which has been shown to be positively related to firms' borrowing decisions. For Equation 3, the variable SOUGHT has been shown to be positively associated with CAR, indicating that the size of the repurchase is related to the market's response.

2.5 Empirical Results

I follow Nohel and Tarhan's (1998) approach using a matched-pair control sample to detect changes in performance, free cash flow, and capital structure variables leading up to and following the repurchase announcement.[13] I define all comparative variables as the paired difference between the treatment (repurchasing) firm and its matched pair (control) firm. I scale variables by the lagged market value of assets. Further, in order to show the relationship between firm borrowings and the repurchase of stock, I partition the sample based on positive and negative changes in borrowing for all empirical tests.

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[13]Match pair methodology is also used by Bartov (1991) and Dann et. al. (1991), among others. Figure 2 provides a detailed analysis of the match design criteria.

2.5.1 Descriptive statistics

Table 1 presents summary statistics for the sample of open-market repurchase announcements. The table details the percentage of firms that repurchase stock each year. It is evident from these data that the number of repurchase transactions increased dramatically in the latter parts of the 1980s, declined in the early 1990s, and then rose in the mid-1990s. This frequency pattern of repurchases is similar to those documented in other research (Dittmar,1999; Grullon,1999; and Stephens &Weisbach,1997). Further, this table shows that the mean (median) proportion of shares sought by the repurchasing firms is 7.8 % (6.3%), which is consistent with the findings of Grullon (1999) and Ikenberry, Lakonishok, and Vermaelen (1995). The table also shows that the average (median) market reaction around open-market repurchase is equal to 2.3% (1.7%), consistent with previous evidence (Grullon, 1999; Comment & Jarrell, 1991). These positive abnormal announcement effects confirm the notion that open-market share repurchases convey some type of positive information to the market.

An examination of firm attributes indicates that the average size (median) of repurchase firms is $ 2,753 (423) million. Grullon shows that 68% of all repurchase firms are in the top two size quintiles. The yearly pattern shows that larger firms substantially increased their repurchasing activity in the mid-1980s, and, as the frequency increased in the early 1990s, the size of the firms participating in stock repurchase transactions decreased. The mean (median) book-to-market ratio of repurchasing firms 66.3%, (60.2%) is consistent with the findings of both Grullon (1999) and Dittmar (1999).

Finally, this table shows that the mean (median) debt change in the repurchase year is a positive 2.8% (.4%), indicating that repurchasing firms, on average, actually increase their outstanding debt.

Table 2 provides descriptive statistics for the sample of repurchasing firms and their matched control pairs. The values of the primary firm characteristics are winsorized, by deleting all observations with values from the upper 1% and lower 1% of each variable's univariate distribution. The number of observations reported for individual variables is constrained by the existence of a common set of variables used in the multivariate models.

Table 2 shows no significant difference between the operating incomes (OPINC) of the treatment firms (median 15.68%) and control firms (median 15.70%), which is consistent with the successful control of this attribute by the matching procedure. Book-to-market (B/M), a second attribute controlled within the match procedure, also shows no significant difference between the treatment firms (median .5742) and control firms (median .5731). Table 2 further reports that repurchasing firms are significantly larger in their asset base, have lower earnings variability, and have lower asset growth in the event year than their matched pairs - all consistent with findings in Grullon (1999) and Dittmar (1999).

2.5.2 Tax and Risk Considerations: Univariate Statistics

In this section I present a look at the progression through time of several proxies of firms' tax and risk motives. The tables cover the period beginning three years prior to

the year of the repurchase and three years after the repurchase. My focus is how the repurchasing firms' capital structure considerations compare relative to their matched control firms.

Tables 3a and 3b present the values of selected potential determinants of the repurchase decision prior to (year -3 to -1) and after (year 0 to +3) the repurchase announcement. Paired differences are reported for several proxies of tax and risk considerations (3a), and for several alternative explanations of repurchases (3b). Median values are reported for most variables to control for skewed data. Mean values have been analyzed and provide similar interpretations to those presented. The sample is subdivided into relative borrowing change groups, shown in Panel B and Panel C. Panel D presents the results of a Wilcoxon Rank-Sum testing for differences between the two sub-samples.

The results for the leverage variable (DEBT) in the year prior to repurchase, reported in Table 5a, Panel A, indicate that, across the full sample, repurchasing firms are significantly underleveraged (DEBT), which is consistent with the findings of Dittmar (1999). An examination of the leverage differences (Panel D) between firms with increases in borrowing (median of –7.38) and firms with decreases in borrowing (median -0.000) indicate support for H1, at the .01 level (Z= 4.65). That is, firms that increase relative borrowing during the repurchase year are less leveraged than both their matched control firms and firms with a decrease in relative borrowing in the year prior to the repurchase announcement. The results are also consistent with H4, that firms increasing their relative borrowing in the repurchase year show no significant differences in their debt-to-equity ratio from those of their matched pairs in the year of repurchase. Further,

firms decreasing their borrowing are significantly more underleveraged in the year of the repurchase, than those increasing their borrowing, with a difference between the sub-samples at the .01 level (Z=3.65).

In order to determine the role that taxes and risk play in the repurchase decision, alternative proxies for tax benefits of debt and default costs are used. The two proxies for the tax advantages of debt are KINK (Graham, 1999), which measures the likelihood that an additional dollar of debt will be deductible by the firm for tax purposes (as computed in Graham, 1999), and AMTR (Graham, 1996), which serves as a proxy for the firm's after-financing marginal tax rate. Mean values are reported for the two tax variables, KINK and AMTR, as the bounding of the constructs prevents outlier problems. Table 3a shows that both tax measures are significantly positive across the full sample of firms in the year preceding repurchase, indicating that repurchase firms would benefit more from additional borrowing. An examination of differences between the sub-samples in the year prior to the repurchase (Panel D) reveals that firms with borrowing increases have significantly greater tax benefits, at the .01 level, than firms with borrowing decreases. This is consistent with H2: firms that increase relative borrowing in the repurchase year have greater tax benefits, in the year prior to the repurchase announcement than both their matched control firms and firms with a decrease in relative borrowing.

The two measures for risk are earnings variability (EARNVAR), a proxy for fundamental cash flow risk, and Altman's Z (ALT Z), a predictor of bankruptcy. These measures were selected over equity beta, commonly used in the literature because they offer a better proxy for the additional default, or bankruptcy, risk placed on the firm from

increases in borrowing. Equity beta is developed as a proxy for the firm's systematic risk, which is not necessarily related to the firm's default or bankruptcy risk. Results from Table 3a indicate that repurchasing firms have significantly less risk both leading up to and following the repurchase announcement, which is consistent with prior studies examining changes in equity beta. An examination of these risk differences for the sub-samples (Panel D) shows that firms with borrowing increases have significantly greater negative (positive) *ex ante* differences in EARNVAR (ALT Z) than firms with borrowing decreases at the .01 level. This finding is consistent with H3: firms that increase relative borrowing in the repurchase year have less financial distress, in the year prior to the repurchase announcement, than both their matched control firms and firms with a decrease in relative borrowing.

2.5.3 Alternative Explanations for Repurchase: Univariate Statistics

There are several reasons a firm may repurchase stock. Through considering these alternative explanations, and their relationship with the firm's capital structure motives, I hope to develop a clearer understanding of the repurchase decisions and the market's reaction to their announcement.

The results from Table 3b for the full sample (Panel A) are consistent with many of the published findings, while the sub-samples partitioned by changes in relative borrowing (Panels B and C) provide new insights into the financing motives of repurchasing firms. The two primary measures of free cash flow motivation are asset

sales and capital expenditures. Across the full sample, these are shown to be negative and significant at the .01 level, confirming the findings of Nohel and Tarhan (1998) and Grullon (1999). An examination of the sub-samples reveals that only firms that reduce their relative borrowing are engaged in asset sales and a reduction in their capital expenditures, while firms that increase their relative borrowing increase their relative asset base in the year of repurchase. The difference between the groups reported in Panel D is significant at the .01 level. Firms with increases in their relative borrowing have positive capital expenditures and positive asset growth (at the .01 level).

Table 3b also shows that operating income[14] is not significantly different from that of the control in the year of repurchase, which is somewhat surprising, considering that the signaling model predicts that performance should improve in the year of repurchase (as found by Bartov, 1991). This insignificant difference holds across the sub-groups. Cash flow from operations (CF) is shown to be positive and significant across the full sample and the sub-samples, indicating some support for the undervaluation theory. However, this variable was significantly positive in the years prior to the repurchase, indicating that the repurchase may not have provided any additional information regarding current and future differences in cash flow.

2.5.4 Tax and Risk Considerations Across Quintiles of Growth: Univariate Statistics

Table 4 reports univariate statistics for several variables of repurchasing firms

[14] Defined as operating income before depreciation, interest and taxes scaled by the market value of the assets of the firm.

across quintiles of growth. It is presented to show the influence that growth may have on the determinants of the repurchase decision. The findings of both Nohel and Tarhan (1998) and Grullon (1999) indicate the importance that growth plays in determining why a firm repurchases its stock. The predictions of both of these studies follow from the findings of Lang and Litzenberger (1991) that low growth firms may be motivated to distribute excess funds because they have relatively few investment opportunities, while high growth firms must be doing so in order to signal better future performance. This table is presented to show the relationship between the capital structure motives of the firm and how they relate to differences in firm growth.

I have partitioned the sample by both debt change and book-to-market quintiles to investigate whether the capital structure considerations vary across different levels of growth. The findings presented in this table are somewhat surprising. Asset sales for firms reducing their borrowing are more extensive for higher-growth firms than for lower-growth firms. Prior studies have established that the free cash flow theory should apply to lower growth firms, with asset sales serving as a proxy for this agency problem. However, the results indicate that asset sales are more significant for higher-growth firms than for lower-growth firms, which contradicts the expectation arising from these prior studies. Nohel and Tarhan (1998) found that asset sales were significant for both high-growth and low-growth firms; however, they show efficiency gains are realized to a greater extent by lower-growth firms. Consistent with this finding, the results show that low-growth firms with decreases in borrowing have significantly better performance increases than firms with increases in borrowing, as measured by operating income and

cash flow, in the years following a repurchase. A possible explanation for this finding is that these firms increase their asset efficiency by disposing of poorly performing assets.

Hypotheses 5a and 5b predict that firms increasing their relative borrowing have greater tax benefits and lower default costs across each quintile of growth. The findings from Table 4 provide some support for these hypotheses. The tax benefits for firms with borrowing increases are higher (H5a), while the risk costs are lower (H5b) across growth quintiles. However, these differences across growth are not monotonic. This pattern may result from the high costs growth firms are often shown to have associated with debt financing (Myers, 1977); these agency costs may serve to reduce the amount of debt in a high growth firm's capital structure, and cause these firms to be less likely to increase leverage.

2.5.5 Pre-Post Regressions

In order to improve the inferences that can be made from these pre- to post-repurchase changes, simple regressions are used to remove any pre-purchase trend of the variable of interest. Tables 5a and 5b show results from regressions of median post-repurchase period values on the median pre-repurchase period values. This test provides a more direct test of the influence that the repurchase has on a firm's capital structure motivation, because it removes any correlation between pre- and post- repurchase values.

In interpreting these results, I have placed the focus on the sign and significance of the constant term, as it represents the impact that the repurchase has on the variable of interest, while the slope coefficient captures any trend that may have existed from the

pre-repurchase period. The design of this test controls for any positive correlation between the pre-repurchase period and post-repurchase period when seeking to determine the influence that the repurchase decision has on the variables of interest. This table is similar to Tables 3a and 3b (which report sample medians), with the results reported for both the full sample and across firms having relative decreases in borrowing and increases in borrowing.

The results from Table 5a provide additional support for those seen in Table 3a. The constant term for the full sample for Debt variable is shown to be insignificant, indicating that the stock repurchase does not significantly affect a firm's leverage. However, the constant term for the borrowing increase sub-group is shown to be positively significant at the .01 level, providing additional support for H5: firms that increase their relative borrowing in the repurchase are not shown to have a debt-to-equity ratio that differs from those of their matched pairs in the year of repurchase. On the other hand, firms decreasing their borrowing display a negative (significant at the 1% level) coefficient on the constant term, indicating that the transaction moves them farther away from their target leverage. This result is consistent with the free cash flow hypothesis, where firms that have excess cash choose to repurchase both debt and equity.

Table 5a results for risk across the full sample show that only the variability of earnings (EARNVAR) declines in the post period, while Altman's Z (ALT Z) shows no change. An examination of the sub-samples shows that the constant for EARNVAR is negative and significant across borrowing groups. However, the coefficient is significantly higher (-.008) for firms increasing their borrowing than for those decreasing

their borrowing (-.004). This decline in risk is consistent with the findings of Bartov (1991), indicating that the repurchase may signal information related to reduced variability of the firm's future earnings. Further, these finding suggest that ex ante estimates of EARNVAR be used in any test concerning any test of the predictions of the trade-off theory. The sub-sample results from ALT Z are somewhat surprising. Firms increasing their borrowing are shown to have a significant increase in risk in the post period, while firms decreasing their borrowing show a decrease in risk in the post period. ALT Z may be more sensitive to the additional risk from the increased borrowing in the repurchase year, while EARNVAR may not be sensitive to these changes because it is computed using operating income before any interest deduction.

Table 5b confirms the finding from Table 3b that firms repurchasing their stock are selling assets, significant for the full sample at .01 level. As in Table 3a, these asset sales are significant only in the borrowing decrease sub-sample. Capital expenditures are shown to be negative and marginally significant at the .10 level only for the borrowing decrease sub-sample. The findings suggest that borrowing decrease firms both increase asset sales and decrease capital expenditures, both of which are consistent with the free-cash-flow hypothesis, where the firm is eliminating poorly performing assets. Confirming recent research supporting free cash flow, cash flow (CF) is found to be positive and significant only for firms decreasing their borrowing. Since these firms are also shown to have both significant asset sales and declining capital expenditures in the post period, these improvements in cash flow may be the result of restructuring activities, allowing the firms to be more efficient with their remaining asset base.

2.6 Multivariate Results

2.6.1 Motivations for the Repurchase Decision

Table 6 presents a logistic regression that examines the joint influences of a firm's decision to repurchase stock, using repurchasing firms and their matched control firms.[15] The sample is subdivided in the same manner as in preceding tables, across relative changes in borrowing. A positive coefficient indicates that an increase in the corresponding variable increases the probability of repurchase. Variable definitions are provided in Figure 1.

$$\Pr(\text{Repurchase}_t) = \alpha_0 + \alpha_1 \text{LnAssets}_t^{t} + \alpha_2 \text{Debt}_t^{t-1} + \alpha_4 \text{AMTR}_t^{t-1} + \alpha_5 \text{VAR}_t^{t-1} + \alpha_6 \text{BM}_t^{t}$$

$$(-) \qquad (-) \qquad (-) \qquad (-)$$

$$+ \alpha_7 \text{Cash}_t^{t} + \alpha_8 \text{ASALE}_t^{t} + \alpha_9 \text{ASALE}_t^{t-1} + \alpha_{10} \text{Oper}_t^{t} + \alpha_{11} \text{OPER}_t^{t-1} + \varepsilon_t \quad (1)$$

In order to determine whether tax and risk explanations are important factors in a firm's decision to repurchase its stock, it is necessary to control for alternative explanations of the repurchase transaction. These include information asymmetry (Ln Assets), undervaluation (Opic, B/M, CF), free cash flow (ASALES), and excess cash (CF).

Confirming previous findings in the literature, firm size (ln ASSETS) is shown to be positive and significant across all samples, indicating that larger firms are more likely to repurchase their stock. This evidence is consistent with the free-cash-flow hypothesis

because large firms tend to grow at lower rates than small firms do. Also, larger firms simply have more equity to repurchase than smaller firms, partly because of the high-issuance costs of equities. The leverage variable (DEBT) is shown to be highly negatively significant across both the full sample and each of the sub-sample groups, indicating that a capital structure incentive exists for all repurchase firms. However, this consideration is more important to those firms increasing their borrowing (coefficient -2.750) than those decreasing their borrowing (-1.391). This finding, consistent with H1, indicates the importance of capital structure motivations as they relate to leverage. The full sample finding also indicates the need to consider the motivations relating to tax and risk. As predicted in H2 and H3, tax and risk considerations are shown to be significantly related to a firm's repurchase decision only for the subgroup of firms with increases in borrowing. The results for the full sample logistic regression indicate that the tax benefits are positively related at the .01 level, and that the default costs (risks) are negatively related at the .10 level with the repurchase transaction. These findings support the broader hypothesis presented in this paper that capital structure motives should be considered in any study of why firms repurchase stock. These results further reveal that the manner in which the repurchase is financed is related to the firm's capital structure motives.

Also consistent with previous findings, asset sales are shown to be negative and significant across the full sample, suggesting that firms sell assets and use the share

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[15] Models are also run using the alternative tax variable (KINK), and pre-median and post-median paired difference values; the results are consistent with those in Table 6.

repurchase to distribute the excess cash to their shareholders. However, when the borrowing group sub-samples are considered, this variable is only negatively significant for firms with decreases in borrowing. Firms increasing their borrowing actually increase their assets, at the .01 level, in the year of the repurchase. Operating income (OPINC), the proxy for undervaluation within this study, is shown to be insignificant in the year of repurchase. OPINC in the year following the repurchase announcement is shown to be positive and significant, providing some evidence that repurchasing firms improve performance.

2.6.2 Determinants of Repurchasing Firm's Decision to Increase Relative Borrowing

Table 7 presents logistic regression results that examine the determinants in the decision to finance the repurchase of stock through borrowing. A positive coefficient indicates that an increase in the corresponding variable increases the probability of a relative debt increase. This model's purpose is to show that increases in relative borrowing are positively related to the firm's tax benefits and negatively related to default costs.[16] Prior research shows that tax and risk considerations are important motivations in the decision to increase debt. Table 7 confirms previous findings.

$$\Pr(\text{DebtIncrease}_i) = \alpha_0 + \alpha_1 \text{LnAssets}_i^t + \alpha_2 \text{CAPINT}_i^{t-1} + \alpha_3 \text{Debt}_i^{t-1} + \alpha_4 \text{AMTR}_i^{t} + \alpha_5 \text{VAR}_i^{t}$$
$$(+) \qquad (+) \qquad (-) \qquad (+) \qquad (-)$$
$$+ \alpha_6 \text{BM}_i^t + \alpha_7 \text{Cash}_i^t + \alpha_8 \text{ASALE}_i^t + \alpha_9 \text{ASALE}_i^{t-1} + \alpha_{10} \text{Oper}_i^t + \alpha_{11} \text{OPER}_i^{t-1} + \varepsilon_i \quad (2)$$

The tax trade-off theory predicts that the tax benefit (H2) from increases in debt should be positively related to the borrowing decision, while the costs of debt, or the additional risk imposed from the borrowing, is negatively related to the borrowing decision (H3). Table 5 shows results that support the tax hypothesis: increased borrowing is positively associated with proxies for the firm's tax benefits, AMTR and KINK, both of which are significant at the .01 level, while default risk is negatively related (at the .01 level) to increased borrowing. These results support the predictions of the trade-off theory. Further, these results support H1: firms farther from their target leverage ratio in the year prior to the repurchase are more likely to increase their borrowing to re-balance their capital structure. The negative coefficient on DEBT confirms Hypothesis 1, which is significant at the .01 level.

With regard to the control variables, I include the same alternative explanations for repurchase as in Table 7, along with a proxy for capital intensity (CAPINT). Capital intensity is a significant factor in financing choice decisions and is used to measure collateral. It is predicted to be positively related to the use of debt because the debt may be collateralized by the fixed assets. Firm size may proxy for firms having lower *ex ante* costs of financial distress and/or lower informational costs associated with borrowing. Both of these explanations indicate a positive relationship with the use of debt. As expected, the results indicate that the likelihood of a borrowing increase is positively related to size (Ln ASSETS) and capital intensity (CAPINT). Asset sales (A.SALES) are, as expected, positive and significant, showing that borrowing firms are expanding

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[16] Graham (1996) shows that the incremental use of debt is positively related to marginal

their asset bases.

2.6.3 Determinants of the Market's Response to Repurchase Announcements

The average (median) market reaction (Table 1) to open-market stock repurchase transactions is 2.12% (1.33%) consistent with the findings of both Grullon (1999) and Ikenberry et al (1995). This analysis extends the work of Masulis (1980) to the open market repurchase setting and examines whether tax factors partially explain the market's positive reaction to repurchase announcements, while controlling for alternative explanations.

Table 8 presents a multivariate regression for analyzing the determinants of the market response to open-market repurchase announcements. It presents a regression of the three-day announcement period returns for firms that announced open-market repurchases, using the following model:

$$AR = \alpha_0 + \alpha_1 LnAssets_i^t + \alpha_2 Sought_i^t + \alpha_4 AMTR_i^{t-1} + \alpha_5 VAR_i^{t-1} + \alpha_6 BM_i^t + \alpha_7 Cash_i^t$$

(-) (+) (+) (-)

$$+\alpha_8 ASALE_i^t + \alpha_9 ASALE_i^{t-1} + \alpha_{10} Oper_i^t + \alpha_{11} OPER_i^{t-1} + \varepsilon_i \quad (3)$$

Tax theory predicts that the marginal tax rate of the firm should only be significantly positive for the sub-group of firms with a borrowing increase. This is because the relationship between taxes and the market response derives from the additional interest deductibility of debt, with the increase in the value of the firm equal to

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tax rates and negatively related with default risk.

the present value of the change in interest payments.

Table 8 shows that, for the full sample of repurchases, the marginal tax rate (AMTR) in the year prior to announcement is positively associated, at the .10 significance level, with the market's reaction to the announcement. However, as predicted above, only the sub-sample of firms increasing their relative borrowing is positively associated, at the .05 significance level, with the market response to the repurchase announcement. For the borrowing decrease sub-sample, the coefficient on AMTR is insignificant.

This result provides support for Masulis' (1980) finding that taxes can have an effect on firm value. Further, this finding confirms that tax considerations are important within the repurchase transaction and are an important element of the market's response to the announcement. EARNVAR for the year prior to repurchase is shown to be insignificant for the full sample, as well as across the two sub-samples. This finding does not support Hypothesis 3 that risk considerations may be important considerations for the market's reaction. Within the univariate results, risk was shown to decline in the years leading up to and following the repurchase announcement. This result may indicate that risk is not changing as a result of the repurchase. The increase in risk attributable to capital structure changes may be offset by the decrease in cash flow risk leading up to and following the repurchase.

As shown in previous studies, the percentage of shares sought is positively associated with CAR, indicating that the size of the repurchase is related to the market's response. Further, firm size (ln ASSETS), a proxy for information asymmetry, is

negatively associated with CAR, indicating that the market reaction is more pronounced for smaller firms. This finding and interpretation are both consistent with the findings of Ho, et al., who investigate the influence of information asymmetry on the market's reaction to open-market stock repurchase announcements.

2.7 Additional Empirical Test

2.7.1 Sensitivity Analysis

I use a matched-pair research design to examine my hypotheses. This research design has the advantage of providing a benchmark of comparison for firm characteristics while allowing for the control of particular attributes (i.e., in this study, the absence of repurchase, B/M quintile, 2-digit SIC code, and performance). Variables within each model are measured as the paired differences between the repurchasing firm and its matched pair control firm. Since borrowing is central to the hypotheses, one concern inherent in this approach may be that the borrowings of the repurchase firms are not captured by the paired difference measure for borrowing change. As a robustness check, the empirical tests are repeated using the actual borrowing change of repurchasing firms to partition the sample, with the results being qualitatively similar to those presented.

2.7.1.1 Sensitivity Analysis – Partitioning the Sample by the Ratio of Dollar Value of the Debt Change to the Dollar Value of the Repurchase

In addition, although tax and risk motives of the repurchasing firm have not been examined in the prior studies, tax and risk factors have been shown to be important

determinants to incremental debt and financing decisions.[17] Graham (1996), finds that tax factors are important to a firms borrowing decisions, consistent with the expectations of the trade-off theory. Because within this study, like Graham (1996), I partition by borrowing change, the issue of whether changes in stock (repurchases) provide a result different from that of the borrowing change alone is important; especially in cases where the degree of the debt change far outweighs the degree of the equity change.

Tables 9a and 9b attempt to address these concerns. The sample is partitioned into three groups using a variable PAYOUT, defined as:

$$\Delta DEBT_{[t-t+1]} / REPURCHASES_{[t-t+1]},$$

where both the total debt change and total repurchase amounts use the repurchase year and the year following to better capture the value of the entire transaction. PAYOUT is then divided into three sub-samples: Negative, where the debt change is negative; Greater2, where the debt change is more than two times the amount of repurchased stock; and 0>P0<2, where the amount of the debt change and amount of repurchased stock are quantitatively similar.

My focus within this analysis is on the third sub-group of firms, where the dollar amounts of the change in debt and equity are positive and bounded. The results for the third sub-group, reported in Table 9a and Table 9b, are consistent with those shown in the main analysis for firms increasing their borrowing. Furthermore, in comparing the sub-groups, it is interesting to note that the tax benefits (AMTR) and capital structure

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[17] See for example, Graham (1996), Mackie-Mason (1990), and Newberry (1998).

incentives (DEBT) are significantly greater for the bounded group (0>PO<2) than they are for the predominate debt change (GREATER2) group. The findings from Table 9a, examining the determinants of the firms' repurchase decisions, indicates that the bounded group (0>PO<2) are more underlevered (-5.025- Debt) than the predominant debt change (GREATER2) group (-1.235 – Debt). This finding, consistent with H1, indicates the importance of capital structure motivations as they relate to leverage. Further, the results show that the bounded group (0>PO<2) have greater tax benefits (1.698-AMTR) than the predominant debt change (GREATER2) group (1.361-AMTR). Table 9b shows that for the bounded group (0>PO<2) of repurchasing firms the marginal tax rate (AMTR) in the year prior to announcement is positively associated, t-statistic=2.16, while this positive significance for predominate debt change (GREATER2), t-statistic=1.29, was very near to traditional insignificance levels. These findings provide some assurance that the borrowing change alone is not the only determining factor in a firm's tax and risk motives.

As a further sensitivity test addressing whether the repurchase of stock combined with the use of borrowing provides additional power to the test of the trade-off theory beyond a debt change alone, I have selected an alternative matched pair sample for the bounded group (0>PO<2) presented in Table 9. The selection criteria varies from the main analysis on only one variable, debt change. I match firms according to the absence of a repurchase (in -1,0,+1), Compustat year, 2-digit SIC code, B/M quintile, and debt change (rather than operating income). Repeating the empirical test using these control firms, the results are qualitatively stronger than those presented within Table 7 for the

third sub-group of firms. The collective evidence suggests that the open-market stock repurchase combined with the use of debt may provide a stronger capital structure setting than debt changes alone. These findings are consistent with a sub-set of repurchases offering a relatively pure capital structure context in which the production and investment activities of the firm remain relatively constant.

2.7.1.2 Sensitivity Analysis: Correlation Analysis

Tables 10 and 11 present a correlation matrix of Equation 1 independent variables. Table 10 reports pairwise correlations between independent variables for the sample of firms announcing repurchase programs. Among the variables measuring the tax and risk motivations of the firm, the correlation between the tax benefits variables (KINK and AMTR) are positive, as expected by construction, while the correlation between the tax benefit variables (AMTR amd KINK) and risk (EARNVAR) are negative and significant at better than the .01 two-tail level. Moreover, the negative correlations between a firm's leverage ratio (DEBT) and the tax benefit variables are significant at better than the .01 two-tail level. Further the positive correlation between income (Oper) and cash flow (CF) with the tax benefit variables are significant at better than the .01 two-tail level.

The negative correlation between these tax benefit proxies (AMTR & KINK) and the tax cost proxy (EARNVAR) and leverage (Debt) are consistent with the hypotheses developed in my dissertation. Further, the positive correlation between the tax benefits

and performance indicate the need to control for these variables in any multivariate model.

Table 11 reports pairwise correlations between firms announcing repurchase programs (test) and their matched pairs (control). Similar inferences from those made from Table 10 can be drawn from these correlations. Moreover, it is apparent from the reduction in the correlations between the performance variables (Oper, CF, BM) and the capital structure variables (KINK and AMTR) that the matching procedure has reduced (controlled) some of the cross-sectional correlation between these variables.

2.7.1.3 Sensitivity Analysis: Outliers/Alternative Tax Proxy

In order to provide some assurance that outlying observations do not drive the results, Tables 12 and 13, variables are defined in terms of pre- and post- repurchase medians rather than yearly observations. The pre-period represents the median values of years -3, -2, -1 relative to the repurchase, while post-period represents the median values from years 0, +1,+2,+3.

Table 12 replicates the analyses of Table 6, which examines the joint influences of a firm's decision to repurchase stock using median values, shown by the modified Equation 1:

$$\Pr(\text{Repurchase}_i) = \alpha_0 + \alpha_1 \text{LnAssets}_{pre} + \alpha_2 \text{Debt}_{pre} + \alpha_3 \text{KINK}_{pre} + \alpha_4 \text{VAR}_{pre} + \alpha_5 \text{BM}_{pre} + \alpha_6 \text{Cash}_{post} + \alpha_7 \text{ASALE}_{post} + \alpha_8 \text{Oper}_{post} + \varepsilon_i \quad (1)$$

Also in Table 12, I use an alternative proxy (KINK) to measure the tax benefit firms derive from a leverage-increasing repurchase, in order to show that the results are robust

to alternative tax proxies. The results in Table 12 are generally consistent with those in Table 6. The leverage variable (Debt) is shown to be highly significant across both the full sample and each of the sub-sample groups, indicating that a capital structure incentive exists for all repurchase firms. However, this consideration is more important to those firms increasing their borrowing. Further, consistent with Table 6, the tax and risk considerations are significantly related to a firm's repurchase decision and show a stronger relationship with the subgroup of firms with increases in borrowing.

As in Table 6, asset sales are shown to be negative and significant for firms with decreases in borrowing, suggesting that these firms sell assets and use the share repurchase to distribute the excess cash to their shareholders. Operating income (OPINC), the proxy for undervaluation within this study, is shown to be positive and significant, providing some evidence that repurchasing firms improve performance following the repurchase announcment.

Table 13 replicates the analyses of Table 8, analyzing the determinants of the market response to open-market repurchase announcements, using median values, shown by the modified Equation 3:

$$AR = \alpha_0 + \alpha_1 LnAssets_{pre} + \alpha_2 Sought_t + \alpha_4 KINK_{pre} + \alpha_5 VAR_{pre} + \alpha_6 BM_{pre} + \alpha_7 Cash_{post} + \alpha_8 ASALE_{post} + \alpha_{10} Oper_{post} + \varepsilon_t \quad (3)$$

Also in Table 13, I use an alternative proxy (KINK), as explained above to show that the results are robust to alternative tax proxies.

Results in Table 13 are generally consistent with those in Table 8. The tax benefit variable (KINK) is positively associated, at the .05 significance level, with only the sub-

sample of firms increasing their borrowing, while the risk measure EARNVAR for the year prior to repurchase is shown to be insignificant for the full sample as well as across the two sub-samples. Also as shown in Table 8, the percentage of shares sought is positively associated with CAR, indicating that the size of the repurchase is related to the market's response. Further, firm size (Ln ASSETS), a proxy for information asymmetry, is negatively associated with CAR, indicating that the market reaction is more pronounced for smaller firms. Overall, the results in Tables 12 and 13 indicate that outlying observations were not driving results reported previously.

CHAPTER III

SUMMARY AND CONCLUSION

This study examines the role tax and risk considerations play in open-market stock repurchase transactions. I approached stock repurchase transactions from a financing perspective by partitioning firms by changes in borrowings. I extend the repurchase literature by examining the tax and risk motivations for firms repurchasing their stock and increasing their borrowing, while controlling for the alternative explanations for repurchases.

The findings indicate that tax and risk motivations are important determinants in stock repurchases when these transactions are accompanied by increases in borrowing. The evidence is also consistent with these transactions being used, in part, by firms to re-balance their capital structure in a manner consistent with the predictions of the tax trade-off theory. These results suggest that the capital structure motivations for the firms need to be considered in any study of seeking to explain why firms repurchase stock.

Further, I find that these tax benefits are positively associated with the market's response to the stock repurchase announcement. My results provide support for Masulis' (1980) finding that taxes can have an effect on firm value, coupled with the results showing firms rebalancing their capital structure in a manner consistent with the tax trade off theory, indicates that firms can increase firm value through capital structure changes.

In addition, I investigate whether tax and risk considerations offer differing

explanations for the repurchase decision across the sample partitioned by quartiles of growth. Using proxies for growth opportunities, recent research has differentiated between the signaling and free cash flow theories as explanations of the positive investor reaction to announcements of stock repurchases. The results, from partitioning the sample by growth, do not yield any interesting insights into how the firm's capital structure incentives may change across growth quintiles. I expected to find that higher growth firms would have greater capital structure incentives than lower growth firms. However, certain considerations oppose this expectation. Growth firms are often shown to have high costs associated with debt financing, caused by agency problems. Further, lower growth firms with free cash flow problems may increase borrowings as part of a repurchase transaction in order to bond their promise to pay out future cash flows.

Collectively, these results suggest that debt-financed repurchases are being used, in part, to re-balance firms' capital structures, and that the resulting tax benefits have a positive influence on firm value.

APPENDIX A

FIGURES

Figure 1

Variable Definitions

Variable Name	Description	Compustat Items
lnAssets	Log of the book value of assets at time t.	ln(d6)
MVA	Market Value of Assets at time t-1 (MV Equity plus BV Debt plus Preferred Stock - Cash).	(25*199)+(9+34)+130-1
A.SALES	Change in book value of assets, less capital expenditures, plus depreciation, as a percentage of beginning book value of assets.	[6-(Lagged 6)-128+14] /lagged 6
OPINC	Return on Assets Operating Income before depreciation, interest, and taxes (EBITDA) as a percentage of beginning-of-year market value of assets.	13/MVA
CF	Cash Flows (Earnings before extraordinary Items + depreciation and amortization).	(18+14)/MVA
B/M	End-of-year book value of common equity, divided by end-of year market value of common equity.	60/(25*199)
CAPEXP	Ratio of capital expenditures to market value of assets.	128/MVA
DIVYLD	Dividend Yield	26/199
REPUR	Purchases of common and preferred stock adjusted for treasury shares reserved for stock options divided by market value.	(115-215)/MVA
AR	Announcement period abnormal returns – are three-day (-1,0,+1) returns adjusted by the CRSP equally-weighted index.	
SOUGHT	Fraction of shares sought divided by shares outstanding when repurchase is announced.	shares sought /shares outstanding

Figure 1 (continued)

Variable Definitions

Variable Name	Description	Compustat Items
KINK	The amount of interest deductions, relative to the actual recorded amount of interest, before the marginal benefit of incremental interest would decline.	
BMTR	Graham's pre-financing marginal tax rate	
AMTR	Graham's after financing marginal tax rate	
EARNVAR	Earnings Variability: Standard deviation of EBIDT(t)-EBITDT(t-1) divided by total assets over the current and five preceding years (at least four years)	Std_deviation[(13-(Lagged13))/(avg 6)]
ALT Z	1.2*(working capital/total assets)+ 1.4*(retained earnings/total assets) 3.3*(EBIT/total assets)+1.0*(Sales/total assets)	d6/ [(1.2*d179)+ (1.4*d36)+((3.3*d170) +d15)+d12]
DC	Debt Change: One-year change in long-term debt plus short-term debt at time t.	[9+34-(Lagged 9) -(Lagged 34)]/MVA
DEBT	Leverage Ratio: Ratio of book long-term debt plus book short-term debt to the market value of equity.	(9+34)/MVA
ALT-DC	Alternate Debt Change: One year change in book value of debt/market value of assets	(6-60-130-(Lag(6-60 -130)))/(25*199)
ALT-LEV	Alternate Leverage Ratio: End-of-year market value of assets, divided by end-of-year book value of equity.	(6-60-130)/((25*199) +130)
CAPI	Ratio of book value of PPE to firm value.	8/MVA

Figure 2

Matched Pair Design

To provide a benchmark for the repurchasing firms, I generated a matched-pair sample of comparison firms. All values in both univariate and multivariate tables are defined as paired differences between repurchasing firms and control firms. As in Nohel and Tarhan (1998), the match firms were selected using a variation of the procedure suggested by Barber and Lyon (1996). This procedure places the focus on matching firms on pre-event income performance and is used in this study in order to control for changes in performance, free cash flow, and capital structure variables leading up to and following the repurchase announcement. Barber and Lyon (1996) show that, if abnormal returns are a primary variable of interest, the control firms should be selected based on pre-event performance. Since the treatment is the repurchase announcement, I match each repurchasing firm to a comparison firm that did not repurchase stock in either the year prior to the announcement of the repurchasing firm, the event year itself, or the following year. The following match attributes are listed in order of importance: book/market quintile, Compustat year, positive or negative performance, performance, standard industrial classification code, and size. I used a computerized matching program which produces the matched set with the smallest total distance between cases and matched controls (Bergstralh & Kosanke 1995). The restrictions imposed are relaxed in the following order:

1. Performance[18] ± 10%, same fiscal year[19], performance sign[20], same book/market quintile[21], same two-digit SIC code.

2. Performance ± 20%, same fiscal year, performance sign, same book/market quintile, same two-digit SIC code.

3. Performance ± 30%, same book/market quintile, same one-digit SIC code.

The findings appear to be robust to the control firm sample selection design, alternative definitions of some variables, and the use of different scalars. I have selected control samples using the book value of assets to scale the lagged performance measure (OPER) used in the matching procedure as well as all variables used in the multivariate test and find that the results are qualitatively similar to those presented in the paper. Further, I run the multivariate models without the variability of earnings (EARNVAR), which requires four years of data to compute, and the results are robust to the changes in the sample. Also, I drop the restrictions on control firms having the same fiscal year, performance sign, and book/market quintile. Repeating the empirical tests with control firms chosen by these three different matching procedures produced qualitatively similar results, and the results are robust with respect to these alternative specifications.

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[18] Performance is measured as the return on the market value of assets (OPINC) in the year prior to repurchase.

[19] Fiscal year is a dummy variable coded 1 if fiscal year is January through June and coded 0 if fiscal year is July through December.

[20] Performance Sign is a dummy variable coded 1 if OPINC is negative and coded 0 if OPINC is positive.

[21] The book/market quintiles are determined for all repurchasing firms that meet all the data restrictions and the match control firms are required to fall within the same book/market quintile.

APPENDIX B

TABLES

Table 1

Descriptive Statistics of the Sample of Firms Announcing Stock Repurchase Programs in the period 1984-1994

This table presents descriptive statistics for 1,257 open-market repurchase program announcements reported by the Securities Data Company (SDC) for the period 1984 through 1994.

	Number of	Percent of	Percentage of Shares Sought		Abnormal Return		SIZE (millions of $)		Book-to-Market Ratio		Debt Change in Repurchase Year	
Year	Firms	Sample	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
84	65	5.2%	9.7%	7.1%	3.8%	2.7%	1,474	587	69.0%	61.8%	2.0%	0.6%
85	60	4.8%	10.0%	7.8%	1.9%	1.4%	6,674	536	72.3%	69.6%	3.6%	0.7%
86	98	7.8%	9.4%	8.1%	2.1%	1.7%	3,769	621	59.5%	56.8%	9.2%	0.0%
87	71	5.6%	8.6%	7.7%	1.3%	1.0%	4,693	831	63.9%	62.7%	5.8%	2.3%
88	147	11.7%	8.5%	6.5%	2.2%	1.7%	3,921	541	70.6%	64.0%	3.1%	1.2%
89	210	16.7%	7.2%	5.8%	2.8%	1.7%	1,455	247	81.4%	73.4%	1.7%	0.1%
90	85	6.8%	6.5%	5.0%	2.4%	2.0%	1,974	269	70.9%	65.9%	-0.2%	-0.3%
91	134	10.7%	6.7%	5.3%	2.4%	1.8%	1,564	195	61.5%	52.5%	0.6%	0.0%
92	145	11.5%	6.7%	5.6%	2.2%	1.5%	2,085	405	50.6%	46.6%	0.9%	0.0%
93	217	17.3%	6.5%	5.3%	2.4%	1.3%	1,840	326	60.8%	51.4%	1.2%	0.0%
94	25	2.0%	6.2%	4.7%	1.6%	1.7%	836	89	68.4%	57.4%	3.0%	0.0%
Entire Sample	1257	100.0%	7.8%	6.3%	2.3%	1.7%	2,753	423	66.3%	60.2%	2.8%	0.4%

Notes:

1) Descriptive Statistics are provided for all observations meeting the requirements of multivariate model specifications.
2) See variable definitions in Figure 1.

Table 2

Descriptive Statistics for Matched Pair Differences Between Repurchasing Firms and their Matched Pair Control.

Descriptive Statistics for yearly paired differences variables between firms announcing repurchase programs (test) and their matched pair (control).

		Repurchase Firms		Matched Control Firms		Paired Differences			
Variable	N	Mean	Median	Mean	Median	Mean	t	Median	t
Sought	1265	7.7%	5.6%						
Abnormal Returns	1257	2.12%	1.33%						
OPINC(Year -1)	1261	17.40%	15.68%	17.94%	15.70%	-0.56%		0.00%	
CF	1265	10.44%	9.88%	9.04%	9.26%	1.40%	***	0.00%	***
B/M	1265	63.11%	57.42%	64.76%	57.31%	-1.63%		0.00%	
ln ASSETS	1265	6.18	6.01	5.04	4.86	1.13	***	0.86	***
MVA(Year 0)	1265	3106.80	430.33	1450.44	134.85	1656.35	***	102.36	***
REPUR	1196	2.38%	0.95%	-1.98%	-0.40%	4.32%	***	2.00%	***
A.SALES(Year 0)	1265	7.71%	4.31%	11.33%	6.65%	-3.63%	***	0	***
A.SALES(Year +1)	1265	6.90%	4.41%	9.49%	4.94%	-2.58%	***	0.00%	***
CAPEXP	1265	6.56%	5.05%	7.58%	5.29%	-1.02%	***	0.00%	***
EARNVAR	1265	4.80%	3.43%	7.23%	4.94%	-2.43%	***	-0.48%	***
ALT Z	1132	2.55	2.57	2.17	2.23	0.37	***	0.12	***
DC(Year 0)	1265	2.51%	0.00%	3.39%	0.00%	-0.88%		0.00%	
DC(Year +1)	1265	3.61%	0.07%	3.33%	0.00%	0.28%		0.00%	*
DEBT(Year -1)	1265	22.36%	15.86%	28.65%	23.41%	-6.29%	***	-1.03%	***
DEBT(Year 0)	1265	23.93%	16.68%	30.83%	24.81%	-6.90%	***	-0.90%	***
KINK(Year -1)	1265	4.15	4.00	2.94	2.00	1.21	***	0.00	***
AMTR(Year -1)	1264	28.65%	34.00%	22.89%	33.50%	5.74%	***	0.00%	***

Notes:

1) Significance levels of 10% (*), 5% (**), and 1% (***) indicated.

2) See variable definitions in Figure 1.

Table 3a

Median Differences Between Test and Control Firms by Year

Variables represent proxies for tax and risk motivations for the financing choices in the year of stock repurchase. The results are shown for the full sample of 1265 firs and for subsamples of firms based on relative changes in financial leverage. Results shown are for the median paired differences for each variable. Definitions of each variable are displayed in Figure 1. Results are evaluated using a nonparametric differences in median test and differences significantly different from zero at 1% and 5% level are marked with ** and *, respectively. Year zero is the year of the repurchase. See variable definitions in Figure 1.

Year	DEBT	KINK(Mean)	AMTR(Mean)	EARNVAR	ALT Z	DC
Panel A: Full Sample						
-3	-0.07%**	1.23**	6.33%**	-0.27%**	0.073**	0.00%
-2	-0.46%**	1.23**	6.34%**	-0.28%**	0.083**	0.00%
-1	-1.03%**	1.21**	5.74%**	-0.36%**	0.015**	0.00%
0	-0.90%**	1.23**	5.97%**	-0.48%**	0.117**	0.00%
1	0.00%**	1.25**	5.56%**	-0.56%**	0.105**	0.00%**
2	0.00%**	1.18**	5.92%**	-0.45%**	0.078**	0.00%**
3	0.00%**	0.98**	5.60%**	-0.59%**	0.053**	0.00%
Panel B: Firms with Decreases in Borrowing						
-3	0.00%*	0.88**	4.91%**	0.00%**	0.000**	0.00%
-2	0.00%	0.92**	4.66%**	0.00%**	0.000*	0.00%
-1	0.00%**	0.76**	3.74%**	0.00%**	0.000	0.00%*
0	0.00%**	0.91**	4.44%**	0.00%**	0.000**	-3.72%**
1	0.00%**	1.07**	3.86%**	0.00%**	0.029**	0.00%
2	0.00%**	1.05**	4.94%**	0.00%**	0.000**	0.00%*
3	0.00%**	0.88**	4.98%**	-0.01%**	0.000**	0.00%
Panel C: Firms with Increases in Borrowing						
-3	-6.72%**	1.67**	8.14%**	-1.11%**	0.371**	0.11%
-2	-8.44%**	1.63**	8.49%**	-1.30%**	0.433**	0.04%
-1	-7.38%**	1.80**	8.30%**	-1.29%**	0.435**	0.36%
0	-1.50%	1.65**	7.92%**	-1.33%**	0.261**	5.64%**
1	-0.77%	1.46**	7.67%**	-1.37%**	0.235**	1.13%**
2	0.08%	1.35**	7.06%**	-1.45%**	0.218**	0.66%*
3	-0.25%	1.09**	6.30%**	-1.39%**	0.281	0.49%
Panel D: Wilcoxan Non-Parametric Test of Medians Between Panel A and Panel B Firms						
-3	-2.92**	-3.99**	-2.73**	-2.55*	3.12**	0.57
-2	-4.81**	-3.71**	-3.41**	-3.03**	3.62**	-0.14
-1	-4.65**	-5.59**	-4.26**	-2.55*	4.00**	1.88
0	3.65**	-3.95**	-3.23**	-3.09**	-0.26	30.59**
1	3.17**	-1.88	-3.56**	-3.77**	-0.47	2.36*
2	3.67**	-1.31	-1.66	-3.31**	-0.28	0.69
3	1.68	-0.79	-0.93	-2.37*	-0.43	0.64

Table 3b

Median Differences Between Test and Control Firms by Year
Significance Levels of 5% (*) and 1% (**) Indicated

These variables represent alternative explanations for the financing choices in the year of the stock repurchase. See variable definitions in figure 1.

Year	ASALES	CAPEXP	OPINC	CF	B/M
Panel A: Full Sample					
-3	0.00%	0.00%	0.00**	0.13%**	0.00%**
-2	0.00%	0.00%	0.00	0.00%**	0.00%
-1	0.00%*	0.00%	0.00	0.00%*	0.00%
0	0.00%**	0.00%**	0.00	0.00%**	0.00%
1	0.00%	0.00%	0.00**	0.27%**	0.00%*
2	0.00%	0.00%*	0.00**	0.00%**	0.00%
3	0.00%	0.00%	0.00*	0.00%*	0.00%*
Panel B: Firms with Decreases in Borrowing					
-3	0.00%	0.00%	0.00**	0.00%**	0.00%
-2	0.00%	0.00%	0.00	0.00%	0.00%
-1	0.00%**	0.00%	0.00	0.00%	0.00%
0	-2.41%**	0.00%**	0.00	0.00%*	0.00%
1	0.00%	0.00%	0.00**	0.00%**	0.00%
2	0.00%	0.00%	0.00**	0.00%**	0.00%
3	0.00%*	0.00%	0.00*	0.00%*	0.00%
Panel C: Firms with Increases in Borrowing					
-3	2.06%	-0.12%	0.02**	1.86%**	-4.61%**
-2	1.50%	0.01%	0.01	1.23%**	-2.51%
-1	0.44%	0.00%	0.00	0.78%*	-1.33%
0	2.51%**	0.15%	0.01	0.82%**	-1.97%
1	-1.27%	0.40%*	0.02**	1.12%**	-1.71%
2	0.50%	0.32%	0.01**	0.76%**	-1.39%
3	-0.25%	0.00%	0.00	0.20%	-4.54%
Panel D: Wilcoxan Non-Parametric Test of Medians Between Panel A and Panel B Firms					
-3	1.36	-0.95	1.87	1.59	-2.66**
-2	1.14	0.70	1.44	2.37*	-2.16*
-1	2.18*	1.21	-0.48	1.39	-1.84
0	11.23**	5.76**	0.47	1.25	-0.98
1	0.43	2.64**	-0.15	-0.15	-0.21
2	0.29	1.38	0.60	-0.57	-0.39
3	-1.02	1.30	0.02	-0.09	-0.96

Table 4

Median Differences Between Test and Control Firms by Growth Quintile

Growth quintiles are based on percentile ranking for repurchase firms. See variable definition in Figure 1.

Growth Quintile		DEBT Year(t-1)	KINK (Mean) Year(t-1)	ANTR (Mean) Year(t-1)	EARNVAR Year(t-1)	ASALES Year(0)
Panel A: Full Sample						
HIGH	1	-1.08%**	1.676**	7.85%**	-0.016**	-0.43%*
	2	-2.20%**	1.377**	6.60%**	-0.003**	-1.04%**
	3	-1.98%**	0.0728**	4.99%**	0.000**	-0.10%*
	4	-0.96%**	1.137**	4.22%**	-0.002**	0.00%*
LOW	5	0.00%	0.781**	4.59%**	0.000*	0.00%
Panel B: Firms with Decreases in Borrowing						
HIGH	1	0.00%	0.963**	6.48%**	-0.005**	-2.70%**
	2	0.00%**	1.06**	3.46%*	0.000*	-4.59%**
	3	0.00%	0.468	2.08%	0.000*	3.25%**
	4	0.00%	0.503	1.38%	0.000*	-1.14%**
LOW	5	0.00%	0.558*	4.85%**	0.000	0.00%
Panel C: Firms with Increases in Borrowing						
HIGH	1	-5.45%**	2.434**	11.03%**	-0.028**	1.01%
	2	-7.00%**	1.873**	7.78%**	-0.011**	2.00%
	3	-6.98%*	1.096**	9.12%**	-0.005	0.93%*
	4	-12.19%**	1.987**	5.43%*	-0.011*	0.29%
LOW	5	-13.42%	1.029**	5.35%	-0.009	0.44%
Panel D: Wilcoxan Non-Parametric Test of Medians Between Panel B and Panel C Firms						
HIGH	1	-2.74**	-3.70**	-2.32*	-1.38	1.24
	2	-1.46	-1.96*	-1.95*	-1.50	1.33
	3	-1.43	-1.60	-3.00**	-0.14	0.27
	4	-2.66**	-3.36**	-1.53	-1.30	1.23
LOW	5	-2.23*	-1.33	-0.15	-0.72	0.49

Notes:

1) Significance Levels of 5% (*) and 1% (**) Indicated.
2) T-test for differences in means reported for KINK and AMTR.

Table 5a

Regression of Post-Repurchase on Pre-Repurchase Median Paired Differences

Results from regressing post-repurchase values on pre-repurchase values, for variables representing tax and risk motivations for the financing choices in the years leading up to, and following, stock repurchase announcements.

The table reports regression results of the form: $POSTVAL = \alpha + \beta PREVAL + \varepsilon$,
where POSTVAL represents the paired difference of median post-repurchase values of a variable, and PREVAL represents the paired difference of median pre-repurchase values of a variable. The pre-repurchase period covers years −3 through −1 and the post-repurchase period covers years 0 through +3.

Variable	Intercept	B-Value	R2	F Statistic
Panel A: Full Sample				
EARNVAR	-0.007***	0.555***	0.538	1419.3***
ALTZ	.0170	.708***	0.5749	1319.36***
DEBT	-0.005	0.581***	0.401	950.4***
KINK	0.126*	0.639***	0.496	1395.6***
AMTR	0.018***	0.436***	0.244	455.7***
Panel B: Firms with Decreases in Borrowing				
EARNVAR	-0.004**	0.565***	0.545	700.9***
ALTZ	.136***	.730***	0.584	641.6***
DEBT	-0.057***	0.634***	0.434	531.9***
KINK	0.326***	0.623***	0.496	682.2***
AMTR	0.018**	0.457***	0.245	224.1***
Panel C: Firms with Increases in Borrowing				
EARNVAR	-0.009***	0.544***	0.527	703.0***
ALTZ	-.092***	.708***	0.586	728.6***
DEBT	0.046***	0.553***	0.406	497.0***
KINK	-0.083	0.661***	0.501	730.5***
AMTR	0.018***	0.420***	0.237	224.9***

Notes:
1) Significance levels of 10% (*), 5% (**), and 1% (***) indicated.
2) See variable definitions in Figure 1.

Table 5b

Results from regressing post-repurchase values on pre-repurchase values, for variables representing alternative explanations for the financing choices in years leading up to, and following, stock repurchase announcements.

The table reports regression results of the form: $POSTVAL = \alpha + \beta PREVAL + \varepsilon$,
where POSTVAL represents the paired difference of median post-repurchase values of a variable, and PREVAL represents the paired difference of median pre-repurchase values of a variable. The pre-repurchase period covers years -3 through -1 and the post-repurchase period covers years 0 through +3

Variable	Intercept	B-Value	R2	F Statistic
Panel A: Full Sample				
A.SALES	-0.029***	0.102***	0.022	32.4***
OPINC	-0.003	0.045**	0.002	4.3**
CF	0.001	0.087***	0.016	23.0***
B/M	-.0240***	0.097	0.009	13.6 ***
CAPEXP	-0.002	0.267***	0.145	102.8***
Panel B: Firms with Decreases in Borrowing				
A.SALES	-0.1***	0.1***	0	18.0***
OPINC	-0.001	0.057*	0.004	3.5*
CF	0.007**	0.143***	0.026	18.2***
B/M	-0.014	.172***	0.024	17.8 ***
CAPEXP	-0.005*	0.287***	0.169	107.8***
Panel C: Firms with Increases in Borrowing				
A.SALES	-0.005***	0.076***	0.013	10.3***
OPINC	-0.005	0.038	0.001	1.6
CF	-0.007**	0.061***	0.012	9.5***
B/M	-.035***	0.036	0.000	0
CAPEXP	0.001	0.222***	0.128	83.0***

Notes:

1) Significance levels of 10% (*), 5% (**), and 1% (***) indicated.
2) See variable definitions in Figure 1.

Table 6

Logistic Regression Results for Analyzing the Determinants of the Decision to Repurchase Stock.

Dependent variable takes value of 1 for repurchase, 0 otherwise. Values used are yearly paired differences between the test and control firms for the years indicated. Chi-squared statistics provided.

Yearly Paired Differences	Predicted Sign Borrowing Increase Group	Full Sample n= 1257	Borrowing Decrease n=712	Borrowing Increase n=545
Constant		-1.428	-0.67	-2.362
		44.1***	5.9**	40.2***
Ln Asset (t)	+	0.271	0.181	0.385
		112.9***	31.7***	77.4***
Debt (t-1)	-	-2.006	-1.391	-2.75
		78.5***	23***	52.6***
AMTR (t-1)	-	1.041	0.594	1.784
		12.5***	2.3	13.8***
EARNVAR (t-1)	-	-1.929	-1.117	-4.703
		5**	1.3	8***
B/M (t-1)		0.329	-0.111	1.093
		5.4**	0.4	18.6***
CF (t)		0.864	1.216	1.972
		0.8	1.2	0.8
ASALE (t)		-0.743	-2.17	2.06
		11.2***	45.3***	21***
A.Sale (t+1)		-0.653	-0.436	-1.285
		8.7***	2.6	9.1***
OPINC (t)		-0.305	-0.256	-2.454
		0.1	0.1	1.7
OPINC (t+1)		0.991	1.015	1.231
		4.1**	2.7	2
% Correct Predictions		72%	71%	77%
Likelihood Ratio Test		355***	170***	289.2***

Notes:

1) Significance levels of 10% (*), 5% (**), and 1% (***) indicated.
2) See variable definitions in Figure 1.

Table 7

Logistic Regression Results for Analyzing the Determinants in the Decision to Finance the Repurchase of Stock Through Borrowing.

Dependent variable takes value of 1 for increased borrowing, 0 otherwise. Values used are yearly paired differences between the test and control firms for the years indicated. Chi-squared statistics provided. Significance levels of 10% (*), 5% (**), and 1% (***) indicated. See variable definitions figure 1.

Variables	Predicted Sign	Model 1 n=1257	Model 2 n=1257
Intercept		-0.361	-0.316
		22.44***	17.65***
ln ASSETS (t)	+	0.010	0.079
		10.42***	7.28***
CAPINT (t-1)	+	1.259	1.219
		18.76***	17.74***
DEBT (t-1)	-	-0.741	-1.134
		5.69**	14.94***
KINK (t-1)	+	0.107	
		21.63***	
AMTR (t-1)	+		0.989
			7.68***
EARNVAR (t)	-	-0.336	-1.245
		0.12	1.77*
B/M (t)		-0.592	-0.546
		1.87*	1.55
CF (t)		-4.569	-4.588
		10.01***	10.15***
A.SALES (t)	-	4.148	4.092
		103.89***	102.23***
A.SALES (t)		0.079	0.106
		0.08	0.14
OPINC (t)		-0.094	0.078
		0.00	0.00
OPINC (t)		-0.664	-0.738
		1.24	1.56
Borrowing Decrease		712	712
Borrowing Increase		545	545
Likelihood Ratio		240.60***	221.20***
% Correct Predictions		74%	73%

TABLE 8

Multivariate Regression Results for Analyzing the Determinants of Market Reaction to the Stock Repurchase Announcement.

Dependent Variable is cumulative abnormal returns for t-1, t=0, t+1 using the CRSP equally weighted index as the market return. Values used are Yearly Paired Differences between the test and control firms for the year indicated. Chi-squared statistics provided. Significance levels of 10% (*), 5% (**), and 1% (***) indicated. See variable definitions figure 1.

$$AR_t = a_0 + a_1 SOUGHT + a_2 LnAsset_t + a_3 KINK_{t-1} + a_4 EARNVAR_t + a_5 B/M_t + a_6 CF_t + a_7 A.SALE_t + a_8 A.SALE_{t+1} + a_9 OPINC_t + a_{10} OPINC_{t+1}$$

Yearly Paired Differences	Predicted Sign	FULL SAMPLE	Borrowing Decrease	Borrowing Increase
Intercept		0.019	0.024	0.011
		7.06***	6.69***	2.43**
SOUGHT	+	0.001	0.001	0.001
		2.84***	2.08**	1.97**
Asset (t)	-	-0.002	-0.003	-0.002
		-2.81***	-2.31**	-1.38
AMTR (t-1)	+	0.017	0.009	0.027
		1.65*	0.6	2***
EARNVAR (t)	-	0.040	0.051	0.021
		1.61	1.47	0.59
B/M (t)		-0.011	-0.014	-0.012
		-0.89	-0.74	-0.71
CF (t)		0.009	-0.002	0.022
		0.25	-0.04	0.41
A.SALE (t)		0.011	0.016	0.012
		1.35	1.43	0.95
A.Sale (t+1)		-0.022	-0.015	-0.032
		-2.7***	-1.31	-2.78***
OPINC (t)		0.016	0.055	-0.019
		0.43	0.96	-0.37
OPINC (t+1)		0.005	-0.013	0.021
		0.26	-0.51	0.9
	R-Square	0.028	0.031	0.030
	F	3.53***	2.24**	1.92**
	N	1257	712	545

Table 9A– Sensitivity Analysis

Logistic Regression Results for Analyzing the Determinants of the Decision to Repurchase Stock.

Dependent variable takes value of 1 for repurchase, 0 otherwise. values used are yearly paired differences between the test and control firms for the years indicated. Chi-squared statistics provided. Significance levels of 10% (*), 5% (**), and 1% (***) indicated. See variable definitions figure 1.

Yearly Paired Differences	Payout Negative n= 764	Payout Greater2 n=436	Payout 0>PO<2 n=608
Constant	-1.126	-2.590	-2.421
	5.80***	18.17***	17.71***
ln ASSETS-Year(0)	0.206	0.351	0.454
	17.40***	25.76***	48.89***
DEBT-Year(t-1)	-2.185	-1.235	-5.025
	18.87***	4.82***	44.04***
AMTR-Year(t-1)	0.795	1.361	1.698
	1.71	3.32***	5.54***
EARNVAR-Year(t-1)	-5.284	-9.486	-9.394
	5.68***	9.94***	9.13***
B/M-Year(0)	-0.020	0.774	0.820
	0.00	3.62***	4.03**
CF-Year(0)	0.332	8.093	3.002
	0.02	4.82***	0.79
A.SALES-Year(0)	-1.898	1.661	-3.269
	11.95***	6.31***	17.46***
A.SALES-Year(t+1)	-2.814	1.240	-1.968
	21.98	3.64***	6.84***
OPINC-Year(0)	-0.152	-4.008	-0.403
	0.01	1.55	0.02
OPINC (t+1)	5.237	0.580	2.457
	19.94***	0.11	3.36**
% Correct Predictions	0.767	0.764	0.770
Likelihood Ratio Test	157.66***	115.17***	242.22***

Notes:

1) Sample partitioned on PAYOUT= $\frac{\text{(Change in Debt from Year(t-1) to Year (t-1))}}{\text{(Change in Purchase of Stock from Year (t-1) to Year (t-1)}}$

2) Change in Debt is equal to the first differences in DEBT/lagged MVA.

3) Purchase of stock is used to proxy for repurchased stock {d115-d215}.

Table 9B Sensitivity Analysis

Multivariate Regression Results for Analyzing the Determinants of Market Reaction to the Stock Repurchase Announcement.

Dependent Variable is cumulative abnormal returns for t-1, t=0, t+1 using the CRSP equally weighted index as the market return. Values used are Yearly Paired Differences between the test and control firms for the year indicated. Chi-squared statistics provided. Significance levels of 10% (*), 5% (**), and 1% (***) indicated. See variable definitions figure 1.

$$AR_t = a_0 + a_1 SOUGHT + a_2 LnAsset_t + a_3 KINK_{t-1} + a_4 EARNVAR_{t-1} + a_5 B/M_t + a_6 CF_t + a_7 A.SALE_t + a_8 A.SALE_{t-1} + a_9 OPINC_t + a_{10} OPINC_{t-1}$$

Yearly Paired Differences		Payout Negative n= 382	Payout Greater2 n=218	Payout 0>PO<2 n=304
Intercept		0.020	0.014	-0.006
		4.28***	2.26***	-1.06
SOUGHT	+	0.000	0.000	0.002
		0.88	0.64	4.1***
ln ASSETS-Year(0)		0.000	-0.001	0.000
		0.13	-0.75	-0.32
AMTR-Year(t-1)	+	-0.006	0.026	0.033
		-0.38	1.29*	2.16**
EARNVAR-Year(0)	-	0.077	0.056	-0.017
		1.46	1.06	-0.37
B/M-Year(0)		0.015	0.025	-0.065
		0.76	0.91	-3.16***
CF-Year(0)		0.040	0.020	-0.030
		0.7	0.28	-0.43
A.SALES-Year(0)		0.006	0.001	0.025
		0.42	0.06	1.87*
A.SALES-Year(t+1)		-0.029	-0.005	-0.028
		-2.13**	-0.29	-2.11**
OPINC-Year(0)		-0.038	0.020	0.090
		-0.67	0.25	1.28
OPINC-Year(t+1)		0.000	0.005	-0.004
		-0.01	0.11	-0.17
R-Square		0.029	0.025	0.042
F		0.98	0.52	3.96***
N		382	218	304

Table 10
Correlation Matrix of Equation (1) Independent Variables

Data reported is Pearson Correlation Coefficient Between the Variables Used to Estimate Multivariate Models.
For the Sample of Firms Announcing Repurchase Programs in the period 1984-1994.

	Debt (t-1)	SOUGHT	Asset (t)	KINK (t-1)	AMTR (t-1)	Var (t-1)	BM (t)	Cash (t)	ASALE (t)	CAPI(t)
SOUGHT	0.039	1								
Asset (t)	0.282***	-0.104***	1.000							
KINK (t-1)	-0.413***	-0.089***	0.049*	1.000						
AMTR (t-1)	-0.075***	-0.037	0.205***	0.335***	1.000					
Var (t-1)	-0.163***	0.068*	-0.399***	-0.151***	-0.238***	1.000				
BM (t)	0.049*	0.129	-0.274***	-0.274***	-0.191***	0.087***	1.000			
Cash (t)	-0.227***	-0.141***	0.041	0.289***	0.153***	-0.136***	-0.341***	1.000		
ASALE (t)	-0.087***	-0.055*	-0.056*	0.049*	-0.023	0.168***	-0.140***	0.193***	1.000	
CAPI (t)	0.124***	-0.004	0.094***	-0.024	0.048*	-0.027	-0.040	0.113***	0.046	1.000
Oper (t)	-0.164***	-0.143***	0.111***	0.320***	0.218***	-0.140***	-0.445***	0.886***	0.250***	0.119***

Notes:
1) Significance levels of 10% (*), 5% (**), and 1% (***) indicated.
2) See variable definitions in Figure 1.

TABLE 11

Correlation Matrix of Equation (1) Independent Variables

Data reported is Pearson Correlation Coefficient Between the Variables Used to Estimate Multivariate Models.

Yearly Paired Differences Variables between Firms Announcing Repurchase Programs (test) and their matched pair (control).

	Debt (t-1)	SOUGHT	Asset (t)	Kink(t-1)	Amtr(t-1)	Var (t-1)	BM (t)	Cash (t)	ASale (t)	CAPI (t)
SOUGHT	0.014									
Asset (t)	0.143***	-0.018	1.000							
KINK (t-1)	-0.447***	-0.080***	0.078***	1.000						
AMTR (t-1)	-0.195***	-0.059**	0.110***	0.412***	1.000					
Var (t-1)	-0.031	0.060**	-0.390***	-0.286***	-0.307***	1.000				
BM (t)	0.055*	-0.079***	-0.065**	-0.080***	-0.096***	0.006	1.000			
Cash (t)	-0.262***	-0.059**	-0.135***	0.146***	0.071**	0.128***	-0.147***	1.000		
ASALE (t)	-0.115***	0.004	-0.038	-0.016	0.000	0.179***	-0.052*	0.340***	1.000	
CAPEXP (t)	0.193***	-0.004	0.142***	-0.040	0.053*	-0.073***	-0.018	0.167***	0.059**	1.000
Oper (t)	-0.177***	-0.051*	-0.134***	0.188***	0.138***	0.109***	-0.217***	0.788***	0.391***	0.150***

Notes:

1)Significance levels of 10% (*), 5% (**), and 1% (***) indicated

2) See variable definitions in Figure 1.

Table 12 - – Outlier Sensitivity – Alternative Tax Proxy

Logistic Regression Results for Analyzing the Determinants of the Decision to Repurchase Stock.

Dependent variable takes value of 1 for repurchase, 0 otherwise. Values used are Median Values. Pre represents values from t-3, -2, -1; Post values from t=0, +1, +2, +3. Chi-square statistic is provided. Significance levels of 10% (*), 5% (**), and 1% (***) indicated

Median Pre & Post - Paired Differences	Predicted Sign Borrowing Increase Group	Full Sample n= 1257	Borrowing Decrease n=712	Borrowing Increase n=545
Intercept		-1.5433 59.5145***	-1.1967 22.3***	-1.8615 29.8***
Ln Assets - pre	+	0.2643 127.764***	0.1949 43.6***	0.3532 83.3***
Debt - pre	-	-1.4738 60.02***	-0.7806 12.8***	-2.5078 52.8***
Kink - pre	+	0.068 18.1477***	0.0503 6.1**	0.0807 9.9***
EARNVAR - pre	-	-1.657 4.3522*	-0.599 0.5	-4.6172 8.5***
B/M - pre		0.2355 3.7145*	0.1461 0.8	0.373 3.9**
Cash -post		-0.8269 1.9939	-0.455 0.5	0.1203 0.0
A.SALE -post		-0.4327 1.9058	-0.8418 4.6**	-0.2437 0.2
OPINC - post		2.2494 8.1758***	1.5199 3.0*	2.4973 2.1
% Correct Predictions		70.9	66.4	76.7
Likelihood Ratio Test		381.24***	116.7***	317.2***

Table 13 – Outlier Sensitivity – Alternative Tax Proxy

Multivariate Regression Results for Analyzing the Determinants of Market Reaction to the Stock Repurchase Announcement.

Dependent Variable is cumulative abnormal returns for t-1, t=0, t+1 using the CRSP equally weighted index as the market return. . Values used are Median Values. Pre represents values from t-3, -2, -1; Post values from t=0, -1,-2,-3. Chi-square statistic is provided. Significance levels of 10% (*), 5% (**), and 1% (***) indicated

$$AR_i = a_0 + a_1 SOUGHT + a_2 LnAsset_{post} + a_3 KINK_{pre} + a_4 EARNVAR_{pre} + a_5 B/M_{pre} + a_6 CF_{post} + a_7 A.SALE_{post} + a_8 OPINC_{post}$$

Median Pre & Post Difference	Predicted Sign	FULL SAMPLE	Borrowing Decrease	Borrowing Increase
Intercept		0.02003	0.02383	0.01199
		7.94***	7.23***	2.95***
SOUGHT	+	0.000582	0.000426	0.00102
		2.94 ***	1.72*	2.95***
LnAsset - pre	-	-0.00307	-0.00335	-0.00241
		-4.03***	-3.04***	-2.24**
KINK – pre	+	0.000337	-0.00083	0.00163
		0.63	-1.01	2.28**
EARNVAR – pre	-	0.00959	0.00248	0.04362
		0.37	-0.41	1.2
B/M - pre		0.00853	0.00248	0.01187
		1.27	0.23	1.42
CF - post		-0.02052	-0.01652	-0.00796
		-0.53	-0.28	-0.15
A. SALE - post		0.000651	-0.00377	0.00273
		0.05	-0.2	0.17
OPINC - post		0.04661	0.02443	0.06454
		1.34	0.47	1.4
	R-Square	.022	.0189	.0391
	F	4.03***	1.89*	3.26***

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