DOES THE METHOD OF FINANCING STOCK REPURCHASES MATTER? EXAMINING THE FINANCING OF SHARE BUYBACKS AND ITS EFFECT ON FUTURE FIRM INVESTMENTS AND VALUE

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Recent increases in stock repurchases among U.S. corporations coupled with a historically low cost of debt since the Global Financial Crisis has created media speculation that firms in recent years are paying for their expanding share buyback programs with debt. Repurchasing stock by increasing leverage, instead of using internal funds, implies that managers may speculate on current low interest rate environments at the expense of shareholders. Recent studies find that stock repurchases are associated with reductions in future firm employment and investments such as capital expenditures and research and development expenses. This study expands on prior studies by evaluating how debt-financed stock repurchases affect firm investment, investigating the likelihood of these repurchases in low interest rate environments and assessing the effects on firm value. Results confirm that, in recent years, debt-financed repurchases have increased substantially and the probability of debt-financed repurchases increases in the presence of low interest rates. This relationship is especially pronounced in the years following the Global Financial Crisis. Debt-financed repurchases are associated with small reductions in firm investment; however, these reductions are significantly less after adjusting for industry conditions. Finally, there is little evidence that the method of financing repurchases affects firm value nor does it increase a firm's operating performance.

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CHAPTER 1

INTRODUCTION

Since the early 2000s, there has been a substantial increase in the amount of stock repurchases. For example, in 2000, there were 3,737 firms that repurchased a total of $203 billion in stock. Both the number of firms and total amount of repurchases has risen steadily since then and, in 2014, there were 4,545 firms that repurchased a total of $534 billion in stock (a 162% increase from the year 2000)[1]. Stock repurchase amounts have increased dramatically over recent years and repurchases are now considered the dominant form of payout (Skinner, 2008). Stock repurchases have advantages over dividends as a way for companies to return money to shareholders; however, some critics of share buybacks believe that the cash spent on repurchase programs could be better utilized by investing it back into the firm.

Recent studies have begun to examine the consequences of share repurchases on future firm investments. For example, Grullon and Michaely (2004) find that repurchasing firms reduce their current level of capital expenditures and research and development (R&D) expenses; however, they attribute this reduction as a response to a deterioration in firm investment opportunity sets and suggest that repurchases may be associated with a firm's transition from a higher growth phase to a lower growth phase. Similarly, Almeida et al. (2016) investigated the effects of share repurchases in an earnings management context, concluding that firms with EPS-motivated repurchases are associated with reductions in future firm employment and investments. They find that these repurchases were primarily paid for in cash.

[1] Nominal repurchase amounts were adjusted by the monthly consumer price index (CPI) to obtain amounts in constant dollars (measured as of January 1, 2015) in order to make valid comparisons in quantities repurchased across time.

Multiple news outlets have speculated that companies in recent years are paying for their expanding share buyback and dividend programs by issuing bonds.[2] The reduced cost of debt caused by the Fed's decision to keep interest rates low since 2008 may incentivize managers to attempt to time the market, especially if managers believe that the current interest rate environment is temporary and want to capitalize on historically low rates. Building on the findings of Graham and Harvey (2001), Stephens and Weisbach (1998) and many others, it is reasonable to assume that managers utilize a low interest rate environment as an opportunity to repurchase stock, especially if managers also believe that their stock is underpriced in today's market. Stock repurchases are a way for managers to signal undervaluation of their stock price to the market (Vermaelen, 1981). Borrowing money in an environment of historically low interest rates to pay for buybacks may be an inexpensive way for managers to "return" money to shareholders without having to dip into internal cash.

The pecking order theory of capital structure states that a company should prefer to finance internally first, followed by debt second and external equity as a last resort (Myers and Majluf, 1984). Repurchasing stock by increasing leverage, instead of using internal funds, could imply that managers are speculating on the current interest rate environment, thus increasing the riskiness of the company at the expense of investors.

This literature raises the following questions that I investigate in this dissertation: Is a firm more likely to execute a repurchase using alternative sources of funds such as debt in low interest rate environments? How does the method of financing repurchases affect firm employment, CapEx and R&D expenditures and how does it affect long-term firm value?

[2] See, for example, "How Apple, Inc.'s Debt-Powered Repurchase Strategy Actually Saves Money," The Motley Fool, December 20, 2015.

Results of this study confirm that, in recent years, the phenomenon of firms utilizing debt to finance share repurchases has increased substantially. Both the number of repurchasing firms and the size of the average repurchase have increased over the years, with the exception of the years during the Global Financial Crisis. The typical debt-financing repurchasing firm is larger, has more cash on hand and is more leveraged than other firms that make repurchases. The size of the median and average repurchase is also significantly larger than those of traditionally-financed repurchasing firms.

Prevailing market interest rates play a role in firms' decisions to finance a repurchase with debt. A low interest rate environment is related to debt-financed repurchases as the probability of a debt-financed repurchase increases in the presence of low interest rates. This relationship is especially pronounced in the years following the Global Financial Crisis. In addition, this dissertation confirms the findings of previous studies that repurchases are associated with a negative change in employment, CapEx and R&D expenditures. However, after adjusting for industry conditions, repurchases are still associated with a negative change in employment, but this relationship is only weakly significant and there are no effects on future CapEx or R&D expenditures. Moreover, the effects of repurchases on future firm investments for debt-financed repurchasing firms are even smaller, indicating that debt-financed repurchasing firms do not sacrifice future firm investments as much as other repurchasing firms. Finally, this study finds little to no evidence that financing a repurchase with debt adds value to firms. While debt-financed repurchases add short-term firm value in the few days immediately surrounding a repurchase (i.e., [-2 to +2]), the value creation is not markedly different from that of traditionally-financed repurchasing firms, indicating that the method of financing repurchases

does not affect firm value. Furthermore, the method of financing repurchases has no effect on long-term stock prices, nor does it increase a firm's operating performance.

The remainder of this dissertation is organized as follows. Chapter 2 provides a literature review with in-depth discussions on the role of stock repurchases, motives for repurchasing stock, theories of financing and the effects of stock repurchases on firm investments. Chapter 3 states the hypotheses investigated in this dissertation. Chapters 4 and 5 describe the data and provide descriptive statistics. Chapter 6 examines market timing and the use of debt for repurchases. Chapters 7 and 8 measure the impact of debt-financed repurchases on firm investment decisions and their impact on firm value and operating performance, respectively. Chapter 9 concludes the study.

CHAPTER 2

LITERATURE REVIEW

This chapter provides a review of relevant areas of the literature, including an overview of stock repurchases, several documented motives for repurchasing stock, methods and theories of financing repurchases and the effects of stock repurchases on firm investments.

2.1 Overview of Stock Repurchases

Stock repurchases and dividends are two prominent ways for managers to distribute excess capital to shareholders. Since 1980, corporate payout policies have substantially shifted toward repurchases. Skinner (2008) documented that the fraction of companies that pay dividends has decreased from 48% in 1980 to 31% in 2010. His study found that "repurchases are increasingly used in place of dividends, even for firms that continue to pay dividends" and concluded that repurchases are now the dominant form of payout. Managers may prefer repurchases over dividends for many reasons, most notably due to their flexibility and because dividends are considered "sticky" as managers are reluctant to make dividend changes that may have to be reversed. Brav et al. (2005) found that "many managers now favor repurchases because they are viewed as being more flexible than dividends and can be used in an attempt to time the equity market or to increase earnings per share."

2.2 Introduction to Stock Repurchases

Instead of paying a dividend to shareholders, companies can use cash to purchase its own stock in the secondary market (known as a share repurchase). In most cases, the reacquired shares are kept in the company's treasury and may be resold if the company needs to raise

additional capital in the future. Vermaelen (2005) summarized the research on share repurchases in the United States, finding that there are five primary methods of stock repurchase: 1) open market, 2) private negotiations, 3) repurchase "put" rights, and 4) self-tender repurchase. The most common method of repurchase is for the firm to announce to buy stock in the open market.

The reduction in outstanding shares caused by share repurchase programs has many benefits to companies such as increasing the share price of the remaining outstanding shares and/or increasing earnings per share. Additionally, share repurchase announcements send positive signals to the market that managers are optimistic about the future. Comment and Jarrell (1991) studied the announcements of open-market repurchase programs and found that, on average, they resulted in an abnormal price rise of 2%.

2.3 Motives for Repurchasing Stock

Firms repurchase their shares for a variety of reasons; however, the reasons are not always obvious. Dittmar (2000) investigated the relation between stock repurchases and distribution, investment, capital structure, corporate control and compensation policies. Dittmar (2000) found that firms repurchase stock to distribute excess capital, take advantage of potential undervaluation, alter their leverage ratios, fend off takeovers and counter the dilution effects of stock options. The following are relevant reasons found in the literature of why a firm may repurchase stock.

2.3.1 Flexibility of Payout Policy

As discussed above, stock repurchases and dividends are two prominent ways for managers to distribute excess capital to shareholders. Prior studies such as Miller and Modigliani

(1961), Bhattacharya (1979), Easterbrook (1984), Miller and Rock (1985) and Jensen (1986) imply that it is the total payout (as either dividends or repurchases) that can be used to signal undervaluation or to reduce agency conflicts (Grullon and Michaely, 2002). Thus, firms have the flexibility of choosing how to distribute excess capital to shareholders. Stephens and Weisbach (1998) found a positive relation between repurchases and levels of cash flow, which supports the excess capital hypothesis. Grullon and Michaely (2002) showed empirically that firms have gradually substituted repurchases for dividends over the years. Firms must choose the best method of payout that fits firm needs and may prefer repurchases over dividends due to their flexibility and tax advantages. The tax advantage of stock repurchases exists because long-term capital gains are often taxed at a lower rate than dividend income and many individual investors can defer the capital gains tax until they realize the gain and sell their stock (Dittmar, 2000).

2.3.2 Market Timing and the Information Content of Repurchases

The undervaluation hypothesis states that managers wait to repurchase shares until the stock price is undervalued. Ikenberry and Vermaelen (1996) and Stephens and Weisbach (1998) found that companies often announce share repurchases via open market transactions due to their flexibility and managers will tend to buy back shares only when they view their stock as undervalued. Otherwise, managers will forego repurchasing shares until a later time. Dittmar and Field (2015) documented some evidence supporting managers' ability to time the market and found that less frequent repurchasers, firms that repurchase when insiders buy on their own account and firms that experience low stock returns prior to the repurchase are able to repurchase their stock at significantly lower prices than the average daily closing stock price in the months surrounding the repurchase. Managers may also capitalize on information asymmetry between

insiders and shareholders to determine when to repurchase. Comment and Jarrell (1991), Dann et al. (1991), Hertzel and Jain (1991) and Lee et al. (1992) provide evidence of the information content of stock repurchases. Stock repurchases may be used by managers to signal to the market that shares are undervalued.

2.3.3 Capital Structure Considerations

Stock repurchases reduce the number of a firm's outstanding shares, thus reducing its equity and increasing its leverage ratio. Share repurchases may be a good way for managers to maintain optimal leverage ratios if they exist (Bagwell and Shoven, 1988; Opler and Titman, 1996). Managers may be more inclined to repurchase stock when they feel as though the firm's leverage ratio is suboptimal. Bonaime et al. (2014) documented that capital structure adjustments are a value-increasing motive for repurchases and that the extent to which adjusting capital structure through a repurchase creates value depends on the undervaluation of the firm, supporting the undervaluation hypothesis (discussed above).

2.3.4 Managerial Incentives

In contrast to dividends, stock repurchases are a way for managers to distribute cash without diluting the per-share value of stock. For example, whenever a dividend is paid, the stock price is adjusted downward (on the ex-dividend date) by the amount of the dividend by the exchange on which the stock trades. This adjustment is because the amount paid out in dividends no longer belongs to the firm and should no longer be reflected in its stock price. Conversely, stock repurchases tend to induce an increase in a firm's stock price because it reduces the number of outstanding shares. This preservation or increase of stock prices may be of particular

interest to managers whose compensation is tied to equity (Dittmar, 2000). Executive compensation schemes utilizing stock options may incentivize managers to prefer repurchases over dividends.

Additionally, managers may use stock repurchases as an earnings management device (Bens et al., 2003; Hribar et al., 2006; Almeida et al., 2016). For example, managerial compensation or some other incentives may be tied to a particular performance ratio such as EPS and, as a result, there may be motivation for managers to execute repurchases if they know that their firms are not expected to meet analysts' EPS expectations in a given quarter. By making a repurchase, they are effectively reducing the denominator of this ratio – thus minimizing the firm's negative EPS surprise or even changing its sign altogether to a positive EPS surprise. Delivering the news of a positive EPS surprise (rather than a negative one) to the market is advantageous for managers for many reasons, in particular because it likely induces an increase in the firm's stock price and/or triggers a potential compensation incentive.

2.4 Financing Stock Repurchases

2.4.1 Prevalent Methods of Financing Stock Repurchases

In many studies examining stock repurchases, by far the most common way that companies pay for stock repurchases is by using available cash (Vermaelen, 1981; Ofer and Thakor, 1987; Grullon and Ikenberry, 2000; etc.). Free cash flow theory suggests that repurchases are a good way for firms to distribute excess cash to shareholders (Easterbrook, 1984; Jensen, 1986). Distributing excess cash both reduces the agency costs of the firm and increases shareholder value.

Another way that firms finance stock repurchases that has gained traction in recent years is through borrowing. Multiple news outlets have speculated that companies are paying for their expanding share buyback programs by issuing bonds. Because the interest payments of debt are tax deductible, this tax subsidy is passed on to shareholders. The leverage hypothesis or tax-subsidy hypothesis predicts that only when a repurchase is financed with borrowed funds, the value of the shares should increase with the present value of the tax savings which accrue to them. If share repurchases are financed by issuing debt, they are practically identical to debt-equity exchanges (Vermaelen, 1981). Masulis (1980) investigated intrafirm debt-equity exchanges and found evidence on the existence of this tax effect. However; critics of debt-financed buybacks could argue that the added debt incurred by firms increases overall firm risk, far outweighing any tax benefits of increasing debt.

Finally, a third way that firms can finance stock repurchases is through issuing new stock. This method seems counterintuitive as it may seem odd for a firm to issue stock and then buy it back in a short period of time. However, there are some benefits of employing this stock buyback strategy. One documented benefit of this strategy is that managers can utilize the signals of issuing stock and subsequently repurchasing it to inform the market of its prospects. Constantinides and Grundy (1989) found that a stock repurchase, coupled with the issue of a stock, permits management to signal its information to the market as well as use some of the proceeds to accept positive net value projects. Also, firm management may employ this strategy as a way to "churn" their stock for short-term profits. For example, issuing new common stock dilutes the number of shares outstanding and reduces stock prices significantly (Asquith and Mullins Jr., 1986) and subsequently repurchasing these shares sends a positive signal to the market and increases stock prices significantly (Dann, 1981). However, it is not clear that the

signal to issue shares and then subsequently repurchase them is stronger than a conventional repurchase. Nonetheless, managers may employ this stock buyback strategy if they believe that current stock prices are inflated.

2.4.2 Theories of Financing

Over the last several decades, there have been many theories addressing how a firm should finance its assets. Two of the more prominent ones are capital structure theory and pecking order theory.

Miller and Modigliani (1958) first proposed that the makeup of a firm's capital structure is irrelevant to value. This original theory made several simplifying assumptions such as no taxes, no bankruptcy or transaction costs, symmetric information, that investors have rational and homogeneous expectations and others. However, Miller and Modigliani (1963) and Miller (1977) added the presence of taxes to this proposition and found that there is an advantage of leverage due to an interest tax shield. Their findings suggest a tradeoff theory of leverage that assumes that there are benefits to leverage within a capital structure up until the optimal capital structure is reached.

The pecking order theory (Myers and Majluf, 1984) states that a company should prefer to finance itself first internally through retained earnings. If this source of financing is unavailable, a company should then finance itself through debt and, as a last resort, through new equity. This pecking order signals to the market how a firm is performing. Internal financing is preferred because it signals that a company is strong. Debt financing also sends a positive signal because it signals that management is confident that the firm can meet its interest payment obligations. Finally, equity financing is considered a negative signal that managers believe that

its stock is overvalued and seeks to raise money prior to its share price falling. Myers and Shyam-Sunder (1999) found that pecking order theory is a much better explanation of the debt-equity choice than an optimal debt ratio as predicted by tradeoff theory.

2.5 The Effects of Stock Repurchases on Firm Investments

In recent years, few studies have examined the effects of stock repurchases on firm investments. Grullon and Michaely (2004) find that repurchasing firms reduce their current level of capital expenditures and research and development (R&D) expenses; however, they attribute this reduction as a response to a deterioration in firm investment opportunity sets and suggest that repurchases may be associated with a firm's transition from a higher growth phase to a lower growth phase. Similarly, Almeida et al. (2016) investigated the effects of share repurchases in an earnings management context, concluding that firms with EPS-motivated repurchases are associated with reductions in future firm employment and investments. They find that these repurchases were primarily paid for in cash.

CHAPTER 3

HYPOTHESES

The literature in Chapter 2 suggests that firms may time market conditions to raise debt in order to repurchase shares. Engendered by speculation in the media and supported by literature, Hypothesis 1 follows the natural conclusion that managers may speculate on prevailing interest rate environments. For example, managers may choose to increase leverage during periods of low interest rates such as those experienced in recent history (Barry et al., 2008). Graham and Harvey (2001) found that executives attempt to time interest rates by issuing debt when they feel that market interest rates are particularly low. They found that market timing is especially important for large firms, which implies that companies are more likely to time interest rates when they have a large or sophisticated treasury department. Finally, debt signaling theory implies that managers' decision to increase leverage may send a positive signal to the market because managers are confident in the firm's ability to meet its monthly debt obligations in the future (Ross, 1977).

> Hypothesis 1: In low interest rate environments, the likelihood of firms to execute stock repurchases that are financed with debt increases relative to medium and high interest rate environments.

The literature, summarized in the prior section (Bens et al., 2003; Grullon and Michaely, 2004; Almeida et al., 2016), examining the effects of stock repurchases on firm investments concludes that repurchases are used to manipulate earnings and they reduce future firm employment and investments such as CapEx and R&D expenditures. Previous studies found that these repurchases were primarily paid for in cash. More recently, the financial media is speculating that companies are paying for their repurchase programs through issuing debt, conjecturing that managers are taking advantage of low interest rate environments. If this

phenomenon is true, then the consequences of repurchases on future firm investments may be different as managers do not have to dig into cash holdings of the firm.

This dissertation aims to expand the body of knowledge surrounding stock repurchases and their effects on future firm investments in two different aspects:

First, I question the potential effects on long-term investments reported in other papers as they do not consider industry-wide conditions. It is logical to assume that industry factors such as increases in technology, productivity or efficiency might influence the levels of investment necessary for firms to continue to develop and grow. Additionally, systemic industry factors might influence all firms within an industry to experience similar changes in the level of future firm investments. For example, the manufacturing industry might, on the whole, struggle to sell and distribute their products during a recession and cut back on firm investments. Similarly, the airline industry might experience strain during times of increased oil prices and respond by spending less on employees or capital expenditures during the foreseeable future.

> Hypothesis 2: The negative association between repurchases and investments reported in prior studies can be explained by industry-wide conditions, and not by firm-specific characteristics.

Second, I evaluate various methods of financing stock repurchase programs to investigate how different financing methods alter future firm investments such as employment, CapEx and R&D expenditures. Hypothesis 3 stems from the belief that debt-financed repurchasing firms do not experience the same reductions in future firm investments because they do not deplete any of their discretionary cash, and can use this cash to invest it back into the firm. Managers may choose leverage over cash to finance repurchases for a few reasons, most notably because of the financial flexibility that this choice affords firm managers. Hess and Immenkotter (2014) found that firms prefer to borrow and preserve their financial flexibility if they have any unused debt

capacity (i.e., the amount of debt a firm can issue before they are threatened to be downgraded in creditworthiness). Several surveys of corporate managers have shown that maintaining financial flexibility outranks traditional factors such as tax benefits, default costs and information asymmetries in their importance for capital structure decisions (Graham and Harvey, 2001; Brounen et al., 2004; Bancel and Mittoo, 2004).

> Hypothesis 3: Firms that finance repurchases with debt do not reduce future firm investments to the same extent as other firms that finance share repurchases with cash reserves.

Debt-financed repurchasing firms are more likely to maintain the necessary cash reserves to invest in future firm prospects, and to preserve financial flexibility, which should translate into increased firm value. Most of the literature that studies the market response to stock repurchases focuses on the short-term effects of repurchase program announcements on stock prices (Comment and Jarrell, 1991; Ikenberry et al., 1995; Stephens and Weisbach, 1998; Peyer and Vermaelen, 2009; Ben-Rephael et al., 2014; and others). The consensus of these studies is that the average market response to the announcement of an open market share repurchase ranges from 2-5% on average for all repurchasing firms. This spike is attributed to a variety of reasons, most notably because of the positive signals that repurchases send to the market about the strength and future prospects of the company.

However, to my knowledge, there are no studies that have examined the short-term effects of debt-financed repurchases on stock prices. It is difficult to hypothesize the magnitude of these effects without drawing on the extant literature that studies optimal methods of financing capital. Most notably, the pecking order theory of financing assets (Myers and Majluf, 1984) suggests that debt financing sends a positive signal to the market because it sends the message that management is confident that the firm can meet its interest payment obligations. This signal

may cause firms that finance repurchases with debt to experience higher short-term abnormal stock returns than other firms.

Bens et al. (2003), Grullon and Michaely (2004) and Almeida et al. (2016) suggest that repurchases can have negative effects on firm value. As argued above, debt-financed repurchases are a way for firms to signal commitment without restricting financial flexibility. Based on this literature, I propose the following hypothesis:

> Hypothesis 4: Firms that finance repurchases with debt experience higher short-term abnormal stock returns than other firms.

Several studies have assessed the long-term performance of firms following repurchases. For example, Ikenberry et al. (1995) report significant positive abnormal returns of 12% in the 4-year period following stock repurchases, hypothesizing that the market treats repurchase announcements with skepticism, leading prices to adjust slowly over time (i.e., the market initially underreacts to open market share repurchases; also see Lakonishok and Vermaelen, 1990). An important aspect of these studies is that the long-term drift in stock returns is in the same direction as the initial reaction of the stock price at the time of the announcement, which suggests that the market, on average, underreacts at the time of an announcement (Spiess and Affleck-Graves, 1999). Chan et al. (2004) also documented excess stock performance in both the 1- and 4-year returns following a repurchases and that this drift in stock returns is amplified for value stocks. In addition to the reasons above, Ikenberry and Vermaelen (1996) documented that stock repurchase programs provide managers the flexibility to buy back shares when they view their stock as undervalued and otherwise forego repurchasing shares. This expansion of the company's investment opportunity set could lead to longer-term excess returns. Based on this literature, I propose the following hypothesis:

Hypothesis 5a: Firms that finance repurchases with debt experience higher long-term abnormal stock returns than other firms.

Many studies have also examined the long-term effects of firm investments such as R&D and CapEx on firm value. For example, Ehie and Olibe (2010), Eberhart et al. (2004) and Johnson and Pazderka (1993) studied the association between investment in R&D and market value among firms, concluding that firm investments such as R&D are beneficial investments that contribute positively to firm performance. Additionally, Del Brio et al. (2010) found that there is a relationship between investment and firm value and this creation of value persists over the long run. Therefore, Hypothesis 5b is a natural extension of Hypothesis 3.

Hypothesis 5b: Firms that finance repurchases with debt experience higher long-term abnormal operating performance than other firms.

CHAPTER 4

DATA DESCRIPTION

Since this dissertation examines repurchasing behavior and its effect on future firm investments, the sample used comes from a variety of sources. Share repurchase data is calculated using Standard and Poor's Compustat database. Analyst forecast data is obtained from the Institutional Brokers' Estimate System (IBES). Corporate loan issue data is obtained from Bloomberg Professional. Finally, historical interest rates data is obtained from the Federal Reserve Bank of St. Louis's FRED database. All firm financial data is obtained from Compustat and historical stock price information is obtained from the Center for Research in Security Prices (CRSP). Firm-quarter observations are gathered from 2004-2015 and more details of the construction of samples used throughout this study are found in Table 1.

4.1 Prevalent Methods of Estimating Share Repurchases

Over the years, there have been many studies examining firms' repurchases of common stock. Early studies of firm repurchasing activity identified repurchasing firms through announcements in the *Wall Street Journal* or other media outlets. Other studies utilized repurchasing announcements found in the Securities Data Company's (SDC) Mergers & Acquisitions database. Banyi et al. (2008) analyzed the accuracy of various estimation methods of share repurchases used in earlier studies and found that there are five common methods used by most financial researchers, each with their own advantages and disadvantages. These estimation methods of share repurchases are highlighted below.

4.1.1 CRSP Decreases in Shares Outstanding

The monthly decrease in common shares outstanding reported by the Center for Research

in Security Prices (CRSP) is the simplest estimate of the number of shares repurchased by a firm. This decrease must be adjusted for any stock dividends, splits or any other activities that may affect the number of outstanding shares. In a given month, if a firm experiences an increase in common shares outstanding, then this is recorded as a zero decrease because shares outstanding may increase for a variety of reasons unrelated to repurchase activity. Banyi et al. (2008) documented that this method of estimating stock repurchases is most likely understated for firms with significant employee stock options activity since the exercise of stock options by employees offset any repurchases made during the month.

4.1.2 Compustat Decreases in Shares Outstanding

The quarterly (or annual) decrease in common shares outstanding reported by Compustat is another straightforward estimate of the number of shares repurchased by a firm in a quarter. Similar to the CRSP measure above, this Compustat measure likely understates actual repurchases in firms with significant employee stock options activity.

4.1.3 Compustat Purchases of Common Stock

Many studies (Stephens and Weisbach, 1998; Dittmar, 2000; Grullon and Michaely, 2002; Kahle, 2002; Dittmar and Dittmar, 2008; Hribar, Jenkins, and Johnson, 2006) use Compustat data to estimate the dollar amount of shares repurchased. Stephens and Weisbach (1998) note this figure is "an aggregate of all security repurchases and retirements during the quarter", which overstates repurchases of common shares due to the retirement or redemption of preferred stock and/or the conversion of preferred stock into common stock (Banyi et al., 2008).

Most studies subtract any decreases in the value of preferred stock in order to reduce any overestimation of common stock repurchases for preferred stock activities.

4.1.4 Changes in Treasury Stock

Several studies such as Stephens and Weisbach (1998) use changes (increases) in the dollar value of treasury stock from Compustat as a proxy for shares repurchased. However, Banyi et al. (2008) documented that there are several problems with using this data such as unknown repurchase prices, overlapping treasury share repurchases and distributions in the same period, inconsistent state laws regarding treasury stock accounts and other issues. These problems ultimately bias open market share repurchases and the use of changes in treasury stock values may not be the best method of estimating share repurchases.

4.1.5 Fama-French Changes in Treasury Stock

Fama and French (2001) use differences between purchases and sales of common and preferred stock in Compustat as a proxy for changes in treasury stock values, which in turn measure share repurchases. However, this measure may not be ideal when firms purchase and retire shares in the same period. Furthermore, Fama and French (2001) note that Compustat inconsistently identifies firms that use the retirement method for treasury stock which leads to unreliable data.

Banyi et al. (2008) found that of the five above estimation methods of share repurchases, the Compustat purchases of common stock method is the best estimate of actual repurchases. This method is used to supplement the share repurchase data obtained from Compustat (see below for more details) from 2004-2015.

4.2 Share Repurchase Data

In December 2003, the Securities and Exchange Commission (SEC) amended Rule 10b-18 of the Securities Exchange Act of 1934 to provide companies a "safe harbor" from liability for manipulation when they repurchase their common stock in the market in accordance with the Rule's manner, timing, price and volume conditions. To enhance the transparency of issuer repurchases, the amendment requires companies to disclose all issuer repurchases (SEC, 2003). Consequentially, share repurchase information regarding number of shares repurchased and average repurchase price became more readily available in Compustat beginning in 2004. Resultantly, this study's sample period begins in 2004 to ensure a consistent measurement of repurchases.

From the period of 2004-2015, quarterly share repurchase information is obtained from Compustat. As discussed above, share repurchase information regarding number of shares repurchased and average repurchase price became more readily available in Compustat beginning in 2004 as a result of an amendment to Rule 10b-18 of the Securities Exchange Act of 1934 (SEC, 2003). The nominal dollar amount of common stock repurchased is computed as Total of Shares Repurchased (CSHOPQ) times Average Repurchase Price (PRCRAQ). Following Hribar et al. (2006), stock repurchases less than $10,000 are excluded. Nominal repurchase amounts are adjusted by the monthly consumer price index (CPI) to obtain amounts in constant dollars (measured as of January 1, 2015) in order to make valid comparisons in quantities repurchased across time. The number of shares repurchased is Total of Shares Repurchased (CSHOPQ). Repurchase information is limited to firms listed on NYSE, AMEX and NASDAQ. Firms in Standard Industrial Classification (SIC) codes 4000-4999 (transportation and utilities), 6000-6999 (financial) or 9000-9999 (government-related) are

excluded due to regulatory restrictions on repurchases (Hribar et al., 2006). Note that if repurchase information using this method is unavailable[3], the *Compustat Purchases of Common Stock* estimation method, described below, is used to supplement the data.

As discussed above, Banyi et al. (2008) found that the *Compustat Purchases of Common Stock* method is the best estimate of actual repurchases. Under this method, the nominal dollar amount of common stock repurchased is computed as Purchase of Stock (PRSTKCY) per quarter minus any decreases in Preferred Stock (PSTKQ) or decreases in Redeemable Preferred Stock (PSTKRQ). Since PRSTKCY is reported each quarter on a year-to-date basis, for the second through fourth quarters of each year, the value of PRSTKCY in the prior quarter is subtracted from the value of PRSTKCY in the current quarter, giving us the purchase of stock each quarter. Following Hribar et al. (2006), stock repurchases less than $10,000 are excluded. Nominal repurchase amounts are adjusted by the monthly consumer price index (CPI) to obtain amounts in constant dollars (measured as of January 1, 2015) in order to make valid comparisons in quantities repurchased across time. The number of shares repurchased is computed as the beginning common shares outstanding ($CSHOQ_{t-1}$) plus shares issued during the quarter (CSHIQ) minus the ending common shares outstanding ($CSHOQ_t$). Repurchase information is limited to firms listed on NYSE, AMEX and NASDAQ. Firms in Standard Industrial Classification (SIC) codes 4000-4999 (transportation and utilities), 6000-6999 (financial) or 9000-9999 (government-related) are excluded due to regulatory restrictions on repurchases (Hribar et al., 2006).

[3] The amendment to the SEC's Rule 10-b-18 requires disclosure of all issuer repurchases, regardless of whether the repurchases are effected in accordance with the safe harbor rule. However, Cook et al. (2003) studied firm compliance in accordance with Rule 10-b-18 and found that although the overall compliance rate is relatively high, there is widespread evidence that the guidelines are not followed all of the time.

Figure 1 illustrates the increase of both the number of firms and volume of repurchases by year from 2004-2015 while Table 2 contains descriptive statistics including the average and median repurchase amounts each year. Over the sample period, a total of 46,249 repurchases were made, totaling over $5 trillion. Each year on average, U.S. corporations conducted 3,854 repurchases of approximately $425 billion. Nominal repurchase amounts are adjusted by the monthly consumer price index (CPI) to obtain amounts in constant dollars (measured as of January 1, 2015) in order to make valid comparisons in quantities repurchased across time. During the mid- to late-2000s, the average number of firms that conducted repurchases each year was 3,586. This number of firms has steadily increased to 4,282 in 2008, decreased during the Global Financial Crisis and has rapidly increased post-crisis. From 2011-2015, the average number of firms that conducted repurchases each year was 4,200. The total amount of stock repurchases has also increased over the years. In the mid-2000s, the total amount of repurchases each year averaged just over $400 billion. In the 2010s, the total amount of repurchases each year averaged about $450 billion. It is noteworthy that both the number of firms repurchasing stock and the repurchase amounts have increased steadily over the past two decades, with a more dramatic increase in stock repurchase amounts since the early 2000s.

4.3 Analyst Forecast Data

Analyst forecasts of Earnings per Share (EPS) are obtained from the Institutional Brokers' Estimate System (IBES) from 2004-2015. An earnings surprise is the difference between the reported EPS and the median EPS forecast at the end of the quarter. This difference is normalized by the end-of-quarter stock price.

4.4 Corporate Loan Issue Data

All new, senior, nonconvertible, syndicated, public debt issues from 2004-2015 are obtained from the U.S. Corporate Loan and Debt Issues database in Bloomberg Professional. Information for each new issue are obtained such as issue date, issue amount in nominal dollars, borrower characteristics such as identity, location and industry, currency and, if applicable, exchange rate to USD on the issue date, loan type, maturity, seniority and lender characteristics. Non-U.S. firms, issues outside of the United States, issues by firms in Standard Industrial Classification (SIC) codes 6000-6999 (financial) or 9000-9999 (government-related), issues by nonprofit organizations and issues that are components of derivative instruments are excluded.

Figure 2 shows the distribution of new debt issues by year. In total, there were 35,123 debt issues during this period. Nominal loan proceeds are adjusted by the monthly consumer price index (CPI) to obtain proceeds in constant dollars (measured as of January 1, 2015) in order to make valid comparisons in quantities issued across time. As shown in Figure 2, domestic new issues have increased steadily over the sample period. More recently, they have increased substantially from 2010-2015 as companies are recovering from the negative shock of the Global Financial Crisis. The year 2015 saw the largest amount of new issues in history of over $1.4 trillion.

4.5 Historical Interest Rates Data

Part of the analysis in this dissertation is to evaluate repurchasing behavior in low-interest rate environments. Following the methodology of Barry et al. (2008) and consistent with the findings of Graham and Harvey (2001), quarterly interest rate data using Moody's seasoned Baa corporate bond yield are obtained from the Federal Reserve Bank of St. Louis from 2004-2015.

Average rates in each quarter are compared to the long-run average quarterly rate throughout the sample period to compute decile rankings. These decile rankings are used to determine periods of low, medium and high interest rates. Figure 3 displays a graph of quarterly interest rates of Moody's Seasoned Baa Corporate Bond Yield, the 10-year Treasury Constant Maturity Rate and the 3-month Treasury Bill (Secondary Market Rate).

4.6 Debt-Financed Repurchase Data

In order to measure debt-financed repurchases, the sample of quarterly stock repurchases is merged with the sample of new issues of corporate bonds. Repurchasing firms that issued bonds less than 6 months prior to a repurchase are classified as debt-financed repurchasing firms. While the choice of using 6 months prior to a repurchase may seem arbitrary, the identification of debt-financed repurchases is challenging. In the prospectuses that firms initially file with the SEC to issue new debt securities, firms need to describe their intentions of utilizing the proceeds raised in the "Use of Proceeds" section. The language that firms use in describing their use of funds is not standard across prospectuses and leaves room for managerial discretion. Most firms choose to use generic language stating that proceeds will be used for "general corporate purposes" and many go on to list several examples of these corporate purposes. An example of the language from the prospectuses is the following: "We intend to use the net proceeds from sales of the notes […] for general corporate purposes, including but not limited to existing operations, business expansion, refinancing existing debt, dividends or repurchases, capital expenditures and other investing activities, and other uses." Clearly, this use of generic language makes it challenging to identify the specific purposes of new debt proceeds.

To help alleviate concerns that the methodology used to identify debt-financed repurchases might not accurately depict these aforementioned repurchases, the prospectuses of a sample of 235 (approximately 15% of the sample used in this study) debt-financed repurchases were hand-collected and classified according to the language used in the "Use of Proceeds" section of the filings. These filings were categorized into different buckets based on how descriptive the language is to help identify which debt issues were likely used to repurchase stock. Findings suggest that nearly 35% of the debt-financed repurchases specifically listed repurchases among the uses in the "Use of Proceeds" section of the filings, an additional 25% provided a laundry list of intended uses[4] and approximately 20% gave few or no specifics. Together, it is possible that almost 80% of the debt-financed repurchases used in this study are correctly identified; however, it is unreasonable to assume that proceeds were used for repurchases just because a filing suggests the possibility that proceeds *could* be used for repurchases. In reality, the actual amount of debt-financed repurchases is lower than 80% of the sample used in this study, but is impossible to know the exact amount with certainty. I estimate that approximately 2/3 of the debt-financed repurchases identified using my methodology mention repurchases among the uses of proceeds. While classifying firms that issued bonds six months prior to a repurchase as debt-financed repurchasing firms is far from perfect, conclusions drawn from hand-collecting the prospectuses from a sample of the debt-financed repurchases used in this study allow this methodology to serve as a decent proxy.

In recent years, the phenomenon of firms utilizing debt to finance share repurchases has increased substantially. Figure 4 illustrates the trend of debt-financed repurchases from 2004-

[4] Failing to specifically state repurchases does not necessarily exclude repurchases as an intended use.

2015 and Table 2 contains descriptive statistics including the average and median repurchase amounts each year. Both the number of repurchasing firms and the size of the average repurchase have increased over the years. For example, in the mid- to late-2000s, an average of 119 firms each year repurchased just over $100 million on average. After the Global Financial Crisis, an average of 152 firms each year repurchased almost $200 million on average. It is noteworthy that the number of debt-financed repurchases has increased post-crisis and average amounts have nearly doubled. Both Figure 4 and Table 2 support speculation that companies in recent years are paying for their expanding share buyback programs with debt. This may be due to the reduced cost of debt caused by the Fed's decision to keep interest rates low since 2008 to incentivize managers to attempt to time the market, especially if managers believe that the current interest rate environment is temporary and want to capitalize on historically low rates. It is reasonable to assume that managers utilize a low interest rate environment as an opportunity to repurchase stock.

4.7 Chapter Figures and Tables

Figure 1 shows the number of quarterly share repurchases and the volume (in $ billions) of quarterly share repurchases by year during the sample period. Share repurchases are measured from Compustat[5]. The figure illustrates an increase in the amount of stock buybacks over time, with a significant decrease during the Global Financial Crisis, as U.S. corporations conducted 3,854 repurchases of approximately $425 billion (adjusted to 2015 USD for consistency) each year on average.

[5] See the data description section of Chapter 4 for more details on how share repurchases are calculated.

Figure 1: Number of Repurchasing Firms and Repurchase Amounts from 2004-2015 (N = 46,249)

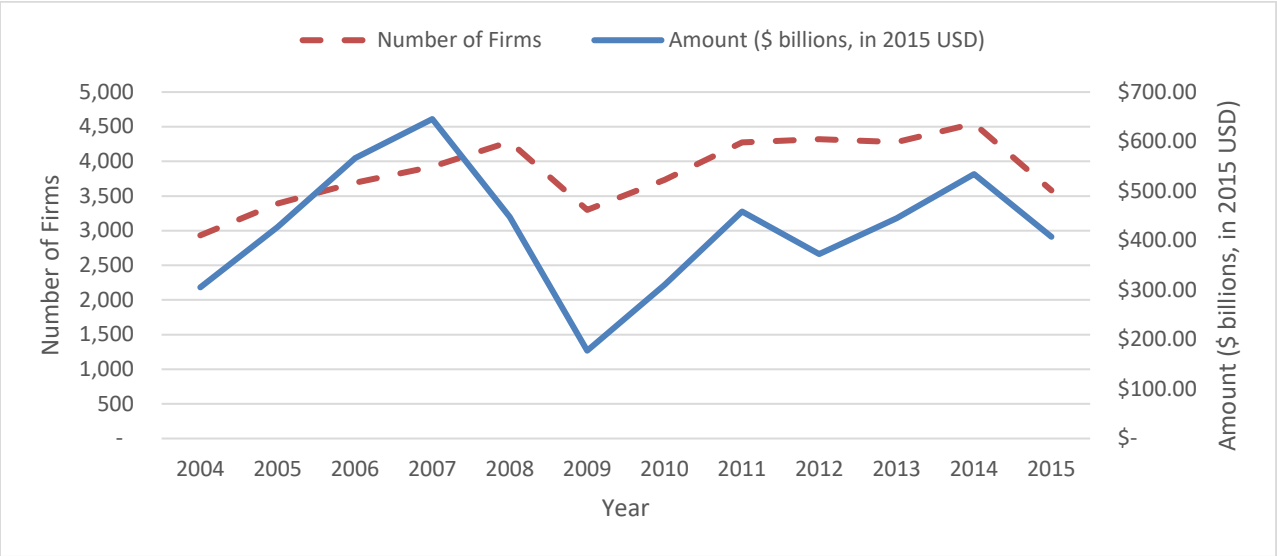


Figure 2 shows the distribution of new debt issues by year during the sample period. All new, senior, nonconvertible, syndicated, public debt issues during the sample period are obtained from the U.S. Corporate Loan and Debt Issues database in Bloomberg Professional. Non-U.S. firms, issues outside of the United States, issues by firms in Standard Industrial Classification (SIC) codes 6000-6999 (financial) or 9000-9999 (government-related) are excluded. Nominal loan proceeds were adjusted to 2015 USD for consistency.

Figure 2: New Issues of U.S. Corporate Bonds from 2004-2015 (N = 35,123)

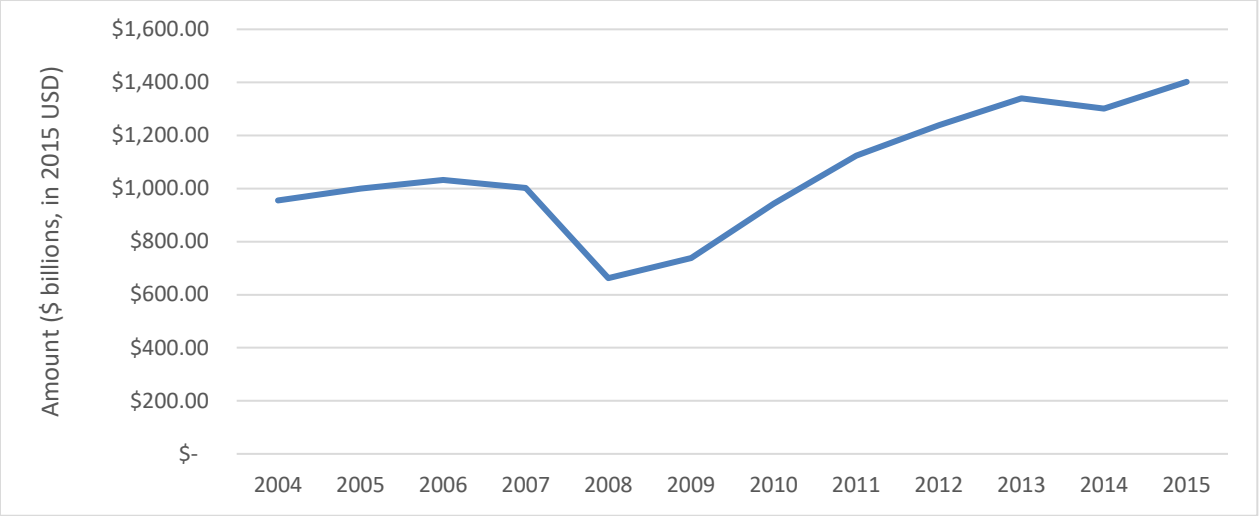
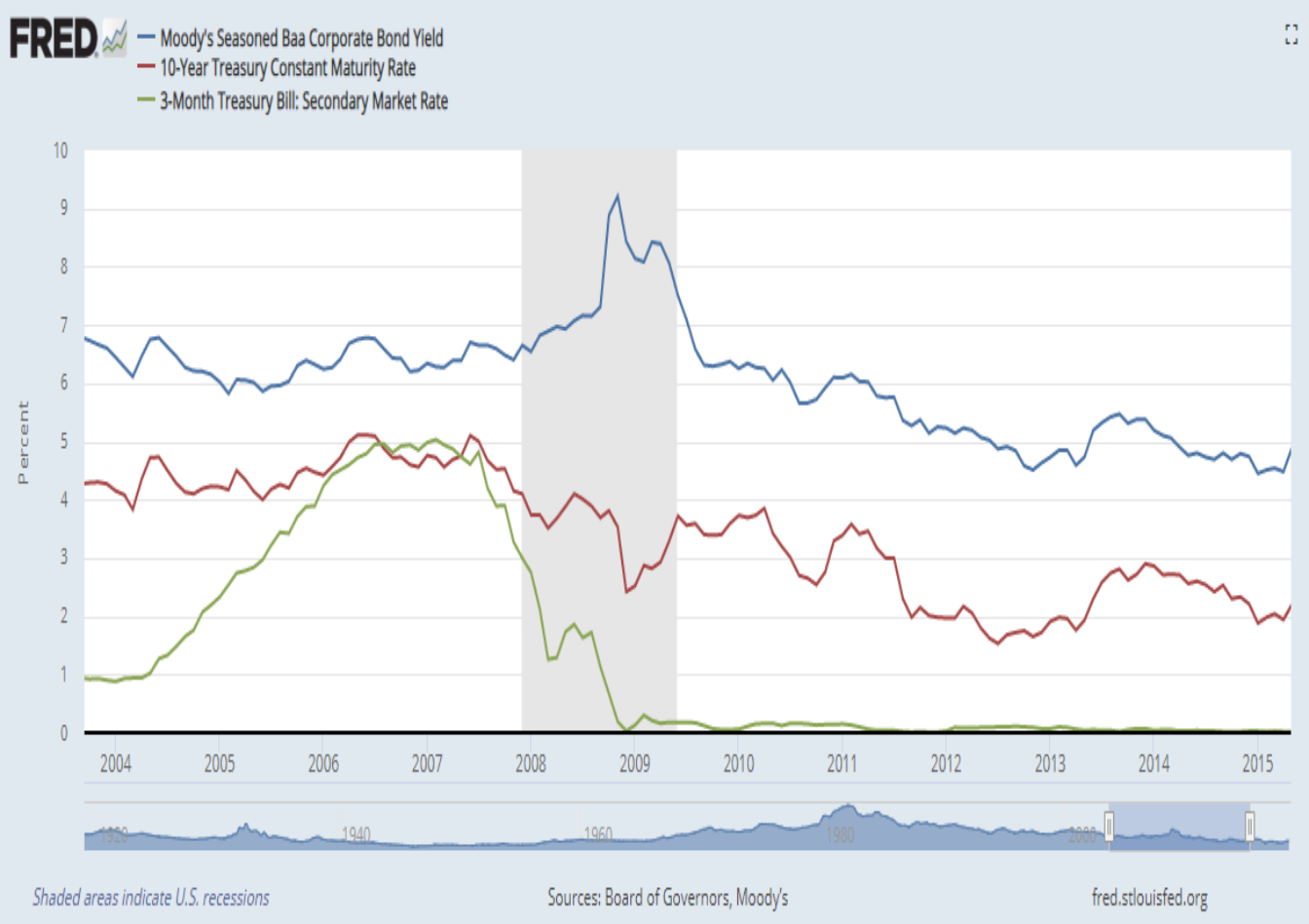


Figure 3 displays a graph of quarterly interest rates of Moody's Seasoned Baa Corporate Bond Yield, the 10-year Treasury Constant Maturity Rate and the 3-month Treasury Bill (Secondary Market Rate) during the sample period. Rates were obtained from the Federal Reserve Bank of St. Louis, www.research.stlouisfed.org. Quarterly interest rate data using Moody's Seasoned Baa Corporate Bond Yield is used in this study to classify periods of low, medium and high interest rate environments[6].

Figure 3: Graph of Quarterly Interest Rates from 2004-2015



[6] See the methodology section of Chapter 6 for details on how interest rate environments are classified.

Figure 4 shows the number of quarterly, debt-financed share repurchases and the volume (in $ billions) by year during the sample period, illustrating the increase in recent history in the number of firms utilizing debt to finance share repurchases, especially after the Global Financial Crisis. For consistency, repurchase amounts are adjusted to 2015 USD.

Figure 4: Trend of Debt-Financed Repurchases from 2004-2015 (N = 1583)

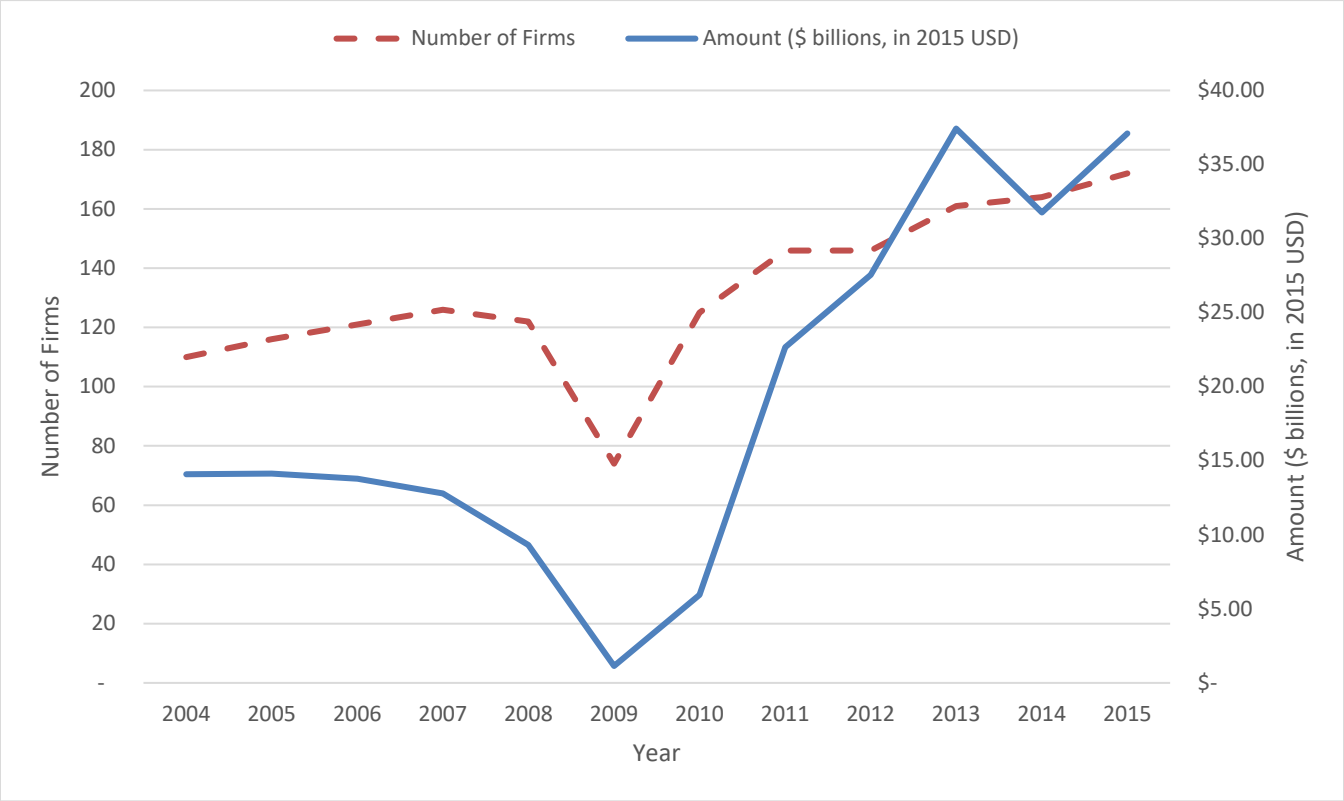


Table 1 describes the different screens applied to samples of quarterly stock repurchases and new issues of corporate bonds to construct the samples used throughout this study and to ultimately determine the sample of debt-financed repurchases. Stock repurchases are obtained from *Compustat*[7]. New issues of corporate bonds are obtained from the U.S. Corporate Loan and Debt Issues database in Bloomberg Professional. The table lists the screening criteria, observations deleted and observations remaining.

Table 1: Construction of Samples of Stock Repurchases, New Bond Issues and Debt-Financed Repurchases from 2004-2015

Screening Criteria	Observations Deleted	Observations Remaining
Sample 1: Stock Repurchases (quarterly)		
All firms in the Compustat database during the sample period		169,712
Firms that did not make a repurchase	120,177	49,535
Repurchases by firms in SIC codes 4000-4999, 6000-6999 or 9000-9999	3,211	46,324
Repurchases less than $10,000	64	46,260
Repurchasing firm has incomplete data in CRSP	10	46,249
Sample 2: New Issues of Corporate Bonds		
All new, senior, nonconvertible, syndicated, public debt issues		48,235
Issues by non-U.S. firms	4,100	44,135
Issues outside of the United States	1,688	42,447
Issues by firms in SIC codes 6000-6999 or 9000-9999	6,656	35,790
Issues by non-profit organizations	478	35,313
Issues that are components of derivative investments	190	35,123
Sample 3: Debt-Financed Stock Repurchases (quarterly)		
All quarterly stock repurchases (sample 1)		46,249
Firms that did not issue bonds prior to the repurchase	32,855	13,394
Firms that issued bonds greater than 1 year prior to the repurchase	10,210	3,184
Firms that issued bonds greater than 6 months prior to the repurchase	1,600	1,583

[7] See the data description section of Chapter 4 for more details on how share repurchases are calculated.

Table 2 contains descriptive statistics of all stock repurchases and debt-financed stock repurchases by year from 2004-2015, highlighting the uptick in both the number of and the size of debt-financed repurchases, with the exception of the years during the Global Financial Crisis. For consistency, repurchase amounts are adjusted to 2015 USD and presented in millions of dollars.

Table 2: Descriptive Statistics of Stock Repurchases and Debt-Financed Repurchases from 2004-2015

Year	Stock Repurchases (quarterly)				Debt-Financed Stock Repurchases (quarterly)			
	n	Total Amount	Mean	Median	n	Total Amount	Mean	Median
2004	2,932	$305,702.02	$104.26	$7.15	110	$14,089.92	$128.09	$11.31
2005	3,391	$427,453.22	$126.06	$9.62	116	$14,131.37	$121.82	$11.42
2006	3,690	$566,710.78	$153.58	$10.93	121	$13,791.81	$113.98	$10.74
2007	3,923	$645,483.43	$164.54	$10.77	126	$12,784.41	$101.46	$9.02
2008	4,282	$447,919.31	$104.61	$7.06	122	$9,313.21	$76.34	$7.12
2009	3,298	$177,476.67	$53.81	$4.02	74	$1,140.94	$15.42	$1.12
2010	3,733	$310,581.96	$83.20	$6.32	125	$5,935.19	$47.48	$3.53
2011	4,272	$458,699.48	$107.37	$7.80	146	$22,670.05	$155.27	$17.92
2012	4,320	$372,374.10	$86.20	$6.56	146	$27,548.83	$188.69	$21.21
2013	4,280	$445,113.76	$104.00	$7.64	161	$37,426.65	$232.46	$25.81
2014	4,545	$534,107.20	$117.52	$7.91	164	$31,765.01	$193.69	$21.67
2015	3,583	$407,782.91	$113.81	$7.41	172	$37,097.21	$215.68	$23.68
TOTAL	46,249	$5,099,404.84	$110.26	$7.53	1,583	$227,694.59	$143.84	$11.36

CHAPTER 5

DESCRIPTIVE STATISTICS

Descriptive statistics of the data are shown below and, to aid the reader, a description of all variables used throughout this study is found in the appendix.

5.1 Characteristics and Repurchase Statistics of Repurchasing Firms

5.1.1 All Repurchasing Firms

Table 3 displays information about all 46,249 quarterly share repurchases from 2004-2015. Panel A presents firm characteristics of the repurchasing firms. The average repurchasing firm's market capitalization is about $2 billion. However, since the median market capitalization is only $201 million, this indicates that there are some very large firms driving this average upward. The 95th and 99th percentiles of firm market capitalization are $7.86 billion and $49.17 billion, respectively. Examining the rest of the table indicates that these very large repurchasing firms distort upwards most of the averages in Table 3 so medians may be the most accurate representation of the sample overall. The median holdings of cash and cash equivalents of repurchasing firms is 10.55% of total assets and total debt is 25.23% of total assets. The median repurchasing firm spends just under 1.7% of total assets on CapEx and R&D. Panel B shows that the size of the median and average repurchase is $4.06 million and $82.18 million, respectively, and the median and average number of repurchased shares as a percentage of total shares outstanding is 0.5% and 1.69%, respectively.

5.1.2 Debt-Financed Repurchasing Firms

Table 4 displays information about firms that financed share repurchases by issuing debt.

There were 1,583 quarterly, debt-financed repurchases from 2004-2015. Panel A presents firm characteristics of the repurchasing firms. The average and median repurchasing firm's market capitalizations are $2.56 billion and $218 million, respectively, suggesting that firms that finance repurchases with debt are larger than other repurchasing firms. The 95th and 99th percentiles of firm market capitalization are $8.15 billion and $55.30 billion, respectively. The median holdings of cash and cash equivalents of debt-financed repurchasing firms is 11.63% of total assets compared to 10.55% of total assets for all repurchasing firms. The median total debt of these firms is 31.42% of total assets compared to 25.23% of total assets for all repurchasing firms. These numbers indicate that debt-financed repurchasing firms may have more cash, but are more leveraged than other repurchasing firms. In addition, Table 4 suggests that debt-financed repurchasing firms spend more, as a percentage of total assets, on CapEx and R&D than other repurchasing firms. Panel B shows that the size of the median and average debt-financed repurchase is $5.77 million and $96.71 million, respectively, which is much larger than the size of all other repurchasing firms. Overall, Table 4 suggests that debt-financed repurchasing firms are larger, have more cash on hand and are more leveraged. These firms may choose to borrow money in order to make larger repurchases than those of their counterparts.

5.1.3 Traditionally-Financed Repurchasing Firms

Table 5 displays information about firms that traditionally financed share repurchases from 2004-2015. These firms did not finance share repurchases by issuing debt. There were 44,666 quarterly repurchases from 2004-2015. Panel A presents firm characteristics of the repurchasing firms. The average repurchasing firm's market capitalization is $1.96 billion and the median is $190 million, suggesting that there are some very large firms driving this average

upward. The 95th and 99th percentiles of firm market capitalization are $7.74 billion and $48.39 billion, respectively. The median holdings of cash and cash equivalents of these repurchasing firms is 10.35% of total assets compared to 11.63% for debt-financed repurchasing firms. This suggests that traditionally-financed repurchasing firms hold less cash than debt-financed repurchasing firms do and this may be due to the fact that debt-financed repurchasing firms are larger. Panel B shows that the size of the median and average repurchase of traditionally-financed repurchasing firms is smaller than those of debt-financed repurchasing firms.

5.2 Tests for Differences in Firm Characteristics and Repurchase Statistics of All, Debt-Financed and Traditionally-Financed Repurchasing Firms

Formal tests are conducted between the samples of all, debt-financed and traditionally-financed repurchasing firms in order to see if there are significant differences in firm and repurchase characteristics. Differences are tested using t-tests for means and the Wilcoxon rank-sum non-parametric test for medians. Table 6 shows the results of these tests, confirming the above indications that some characteristics of debt-financed repurchasing firms are different from traditionally-financed repurchasing firms. Panel A displays the results of testing for differences in firm characteristics. Firms that finance repurchases with debt are larger than other repurchasing firms in terms of market capitalization and level of total assets. These debt-financed repurchasing firms also are more leveraged with higher debt ratios. In addition, there is some evidence confirming that debt-financed repurchasing firms have more cash on hand and spend slightly more on CapEx and R&D than traditionally-financed repurchasing firms. These results are statistically significant.[8] Panel B displays the results of testing for differences in repurchase

[8] See Table 6 for more details.

size, confirming that the average size of debt-financed repurchases is larger than that of other repurchasing firms. These results are significant at 1%.[8]

5.3 Chapter Tables

Table 3 reports summary statistics on the characteristics of all firms that conducted share repurchases during the sample period, with observations at the firm-quarter level. A description of table variables can be found in the appendix. The variables below are used to expand on the findings of Almeida et al. (2016) and are utilized to test Hypotheses 2 and 3. All asset-scaled measures are lagged assets from the end of the previous quarter. Panel A presents firm characteristics of the repurchasing firms and Panel B displays repurchase statistics.

Table 4 reports summary statistics on the characteristics of the subsample of firms that conducted debt-financed share repurchases during the sample period, with observations at the firm-quarter level. A description of table variables can be found in the appendix. The variables below are used to expand on the findings of Almeida et al. (2016) and are utilized to test Hypotheses 2 and 3. All asset-scaled measures are lagged assets from the end of the previous quarter. Panel A presents firm characteristics of the repurchasing firms and Panel B displays repurchase statistics.

Table 5 reports summary statistics on the characteristics of the subsample of firms that did not conduct debt-financed share repurchases during the sample period, with observations at the firm-quarter level. A description of table variables can be found in the appendix. The variables below are used to expand on the findings of Almeida et al. (2016) and are utilized to test Hypotheses 2 and 3. All asset-scaled measures are lagged assets from the end of the previous

quarter. Panel A presents firm characteristics of the repurchasing firms and Panel B displays repurchase statistics.

Table 6 reports the results of tests for differences in firm characteristics of the samples of all, debt-financed and traditionally-financed repurchasing firms during the sample period, with observations at the firm-quarter level. A description of table variables can be found in the appendix. The variables below are used to expand on the findings of Almeida et al. (2016). All asset-scaled measures are lagged assets from the end of the previous quarter. Panel A contrasts the means and medians [found in brackets] of firm characteristics of the repurchasing firms and Panel B contrasts the means and medians [found in brackets] of the repurchase statistics. Differences are tested using t-tests for means and the Wilcoxon rank-sum non-parametric test for medians. t-Statistics based on standard errors that are robust to heteroscedasticity and clustered at the firm level are reported in parentheses.

Table 3: Descriptive Statistics of All Repurchasing Firms from 2004-2015

	Mean	SD	p1	p5	p25	p50	p75	p95	p99	n
Panel A: Firm Characteristics of Repurchasing Firms										
Market capitalization ($M)	2,008	3,141	4	9	54	201	843	7,860	49,170	46,249
Assets ($M)	1,852	4,237	3	10	52	196	809	8,271	43,440	46,249
Cash and cash equivalents / Assets	22.91%	21.31%	0.00%	0.40%	2.91%	10.55%	32.06%	76.58%	141.50%	46,249
Total debt / Assets	30.85%	26.33%	0.00%	0.20%	3.42%	25.23%	40.30%	70.45%	119.70%	46,249
Capital expenditures / Assets	1.99%	1.99%	-0.10%	0.00%	0.70%	1.69%	2.69%	7.26%	14.83%	46,249
R&D / Assets	1.84%	2.76%	0.00%	0.00%	0.00%	0.00%	2.12%	7.82%	18.12%	46,249
Employees / Assets (per $M)	10.11	12.27	0.07	0.55	2.53	5.38	10.86	30.31	79.05	46,249
ROA	3.67%	31.92%	-151.90%	-62.82%	-4.34%	3.74%	9.09%	21.51%	52.41%	46,249
Q	2.36	1.69	0.60	0.81	1.14	1.60	2.46	5.92	13.06	46,249
Market-to-book	4.07	4.98	0.00	0.51	1.22	2.24	3.66	10.68	31.02	46,249
Cash flow / Assets	0.27%	7.50%	-35.85%	-14.05%	0.04%	2.07%	3.54%	6.92%	13.50%	46,249
Stock return (quarter)	5.35%	34.04%	-48.99%	-36.87%	-14.04%	1.11%	17.78%	60.10%	138.77%	46,249
Dividend payer	0.38	0.49	0	0	0	1	1	1	1	46,249
Panel B: Repurchase Statistics										
Repurchases ($M)	82.18	53.82	0.00	0.01	0.24	4.06	15.57	218.53	244.19	46,249
Repurchased shares / Shares outstanding	1.69%	1.79%	0.00%	0.00%	0.10%	0.50%	1.39%	5.78%	7.27%	46,249
Repurchases / Assets	1.91%	1.91%	0.00%	0.00%	0.10%	0.70%	1.81%	6.94%	8.25%	46,249

Table 4: Descriptive Statistics of Debt-Financed Repurchasing Firms from 2004-2015

	Mean	SD	p1	p5	p25	p50	p75	p95	p99	n
Panel A: Firm Characteristics of Debt-Financed Repurchasing Firms										
Market capitalization ($M)	2,556	3,143	5	15	62	218	878	8,148	55,298	1,583
Assets ($M)	2,449	4,279	4	9	55	208	835	8,808	50,608	1,583
Cash and cash equivalents / Assets	26.62%	19.99%	0.10%	0.51%	3.16%	11.63%	37.64%	82.72%	152.59%	1,583
Total debt / Assets	36.62%	25.30%	0.00%	0.00%	3.77%	31.42%	44.57%	76.09%	131.38%	1,583
Capital expenditures / Assets	2.40%	2.00%	-0.20%	0.00%	0.90%	2.20%	2.89%	7.88%	16.37%	1,583
R&D / Assets	2.59%	2.69%	0.00%	0.00%	0.00%	0.20%	2.59%	9.25%	22.39%	1,583
Employees / Assets (per $M)	10.70	12.10	0.06	0.60	2.64	5.93	10.92	31.51	82.23	1,583
ROA	3.70%	31.20%	-153.77%	-63.52%	-4.76%	3.75%	9.32%	21.58%	46.80%	1,583
Q	2.40	1.65	0.60	0.84	1.15	1.62	2.49	5.91	13.28	1,583
Market-to-book	3.96	4.86	0.00	0.50	1.19	2.28	3.86	10.50	30.42	1,583
Cash flow / Assets	0.31%	7.62%	-36.42%	-14.26%	0.04%	2.17%	3.60%	7.08%	13.80%	1,583
Stock return (quarter)	5.46%	35.22%	-48.51%	-36.51%	-13.79%	1.29%	17.76%	58.92%	139.28%	1,583
Dividend payer	0.41	0.52	0	0	0	1	1	1	1	1,583
Panel B: Repurchase Statistics										
Repurchases ($M)	96.71	50.09	0.00	0.03	0.37	5.77	16.57	219.72	246.65	1,583
Repurchased shares / Shares outstanding	1.61%	1.71%	0.00%	0.10%	0.20%	0.40%	1.31%	5.83%	7.04%	1,583
Repurchases / Assets	1.52%	1.62%	0.00%	0.00%	0.20%	0.51%	1.62%	6.87%	7.98%	1,583

Table 5: Descriptive Statistics of Traditionally-Financed Repurchasing Firms from 2004-2015

	Mean	SD	p1	p5	p25	p50	p75	p95	p99	n
Panel A: Firm Characteristics of Traditionally-Financed Repurchasing Firms										
Market capitalization ($M)	1,966	3,087	4	10	54	190	825	7,740	48,388	44,666
Assets ($M)	1,806	4,220	3	9	51	190	805	8,268	43,435	44,666
Cash and cash equivalents / Assets	22.71%	21.11%	0.00%	0.30%	2.71%	10.35%	31.26%	75.88%	139.49%	44,666
Total debt / Assets	29.50%	25.84%	0.00%	0.20%	3.27%	24.55%	39.40%	69.20%	117.51%	44,666
Capital expenditures / Assets	1.91%	2.01%	-0.10%	0.00%	0.60%	1.50%	2.61%	7.22%	14.74%	44,666
R&D / Assets	1.78%	2.87%	0.00%	0.00%	0.00%	0.00%	2.08%	8.22%	19.31%	44,666
Employees / Assets (per $M)	9.92	12.07	0.07	0.54	2.47	5.27	10.63	29.59	77.12	44,663
ROA	3.60%	31.56%	-150.65%	-62.61%	-4.22%	3.62%	8.94%	21.41%	46.33%	44,559
Q	2.37	1.71	0.61	0.83	1.16	1.60	2.47	5.99	13.24	44,666
Market-to-book	3.88	4.78	0.00	0.50	1.09	2.19	3.68	10.25	30.25	44,666
Cash flow / Assets	0.26%	7.49%	-35.80%	-13.93%	0.03%	2.06%	3.52%	6.92%	13.46%	44,666
Stock return (quarter)	5.25%	33.84%	-48.88%	-36.76%	-13.94%	1.11%	17.68%	60.30%	138.98%	44,666
Dividend payer	0.40	0.51	0	0	0	1	1	1	1	44,666
Panel B: Repurchase Statistics										
Repurchases ($M)	77.02	47.14	0.00	0.01	0.24	3.88	13.84	207.44	230.64	44,666
Repurchased shares / Shares outstanding	1.68%	1.68%	0.00%	0.00%	0.10%	0.50%	1.29%	5.74%	7.13%	44,666
Repurchases / Assets	2.01%	1.81%	0.00%	0.00%	0.20%	0.80%	1.71%	7.04%	8.04%	44,666

Table 6: Tests for Differences in Firm Characteristics of All, Debt-Financed and Traditionally-Financed Repurchasing Firms from 2004-2015

	All Repurchasing Firms (1)	Debt-Financed Repurchasing Firms (2)	Traditionally-Financed Repurchasing Firms (3)	(2 - 1)	(3 - 1)	(3 - 2)
Panel A: Firm Characteristics of Repurchasing Firms						
n	46,249	1,583	44,666	n/a	n/a	n/a
Market capitalization ($M)	2,008	2,556	1,966	548**	-42	-590**
	[201]	[218]	[190]	[17]*	[-11]	[-28]*
				(1.96)	(-0.28)	(-2.27)
				(1.72)	(-0.14)	(-1.80)
Assets ($M)	1,852	2,449	1,806	596***	-46	-643***
	[196]	[208]	[190]	[12]	[-6]	[-18]*
				(2.40)	(-0.05)	(-2.55)
				(1.45)	(-1.13)	(-1.69)
Cash and cash equivalents / Assets	22.91%	26.62%	22.71%	3.71%*	-0.20%	-3.91%*
	[10.55%]	[11.63%]	[10.35%]	[1.08%]	[-0.20%]	[-1.28%]
				(1.70)	(-0.48)	(-1.75)
				(-1.21)	(-0.30)	(-1.39)
Total debt / Assets	30.85%	36.62%	29.50%	5.76%**	-1.35%	-7.12%***
	[25.23%]	[31.42%]	[24.55%]	[6.19%]	[-0.68%]	[-6.87%]*
				(2.29)	(-1.27)	(-2.37)
				(1.55)	(-0.58)	(-1.66)
Capital expenditures / Assets	1.99%	2.40%	1.91%	0.41%	-0.08%	-0.49%*
	[1.69%]	[2.20%]	[1.50%]	[0.51%]	[-0.19%]	[-0.70%]*
				(1.60)	(-0.95)	(-1.73)
				(1.56)	(-0.74)	(-1.68)

(table continues)

	All Repurchasing Firms (1)	Debt-Financed Repurchasing Firms (2)	Traditionally-Financed Repurchasing Firms (3)	(2 - 1)	(3 - 1)	(3 - 2)
R&D / Assets	1.84%	2.59%	1.78%	0.75% (1.60)	-0.06% (-0.27)	-0.81%* (-1.77)
	[0.00%]	[0.20%]	[0.00%]	[0.20%]* (1.80)	[0.00%] (-0.11)	[-0.20%]* (-1.88)
Employees / Assets (per $M)	10.11	10.70	9.92	0.59 (1.32)	-0.19 (-0.18)	-0.78 (-1.41)
	[5.38]	[5.93]	[5.27]	[0.55] (0.84)	[-0.11] (-0.25)	[-0.11] (-0.31)
ROA	3.67%	3.70%	3.60%	0.03% (0.18)	-0.07% (-0.33)	-0.10% (-0.46)
	[3.74%]	[3.75%]	[3.62%]	[0.01%] (0.13)	[-0.12%] (-0.34)	[-0.13%] (-0.36)
Q	2.36	2.40	2.37	0.04 (0.21)	0.02 (0.14)	-0.02 (-0.16)
	[1.60]	[1.62]	[1.60]	[0.02] (0.28)	[0.00] (-0.10)	[-0.02] (-0.34)
Market-to-book	4.07	3.96	3.88	-0.10 (-0.29)	-0.19 (-0.47)	-0.08 (-0.26)
	[2.24]	[2.28]	[2.19]	[0.04] (0.12)	[-0.05] (-0.20)	[-0.09] (-0.31)
Cash flow / Assets	0.27%	0.31%	0.26%	0.04% (0.95)	-0.01% (-0.39)	-0.05% (-1.22)
	[2.07%]	[2.17%]	[2.06%]	[0.10%]** (1.99)	[-0.01%] (-0.34)	[-0.11%]** (-2.06)

(table continues)

	All Repurchasing Firms (1)	Debt-Financed Repurchasing Firms (2)	Traditionally-Financed Repurchasing Firms (3)	(2 - 1)	(3 - 1)	(3 - 2)
Stock return (quarter)	5.35%	5.46%	5.25%	0.10% (0.28)	-0.10% (-0.31)	-0.20% (-0.62)
	[1.11%]	[1.29%]	[1.11%]	[0.18%] (0.88)	[0.00%] (0.26)	[-0.18%] (-0.93)
Dividend payer	0.38	0.41	0.40	0.03 n/a	0.02 n/a	-0.01 n/a
	[1]	[1]	[1]	[0] n/a	[0] n/a	[0] n/a
Panel B: Repurchase Statistics						
n	46,249	1,583	44,666	n/a	n/a	n/a
Repurchases ($M)	82.18	96.71	77.02	14.52** (1.98)	-5.16 (-0.64)	-19.69*** (-2.35)
	[4.06]	[5.77]	[3.88]	[1.71] (1.62)	[-0.18] (-0.35)	[-1.89]* (-1.88)
Repurchased shares / Shares outstanding	1.69%	1.61%	1.68%	-0.09% (-0.51)	-0.01% (-0.08)	0.08% (0.49)
	[0.50%]	[0.40%]	[0.50%]	[-0.10%] (-0.31)	[0.00%] (0.20)	[0.10%] (0.41)
Repurchases / Assets	1.91%	1.52%	2.01%	-0.40%* (-1.79)	0.10% (0.72)	0.50%* (1.83)
	[0.70%]	[0.51%]	[0.80%]	[-0.19%] (-1.18)	[-0.10%] (-0.88)	[0.29]* (1.66)

Significance is indicated as follows: *** = 1%, ** = 5%, * = 10%.

CHAPTER 6

HYPOTHESIS 1: MARKET TIMING AND THE USE OF DEBT FOR REPURCHASES

6.1 Testing of Hypothesis 1

6.1.1 Methodology

In order to test my first hypothesis, I analyze a sample of all firms that made a quarterly repurchase from 2004-2015. The entire sample consists of 46,249 share repurchases. These repurchases are categorized into periods of low, medium and high interest rate environments following the methodology of Barry et al. (2008) and consistent with the findings of Graham and Harvey (2001). The rankings of current interest rates compared to recent historical rates are calculated. Using Moody's seasoned Baa corporate bond yield obtained from the Federal Reserve Bank of St. Louis, average rates in each quarter are compared to the long-run average quarterly rate throughout the sample period to compute decile rankings. Rates that are below the 30th percentile of the long-run average quarterly rate are considered "low." Rates that are above the 70th percentile of the long-run average quarterly rate are considered "high." Finally, rates in the middle 4 deciles of the long-run average quarterly rate are considered "medium."

Subsamples of firms that made repurchases during periods of low, medium and high interest rate environments are examined to observe both the occurrence and characteristics of debt-financed repurchasing firms. Following the methodology of Dittmar (2000), Probit model estimation is utilized to measure the likelihood of debt-financed repurchases in different interest rate environments. The following equation is estimated, controlling for prominent reasons why firms repurchase stock and industry effects:

$$I_{DebtRepurchase,it} = \alpha_i + \beta_1 I_{LowInterest,it} + controls_{i(t-1)} + \varepsilon_{it} \quad (1)$$

where $I_{DebtRepurchase}$ is an indicator for if a firm made a quarterly stock repurchase and $I_{LowInterest}$ is

an indicator for if the repurchase was made during a period of low interest rate environments. The control variables are *Cash*, *Cashflow*, *Mkbk*, *Payout*, *lnAssets*, *Return*, *Lever*, *CorpBondYield*, and *PostFinancialCrisis*. *Cash* is the ratio of cash and cash equivalents to total assets at the end of the year prior to the repurchase. *Cashflow* is the ratio of net income before taxes plus depreciation and changes in deferred taxes and other deferred charges to total assets at the end of the year prior to the repurchase. Both *Cash* and *Cashflow* control for the excess capital hypothesis. *Mkbk* is the market value of equity plus debt to the book value of assets at the end of the year prior to the repurchase. *Mkbk* controls for firms' investment opportunities. *Payout* is the ratio of cash dividends paid to net income in the year prior to the repurchase. *Payout* controls for the substitution effect of firms paying dividends in lieu of repurchases. *lnAssets* is the natural log of total assets at the end of the year prior to the repurchase. *Return* is the value-weighted, market-adjusted stock return in the calendar year prior to the repurchase. *Mkbk*, *lnAssets* and *Return* control for the undervaluation hypothesis, measuring information asymmetry (*lnAssets*) and undervaluation (*Mkbk* and *Return*). *Lever* is the difference between a firm's total debt to asset ratio in the year prior to the repurchase minus the median net debt-to-asset ratio of all firms in the same industry using the Fama and French (1997) classifications. *Lever* controls for the optimal leverage ratio hypothesis. *CorpBondYield* is the average quarterly rate of the Moody's Seasoned Baa Corporate Bond Yield at the time of the repurchase. *PostFinancialCrisis* is an indicator for if the repurchase was made after the Global Financial Crisis (i.e., 2009 or later).

Next, an OLS regression is utilized to assess if a low interest rate environment affects repurchase amounts. The following equation is estimated:

$$AllDistributions_{it} = \alpha_i + \beta_1 I_{LowInterest,it} * DebtRepurchases_{it} + \beta_2 I_{LowInterest,it} * TraditionalRepurchases_{it} + controls_{i(t-1)} + \varepsilon_{it} \quad (2)$$

where *AllDistributions* is the sum of cash dividends and repurchase amounts in a quarter,

$I_{LowInterest}$ is an indicator for if the repurchase was made during a period of low interest rate environments and *DebtRepurchases* and *TraditionalRepurchases* are the amounts of quarterly debt-financed and traditionally-financed repurchases, respectively. The same control variables found in Equation 1 are used with the exception of *Payout* to avoid simultaneity.

Additional tests of Hypothesis 1 are found in Chapter 7 that evaluates the likelihood of debt-financed repurchases utilizing the managerial motive of earnings management to induce share repurchases.

6.1.2 Results

Tables 7 and 8 display information about firms that made debt-financed repurchases during low and medium/high interest rate environments, respectively. Almost two thirds (1,034 out of 1,583 quarterly repurchases, or 65.32%) of all debt-financed repurchases were conducted during periods of low interest rates. The remaining 34.68% of repurchases were made during medium or high interest rate environments. Panels A present firm characteristics of the repurchasing firms and Panels B display information about the size of the repurchases. Differences between both firm characteristics and repurchase sizes of debt-financed repurchasing firms in low and medium or high interest rate environments are tested using t-tests for means and the Wilcoxon rank-sum non-parametric test for medians. A comparison of Tables 7 and 8 concludes that firms that make debt-financed repurchases in low interest rate environments are larger in terms of market capitalization and total assets and are more levered than firms that make debt-financed repurchases in medium or high interest rate environments. These differences are statistically significant at either 5% or 10% (see Table 7 for more details). The average and median repurchasing firm's market capitalizations are $2.68 billion and $231 million,

respectively, in low interest rate environments compared to $2.41 billion and $202 million in medium or high interest rate environments. The median debt ratio in low interest rate environments is 33.97% compared to 28.47% in medium or high interest rate environments. Finally, the median and average repurchase is $6.50 million and $100.82 million, respectively, in low interest rate environments compared to $5.29 million and $92.28 million in medium or high interest rate environments.

In order to formally test Hypothesis 1, a regression equation is estimated to measure how the presence of a low interest rate environment affects the likelihood of firms to execute debt-financed stock repurchases relative to medium and high interest rate environments. In addition, a second regression is utilized to ascertain if a low interest rate environment is associated with repurchase levels. The main independent variables of importance are $I_{LowInterest}$ and *DebtRepurchases*. The results are found in Table 9. Panel A presents the results of a Probit regression testing for the effects on the likelihood of debt-financed repurchases and Panel B presents the results of an OLS regression assessing effects on repurchase amounts. An examination of these coefficients provides some interesting interpretations. After controlling for prominent reasons why firms repurchase stock as well as industry effects, a prevailing environment of low interest rates is related to debt-financed repurchases. The probability of a debt-financed repurchase increases approximately 2.09% in the presence of low interest rates. This result is statistically significant at 5%. The coefficients for *lnAssets* and *Lever* are statistically significant and confirm previous inferences that firms that make debt-financed repurchases in low interest rate environments are larger and more levered. The coefficient for *Cashflow* is also significant, confirming previous inferences that debt-financed repurchasing firms have higher cash flows. *CorpBondYield* is negative and marginally significant, suggesting

that there is a relation between debt-financed repurchases and lower interest rates. Finally, *PostFinancialCrisis* is positive and significant in Panel A and negative and significant in Panel B. This suggests that the propensity of debt-financed repurchases marginally increases after the Global Financial Crisis, but all distribution amounts (both dividends and repurchases) significantly decreased post-2008. However, little to no evidence is found that low interest rate environments have an effect on repurchase amounts (both debt- and traditionally-financed).

These regressions are repeated on subsamples of firms that made debt-financed repurchases before and after the Global Financial Crisis and the results are also presented in Table 9. Interestingly, the results are stronger after the financial crisis (and insignificant before!) where the probability of a debt-financed repurchases increases approximately 3.20% in the presence of low interest rates. This result is statistically significant at 1%. The coefficients for *lnAssets*, *Lever* and *Cashflow* are also significant post-crisis. In addition, the coefficient on *CorporateBondYield* is negative and very significant after the crisis and insignificant before the crisis, further confirming that there is a relation between debt-financed repurchases and lower interest rates. Finally, in the period after the crisis, a low interest rate environment significantly increases debt-financed repurchase amounts. This result is significant at 5%. Overall, these results confirm speculation that managers may time debt markets in order to repurchase stock, especially in the low interest rate environment after the Global Financial Crisis.

6.2 Chapter Tables

Table 7 reports summary statistics on the characteristics of the subsample of firms that conducted debt-financed share repurchases during low interest rate environments[9] of the sample

[9] See the methodology section of Chapter 6 for details on how interest rate environments are classified.

period, with observations at the firm-quarter level. A description of table variables can be found in the appendix. The variables below are used to expand on the findings of Almeida et al. (2016) and are utilized as an additional test of Hypothesis 1. All asset-scaled measures are lagged assets from the end of the previous quarter. Panel A presents firm characteristics of the repurchasing firms and Panel B displays repurchase statistics. Differences between both firm characteristics and repurchase sizes of debt-financed repurchasing firms in low and medium or high interest rate environments (see Table 8) are tested using t-tests for means and the Wilcoxon rank-sum non-parametric test for medians.

Table 8 reports summary statistics on the characteristics of the subsample of firms that conducted debt-financed share repurchases during medium or high interest rate environments[10] of the sample period, with observations at the firm-quarter level. A description of table variables can be found in the appendix. The variables below are used to expand on the findings of Almeida et al. (2016) and are utilized as an additional test of Hypothesis 1. All asset-scaled measures are lagged assets from the end of the previous quarter. Panel A presents firm characteristics of the repurchasing firms and Panel B displays repurchase statistics. Differences between both firm characteristics and repurchase sizes of debt-financed repurchasing firms in low (see Table 7) and medium or high interest rate environments are tested using t-tests for means and the Wilcoxon rank-sum non-parametric test for medians. These results are shown in Table 7.

Table 9 shows the results of regressions measuring how the presence of a low interest rate environment affects the likelihood of firms to execute and the amounts of debt-financed stock repurchases relative to medium and high interest rate environments[11] of the sample period.

[10] See the methodology section of Chapter 6 for details on how interest rate environments are classified.

[11] See the methodology section of Chapter 6 for details on how interest rate environments are classified.

A description of table variables can be found in the appendix. Two different models are tested and the main independent variables of importance are $I_{LowInterest}$ and the interaction of $I_{LowInterest}$ and *DebtRepurchases*. These models are utilized to test Hypothesis 1 and control for prominent reasons why firms repurchase stock and industry effects. *Cash* and *Cashflow* control for the excess capital hypothesis; *Mkbk* controls for firms' investment opportunities; *Payout* controls for the substitution effect of firms paying dividends in lieu of repurchases; *Mkbk, lnAssets* and *Return* control for the undervaluation hypothesis, measuring information asymmetry (*lnAssets*) and undervaluation (*Mkbk* and *Return*); *Lever* controls for the optimal leverage ratio hypothesis; *CorpBondYield* is the average quarterly rate of the Moody's Seasoned Baa Corporate Bond Yield at the time of the repurchase; and *PostFinancialCrisis* is a dummy variable that takes on a value of 1 if the repurchase was made after the Global Financial Crisis. Panel A presents the results of a Probit regression testing for the effects of a low interest rate environment on the likelihood of debt-financed repurchases and Panel B presents the results of an OLS regression assessing if a low interest rate environment affects repurchase amounts. *Payout* is excluded as a control variable from the second model to avoid simultaneity. z-statistics (Panel A) and t-statistics *(*Panel B*) b*ased on standard errors that are robust to heteroscedasticity and clustered at the firm level are reported in parentheses below the coefficient estimates. The marginal effects of the coefficient estimates i*n Model A* are found in brackets. Each model is conducted on the entire sample as well as before and after the Global Financial Crisis.

Table 7: Descriptive Statistics of Debt-Financed Repurchasing Firms in Low-Interest Rate Environments from 2004-2015

	Mean	SD	p1	p5	p25	p50	p75	p95	p99	n
Panel A: Firm Characteristics of Debt-Financed Repurchasing Firms in Low-Interest Rate Environments										
Market capitalization ($M)	2,682**	3,092	7	16	68	231**	885	8,279	58,118	1,034
Assets ($M)	2,527*	4,228	5	10	57	216**	835	8,887	53,100	1,034
Cash and cash equivalents / Assets	26.63%	19.21%	0.10%	0.59%	3.07%	11.48%	36.33%	81.18%	149.09%	1,034
Total debt / Assets	36.82%**	24.79%	0.00%	0.00%	3.88%	33.97%*	44.68%	76.70%	132.70%	1,034
Capital expenditures / Assets	2.42%	1.92%	-0.20%	0.00%	1.01%	2.32%	3.03%	8.18%	16.77%	1,034
R&D / Assets	2.86%	2.55%	0.00%	0.00%	0.00%	0.41%	2.96%	10.20%	24.28%	1,034
Employees / Assets (per $M)	10.67	12.07	0.06	0.62	2.65	5.92	10.89	32.11	83.05	1,034
ROA	3.63%	30.35%	-150.05%	-62.19%	-4.38%	3.78%	9.25%	21.19%	46.07%	1,034
Q	2.54	1.66	0.59	0.83	1.15	1.59	2.47	5.90	13.22	1,034
Market-to-book	4.04	4.85	0.00	0.61	1.31	2.42	3.84	10.71	31.21	1,034
Cash flow / Assets	0.29%	7.54%	-36.23%	-14.17%	0.05%	2.17%	3.59%	7.04%	13.74%	1,034
Stock return (quarter)	5.47%	35.96%	-50.65%	-36.67%	-13.88%	1.52%	18.03%	60.37%	142.63%	1,034
Dividend payer	0.43	0.52	0	0	0	1	1	1	1	1,034
Panel B: Repurchase Statistics										
Repurchases ($M)	100.82**	51.47	0.00	0.04	0.41	6.50**	17.41	227.01	257.81	1,034
Repurchased shares / Shares outstanding	1.82%	1.82%	0.00%	0.10%	0.20%	0.71%*	1.52%	6.06%	7.17%	1,034
Repurchases / Assets	1.39%	1.49%	0.00%	0.00%	0.20%	0.40%	1.58%	6.63%	7.72%	1,034

Significance is indicated as follows: *** = 1%, ** = 5%, * = 10%.

Table 8: Descriptive Statistics of Debt-Financed Repurchasing Firms in Medium/High-Interest Rate Environments from 2004-2015

	Mean	SD	p1	p5	p25	p50	p75	p95	p99	n
Panel A: Firm Characteristics of Debt-Financed Repurchasing Firms in Medium/High-Interest Rate Environments										
Market capitalization ($M)	2,441	3,085	4	15	59	202	850	7,917	52,885	549
Assets ($M)	2,342	4,162	3	9	51	195	800	8,513	48,057	549
Cash and cash equivalents / Assets	25.73%	19.90%	0.10%	0.50%	3.12%	11.36%	37.08%	81.10%	149.44%	549
Total debt / Assets	34.28%	24.72%	0.00%	0.00%	3.55%	28.47%	42.95%	72.99%	124.90%	549
Capital expenditures / Assets	2.38%	1.98%	-0.20%	0.00%	0.89%	2.08%	2.77%	7.92%	16.34%	549
R&D / Assets	2.39%	2.89%	0.00%	0.00%	0.00%	0.10%	2.49%	9.15%	21.99%	549
Employees / Assets (per $M)	10.56	11.95	0.06	0.6	2.59	5.86	10.8	31.02	80.97	549
ROA	3.51%	39.80%	-151.54%	-62.59%	-4.78%	3.58%	9.05%	21.09%	45.77%	549
Q	2.39	1.67	0.63	0.86	1.19	1.68	2.56	6.01	13.57	549
Market-to-book	4.02	5.03	0.00	0.50	1.21	2.21	3.92	10.65	30.75	549
Cash flow / Assets	0.32%	7.66%	-36.55%	-14.30%	0.05%	2.15%	3.60%	7.09%	13.82%	549
Stock return (quarter)	5.81%	36.31%	-49.78%	-37.43%	-14.28%	1.22%	18.36%	60.69%	143.00%	549
Dividend payer	0.42	0.55	0	0	0	1	1	1	1	549
Panel B: Repurchase Statistics										
Repurchases ($M)	92.28	48.89	0.00	0.02	0.36	5.29	16.19	213.38	234.37	549
Repurchased shares / Shares outstanding	1.43%	1.63%	0.00%	0.10%	0.20%	0.31%	1.22%	5.71%	6.83%	549
Repurchases / Assets	1.59%	1.59%	0.00%	0.00%	0.20%	0.60%	1.69%	6.87%	7.96%	549

Table 9: The Effect of Low Interest Rate Environments on Debt-Financed Stock Repurchases

	Entire Sample Period (2004-2015)	Before Global Financial Crisis (2004-2007)	After Global Financial Crisis (2010-2015)
Panel A: Effect of Low Interest Rate Environments on the Likelihood of Debt-Financed Repurchases (Probit)			
Dependent Variable: $I_{DebtRepurchase}$			
Marginal Effects [in brackets]: Probability that $I_{DebtRepurchase}=1$			
	Model A Estimates (Equation 1)		
$I_{LowInterest}$	0.4482**	0.1256	0.6839***
	(2.09)	(0.89)	(3.20)
	[0.0294]	[0.0093]	[0.0388]
Cash	0.2100	0.3800	0.2997
	(1.24)	(1.33)	(1.28)
	[0.0096]	[0.0108]	[0.0099]
Cashflow	0.6822**	0.8864*	0.6893**
	(1.99)	(1.76)	(1.97)
	[0.0144]	[0.0112]	[0.0150]
Mkbk	-0.0482	-0.0551	-0.0356
	(-1.31)	(-1.36)	(-1.14)
	[-0.0237]	[-0.0222]	[-0.0197]
Payout	1.6005	1.6421	1.5547
	(1.52)	(1.60)	(1.39)
	[0.0197]	[0.0204]	[0.0177]

(table continues)

	Entire Sample Period (2004-2015)	Before Global Financial Crisis (2004-2007)	After Global Financial Crisis (2010-2015)
lnAssets	1.1267***	1.0517**	1.2552***
	(2.60)	(2.02)	(2.46)
	[0.0254]	[0.0188]	[0.0261]
Return	-0.2006	-0.3012	-0.2156
	(-0.92)	(-1.03)	(-0.99)
	[-0.0033]	[-0.0055]	[-0.0106]
Lever	0.3910**	0.2947*	0.4268**
	(2.29)	(1.69)	(2.33)
	0.0185	[0.0100]	[0.0199]
CorpBondYield	-0.8109*	0.0545	-1.406***
	(-1.70)	(0.34)	(-2.38)
	[-0.0104]	[0.0033]	[-0.0166]
PostFinancialCrisis	0.4188**		
	(2.03)		
	[0.0201]		
Intercept	-10.5529*	-6.9982*	-12.5413*
	(-1.70)	(-1.67)	(-1.88)
	[n/a]	[n/a]	[n/a]
Industry dummies	Yes	Yes	Yes
n	1,583	473	914

(table continues)

	Entire Sample Period (2004-2015)	Before Global Financial Crisis (2004-2007)	After Global Financial Crisis (2010-2015)
Panel B: Effect of Low Interest Rate Environments on Repurchase Amounts (OLS)			
Dependent Variable: AllDistributions			
	Model B Estimates (Equation 2)		
$I_{LowInterest}$* DebtRepurchases	1.0826*	0.8562	2.3423**
	(1.72)	(0.64)	(2.14)
$I_{LowInterest}$* TraditionalRepurchases	0.4932	0.2143	0.7852*
	(0.35)	(0.21)	(1.68)
Cash	2.9726	2.1421	2.9523
	(1.55)	(1.26)	(1.58)
Cashflow	5.6212***	4.5967***	6.2131***
	(2.69)	(2.23)	(3.00)
Mkbk	-2.5552	-2.0199	-2.4999
	(-1.39)	(-1.20)	(-1.37)
lnAssets	2.6552**	2.5524*	2.7854**
	(2.08)	(1.82)	(2.11)
Return	-1.5732	-1.4931	-1.3989
	(-0.83)	(-0.78)	(-0.65)
Lever	-2.1563*	-1.9876	-2.5200*
	(-1.70)	(-1.59)	(-1.78)

(table continues)

	Entire Sample Period (2004-2015)	Before Global Financial Crisis (2004-2007)	After Global Financial Crisis (2010-2015)
CorpBondYield	-0.2542	0.0456	-0.5459
	(-0.99)	(0.39)	(-1.50)
PostFinancialCrisis	-0.8100**		
	(-2.07)		
Industry dummies	Yes	Yes	Yes
n	1,583	473	914

** Significant at 1%; ** Significant at 5%; * Significant at 10%

CHAPTER 7

HYPOTHESES 2 AND 3: IMPACT OF DEBT-FINANCED REPURCHASES ON FIRM INVESTMENT DECISIONS

7.1 Testing of Hypotheses 2 and 3

7.1.1 Methodology

In order to test Hypotheses 2 and 3, I expand on the findings of Almeida et al. (2016). However, there are a few key distinctions: 1) The method of measuring share repurchases is different. Almeida et al. (2016) used the Fama and French (2001) method of measuring share repurchases as the increase in common Treasury stock while this dissertation uses share repurchase information from Compustat that became more readily available beginning in 2004 as a result of an amendment to Rule 10b-18 of the Securities Exchange Act of 1934 (SEC, 2003). This measurement of repurchases increases accuracy compared to prior studies. 2) When evaluating the effects of share repurchases on future investments, industry-adjustments are made to future changes in investment variables using the Fama and French (1997) industry classifications. And 3) This dissertation expands on their findings by examining if the method of financing stock repurchases makes a difference to future firm investments and long-term firm value.

Hypotheses 2 and 3 are tested by utilizing the motive of earnings management to evaluate the consequences of stock repurchases on future firm investments (i.e., employment, CapEx and R&D). Managers may choose to execute share repurchase programs if they believe that they will not hit analysts' EPS forecasts in a given quarter. I collect share repurchase data and other information as described in Chapter 4 from 2004-2015. Descriptive statistics of repurchases,

earnings surprises and firm characteristics, including key differences in the characteristics of repurchasing firms and non-repurchasing firms, are found in the *Chapter 5*.

OLS regressions are conducted to examine the relationship between repurchases and investments (see Equation 3):

$$\bar{Y}_{i,(t+1,t+4)} - \bar{Y}_{i,(t-4,t-1)} = \propto + \beta_1 Repurchases_{it} + controls + \theta_t + \varepsilon_{it} \quad (3)$$

The investment outcome variables are employment, CapEx and R&D. The regression relates repurchases at t=0, normalized by $Assets_{t-4}$, to a *change* in outcome variables. The change in outcome variables is measured as the difference between the average level of the outcome variables over the next four quarters after the quarter of the share repurchase, compared with the average over the four quarters before the repurchase, where this difference is normalized by $Assets_{t-4}$. Following Rauh (2006), the control variables of Q and cash flow / assets are used as controls for unobserved investment opportunities among firms. All of the regressions control for year-quarter fixed effects (θ_t). The above regressions are repeated only for the subset of debt-financed repurchasing firms to test Hypothesis 3.

In addition to these univariate and multivariate regressions and in order to test Hypothesis 2, I adjust the change in outcome variables by the median industry change according to the Fama and French (1997) industry classifications. The median industry change is chosen as an adjustment because it is likely that future firm investments are affected by systematic, industry-wide conditions that are specific to unique industries. For example, drought-like conditions could adversely affect the investments of firms in the agriculture industry while the cost of a major input could adversely affect the investments of firms in the manufacturing industry. Likewise, large swings in fuel prices could affect the investments of firms in the airline, automotive or oil industries. Therefore, an adjustment of the change in outcome variables by the median industry

change helps control for these systematic factors. These results are found below for all repurchasing firms (Hypothesis 2) and only debt-financed repurchasing firms (Hypothesis 3).

Next, continuing to build on the findings of Almeida et al. (2016), I examine the propensity of firms to execute share repurchases around having a zero pre-repurchase EPS surprise. Hribar et al. (2006) were the first to show that there is a strong discontinuity in the probability of share repurchases around the threshold at which the firm would narrowly miss the analyst earnings consensus without conducting share repurchases. Similarly, Bens et al. (2003) found that executives increase their firms' stock repurchases when earnings are below the level required to achieve the desired rate of EPS growth. An example from Almeida et al. (2016) explains this phenomenon: Suppose that the existing analyst EPS consensus forecast is $3.00 a share and that the company has one billion shares outstanding. A manager learns that the actual reported EPS number is going to be $2.99 a share. The manager can meet the forecast by increasing share repurchases. Suppose that the manager uses $600 million to repurchase stock at an assumed price of $60 a share and reduces shares outstanding to 990 million. The company's earnings would also tend to decrease because the company forgoes interest payments on its cash holdings. Assuming, for example, that the interest rate is 5%, the firm's marginal tax rate is 30%, and the company forgoes one quarter of interest, the forgone interest is 1.25%*(1-30%)*$600 million = $5.25 million. Thus, total earnings would decrease from $2.99 billion to $2.98475 billion, resulting in a new EPS equal to $3.01 (rounded to the nearest cent). This example illustrates how firms can move from a pre-repurchase EPS of $2.99 to an actual EPS of $3.01, or equivalently, moving the EPS surprise from -1 cent to +1 cent.

I collect analyst forecasts of quarterly EPS and calculate an earnings surprise for each firm. An earnings surprise is the difference between the reported EPS and the median EPS

forecast at the end of the quarter. This difference is normalized by the end-of-quarter stock price. Similar to Hribar et al. (2006), this dissertation focuses on accretive share repurchases, defined as a repurchase that increases EPS by at least one cent. For all firms that made a share repurchase during the sample period, I use the dollar amount of each repurchase and the average quarterly stock price to calculate the pre-repurchase EPS surprise. This pre-repurchase EPS surprise is effectively the EPS surprise that a firm would have without a repurchase.

I examine the probability of firms to execute share repurchases around having a zero pre-repurchase EPS surprise for all repurchasing firms and debt-financed repurchasing firms only. The following regression is estimated (using Probit model estimation, see Equation 4) following the methodology of Almeida et al. (2016):

$$I_{accr,rep.,it} = \propto + \beta_1 I_{Negative\ Sue\ adj,it} + \beta_2 Sue_{adj,it} + \beta_3 Sue^2_{adj,it} + \beta_4 Sue^3_{adj,it} + \beta_5 Sue_{adj,it} I_{Negative\ Sue\ adj,it} + \beta_6 Sue^2_{adj,it} I_{Negative\ Sue\ adj,it} + \beta_7 Sue^3_{adj,it} I_{Negative\ Sue\ adj,it} + \beta_8 X_{it} + \eta_i + \theta_t + \varepsilon_{it}, \quad (4)$$

where $I_{accr,rep.}$ is an indicator for executing an accretive repurchase, Sue_{adj} is the pre-repurchase EPS surprise, $I_{Negative\ Sue\ adj}$ is an indicator of having a negative pre-repurchase EPS surprise, *X* is a vector of controls (an indicator of whether the firm paid a dividend in the previous year, ROA, quarterly stock returns and the ratio of cash to assets), η_i are firm fixed effects and θ_t are year-quarter fixed effects.

Also, following Almeida et al. (2016), I consider a small window around a zero pre-repurchase EPS surprise (i.e., -0.003 ≤ Sue_{adj} ≤ 0.003) to see if the likelihood of conducting a share repurchase increases if firms are *very* close to meeting consensus EPS forecasts. Additionally, I evaluate if having a small negative repurchase EPS surprise has a significant impact on the total size of share repurchases for all repurchasing firms and debt-financed repurchasing firms only by estimating the following equation:

$$Repurchases_{it} = \propto + \beta_1 I_{Negative\ Sue\ adj,it} + \beta_2 Sue_{adj,it} + \beta_3 Sue^2_{adj,it} + \beta_4 Sue^3_{adj,it} + \beta_5 Sue_{adj,it} I_{Negative\ Sue\ adj,it} + \beta_6 Sue^2_{adj,it} I_{Negative\ Sue\ adj,it} + \beta_7 Sue^3_{adj,it} I_{Negative\ Sue\ adj,it} + \beta_8 X_{it} + \eta_i + \theta_t + \varepsilon_{it}, \quad (5)$$

Finally, as an additional test of Hypothesis 1, the above regressions are repeated to examine the propensity of a debt-financed repurchase for firms facing negative EPS surprises in low interest rate environments[12].

7.1.2 Results

The final sample consists of 227,416 quarterly observations from 2004-2015 for which firm Compustat data successfully matches to both CRSP and IBES data. Descriptive statistics of the final sample are found in Table 10. Panel A describes firms' repurchase activity and is largely a restatement of Panel B of Table 3. Firms repurchase shares in 24% of all firm-quarters in the sample. The average size of the median and average repurchase is $4.06 million and $82.18 million, respectively, and the median and average number of repurchased shares as a percentage of total shares outstanding is 0.50% and 1.69%, respectively. Panel B reports statistics on earnings surprises and earnings announcement returns. These statistics show that earnings forecasts are generally very accurate as the median surprise is close to zero. 44% of surprises in the sample are positive and 38% are negative. Panel C reports summary statistics on other firm characteristics in the sample. Noteworthy items are the ratios of Capex / Assets, R&D / Assets and Employees / Assets. These are the dependent variables measuring firm investments and are evaluated in tests of Hypotheses 2 and 3. Firms spend, as a percentage of total assets, a median and average of 1.41% and 1.92%, respectively, on CapEx and a median and average of

[12] See Chapter 6 for details on the classification of a low interest rate environment.

0.00% and 1.82%, respectively, on R&D expenditures. Firms employ a median and average of 5.22 and 9.69 workers, respectively, per million dollars of total assets. These values serve as the baseline in subsequent analyses.

Table 11 displays firm characteristics of repurchasing vs. non-repurchasing firms in order to observe any differences between the two groups, paying particular attention to firm investments such as employment, CapEx and R&D expenditures. An examination of Table 11 indicates that repurchasing firms are larger than non-repurchasing firms. The average and median repurchasing firm's market capitalizations are $2.01 billion and $201 million, respectively, compared to an average and median market capitalization of non-repurchasing firms of $1.42 billion and $177 million, respectively. The level of total assets are also substantially larger for repurchasing firms. These findings are in line with previous studies. Additionally, repurchasing firms spend a larger percentage of total assets on CapEx and R&D expenditures than non-repurchasing firms. The median and average percentage of total assets spent on CapEx are 1.69% and 1.99%, respectively. The average percentage of total assets spent on R&D expenditures is 1.84%, compared to 1.58% for non-repurchasing firms. Repurchasing firms employ a median and average of 5.38 and 10.11 employees per million dollars of total assets, which is comparable to that of non-repurchasing firms.

Results of tests for differences in firm characteristics of the samples of repurchasing and non-repurchasing firms are found in Table 12. Differences in means and medians of each variable in Table 11 are formally tested using t-tests for means and the Wilcoxon rank-sum non-parametric test for medians. These results confirm that repurchasing firms have significantly[13]

[13] The differences in means and medians between the two groups are significant at 1% and 5%, respectively.

larger market capitalizations than those of non-repurchasing firms. These results also indicate that repurchasing firms have more total assets and higher cashflows than non-repurchasing firms. Furthermore, previous results (discussed in *Chapter 5* above) indicate that firms that finance repurchases with debt are even larger, have more cash on hand, are more levered, spend slightly more on CapEx and R&D and make larger repurchases.

OLS regressions are conducted to examine the relationship between repurchases and future firm investments (see Equation 3) to test Hypotheses 2 and 3. Table 13 shows the results of these regressions. Note that the outcome variables are the *change* in future firm investments (i.e., employment, CapEx and R&D expenditures) over the next four quarters after the quarter of the share repurchase (see above for details on the methodology). This assesses the ramifications of share repurchases on future firm investments. Panel A of Table 13 displays the effect of repurchases on future firm investments for all repurchasing firms and the results are consistent with the findings of Almeida et al. (2016). In the univariate OLS regressions, repurchases are associated with a negative change in employment as well as capital expenditures, but no change in R&D expenditures. After adding the common controls of Q and cash flow / assets in the investment regressions [following Rauh (2006)], the results become stronger and the effect on R&D now also becomes negative and significant. However, if these regressions are run on only the subsample of debt-financed repurchasing firms, then the effects of repurchases on future firm investments are substantially smaller. Panel B shows the effect of repurchases on changes in firm investments for debt-financed repurchasing firms only. For employment, the negative relationship remains but is only weakly significant. For CapEx, the negative relationship remains but is weaker than the finding in Panel A. And finally, for R&D expenditures, there is no relationship in either the univariate or multivariate regressions. This indicates that debt-financed

repurchasing firms do not sacrifice future firm investments as much as other repurchasing firms. It is difficult to ascertain exactly why, but this could be because of the source of financing the repurchases.

Table 14 displays the results of these regressions after adjusting the change in outcome variables by the median industry change according to the Fama and French (1997) industry classifications. This modification tests Hypothesis 2 that industry-wide conditions (and not firm-specific characteristics) could explain the negative association between repurchases and investments reported in prior studies. Panel A shows the industry-adjusted effect of repurchases on future firm investments for all repurchasing firms and Panel B shows these effects for debt-financed repurchasing firms only. The findings of Table 13 either go away or are significantly reduced. After adjusting for industry conditions, repurchases are still associated with a negative change in employment, but this relationship is only weakly significant. However, there are no effects of repurchases on future CapEx or R&D expenditures. Panel B shows the results for debt-financed repurchasing firms only and indicates that there is virtually no effect of repurchases on future firm investments after adjusting by industry. This supports the finding that debt-financed repurchasing firms do not sacrifice future firm investments as much as other repurchasing firms.

Finally, as an additional test of Hypothesis 1 (see Table 17) and building on the findings of Almeida et al. (2016), regressions are conducted to examine the relationship between a firm having a negative pre-repurchase EPS surprise and the probability of doing a share repurchase in a quarter. Table 15 displays the results, suggesting that having a negative pre-repurchase EPS surprise significantly predicts an accretive share repurchase. Panel A indicates that the probability of a repurchase increases by 2.5-3.0% around the zero pre-repurchase EPS surprise threshold. When a small window around a zero pre-repurchase EPS surprise ($-0.003 \leq Sue_{adj} \leq$

0.003) is evaluated (see Panel B), the probability of a repurchase increases by 3-5%. Given that the unconditional likelihood of a positive net repurchase is 24% (see Table 10), these results are economically significant[14]. Panels C and D show that the level of stock repurchases also increases when firms face a negative pre-repurchase EPS surprise. These findings are consistent with those of Almeida et al. (2016).

Table 16 shows the propensity of a debt-financed repurchase for firms facing negative EPS surprises. Interestingly, the probability of a repurchase is significantly reduced for these firms compared to all firms in similar circumstances (see Table 15). Panel A displays the probability of a debt-financed repurchase. Most of the models tested are not significant with the exception of models 5 and 6[15], which indicate that the probability of a debt-financed repurchase increases more than 1% around the zero pre-repurchase EPS surprise threshold. When a small window around a zero pre-repurchase EPS surprise ($-0.003 \leq Sue_{adj} \leq 0.003$) is evaluated (see Panel B), the probability of a debt-financed repurchase remains the same. Panels C and D support these findings, suggesting that the level of debt-financed stock repurchases somewhat increases when firms face a negative pre-repurchase EPS surprise. Overall, these findings are much weaker than those found in Table 15 and of Almeida et al. (2016). The reasons why are unclear; however, it is reasonable to conclude that firms cannot go through the long process[16] of a bond issuance in time to react to an impending negative EPS surprise in a given quarter. The larger, more leveraged firms that conduct debt-financed repurchases do so for other reasons than

[14] These results are statistically significant at 1%.

[15] These results are statistically significant at either 5% or 10%, depending on the model.

[16] The process of issuing corporate bonds usually takes 1-4 months, depending on factors like size of the offering, whether the offering is initial or follow-on and market demand for the offering.

short-term earnings management. Furthermore, the small sample size of debt-financed repurchases may be problematic to obtain meaningful results from these regressions.

As an additional test of Hypothesis 1, the above regressions are repeated to examine the propensity of a debt-financed repurchase for firms facing negative EPS surprises *in low interest rate environments*. Approximately 65% of the debt-financed repurchases in the sample were conducted at times when prevailing interest rates were considered low[17]. The results are shown in Table 17 and are very similar to the results found in Table 16. Similar to the regression results found in Table 16, the small sample size of debt-financed repurchases may be problematic to obtain meaningful results from these regressions. Panels A and B display the probabilities of debt-financed repurchases while Panels C and D display the levels of repurchases. Overall, there is very little evidence that the existence of a low interest rate environment and the likelihood of a debt-financed repurchase are related for firms facing negative EPS surprises. Other motivations may exist as this contradicts previous findings in this study that the presence of low interest rates is marginally related to debt-financed repurchases.

7.2 Chapter Tables

Table 10 reports summary statistics, with observations at the firm-quarter level. A description of table variables can be found in the appendix. The information below is used to expand on the findings of Almeida et al. (2016) and are utilized to test Hypotheses 2 and 3. All asset-scaled measures are lagged assets from the end of the previous quarter. Panel A reports summary statistics on share repurchases. The quantity of repurchased shares is measured as the

[17] See Chapter 6 for details on the classification of a low interest rate environment.

repurchase amount divided by the average daily share price during the quarter. Panel B reports summary statistics on earnings surprises and abnormal returns around earnings announcements. Panel C reports statistics on firm characteristics of all firms (both repurchasing and non-repurchasing) during the sample period.

Table 11 reports summary statistics on the characteristics of repurchasing and non-repurchasing firms during the sample period, with observations at the firm-quarter level. A description of table variables can be found in the appendix. The variables in the table are used to expand on the findings of Almeida et al. (2016) and are utilized to test Hypotheses 2 and 3. All asset-scaled measures are lagged assets from the end of the previous quarter. Panel A presents firm characteristics of the repurchasing firms and Panel B presents firm characteristics of non-repurchasing firms.

Table 12 reports the results of tests for differences in firm characteristics of the samples of repurchasing and non-repurchasing firms during the sample period, with observations at the firm-quarter level. A description of table variables can be found in the appendix. The variables in the table are used to expand on the findings of Almeida et al. (2016). All asset-scaled measures are lagged assets from the end of the previous quarter. Differences in means and medians [found in brackets] of each variable are formally tested using t-tests for means and the Wilcoxon rank-sum non-parametric test for medians. t-Statistics based on standard errors that are robust to heteroscedasticity and clustered at the firm level are reported in parentheses.

Table 13 reports the relationship between share repurchases and changes in future employment / investment outcomes utilizing the motive of earnings management following Almeida et al. (2016). The investment outcome variables are changes in employment, CapEx and R&D. The change in outcome variables is measured as the difference between the average level

of the outcome variables over the next four quarters after the quarter of the share repurchase, compared with the average over the four quarters before the repurchase, where this difference is normalized by $Assets_{t-4}$. Following Rauh (2006), the control variables of Q and cash flow / assets are used as controls for unobserved investment opportunities among firms. Panel A shows results of univariate (Regression 1) and multivariate (Regression 2, adding the control variables) regressions for all repurchasing firms and Panel B displays results of the same regressions for the subset of debt-financed repurchasing firms only. Observations are at the firm-quarter level and descriptions of variables can be found in the appendix. All asset-scaled measures are lagged assets from the end of the previous quarter. t-Statistics based on standard errors that are robust to heteroscedasticity and clustered at the firm level are reported in parentheses below the coefficient estimates.

Table 14 reports the relationship between share repurchases and changes in future employment / investment outcomes utilizing the motive of earnings management following Almeida et al. (2016). The investment outcome variables are changes in employment, CapEx and R&D. The change in outcome variables is measured as the difference between the average level of the outcome variables over the next four quarters after the quarter of the share repurchase, compared with the average over the four quarters before the repurchase, where this difference is normalized by $Assets_{t-4}$. The change in outcome variables is adjusted by the median industry change according to the Fama and French (1997) industry classifications to test Hypothesis 2. Following Rauh (2006), the control variables of Q and cash flow / assets are used as controls for unobserved investment opportunities among firms. Panel A shows results of univariate (Regression 1) and multivariate (Regression 2, adding the control variables) regressions for all repurchasing firms and Panel B displays results of the same regressions for the subset of debt-

financed repurchasing firms only. Observations are at the firm-quarter level and descriptions of variables can be found in the appendix. All asset-scaled measures are lagged assets from the end of the previous quarter. t-Statistics based on standard errors that are robust to heteroscedasticity and clustered at the firm level are reported in parentheses below the coefficient estimates.

Table 15 reports the relationship between having a negative pre-repurchase EPS surprise and the probability of doing a share repurchase in a quarter. A description of the calculation of a pre-repurchase EPS surprise is found in Chapter 7. Observations are at the firm-quarter level. Following Almeida et al. (2016), each model reports results using distinct sets of controls, which include linear or third-order polynomials of the pre-repurchase EPS surprise, interacted with the indicator of a negative pre-repurchase EPS surprise, firm and year-quarter fixed effects, and time-varying firm characteristics (i.e., ROA, stock returns, cash/assets, dividend payer). A description of variables can be found in the appendix. Panel A shows the probability of doing a share repurchase when facing a negative pre-repurchase EPS surprise. Panel B shows the probability among firms that are in a small window around the zero pre-repurchase EPS surprise threshold (the pre-repurchase EPS surprise normalized by share price between -0.003 and 0.003). Panels C and D report the relationship between having a negative pre-repurchase EPS surprise and the amount of net repurchases for the full sample and in a small window around the threshold. t-Statistics based on standard errors that are robust to heteroscedasticity and clustered by firm id are reported in parentheses below the coefficient estimates.

Table 16 reports the relationship between having a negative pre-repurchase EPS surprise and the probability of doing a debt-financed share repurchase in a quarter. A description of the calculation of a pre-repurchase EPS surprise is found in Chapter 7. Observations are at the firm-quarter level. Following Almeida et al. (2016), each model reports results using distinct sets of

controls, which include linear or third-order polynomials of the pre-repurchase EPS surprise, interacted with the indicator of a negative pre-repurchase EPS surprise, firm and year-quarter fixed effects, and time-varying firm characteristics (i.e., ROA, stock returns, cash/assets, dividend payer). A description of variables can be found in the appendix. Panel A shows the probability of doing a debt-financed share repurchase when facing a negative pre-repurchase EPS surprise. Panel B shows the probability among firms that are in a small window around the zero pre-repurchase EPS surprise threshold (the pre-repurchase EPS surprise normalized by share price between -0.003 and 0.003). Panels C and D report the relationship between having a negative pre-repurchase EPS surprise and the amount of (debt-financed) net repurchases for the full sample and in a small window around the threshold. t-statistics based on standard errors that are robust to heteroscedasticity and clustered by firm id are reported in parentheses below the coefficient estimates.

Table 17 reports the relationship between having a negative pre-repurchase EPS surprise and the probability of doing a debt-financed share repurchase in a quarter during low rate environments[18] of the sample period . A description of the calculation of a pre-repurchase EPS surprise is found in Chapter 7. Observations are at the firm-quarter level. Following Almeida et al. (2016), each model reports results using distinct sets of controls, which include linear or third-order polynomials of the pre-repurchase EPS surprise, interacted with the indicator of a negative pre-repurchase EPS surprise, firm and year-quarter fixed effects, and time-varying firm characteristics (i.e., ROA, stock returns, cash/assets, dividend payer). A description of variables can be found in the appendix. Panel A shows the probability of doing a debt-financed share

[18] See the methodology section of Chapter 6 for details on how interest rate environments are classified.

repurchase when facing a negative pre-repurchase EPS surprise. Panel B *shows the probability among firms that are in a small window around the zero pre-repurchase EPS surprise threshold (the pre-repurchase EPS surprise normalized by share price between -0.003 and 0.003). Panels C and D report the relationship between having a negative pre-repurchase EPS surprise* and the amount of (debt-financed) net repurchases for the full sample and in a small window around the threshold. t-Statistics based on standard errors that are robust to heteroscedasticity and clustered by firm id are reported in parentheses below the coefficient estimates.

Table 10: Descriptive Statistics of All Firms from 2004-2015

	Mean	SD	p1	p5	p25	p50	p75	p95	p99	n
Panel A: Repurchase Statistics										
Positive net repurchases (indicator)	0.24	0.38	0	0	0	0	0	1	1	220,500
If repurchases > 0										
Repurchases ($M)	82.18	53.82	0.00	0.01	0.24	4.06	15.57	218.53	244.19	46,249
Repurchased shares / Shares outstanding	1.69%	1.79%	0.00%	0.00%	0.10%	0.50%	1.39%	5.78%	7.27%	46,249
Repurchases / Assets	1.91%	1.91%	0.00%	0.00%	0.10%	0.70%	1.81%	6.94%	8.25%	46,249
Panel B: Earnings Surprise Statistics										
Earnings surprise / Stock price	-0.42%	1.89%	-10.21%	-2.12%	-0.16%	-0.01%	0.15%	2.05%	4.93%	104,496
Positive earnings surprise	0.44	0.50	0	0	0	0	1	1	1	104,496
Negative earnings surprise	0.38	0.48	0	0	0	0	1	1	1	104,496
Zero earnings surprise	0.11	0.26	0	0	0	0	0	1	1	104,496
Abnormal return around earnings announcement (%)	0.21%	3.18%	-8.71%	-4.72%	-1.33%	0.10%	1.54%	5.02%	10.05%	222,097
Panel C: Firm Characteristics										
Market capitalization ($M)	1,727	5,811	3	10	53	185	824	7,921	46,034	223,692
Assets ($M)	1,627	5,095	2	8	49	186	804	8,081	40,286	227,416
Cash and cash equivalents / Assets	20.30%	23.76%	0.00%	0.30%	2.77%	10.10%	30.69%	74.84%	123.16%	222,094
Total debt / Assets	29.30%	24.06%	0.00%	0.10%	3.37%	24.06%	39.30%	69.20%	109.10%	222,513
Capital expenditures / Assets	1.92%	2.22%	-0.10%	0.00%	60.60%	1.41%	2.53%	7.07%	14.44%	216,667
R&D / Assets	1.82%	3.03%	0.00%	0.00%	0.00%	0.00%	2.12%	8.28%	18.99%	222,153
Employees / Assets (per $M)	9.69	11.86	0.06	0.54	2.44	5.22	10.51	28.54	74.59	217,923
ROA	3.58%	30.67%	-146.90%	-60.76%	-4.02%	3.72%	8.82%	21.07%	45.57%	222,250

(table continues)

	Mean	SD	p1	p5	p25	p50	p75	p95	p99	n
Q	2.37	1.71	0.60	0.83	1.16	1.60	2.49	5.99	13.24	222,126
Market-to-book	3.69	4.85	0.00	0.39	1.16	2.04	3.49	9.99	29.29	217,037
Cash flow / Assets	0.25%	7.36%	-35.49%	-13.82%	0.03%	2.03%	3.45%	6.77%	13.27%	205,889
Stock return (quarter)	5.25%	34.24%	-48.78%	-36.87%	-14.04%	1.01%	17.68%	59.89%	138.77%	217,620
Dividend payer	0.34	0.47	0	0	0	0	1	1	1	227,366

Table 11: Descriptive Statistics of Repurchasing Firms and Non-Repurchasing Firms from 2004-2015

	Mean	SD	p1	p5	p25	p50	p75	p95	p99	n
Panel A: Firm Characteristics of Repurchasing Firms										
Market capitalization ($M)	2,008	3,141	4	9	54	201	843	7,860	49,170	46,249
Assets ($M)	1,852	4,237	3	10	52	196	809	8,271	43,440	46,249
Cash and cash equivalents / Assets	22.91%	21.31%	0.00%	0.40%	2.91%	10.55%	32.06%	76.58%	141.50%	46,249
Total debt / Assets	30.85%	26.33%	0.00%	0.20%	3.42%	25.23%	40.30%	70.45%	119.70%	46,249
Capital expenditures / Assets	1.99%	1.99%	-0.10%	0.00%	0.70%	1.69%	2.69%	7.26%	14.83%	46,249
R&D / Assets	1.84%	2.76%	0.00%	0.00%	0.00%	0.00%	2.12%	7.82%	18.12%	46,249
Employees / Assets (per $M)	10.11	12.27	0.07	0.55	2.53	5.38	10.86	30.31	79.05	46,249
ROA	3.67%	31.92%	-151.90%	-62.82%	-4.34%	3.74%	9.09%	21.51%	52.41%	46,249
Q	2.36	1.69	0.60	0.81	1.14	1.60	2.46	5.92	13.06	46,249
Market-to-book	4.07	4.98	0.00	0.51	1.22	2.24	3.66	10.68	31.02	46,249
Cash flow / Assets	0.27%	7.50%	-35.85%	-14.05%	0.04%	2.07%	3.54%	6.92%	13.50%	46,249
Stock return (quarter)	5.35%	34.04%	-48.99%	-36.87%	-14.04%	1.11%	17.78%	60.10%	138.77%	46,249
Dividend payer	0.38	0.49	0	0	0	0	1	1	1	46,249

(table continues)

	Mean	SD	p1	p5	p25	p50	p75	p95	p99	n
Panel B: Firm Characteristics of Non-Repurchasing Firms										
Market capitalization ($M)	1,419	4,811	1	8	49	177	797	7,587	42,487	177,443
Assets ($M)	1,517	5,083	2	7	47	173	747	7,428	37,583	181,167
Cash and cash equivalents / Assets	19.39%	24.14%	0.00%	0.30%	2.73%	10.10%	31.11%	75.35%	122.61%	175,845
Total debt / Assets	28.81%	23.81%	0.00%	0.10%	3.23%	23.62%	38.61%	67.13%	105.74%	176,264
Capital expenditures / Assets	1.68%	2.28%	-0.10%	0.00%	0.50%	1.39%	2.28%	6.73%	13.56%	170,418
R&D / Assets	1.58%	3.07%	0.00%	0.00%	0.00%	0.00%	2.08%	7.92%	18.02%	175,904
Employees / Assets (per $M)	9.66	11.85	0.06	0.53	2.42	5.20	10.47	28.29	74.28	171,674
ROA	3.61%	30.89%	-147.91%	-61.28%	-3.76%	3.76%	9.01%	21.29%	46.13%	176,001
Q	2.37	1.70	0.59	0.82	1.17	1.59	2.50	5.98	13.23	175,877
Market-to-book	3.90	5.13	0.00	0.41	1.23	2.05	3.69	10.56	30.85	170,788
Cash flow / Assets	0.19%	7.10%	-32.63%	-14.38%	0.06%	1.90%	3.66%	6.81%	13.38%	159,640
Stock return (quarter)	5.35%	34.24%	-48.78%	-36.56%	-13.94%	1.01%	17.78%	59.89%	138.27%	171,371
Dividend payer	0.34	0.47	0	0	0	0	1	1	1	181,117

Table 12: Tests for Differences in Firm Characteristics of Repurchasing and Non-Repurchasing Firms from 2004-2015

	Repurchasing Firms (1)	Non-Repurchasing Firms (2)	(1-2)
n	46,249	181,167	n/a
Market capitalization ($M)	2,008	1,419	589***
			(2.38)
	[201]	[177]	[24]**
			(2.00)
Assets ($M)	1,852	1,517	335**
			(1.97)
	[196]	[173]	[23]*
			(1.71)
Cash and cash equivalents / Assets	22.91%	19.39%	3.52%
			(1.50)
	[10.55%]	[10.10%]	[0.45%]*
			(1.69)
Total debt / Assets	30.85%	28.81%	2.04%*
			(1.65)
	[25.23%]	[23.62%]	[1.61%]
			(1.61)
Capital expenditures / Assets	1.99%	1.68%	0.31%
			(1.45)
	[1.69%]	[1.39%]	[0.30%]
			(1.52)
R&D / Assets	1.84%	1.58%	0.26%
			(1.30)
	[0.00%]	[0.00%]	[0.00%]
			(0.66)
Employees / Assets (per $M)	10.11	9.66	0.45
			(1.26)
	[5.38]	[5.20]	[0.18]
			(0.77)

(table continues)

	Repurchasing Firms (1)	Non-Repurchasing Firms (2)	(1-2)
ROA	3.67%	3.61%	0.06%
			(0.21)
	[3.74%]	[3.76%]	[-0.02%]
			(-0.17)
Q	2.36	2.37	-0.02
			(-0.11)
	[1.60]	[1.59]	[0.01]
			(0.29)
Market-to-book	4.07	3.90	0.17
			(0.45)
	[2.24]	[2.05]	[0.19]
			(0.38)
Cash flow / Assets	0.27%	0.19%	0.08%*
			(1.91)
	[2.07%]	[1.90%]	[0.17%]*
			(1.68)
Stock return (quarter)	5.35%	5.35%	0.00%
			(0.22)
	[1.11%]	[1.01%]	[0.10%]
			(0.47)
Dividend payer	0.38	0.34	0.04
			n/a
	[0]	[0]	[0]
			n/a

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Table 13: OLS Regressions Examining the Effect of Repurchases on Future Firm Investments

Dependent variable:	Change in Employment	Change in CapEx	Change in R&D
Panel A: Effect of Repurchases on Future Firm Investments for All Repurchasing Firms			
Regression 1:			
Repurchases / Assets	-6.6451***	-0.0304***	0.0050
	(-4.20)	(-5.26)	(-1.22)
n	46,247	46,249	46,249
Regression 2:			
Repurchases / Assets	-9.5123***	-0.0529***	-0.0100**
	(-6.99)	(-4.54)	(-1.98)
Q	12.8246***	0.1095**	0.0096*
	(4.57)	(2.21)	(1.75)
Cash flow / Assets	0.2574***	0.0005**	0.0007**
	(3.55)	(2.02)	(2.14)
n	46,240	46,242	46,242
Year-quarter fixed effects	Yes	Yes	Yes
Panel B: Effect of Repurchases on Future Firm Investments for Debt-Financed Repurchasing Firms			
Regression 1:			
Repurchases / Assets	-1.6785*	-0.0109*	0.0009
	(-1.68)	(-1.90)	(1.11)
n	1,583	1,583	1,583
Regression 2:			
Repurchases / Assets	-2.5138*	-0.0187**	0.0106
	(-1.92)	(-2.17)	(1.45)
Q	1.8552*	0.0101*	0.0004
	(1.70)	(1.99)	(0.94)
Cash flow / Assets	0.2017*	0.0002	0.0003
	(1.80)	(1.25)	(0.64)
n	1,583	1,583	1,583
Year-quarter fixed effects	Yes	Yes	Yes

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Table 14: OLS Regressions Examining the Effect of Repurchases on Future Firm Investments, Adjusted by Industry

Dependent variable:	Change in Employment	Change in CapEx	Change in R&D
Panel A: Effect of Repurchases on Future Firm Investments for All Repurchasing Firms			
Regression 1:			
Repurchases / Assets	-1.3277	-0.0114*	-0.0003
	(-1.29)	(-1.77)	(-0.44)
n	46,247	46,249	46,249
Regression 2:			
Repurchases / Assets	-2.3843*	-0.0216	-0.0048
	(-1.71)	(-1.33)	(-0.29)
Q	2.7594*	0.0449**	0.0112
	(1.89)	(2.00)	(1.03)
Cash flow / Assets	0.0306	0.0003	0.0002*
	(1.29)	(0.71)	(1.88)
n	46,240	46,242	46,242
Year-quarter fixed effects	Yes	Yes	Yes
Panel B: Effect of Repurchases on Future Firm Investments for Debt-Financed Repurchasing Firms			
Regression 1:			
Repurchases / Assets	-0.3315	-0.0066*	0.0001
	(-1.31)	(-1.70)	(0.54)
n	1,583	1,583	1,583
Regression 2:			
Repurchases / Assets	-0.6568	-0.0062	-0.0005
	(-0.97)	(-1.33)	(-1.08)
Q	0.5409*	0.0213*	0.0036
	(1.76)	(1.88)	(1.10)
Cash flow / Assets	0.0133*	0.0004	0.0003*
	(1.82)	(0.89)	(1.77)
n	1,583	1,583	1,583
Year-quarter fixed effects	Yes	Yes	Yes

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Table 15: Propensity of a Repurchase for Firms Facing Negative EPS Surprises

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Panel A: Probability of Stock Repurchase (Probit)						
Negative pre-repurchase EPS surprise	0.0225***	0.0243***	0.0259***	0.0285***	0.0287***	0.0281***
	(4.53)	(3.63)	(4.82)	(5.25)	(4.58)	(4.38)
R^2	0.0009	0.0068	0.0038	0.0296	0.0311	0.0329
n	45,319	45,319	45,319	45,319	45,319	45,319
Panel B: Probability of Stock Repurchase (Small Window, Probit)						
Negative pre-repurchase EPS surprise	0.0265***	0.0532***	0.0299***	0.0318***	0.0406***	0.0433**
	(5.05)	(4.83)	(4.01)	(4.19)	(3.24)	(2.30)
R^2	0.0013	0.0051	0.0019	0.0348	0.0296	0.0384
n	30,500	30,500	30,500	30,500	30,500	30,500
Panel C: Level of Stock Repurchase (OLS)						
Negative pre-repurchase EPS surprise	0.0008***	0.0009***	0.0013***	0.0014***	0.0015***	0.0016***
	(6.21)	(5.64)	(7.01)	(6.69)	(5.90)	(5.80)
R^2	0.0025	0.0080	0.0063	0.0411	0.0428	0.0509
n	45,319	45,319	45,319	45,319	45,319	45,319
Panel D: Level of Stock Repurchase (Small Window, OLS)						
Negative pre-repurchase EPS surprise	0.0011***	0.0021***	0.0017***	0.0016***	0.0023***	0.0024***
	(5.91)	(5.81)	(4.62)	(4.78)	(2.77)	(2.69)
R^2	0.0043	0.0088	0.0085	0.0460	0.0550	0.0606
n	30,500	30,500	30,500	30,500	30,500	30,500
Pre-repurchase EPS surprise (polynomial)	No	1-order	1-order	1-order	3-order	3-order
Firm fixed effects	No	No	Yes	Yes	Yes	Yes
Year-quarter fixed effects	No	No	No	Yes	Yes	Yes
Controls	No	No	No	No	No	Yes

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Table 16: Propensity of a Debt-Financed Repurchase for Firms Facing Negative EPS Surprises

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Panel A: Probability of Debt-Financed Stock Repurchase (Probit)						
Negative pre-repurchase EPS surprise	0.0015	0.0048	0.0076	0.0108	0.0132*	0.0141*
	(1.24)	(1.36)	(1.54)	(1.63)	(1.76)	(1.90)
R^2	0.0023	0.0088	0.0047	0.0598	0.0491	0.0548
n	1,581	1,581	1,581	1,581	1,581	1,581
Panel B: Probability of Debt-Financed Stock Repurchase (Small Window, Probit)						
Negative pre-repurchase EPS surprise	0.0024	0.0028	0.0091	0.0111	0.0135*	0.0146**
	(1.39)	(1.33)	(1.58)	(1.56)	(1.78)	(1.96)
R^2	0.0024	0.0072	0.0023	0.0581	0.0584	0.0595
n	1,064	1,064	1,064	1,064	1,064	1,064
Panel C: Level of Debt-Financed Stock Repurchase (OLS)						
Negative pre-repurchase EPS surprise	0.0001	0.0004	0.0008	0.0012**	0.001*	0.0020**
	(1.03)	(1.21)	(1.52)	(1.99)	(1.69)	(2.06)
R^2	0.0035	0.0097	0.0078	0.0431	0.0582	0.0544
n	1,581	1,581	1,581	1,581	1,581	1,581
Panel D: Level of Debt-Financed Stock Repurchase (Small Window, OLS)						
Negative pre-repurchase EPS surprise	0.0006	0.0008	0.0013*	0.0010	0.0017*	0.0028**
	(1.15)	(1.24)	(1.74)	(1.58)	(1.87)	(1.99)
R^2	0.0041	0.0109	0.0084	0.0583	0.0594	0.0606
n	1,064	1,064	1,064	1,064	1,064	1,064
Pre-repurchase EPS surprise (polynomial)	No	1-order	1-order	1-order	3-order	3-order
Firm fixed effects	No	No	Yes	Yes	Yes	Yes
Year-quarter fixed effects	No	No	No	Yes	Yes	Yes
Controls	No	No	No	No	No	Yes

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Table 17: Propensity of a Debt-Financed Repurchase for Firms Facing Negative EPS Surprises in Low-Interest Rate Environments

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Panel A: Probability of Debt-Financed Stock Repurchase (Probit)						
Negative pre-repurchase EPS surprise	0.0013	0.0043	0.0070	0.0096	0.0123*	0.0127*
	(1.21)	(1.31)	(1.51)	(1.57)	(1.70)	(1.85)
R^2	0.0018	0.0073	0.0040	0.0491	0.0421	0.0457
n	1,033	1,033	1,033	1,033	1,033	1,033
Panel B: Probability of Debt-Financed Stock Repurchase (Small Window, Probit)						
Negative pre-repurchase EPS surprise	0.0020	0.0024	0.0088	0.0097	0.0116*	0.0128*
	(1.35)	(1.30)	(1.56)	(1.50)	(1.68)	(1.91)
R^2	0.0019	0.0059	0.0020	0.0464	0.0465	0.0480
n	660	660	660	660	660	660
Panel C: Level of Debt-Financed Stock Repurchase (OLS)						
Negative pre-repurchase EPS surprise	0.0001	0.0002	0.0007	0.0010*	0.0008	0.0016**
	(1.08)	(1.15)	(1.41)	(1.82)	(1.64)	(1.97)
R^2	0.0028	0.0078	0.0061	0.0347	0.0481	0.0446
n	1,033	1,033	1,033	1,033	1,033	1,033
Panel D: Level of Debt-Financed Stock Repurchase (Small Window, OLS)						
Negative pre-repurchase EPS surprise	0.0006	0.0007	0.0012	0.0009	0.0015*	0.0025**
	(1.18)	(1.21)	(1.55)	(1.62)	(1.78)	(1.96)
R^2	0.0036	0.0090	0.0067	0.0487	0.0474	0.0496
n	660	660	660	660	660	660
Pre-repurchase EPS surprise (polynomial)	No	1-order	1-order	1-order	3-order	3-order
Firm fixed effects	No	No	Yes	Yes	Yes	Yes
Year-quarter fixed effects	No	No	No	Yes	Yes	Yes
Controls	No	No	No	No	No	Yes

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

CHAPTER 8

HYPOTHESES 4 AND 5: IMPACT OF DEBT-FINANCED REPURCHASES ON FIRM VALUE AND OPERATING PERFORMANCE

8.1 Testing of Hypotheses 4 and 5

8.1.1 Methodology

In order to test Hypotheses 4 and 5, this study utilizes the Fama and French (1993) three-factor model test for abnormal returns. Because the debt-financed repurchase "event" is based on quarterly accounting data, and not on any formal repurchase announcement, this study does not examine "announcement period" abnormal returns. However, following Ikenberry et al. (1995), abnormal returns[19] are measured for both debt-financed repurchasing firms and traditionally-financed repurchasing firms in the days surrounding a repurchase for the following windows: [-20 to -3], [-2 to +2] and [+3 to +10]. These windows are utilized to test Hypothesis 4. The periods of 3 months, 6 months, 1 year and 3 years following the repurchase are utilized to test for long-term abnormal returns (i.e., Hypothesis 5a). The equation for the Fama and French (1993) three-factor model is shown below:

$$R_{pt} - R_{ft} = \propto + b(R_{mt} - R_{ft}) + sSMB_t + hHML_t + \varepsilon_{pt}, \quad (6)$$

where R_{pt} is the average raw return for stocks during time t (for the firms in the appropriate subsample of either debt- or traditionally-financed repurchasing firms), R_{ft} is the one month T-bill return, R_{mt} is the CRSP value-weighted market index return, SMB_t is the return on a portfolio of small stocks minus the return on a portfolio of large stocks, and HML_t is the return on a portfolio of stocks with high book-to-market ratios minus the return on a portfolio of stocks

[19] Both equally- and value-weighted cumulative average abnormal returns (CAARs) are calculated.

with low book-to-market ratios. Daily returns are used to measure short-term abnormal returns and monthly returns are used to measure long-term abnormal returns.

Additionally, because Carhart (1997) shows the importance of momentum in expected return measures, abnormal stock returns are estimated with a momentum factor (i.e., *UMD*, the return on high momentum stocks minus the return on low momentum stocks) included as an additional risk factor. The equation for the Carhart (1997) four-factor model is shown below:

$$R_{pt} - R_{ft} = \propto + b(R_{mt} - R_{ft}) + sSMB_t + hHML_t + mUMD_t + \varepsilon_{pt}, \quad (7)$$

The intercepts ($\propto$) in Equations 6 and 7 are the abnormal return measures. Abnormal returns are estimated for both debt-financed repurchasing firms and traditionally-financed repurchasing firms to ascertain a difference between the two groups.

Finally, as additional tests of Hypotheses 4 and 5a, the following equation is estimated for each period:

$$CAAR_{i,\tau} = \propto + B_1 I_{DebtRepurchase,it} + B_2 lnAssets_{i,t-1} + B_3 ROA_{i,t-1} + B_4 StockReturnBeforeRep_{i,t-1} + \varepsilon_{i,\tau}, \quad (8)$$

where *CAAR* is the cumulative average abnormal return for each period, $I_{DebtRepurchase}$ is a binary variable that takes on a value of 1 if a firm made a quarterly stock repurchase that was financed with debt and 0 otherwise, *lnAssets* is the natural logarithm of total assets at the end of the year prior to the repurchase, *ROA* is net income (times 4) divided by lagged assets from the end of the previous quarter, and *StockReturnBeforeRep* is the one-year stock return (i.e., -284 to -24 trading days) immediately preceding the repurchase. τ is the window around (Hypothesis 4) or the period after (Hypothesis 5a) the repurchase to measure *CAARs*. The independent variable of importance is $I_{DebtRepurchase}$, which tests if debt-financed repurchases affect abnormal returns.

In order to measure operating performance (Hypothesis 5b) and following Eberhart et al. (2004), profit margin (PM) is used, defined as earnings before interest and taxes (EBIT) divided

by total revenue. Abnormal profit margins for firms are calculated as profit margins minus the industry average profit margins according to the Fama and French (1997) industry classifications. Average abnormal profit margins are measured for both debt-financed repurchasing firms and traditionally-financed repurchasing firms for 3 years following the repurchase. Given statistical concerns about clustering and cross-sectional correlations, profit margins are calculated in calendar time. In addition, a value-weighted average abnormal profit margin (using the book value of firm assets as weights) is calculated following Eberhart et al. (2004).

8.1.2 Results

In order to test Hypothesis 4, abnormal returns[20] are calculated using the Fama and French (1993) three-factor and Carhart (1997) four-factor models in the days surrounding a repurchase for the following windows: [-20 to -3], [-2 to +2] and [+3 to +10]. Short-term abnormal returns for both groups are found in Table 18. Overall, the CAARs for debt-financed repurchasing firms and traditionally financed repurchasing firms are somewhat similar for each window tested. For the window of 20 to 3 days before the repurchase, CAARs are negative and range from -0.21% to -0.10% and -0.63% to -0.42% for debt- and traditionally-financed repurchasing firms, respectively (depending on the model). These findings are insignificant for debt-financed repurchasing firms and significant at 5% or 10% (depending on the model) for traditionally-financed repurchasing firms. The window of 2 days before to 2 days after the repurchase provides some interesting results. Abnormal returns for this window are positive and

[20] Both equally- and value-weighted cumulative average abnormal returns (CAARs) are calculated.

significant at 1% for both groups, ranging from 1.79% to 2.36% (debt-financed repurchasing firms) and 1.81% to 2.32% (traditionally-financed repurchasing firms), depending on the model. This result is consistent with other event studies that calculate short-term abnormal returns; however, it is important to note that this study evaluates abnormal returns surrounding actual repurchases in contrast to abnormal returns surrounding repurchase announcements found in other studies. After a repurchase program is formally announced, it can take firms anywhere from several months to over a year to complete the program (if completed at all). Finally, for the window of 3 to 10 days after the repurchase, CAARs are positive and range from 0.18% to 0.32% and 0.20% to 0.40% for debt- and traditionally-financed repurchasing firms, respectively (depending on the model). These findings are not significant.

Additionally for each window stated above, regressions are run of several independent variables on CAARs to examine the effect of debt-financed repurchases on abnormal returns. The variable of importance is $I_{DebtRepurchase}$, which tests if debt-financed repurchases affect abnormal returns. Overall, the results found in Table 18 indicate that while debt-financed repurchases add short-term firm value in the few days immediately surrounding a repurchase (i.e., [-2 to +2]), the value creation is not different from that of traditionally-financed repurchasing firms, indicating that the method of financing repurchases does not affect firm value in the short-term.

In order to test Hypothesis 5a, abnormal returns[21] are calculated using the Fama and French (1993) three-factor and Carhart (1997) four-factor models for the periods of 3 months, 6 months, 1 year and 3 years following the repurchase. These results are found in Table 19. Both

[21] Both equally- and value-weighted cumulative average abnormal returns (CAARs) are calculated.

the 3- and 6-month CAARs for debt-financed repurchasing firms and traditionally financed repurchasing firms are similar, ranging from -0.24% to -0.09% for 3 months and from 0.02% to 0.10% for 6 months (depending on the model). The 1- and 3-year CAARs for both groups are similar, ranging from -0.06% to 0.23% for 1 year and -0.09% to 0.11% for 3 years (depending on the model). Additionally for each period, regressions are run of several independent variables on CAARs to examine the effect of debt-financed repurchases on abnormal returns. The variable of importance is $I_{DebtRepurchase}$, which tests if debt-financed repurchases affect abnormal returns. None of these results are significant for either group or period, indicating that the method of financing repurchases has no effect on long-term stock prices. Additionally, there is no evidence that long-term abnormal returns are higher for debt-financed repurchasing firms compared to other firms.

Finally, Hypothesis 5b states that firms that finance repurchases with debt experience higher operating performance than other firms. Average abnormal profit margins for both debt- and traditionally-financed repurchasing firms for 3 years following the repurchase are found in Table 20. Both equally- and value-weighted (using the book value of firm assets as weights) average abnormal profit margins are calculated. Average abnormal profit margins for debt-financed repurchasing firms are 0.20% (equally weighted) and 0.52% (value weighted) and average abnormal profit margins for traditionally-financed repurchasing firms are 0.10% (equally weighted) and 0.42% (value weighted). A possible explanation for finding relatively higher abnormal operating performance with value-weighting (relative to equal-weighting) is the fact that more profitable firms should have higher book values of assets, ceteris paribus. Differences in operating performance between the two groups are not statistically significant, indicating that the method of financing repurchases has no effect on long-term operating

performance. There is no evidence that long-term operating performance is higher for debt-financed repurchasing firms compared to other firms.

8.2 Chapter Tables

Table 18 displays abnormal returns (in percent) of debt- and traditionally-financed repurchasing firms in the days surrounding a repurchase. Both equally- and value weighted cumulative average abnormal returns (CAARs) are calculated using the Fama and French (1993) three-factor and Carhart (1997) four-factor models for the following windows in days: [-20 to -3], [-2 to +2] and [+3 to +10]. The reported abnormal return measures are the intercepts (α) of the models in Equations 6 and 7. Panel A displays the CAARs while Panel B is a regression of several independent variables on CAARs, where the variable of importance is $I_{DebtRepurchase}$ to examine the effect of debt-financed repurchases on abnormal returns. t-Statistics based on standard errors that are robust to heteroscedasticity and clustered by firm id are reported in parentheses below the coefficient estimates.

Table 19 displays the results of tests of abnormal stock returns of debt- and traditionally-financed repurchasing firms following a repurchase. Both equally- and value weighted cumulative average abnormal returns (CAARs) are calculated using the Fama and French (1993) three-factor and Carhart (1997) four-factor models for 3 months, 6 months, 1 year and 3 years following the repurchase. The intercepts (α) are the abnormal return measures and are displayed in monthly percentages. Panel A displays the CAARs while Panel B is a regression of several independent variables on CAARs, where the variable of importance is $I_{DebtRepurchase}$ to examine the effect of debt-financed repurchases on abnormal returns. t-Statistics based on

standard errors that are robust to heteroscedasticity and clustered by firm id are reported in parentheses below the coefficient estimates.

Table 20 displays the results of tests of abnormal operating performance of debt- and traditionally-financed repurchasing firms 3 years following a repurchase. Following Eberhart et al. (2004), profit margin is used as a measure of operating performance. Abnormal profit margins for firms are calculated as profit margins minus the industry average profit margins according to the Fama and French (1997) industry classifications. Reported are time-series averages of abnormal profit margins. Given statistical concerns about clustering and cross-sectional correlations, profit margins are calculated in calendar time. In addition, a value-weighted average abnormal profit margin (using the book value of firm assets as firm weights) is calculated following Eberhart et al. (2004). Differences between debt- and traditionally-financed repurchasing firms are tested using t-tests for means using the time-series volatility of abnormal profit margins to estimate standard errors.

Table 18: Short-Term Abnormal Stock Returns of Debt- and Traditionally-Financed Repurchasing Firms

	Days Relative to Repurchase		
	[-20 to -3]	[-2 to +2]	[+3 to +10]
Panel A: Short-Term, Cumulative Average Abnormal Returns (CAAR, %)			
Debt-Financed Repurchasing Firms			
Fama and French (1993) Three-Factor Model			
CAAR (equal weight)	-0.10	2.36***	0.32
CAAR (value weight)	-0.11	1.97***	0.23
Carhart (1997) Four-Factor Model			
CAAR (equal weight)	-0.21	2.16***	0.19
CAAR (value weight)	-0.20	1.79***	0.18
n	1,583	1,583	1,583

(table continues)

	Days Relative to Repurchase		
	[-20 to -3]	[-2 to +2]	[+3 to +10]
Traditionally-Financed Repurchasing Firms			
Fama and French (1993) Three-Factor Model			
CAAR (equal weight)	-0.42*	2.27***	0.40
CAAR (value weight)	-0.45**	2.32***	0.33
Carhart (1997) Four-Factor Model			
CAAR (equal weight)	-0.47*	1.81***	0.20
CAAR (value weight)	-0.63**	2.23***	0.29
n	44,666	44,666	44,666
Panel B: Effect of Debt-Financed Repurchases on Cumulative Average Abnormal Returns (CAARs)			
Dependent Variable: CAAR			
$I_{DebtRepurchase}$	-0.0034	0.0243*	-0.0077
	(-0.09)	(1.73)	(-0.44)
lnAssets	0.0008	0.0142**	0.0054
	(0.98)	(2.15)	(1.11)
ROA	-0.0106	0.0005	-0.0103
	(-0.37)	(1.59)	(-0.33)
StockReturnBeforeRep	-0.0101	0.0162**	0.0099
	(-1.39)	(1.99)	(0.92)
Intercept	-0.0025	0.0079*	0.0052
	(-0.88)	(1.83)	(1.47)
n	46,249	46,249	46,249

***Significant at 1%; **Significant at 5%; *Significant at 10%

Table 19: Long-Term Abnormal Stock Returns of Debt- and Traditionally-Financed Repurchasing Firms

Panel A: Long-Term, Cumulative Average Abnormal Returns (CAAR, Monthly %)										
	Debt-Financed Repurchasing Firms					Traditionally-Financed Repurchasing Firms				
	Intercept	b	s	h	m	Intercept	b	s	h	m
Fama and French (1993) Three-Factor Model										
3-month CAAR (equal weight)	-0.10	1.23	1.44	-0.21		-0.09	1.19	1.39	-0.20	
3-month CAAR (value weight)	-0.13	1.10	0.12	-0.16		-0.12	1.06	0.12	-0.15	
6-month CAAR (equal weight)	0.03	0.87	1.01	-0.18		0.03	0.84	0.97	-0.18	
6-month CAAR (value weight)	0.08	0.92	0.13	-0.15		0.10	0.88	0.12	-0.14	
Carhart (1997) Four-Factor Model										
3-month CAAR (equal weight)	-0.14	1.27	1.47	-0.22	-0.03	-0.11	0.95	1.11	-0.17	-0.02
3-month CAAR (value weight)	-0.21	1.13	0.12	-0.16	-0.09	-0.24	0.85	0.09	-0.13	-0.07
6-month CAAR (equal weight)	0.02	0.90	1.03	-0.19	-0.04	0.04	0.67	0.78	-0.14	-0.03
6-month CAAR (value weight)	0.09	0.94	0.13	-0.15	-0.10	0.07	0.71	0.10	-0.11	-0.08
n	1,583	1,583	1,583	1,583	1,583	44,666	44,666	44,666	44,666	44,666
Fama and French (1993) Three-Factor Model										
1-year CAAR (equal weight)	-0.01	1.35	1.58	-0.23		0.02	1.22	1.52	-0.22	
1-year CAAR (value weight)	0.10	1.22	0.13	-0.17		0.13	1.16	0.13	-0.16	
3-year CAAR (equal weight)	0.09	0.96	1.11	-0.20		0.11	0.92	1.06	-0.15	
3-year CAAR (value weight)	0.05	1.02	0.14	-0.17		0.03	1.03	0.14	-0.16	
Carhart (1997) Four-Factor Model										
1-year CAAR (equal weight)	-0.04	1.01	1.18	-0.18	-0.02	-0.06	1.27	1.47	-0.22	-0.03
1-year CAAR (value weight)	0.18	0.91	0.09	-0.13	-0.07	0.23	1.13	0.12	-0.16	-0.09
3-year CAAR (equal weight)	0.03	0.71	0.82	-0.15	-0.03	0.04	0.90	1.03	-0.19	-0.04
3-year CAAR (value weight)	-0.07	0.76	0.10	-0.12	-0.08	-0.09	0.94	0.13	-0.15	-0.10
n	1,555	1,555	1,555	1,555	1,555	44,556	44,556	44,556	44,556	44,556

(table continues)

Panel B: Effect of Debt-Financed Repurchases on Cumulative Average Abnormal Returns (CAARs)				
Dependent Variable: *CAAR*	Period Following Repurchase			
	3-Month	6-Month	1-Year	3-Years
$I_{DebtRepurchase}$	0.0056	0.0021	0.0042	-0.0019
	(0.65)	(0.21)	(0.36)	(-0.30)
lnAssets	0.0067	0.0054	-0.0018	0.0016
	(0.42)	(0.39)	(-0.28)	(0.34)
ROA	0.0050	0.0033	0.0029	-0.0047
	(0.88)	(0.78)	(0.66)	(-0.70)
StockReturnBeforeRep	-0.0099	-0.0100	0.0024	0.0039
	(-1.21)	(-1.31)	(0.81)	(0.97)
Intercept	0.0035	0.0025	-0.0009	0.0034
	(1.13)	(0.92)	(-0.49)	(1.10)
n	46,249	46,249	46,188	46,105

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Table 20: Long-Term Abnormal Operating Performance of Debt- and Traditionally-Financed Repurchasing Firms

Long-Term Abnormal Operating Performance (%): 3 Years Following the Repurchase	
Debt-Financed Repurchasing Firms	
Average abnormal profit margin (equal weight)	0.2003
Average abnormal profit margin (value weight)	0.5246
n	1,569
Traditionally-Financed Repurchasing Firms	
Average abnormal profit margin (equal weight)	0.1005
Average abnormal profit margin (value weight)	0.4231
n	44,591

CHAPTER 9

CONCLUSION

Results of this study confirm that, in recent years, the phenomenon of firms utilizing debt to finance share repurchases has increased substantially. Both the number of repurchasing firms and the size of the average repurchase have increased over the years. The typical debt-financing repurchasing firm is larger, has more cash on hand and is more leveraged than other firms that make repurchases. The size of the median and average repurchase is also larger than those of traditionally-financed repurchasing firms.

Prevailing market interest rates play a role in firms' decisions to finance a repurchase with debt. A low interest rate environment is related to debt-financed repurchases as the probability of a debt-financed repurchase increases in the presence of low interest rates. This relationship is especially pronounced in the years following the Global Financial Crisis. The reduced cost of debt caused by the Fed's decision to keep interest rates low since 2008 may incentivize managers to attempt to time the market, especially if managers believe that the current interest rate environment is temporary and want to capitalize on historically low rates.

In addition, this dissertation confirms the findings of previous studies that repurchases are associated with a negative change in employment, CapEx and R&D expenditures. However, after adjusting for industry conditions, repurchases are still associated with a negative change in employment, but this relationship is only weakly significant and there are no effects on future CapEx or R&D expenditures. Moreover, the effects of repurchases on future firm investments for debt-financed repurchasing firms are even smaller, indicating that debt-financed repurchasing firms do not sacrifice future firm investments as much as other repurchasing firms.

Finally, this study finds little to no evidence that financing a repurchase with debt adds value to firms. While debt-financed repurchases add short-term firm value in the few days immediately surrounding a repurchase (i.e., [-2 to +2]), the value creation is not markedly different from that of traditionally-financed repurchasing firms, indicating that the method of financing repurchases does not affect firm value. Furthermore, the method of financing repurchases has no effect on long-term stock prices, nor does it increase a firm's operating performance.

APPENDIX

DESCRIPTIONS OF ALL VARIABLES

This table describes all variables used throughout this study, grouped by hypotheses tested and listed in alphabetical order.

Variable	Description
Tests of Hypothesis 1	
AllDistributions ($M)	The sum of cash dividends and repurchase amounts in a quarter in millions of dollars
Cash	The ratio of cash and cash equivalents to total assets at the end of the year prior to the repurchase
Cashflow	The ratio of net income before taxes plus depreciation and changes in deferred taxes and other deferred charges to total assets at the end of the year prior to the repurchase
CorpBondYield	The average quarterly rate of the Moody's Seasoned Baa Corporate Bond Yield at the time of the repurchase
DebtRepurchases ($M)	The amount of a quarterly, debt-financed repurchase in millions of dollars
$I_{DebtRepurchase,it}$	A binary variable that takes on a value of 1 if a firm made a quarterly stock repurchase that was financed with debt, and 0 otherwise
$I_{LowInterest,\ it}$	A binary variable that takes on a value of 1 if the repurchase was made during a period of low interest rate environments, and 0 otherwise
Industry dummies	Binary variables that take on a value of 1 for firms that are in each industry using the Fama and French (1997) classifications, and 0 otherwise
Lever	The difference between a firm's total debt to asset ratio in the year prior to the repurchase minus the median net debt-to-asset ratio of all firms in the same industry using the Fama and French (1997) classifications.
lnAssets	The natural logarithm of total assets at the end of the year prior to the repurchase
Mkbk	The market value of equity plus debt to the book value of assets at the end of the year prior to the repurchase
Payout	The ratio of cash dividends paid to net income in the year prior to the repurchase
PostFinancialCrisis	A binary variable that takes on a value of 1 if the repurchase was made after the Global Financial Crisis (2009 or later), and 0 otherwise
Return	The value-weighted, market-adjusted stock return in the calendar year prior to the repurchase
TraditionalRepurchases	The amount of a quarterly, traditionally-financed repurchase in millions of dollars

Variable	Description
Tests of Hypothesis 2 and 3	
Abnormal return around earnings announcement (%)	The cumulative return within three trading days around the earnings announcement minus the cumulative return of the CRSP market portfolio over the same period
Assets ($M)	The book value of total assets
Capital expenditures (CapEx)	The funds used for additions to property, plant, and equipment, excluding amounts arising from acquisitions (for example, fixed assets of purchased companies), including property & equipment expenditures [CAPEXY]
Capital expenditures / Assets	CAPEXY divided by lagged assets from the end of the previous quarter
Cash and cash equivalents / Assets	The sum of cash and cash equivalents divided by lagged assets from the end of the previous quarter
Cash flow / Assets	Net income plus depreciation, divided by lagged assets from the end of the previous quarter
Dividend payer	A binary variable that takes on a value of 1 if the firm has paid any dividends in the last four quarters (including the current quarter) prior to the repurchase, and 0 otherwise
Earnings surprise / Stock price	The difference between the reported EPS and the median EPS forecast at the end of the quarter, and this difference is normalized by the end-of-quarter stock price
Employees / Assets (per $M)	EMP divided by lagged assets from the end of the previous quarter
Employment	The number of people employed by the company and its consolidated subsidiaries in thousands [EMP]
$I_{accr,rep.,it}$	A binary variable that takes on a value of 1 if the firm executed an accretive quarterly repurchase, and 0 otherwise
$I_{NegativeSueadj,\ it}$	A binary variable that takes on a value of 1 if the firm has a negative pre-repurchase EPS surprise
$I_{NegativeSue,it}$	A binary variable that takes on a value of 1 if the firm has a negative EPS surprise
$I_{PositiveSue,it}$	A binary variable that takes on a value of 1 if the firm has a positive EPS surprise
$I_{ZeroSue,it}$	A binary variable that takes on a value of 1 if the firm has a zero EPS surprise
Market capitalization ($M)	The market value of common equity
Market-to-book	The market value of common equity divided by the book value of common equity
Negative earnings surprise	A binary variable that takes on a value of 1 if the firm has a negative EPS surprise (see $I_{NegativeSue,it}$), and 0 otherwise

Variable	Description
Negative pre-repurchase EPS surprise	A binary variable that takes on a value of 1 if the firm would have had a negative EPS surprise without a repurchase, and 0 otherwise
Positive earnings surprise	A binary variable that takes on a value of 1 if the firm has a positive EPS surprise (see $I_{PositiveSue,it}$), and 0 otherwise
Q	The book value of liabilities plus the market value of common equity divided by the book value of assets
Repurchased shares / Shares outstanding	The number of (quarterly) repurchased shares, calculated as the repurchase amount divided by the average daily share price during the quarter, divided by the total number of shares outstanding
Repurchases / Assets	The amount of a quarterly repurchase divided by lagged assets from the end of the previous quarter
Repurchases ($M)	The amount of a quarterly repurchase in millions of dollars
ROA	Net income (times 4) divided by lagged assets from the end of the previous quarter
R&D	The research and development expenses, representing all costs incurred during the year that relate to the development of new products or services [XRNDQ], set to zero if missing
R&D / Assets	XRNDQ divided by lagged assets from the end of the previous quarter
Stock return (quarter)	The quarterly raw stock return from CRSP
Sue_{adj}	The pre-repurchase EPS surprise, found by subtracting the effect of a repurchase on earnings per share from the quarterly earnings surprise
Total debt / Assets	The book value of liabilities [ATQ-CEQQ]
Zero earnings surprise	A binary variable that takes on a value of 1 if the firm has a zero EPS surprise (see $I_{ZeroSue,it}$), and 0 otherwise
Tests of Hypothesis 4 and 5	
Abnormal Profit Margin	Profit margins minus the industry average profit margins according to the Fama and French (1997) industry classifications
CAARs	The cumulative average abnormal returns, calculated using the Fama and French (1993) three-factor and Carhart (1997) four-factor models, stated as monthly percentages
HML_t	The return on a portfolio of stocks with high book-to-market ratios minus the return on a portfolio of stocks with low book-to-market ratios
$I_{DebtRepurchase,it}$	A binary variable that takes on a value of 1 if a firm made a quarterly stock repurchase that was financed with debt, and 0 otherwise

Variable	Description
lnAssets	The natural logarithm of total assets at the end of the year prior to the repurchase
Profit Margin	Earnings before interest and taxes divided by total revenue
R_{ft}	The 1-month T-bill return
R_{mt}	The CRSP value-weighted market index return
R_{pt}	The average raw return for stocks in calendar month t
ROA	Net income (times 4) divided by lagged assets from the end of the previous quarter
SMB_t	The return on a portfolio of small stocks minus the return on a portfolio of large stocks
StockReturnBeforeRep	The one-year stock return (i.e., -284 to -24 trading days) immediately preceding the repurchase
UMD_t	The return on high momentum stocks minus the return on low momentum stocks

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