Is Price Support for Overvalued Equity a Motive for Increasing Share Repurchases?

Harrison Liu
Assistant Professor
University of Texas – San Antonio
San Antonio, TX 78249-0632
Harrison.liu@utsa.edu

Edward P. Swanson
Professor and Holder of Durst Chair
Mays Business School, Texas A&M University
College Station, TX 77843-4353
eswanson@mays.tamu.edu

Is Price Support for Overvalued Equity a
Motive for Increasing Share Repurchases?

Harrison Liu
Assistant Professor
University of Texas – San Antonio
San Antonio, TX 78249-0632
Harrison.liu@utsa.edu

Edward P. Swanson
Professor and Holder of Durst Chair
Mays Business School, Texas A&M University
College Station, TX 77843-4353
eswanson@mays.tamu.edu

July 6, 2015

Abstract: Economy-wide, corporate share repurchases increase at market tops, suggesting that price support for overvalued equity could be a motive for repurchasing stock. We investigate this possibility using short selling as a proxy for sophisticated investors' beliefs about firm valuation. Regressing changes in share repurchases on changes in short interest (and control variables), we find a robust positive association, which is consistent with price support being a significant motive for increasing share repurchases. Examining the subsequent two years, companies with increases in short interest accompanying an increase in repurchases experience a sizable decline in profitability, liquidity, and stock price.

Contact author:
Edward P. Swanson

Is Price Support for Overvalued Equity a Motive for Increasing Share Repurchases?

1. Introduction

Since 1996, share repurchases have replaced dividends as the dominant form of corporate payout (Hsieh and Wang 2009). Most corporate managers say they would use repurchases as the exclusive means of returning capital to stockholders if they could start over (Brav, Graham, Harvey, and Michaely 2005). Managers say they like the flexibility to adjust payouts and the possibility of using share repurchases "to time the equity market or to increase earnings per share." Yet, DeAngelo, DeAngelo, and Skinner (2008, 257) observe that during the market bubble preceding the 2008 financial crisis, many prominent firms, including Merrill Lynch, Lehman Brothers, and General Electric, purchased large quantities of their shares at high prices. And Warren Buffett in his 2000 Berkshire letter states: "repurchases are all the rage, but are all too often made for an unstated and, in our view, ignoble reason: to pump or support the stock price." The business press has also criticized the timing of stock buybacks.[1]

This study provides large-sample evidence on whether support for overvalued equity is a motive for repurchasing stock. To-date, the evidence is primarily anecdotal.[2] Repurchasing stock can support a stock's price by simultaneously increasing demand and reducing supply. Repurchases can also have an indirect positive effect on stock price by increasing earnings per share (Bens, Nagarb, Skinner, and Wong 2003, Hribar, Jenkins, and Johnson 2006). We

---

[1] Murphy in the *Wall Street Journal*'s CFO Journal (April 24, 2012) comments: "Buying on the dips and pulling back on the crests makes sense, but companies have rarely done so in recent years. Buybacks surged to a record $180 billion in the fourth quarter of 2007 … the same quarter the S&P 500 hit its own all-time high. When the index later fell by more than half, buyback activity dropped with it." Similarly, Jakab reports (*WSJ*, September 10, 2012, C1, Ahead of the Tape column) that buybacks dropped to just $24 billion in the second quarter of 2009, when prices were at their lowest level. He concludes: "count on managers to keep destroying value by buying shares when they are at their frothiest."

[2] One interesting case is the lawsuit filed against Harnischfeger Industries on June 5, 1998 alleging use of accounting irregularities (primarily profits on long-term construction contracts) and a "massive stock repurchase plan that further served to artificially inflate the price of Harnischfeger's stock." (See the Stanford University Law School Securities Class Action Clearinghouse.)

therefore hypothesize that a significant motive for repurchasing stock in recent years is to support a high stock price.

Our research design uses an increase in short selling to identify when equity is overvalued. Empirical research shows that short sellers are highly sophisticated in identifying overvalued stock (Boehmer, Jones, and Zhang 2008; Boehmer, Huszar, and Jordan 2010). One reason is that institutional investors and hedge funds account for about 74 percent of all short sales, and individual investors account for less than two percent (Boehmer et al. 2008).[3] The use of short selling as a proxy for overvalued equity has recently been used by Ben-David, Drake, and Roulstone (2015) to investigate acquirer overvaluation as a motive for corporate acquisitions. They argue that high short interest is indicative of overvaluation because it is mispricing that induces investors to initiate costly arbitrage.[4] To earn positive returns, short sellers must be highly informed to compensate for the high costs of short selling (Diamond and Verrecchia 1987).

An alternative to short interest would be to use future (ex post) changes in the stock price to determine whether equity is overvalued, but this would introduce "look-ahead bias" by inferring managers' motives from information that was not available when they made the repurchase decision. We do examine ex post changes in stock price, however, to confirm that short interest provides a reasonable proxy for overvalued equity in our setting. Note that using short interest as an ex ante measure of equity overvaluation biases against finding significance for a price support motive. Due to limits of arbitrage (Shleifer and Vishny 1997), short interest does not always increase when equity becomes overvalued (Jensen 2005). Those limits include

---

[3] The remainder is primarily from market makers who may take a short position to hedge against losses when they temporarily take the buy side to provide liquidity in a stock.
[4] Our discussion of the rationale in Ben-David et al. (2015) is abbreviated, and readers are referred to their study for a more detailed discussion.

transaction costs, capital constraints, and idiosyncratic risks associated with taking large, concentrated positions. Idiosyncratic risk would be especially high when a company is influencing its stock price through share repurchases.

Prior research provides evidence that managers use share repurchases to distribute excess capital (Jensen 1986), to take advantage of undervaluation (Ikenberry, Lakonishok, and Vermaelen 1995; Baker and Wurgler, 2002), to adjust the capital structure (Dittmar, 2000; Baker and Wurgler, 2002), to avoid dilution from stock option grants (Fenn and Liang, 2001; Kahle, 2002), and to deter hostile takeovers (Bagwell 1991). We consider price support for overvalued equity as an additional motive. The dependent variable in our model is quarterly changes in actual share repurchases. This variable is regressed on quarterly changes in short interest and several control variables. In this respect, our research design differs from Ben-David et al. (2015) who use levels of short interest to identify overvalued equity. Change models have some important advantages: They reduce the problem of correlated omitted variables by narrowing the time period to when the change is calculated, and variables found to be significant are more likely to be causal. Change models also control for company effects that are fixed over time, without the researcher having to identify them. Note that firms that invest similar amounts of capital to buy back shares each quarter would have relatively small changes, even if the dollar amounts of the buybacks are sizable. A report by Credit Suisse (June 2012, 6) refers to companies with sizable changes in stock repurchases as having a "more undisciplined buyback process." They present some evidence of monotonically decreasing year-over-year abnormal returns following increases in repurchases. We provide an in depth analysis of such companies. [5]

---

[5] We acknowledge that some companies that allocate sizable, but similar, amounts of capital to repurchasing stock each quarter may be supporting a high stock price. Our results are therefore likely to understate the extent to which shares are repurchased to support stock prices.

In both univariate and multivariate tests, we find the association between changes in share repurchases and changes in short interest is positive and highly significant. Price support has explanatory power similar to, or greater than, the motives identified in prior research. Further, subsample analyses show that price support is highly statistically significant: 1) in bull and bear market years, 2) without accelerated share repurchase transactions, 3) without quarters affected by the 2008 short selling ban, and 4) during all four fiscal quarters. Nevertheless, we find that the first quarter is different from the other three quarters of the year. The coefficients on short interest and on the control variables are smaller and less significant in the first quarter than in the other three quarters. We believe this is because routine, planned repurchases are likely to be scheduled for the first quarter, while repurchases during the remaining quarters depend more on changing economic conditions. For this reason, we recommend that the first quarter be examined separately from other quarters in future research on the motives for corporate share repurchases.

By including a comprehensive set of explanatory variables as controls, we update prior research. This is needed because the disappearance of the "repurchase price anomaly" in our test period (Fu, Huang, and Lin 2015) suggests that motives for buying back stock may have changed. One source of change is enactment of the 2002 Sarbanes-Oxley Act (SOX). Chen and Huang (2013) find that pre-buyback, downward accrual-based earnings management to reduce the stock price no longer occurs after SOX. Following prior research, our regression model includes two market-based variables to capture undervaluation. The first shows that companies buy more shares when the book-to-market ratio at the beginning of a quarter is high (i.e., value firms repurchase more stock). The second shows that more shares are purchased when the return

during the current quarter is low.[6] We find that larger companies also buy more shares, and several financial statement-based measures of capital availability and operating performance affect repurchases: Companies acquire more shares when cash and short-term investments are high or when free cash flow increases. They acquire fewer shares when debt is high or the company pays a large dividend. In addition, companies with an increase in return-on-assets repurchase more shares. Finally, consistent with Blouin and Krull (2009), we find that the current quarter's change in repurchases is negatively related to the prior quarter's change (indicating regression to the mean). Each of these variables has a high level of statistical significance, so economic factors that generally add value for long-term shareholders explain much of the repurchase decision, with the exception that some companies acquire shares that are overvalued.

To evaluate whether the change in short interest is a good indicator of equity overvaluation in our research setting, we examine subsequent stock prices. During the quarter in which repurchases and short interest increase (see Figure 1, quarter 0), the stock price declines 1.7 percent (on average). In the next quarter, the average price increases by 0.8 percent, so the shares purchased in quarter 0 initially appear to be undervalued and/or the effort to support the stock price is initially successful. However, that quarter is followed by six straight quarterly price declines, at which point the aggregate (eight-quarter) decline is 5.9 percent (see Figure 1).[7] This price decline supports using the change in short interest as an ex ante measure of whether equity is overvalued. The price decline also shows that the company has incurred an agency cost by overpaying to acquire stock.

---

[6] This result does not mean that equity is not overvalued since low returns can continue.
[7] Note that a percentage price decline is straightforward to calculate but understates the reduction of long-term shareholder value because corporate expenditures should produce a positive return after covering the cost of capital.

Next, we use financial ratios to examine operating results for those companies. We use three components of an overall measure of financial condition originally developed by Zmijewski (1984): return on assets, debt-to-assets, and liquidity (the current ratio). We report on each component separately because they are familiar to readers and are more intuitive than the aggregate Z-score. From quarter 0 (when repurchases and short sales increase) to quarter +8, we find return-on-assets (ROA) drops an average of 36 percent, debt-to-assets increases 10 percent, and the current ratio decreases 8.4 percent. The decline in these fundamentals begins prior to quarter 0, so these companies increased share repurchases as operating performance began to decline. This timing adds to evidence that repurchases are intended to prevent, or at least reduce, a drop in stock price. Operating results decline so sharply, however, that repurchasing additional stock does not prevent a sizable decline in stock price.

Prior literature has identified overconfidence as a key factor in understanding some manager actions, including share repurchases. Of particular relevance to our research, Chen and Wang (2012) conclude their study with the following statement: "Thus, considerable support exists for a managerial hubris explanation for share repurchases that are not shareholder value-enhancing." To provide some evidence about manager confidence, we extend our primary analyses to examine insider trades. Holding onto personal stock holdings would indicate insiders are confident. Buying stock with personal funds would be an even stronger indicator of confidence, but insider buying is relatively infrequent. Insider selling is more frequent than buying, but the motives are less clear because managers may sell their shares to raise cash or diversify their stock holdings, rather than because the stock is overvalued. Regardless of the reason, evidence of insider selling would raise the possibility that corporate share repurchases were increased to allow insiders to sell at a higher price. To provide a point of comparison, we

first examine quarters *without* a change in corporate share repurchases. We find net insider selling (i.e., sales less purchases) is then significantly positively associated with changes in short interest, so managers and shorts trade consistently. In contrast, when examining quarters *with* changes in corporate repurchases, we find net insider selling is not significantly related to either changes in share repurchases or short interest. Insiders therefore trade differently and hold onto their stock when the company is repurchasing stock. Insiders therefore do not sell to benefit from a short-term price increase from repurchases, which is consistent with overconfidence.

Our study contributes to understanding the dramatic increase in share repurchases in recent years. The primary contribution is to provide evidence of a motive not directly considered in prior research, namely, that corporate share repurchases are used to support overvalued equity. Repurchases can directly support a stock's price by increasing demand and reducing supply; repurchases can provide indirect support by increasing earnings per share. A price support motive can explain why Bonaimé (2012) finds that more highly valued firms have higher repurchase completion rates. Identifying when price support is the motive for share repurchases is important to long-term shareholders because an agency cost arises when companies overpay to acquire stock, and this cost reduces long-term shareholder value.

We also contribute to a new, but potentially important, line of research that uses short interest to identify when equity is overvalued. This use of short interest has numerous potential research applications. Ben-David et al. (2015) introduce this approach by using the level of short interest to identify when equity is overvalued in the context of corporate mergers. We extend this approach to corporate share repurchases and use changes in short interest instead of levels. In the past, researchers had to hand-collect short interest data or purchase it from a third party, but short interest data are now available from Compustat.

The remainder of the study proceeds as follows. The next section provides background on SEC regulation of corporate share repurchases and a brief review of prior research on the motives for share repurchases. Section 3 presents the regression model used to explain changes in share repurchases and discusses other aspects of the research design. Data collection and descriptive statistics are reported in Section 4. Section 5 presents empirical results on share repurchases, subsample analyses, and robustness tests. Section 6 examines subsequent stock prices and accounting fundamentals. Trading by insiders is reported in section 7, and we conclude in section 8.

2. SEC Regulation of Corporate Repurchases and Related Research

The potential for price manipulation via share repurchases has been recognized for a long time. More than thirty years ago, Congress required that the SEC regulate open market corporate share repurchases to prevent "fraudulent, deceptive, or manipulative" practices by issuers (Cook, Krigman, and Leach 2003). After considering several alternatives, the SEC passed Rule 10b-18 (1982) which provides four safe harbor conditions that, if met each day when shares are repurchased, provide protection to issuers against charges of price manipulation. The safe harbor conditions are designed to protect investors by assuring that price is set by "independent market forces without undue influence by the issuer" (SEC 2003, 64953). However, 10b-18 did not mandate any new disclosures to monitor compliance, and 10b-18 conformity is not verifiable with public data. This limits SEC enforcement, as well as academic research.

Investigating compliance for a small sample of about 60 firms willing to voluntarily provide data (from 478 requests), Cook et al. (2003) and Cook (2004) find a high rate of non-compliance with 10b-18, including repurchase volume in excess of daily limits and repurchases

made at prices exceeding restrictions on how much companies can pay to acquire shares. [8] They

discover that companies violate the safe harbor rules more frequently "following price drops,

apparently intentionally trading outside of the safe harbor …." (Cook et al. 2003, 291-2). They

comment (p. 305) that the discrepancies "introduce the possibility that noncompliance is

strategic and intended to influence market returns." Our study provides further evidence that

managers use share repurchases to influence their company's stock price.

Early studies of corporate repurchases indicated they provide a signal that equity is

undervalued. Ikenberry et al. (1995) investigate open-market repurchase programs announced

from 1980 to 1990. They report that significantly positive returns occur for several years after the

program announcement. Peyer and Vermaelen (2009) consider the next ten years, from 1991 to

2001, and again find positive abnormal returns following a program announcement. Fu et al.

(2015) replicate and extend both of those studies by investigating 14,309 open-market program

announcements from 1985 to 2012. Fu et al. (2015) confirm that positive abnormal returns

follow program announcements through 2002, but they find that abnormal returns do not exist

thereafter. They state: "The contrasting results between the early and later periods are robust to

various estimation methods of long-run abnormal returns and are not explained by the "bad

model" problem since we employ the same set of models for the two time periods." They

attribute the difference in results to a changing market environment. The passage of SOX in July

2002 has affected corporate governance and the market environment in several ways that

---

[8] The "price condition" of Rule 10b-18 caps a company's offer price at the last independent transaction or bid price. The SEC further cautions that constantly offering the last price, thereby forcing others to raise the price, can constitute price manipulation (SEC 2003, p. 64954, fn. 19). Compliance with the "price condition" thereby limits managers' ability to raise the bid price. The other three safe harbor conditions can be met relatively easily: 1) by using a single broker, 2) by not trading at the market opening or near the closing (i.e., last 30 minutes, reduced to 10 minutes for highly liquid stocks), and 3) by limiting daily purchases to 25 percent of average daily trading volume. For a detailed discussion of each condition, see SEC (2003).

influence share repurchases (Chen and Huang 2013). Our research covers the period after SOX

has been enacted and abnormal returns no longer follow announcement of a repurchase plan.

3. Research Design

To test the hypothesis that, in recent years, a motive for repurchasing stock is "to pump or

support" a high stock price (see introduction), we use actual share repurchases. We extend the

models used by Dittmar (2000), Stephens and Weisbach (1998), Hribar et al. (2006), and Blouin

and Krull (2009). Our model is most similar to equation (5) in Blouin and Krull (2009).[9]

$$\Delta Repurchase_{i,t} = \beta_0 + \beta_1 \Delta ShoIntQ_{i,t} + \beta_2 BTM_{i,t-1} + \beta_3 Return_{i,t} + \beta_4 Cash_{i,t-1} + \beta_5 Debt_{i,t-1}$$

$$+ \beta_6 \Delta FCF_{i,t} + \beta_7 ROA_{i,t-1} + \beta_8 \Delta ROA_{i,t} + \beta_9 Size_{i,t-1} + \beta_{10} DivYld_{i,t-1} + \beta_{11} QOpGnt_{i,t}$$

$$+ \beta_{12} \Delta Repurchase_{i,t-1} + \Sigma \beta_m Industry_m + \Sigma \beta_n Year\text{-}Qtr_n + e_{i,t} \qquad (1)$$

The dependent variable, $\Delta Repurchase_{i,t}$, is the change in a company's repurchase of common

stock from quarter t-1 to quarter t. Following Blouin and Krull (2009) and Banyi, Dyl, and Kahle

(2008), we calculate $Repurchase_{i,t}$ as purchases of common and preferred stock from the

Statement of Cash Flows, less any decrease in preferred stock from the balance sheet, scaled by

total assets at the beginning of the quarter (multiplied by 100 to report as a percentage).

The explanatory variable of primary interest, $\Delta ShoIntQ_{i,t}$, is the change in short interest

from quarter t-1 to quarter t, where short interest is the number of shares sold short divided by

common shares outstanding. If valuation drives trading and if short sellers and companies have

similar views about any mispricing of the stock, the coefficient on $\Delta ShoIntQ$ would be negative.

For example, if both parties view the stock as overvalued, shorts would increase their selling and

companies would decrease repurchases. A positive coefficient on $\Delta ShoIntQ$ would require

conflicting trades. In general, this relation would seem unlikely because highly informed parties,

---

[9] Blouin and Krull (2009) investigate whether firms distribute cash from repatriated foreign earnings (due to the tax holiday provided by the 2004 American Jobs Creation Act) to their shareholders via share repurchases. Equation (5) of Blouin and Krull (2009) therefore includes some variables that are not relevant to our study, such as a tax penalty.

like corporate managers and short sellers, would not be expected to systematically disagree about the stock's value. Shorts trade with their own capital, however, while the managers trade with stockholders' capital. An agency relationship therefore exists between corporate managers and stockholders, and agents do not always act in the best interest of the principals. As a result, corporate managers may use stockholders' capital to support overvalued equity. For these reasons, we do not propose a sign for the coefficient on $\Delta ShoIntQ$.

Recall that by calculating share repurchases and short interest as changes, our research design controls for firm-specific factors that are stable in consecutive quarters (without our needing to identify the factors). To control for cross-sectional factors that influence corporate share repurchases, we include several market and financial ratios. $BTM_{i,t-1}$ is the ratio of book value of equity to the market value of equity at the end of quarter t-1. $Return_{i,t}$ is the raw stock return during quarter t. $Cash_{i,t-1}$ is calculated as cash and short term-investments at the end of quarter t-1, deflated by total assets at that time. $Debt_{i,t-1}$ is calculated as the ratio of current plus long term debt to total assets at the end of quarter t-1. $\Delta FCF_{i,t}$ is the change in free cash flow (operating cash flow minus capital expenditures) from quarter t-1 to quarter t, scaled by total assets at the end of quarter t-1. $ROA_{i,t-1}$ is the ratio of net income for quarter t-1, divided by total assets. $\Delta ROA_{i,t}$ is the change from quarter t-1 to quarter t. $Size_{i,t-1}$ equals the natural log of total assets at the end of quarter t-1. $DivYld_{i,t-1}$ is dividends per share for quarter t-1 divided by stock price at the end of that quarter. $QOpGnt_t$ is the total number of stock options granted to managers in quarter t, scaled by common shares outstanding.

A commonly cited reason for initiating a repurchase plan is to signal undervaluation (Vermaelen 1981, Jagannathan and Stephens 2003, Louis and White 2007). The book-to-market ratio has been widely used in the share repurchase literature as a proxy for undervaluation with a

positive coefficient expected (Ikenberry et al. 1995; Dittmar 2000). Another rationale for a positive coefficient is that growth firms prefer to use capital for promising investment opportunities, rather than to repurchase stock. The other widely used proxy for undervaluation is the current period's stock return, with a negative sign expected, on the assumption that companies increase repurchases when prices decline. The coefficients on cash and short-term investments are expected to be positive because firms with more resources on hand can more easily increase share repurchases. Consistent with Dittmar (2000) and Core, Guay, Richardson, and Verdi (2006), we expect a negative coefficient on debt. Debt servicing requires that firms keep cash on hand, and some debt covenants have strict limitations on payouts to shareholders. Firms with increasing free cash flow are more able to increase share repurchases, so we expect a positive coefficient on ΔFCF (Stephens and Weisbach 1998). We expect positive signs on return-on-assets and changes in ROA because profitable firms can increase earnings per share by reducing outstanding shares via repurchases. Firm size is expected to be positively related to repurchases based on studies by Dittmar (2000), Core et al. (2006), and Blouin and Krull (2009). Dividend yield would have a negative coefficient assuming that share repurchases and dividends are substitutes for returning capital to shareholders (Skinner 2008). Companies that use stock options as compensation often repurchase shares in order to minimize dilution of existing stockholders, so we expect a positive sign (Kahle 2002).

4. Data and Descriptive Statistics

4.1 Data

We obtain monthly short interest, quarterly share repurchases, and quarterly financial data from Compustat; share prices, common shares outstanding, and cumulative adjustment factors from CRSP; insider trades from the Thomson Reuters TFN database; and option grants

from ExecuComp. Our test period begins with 2003, the first year with short interest data available from Compustat when we began the study, [10] and extends through 2009. We merge data from the four databases, including only firms with ordinary common shares (CRSP share codes of 10 or 11). As summarized in Table 1, the final sample consists of 4939 firms and 76,451 firm-quarters. We exclude firms in financial services or regulated industries because they may need regulator permission to repurchase shares. We drop observations with stock prices less than or equal to $1.00.

In an extension, we examine whether corporate share repurchases influence how insiders trade with their personal capital. The Thompson Reuters TFN database obtains insider trading data from SEC Forms 3, 4, and 5. We aggregate daily data from TFN to calculate a quarterly measure and keep only records with a cleanse indicator (assigned by Thomson) of R, H, C, L, or I. Codes R, H, and C indicate that the data are accurate with a very high degree of confidence. Codes L and I indicate that Thomson either cleaned or improved the data, but they could not verify the data from secondary sources. Roughly a third of the data have an indicator of either L or I. Following Kahle (2002) and Jategaonkar (2010), we collect acquisitions and dispositions of shares by company executives, officers, directors, and controlling persons. (We collected insiders' trades with TFN role codes 'CB', 'CEO', 'CO', 'GC', 'P', 'CFO', 'CI', 'CT', 'D', 'DO', 'H', 'OB', 'OD', 'OT', 'TR', 'VC', 'AV', 'C', 'EVP', 'SVP', 'VP', 'CP', and 'F'.)

4.2 Descriptive Statistics

Table 2 presents descriptive statistics. The mean for *Repurchases* of 0.5427 indicates that corporate share repurchases constitute about half of one percent of total assets in an average

---

[10] We use short interest compiled in the middle of the last month of the quarter. The stock exchanges compile firm-level short interest at mid-month and release it before month-end throughout our test period. In 2007, they added a second measure compiled at month-end and reported a few weeks later. In robustness tests, we consider other measures of short interest, including the average short interest for the quarter.

quarter. However, most quarters do not have a share repurchase (median is zero). The average

quarterly share repurchase increases to 2.09 percent of total assets when only non-zero quarters

are included (not tabulated). This amount is clearly of economic importance. The mean for

ΔRepurchase is -0.0141, which is low because a zero change is common in many quarters and a

very large increase in repurchases tends to be followed by a decrease (mean reversion). This

results in sizable changes at the 90th and 10th percentile, at 0.2801 percent and -0.3078 percent of

total assets, respectively.

Short interest averages 4.63 percent (median 2.75 percent) over the sample period. The

quarterly change, *ΔShoIntQ*, has a mean (median) of 0.11 (0.01) percent, which is small because

short interest for many companies is similar in consecutive quarters. The changes at the 90th and

10th percentile, however, are sizable at 2.05 and -1.74 percent. Insider net stock sales,

QInsNetSell, has a mean of 0.5793, with positive (negative) values of one indicating all

transactions in the quarter are sells (buys). In untabulated results, we find the mean for sells is

0.649, compared to 0.038 for buys, so insiders sell about 17 times more shares than they buy.

Quarterly raw returns tend to be positive over our sample period, with a mean (median) of

0.0373 (0.0164). Abnormal returns are characteristic-based, benchmark adjusted (Daniel,

Grinblatt, Titman, and Wermers 1997), and the mean (median) is 0.0169 (-0.0103). Mean and

median percent operating accruals are both negative at -3.0300 and -0.5765, respectively. More

than ninety percent of the quarters do not have any option grants, resulting in a small mean

(median) grant of 0.0018 (0.0000). The remaining values are similar to other studies.

Table 3 reports correlations among the variables used in Model 1 to explain the change in

corporate share repurchases. The first column (first row) presents Spearman (Pearson) univariate

correlations between the quarterly change in repurchases and individual explanatory variables.

Most correlations are statistically significant in the direction expected. Using either correlation statistic, changes in repurchases are significantly positively associated with five variables: changes in short interest, cash and short-term investments, changes in free cash flow, changes in return on assets, and option grants. Repurchase changes are significantly negatively correlated with four variables: current-quarter stock returns, debt, dividend yield, and changes in repurchases during the preceding quarter. Comparing correlation magnitudes, the change in short interest is third (second) highest using the Spearman (Pearson) measure. The highest correlation is with the lagged change in repurchases. In the next section, we examine whether these univariate associations are statistically significant in a multivariate model.

5. Multivariate Analysis

5.1 Changes in Short Interest and Corporate Share Repurchases

Table 4 presents the results for four versions of Model 1. Version 1 includes only the change in short interest. Version 2 includes all the explanatory (control) variables, except for the change in repurchases during the prior quarter. Versions 3 and 4 add this variable. In versions 1, 2, and 3 of the model, we correct for the possibility of biased standard errors by clustering on the firm and by using indicator variables to control fixed effects (Petersen 2009) for industry (two-digit SIC codes) and for time (quarter-year). Version 4 differs from version 3 by clustering on both firm and time (Gow, Ormazabal, and Taylor 2010).

Our main finding is that the coefficient on $\Delta ShoIntQ$ is always positive and highly statistically significant. Further, the size and statistical significance of the coefficient on $\Delta ShoIntQ$ increases as we add variables to consider additional factors (i.e., from Version 1 to 4). A positive association is consistent with our hypothesis that corporate share repurchases are

being used to support overvalued equity. Later, we report on subsequent stock and operating performance.

The regression model includes a comprehensive set of explanatory variables, thereby minimizing the likelihood of a correlated omitted variable. Although most of the variables have been used in prior research, they have not been examined over our more recent time period. In general, the coefficients are statistically significant with the expected signs. Consistent with prior research, we use two market-based variables. We find that repurchases increase when the book-to-market ratio at the beginning of a quarter is high, indicating that value firms buy back more shares than growth firms. Second, companies repurchase more shares when the return during the current quarter is low. This finding should be considered along with the change in short interest since the stock price may decline further. Several accounting-based measures of capital availability also affect repurchases. Companies acquire more shares when cash and short-term investments at the beginning of the quarter are high. Changes in free cash flows have a positive but marginal effect on repurchases. Companies buy back fewer shares when debt is high at the beginning of a quarter. Companies with a positive change in return-on-assets repurchase more shares, and larger firms buy back more stock. The coefficient on dividend yield is negative and statistically significant, providing support for the proposition that dividend distributions and repurchases are substitutes. Executive stock option grants are positive (albeit insignificant in Version 3), indicating that some companies repurchase shares to reduce dilution of ownership of existing stockholders. We find the prior quarter's change in repurchases is strongly negatively related to the current quarter's change in repurchases, which is consistent with regression to the mean. Despite its high level of statistical significance, this variable has little effect on the statistical significance of the other variables.

The results presented on Table 4 provide a direct link to prior research by including all quarters within the time period being studied, even though the majority of quarters have zero repurchases. We expect companies with changing amounts of repurchases are more likely to be supporting their stock price. Credit Suisse (June 2012, 6) refers to companies with sizable changes in stock repurchases as having a "more undisciplined buyback process." The results reported in Table 5 focus on those companies by including only quarters with a non-zero change in repurchases. The number of observations is reduced from 76,451 to 19,873 firm-quarters. We refer to this subsample as "active repurchasers." We find the coefficient on $\Delta ShoIntQ$ is again positive and highly statistically significant, but it is now more than three times larger (roughly 11 vs. 3.5). An increase in quarterly share repurchases of $1,077,515 ((0.01*11.519*exp(6.8410)) is accompanied by a one percent increase in short interest. This is a strong indication that short sellers view the increase as supporting overvaluation, since the mean level of short interest across our sample is 0.0463. The coefficients on most of the other explanatory variables are also much larger for active repurchasers than for the full sample (i.e., comparing Tables 3 and 4).

5.2 Subsample Analysis

In Table 6, we present results for three subsamples. First, we split the sample period into bull market and bear market years, using the breakdown in Milano and Cryan (CFO.com, July 3, 2012). We are uncertain about how a bear vs. bull market would influence the relation between short interest and repurchases. More stock would be overvalued in a bull market, which would provide greater opportunity for using repurchases to support overvalued equity. On the other hand, Lamont and Stein (2004) show that aggregate short interest decreases during bull markets, as investors withdraw money from hedge funds due to losses and traders become cautious. Examining columns 1 and 2, we find the change in short interest is significantly positively

associated with the change in share repurchases in both bull and bear markets. Consistent with a withdrawal of funds reducing short selling (Lamont and Stein 2004), the coefficient is somewhat smaller in bull market years.

Next, we examine whether the first quarter is different from the other three quarters. Routine, planned repurchases are likely to be scheduled for the first quarter, while repurchases during the remaining quarters depend more on changing economic conditions (including a decision to support overvalued equity). Comparing columns 3 and 4 of Table 6, we find that a statistically significant positive association between changes in repurchases and short interest exists in the first fiscal quarter and in the rest of the year. The coefficient on ΔShoIntQ is larger and more statistically significant, however, after the first quarter. Coefficients on several other variables are also larger in the other three quarters than in the first quarter. Specifically, coefficients indicate a greater response to a negative return, a positive change in free cash flow, a positive ROA, a positive change in ROA, and an increase in option grants. Firm size and the dividend substitution effect are less important. Based on these differences, we recommend that the first quarter be examined separately in future research on the motives for corporate share repurchases.

The last subsample removes accelerated share repurchases (ASRs) from our data. ASRs remove shares from circulation immediately, generally by contracting with an investment bank that delivers borrowed shares and then acquires shares gradually in the open market to replace the borrowed shares. ASRs provide price support by immediately increasing demand and reducing the supply of shares; ASRs also boost EPS (Dickinson et al. 2012, Marquardt et al. 2011). The company is typically responsible for losses incurred by any drop in stock prices. The frequency of ASRs has grown exponentially in recent years (Bargeron, Kulchania and Thomas

(2011). Because ASRs are more credible than open market buybacks, Bonaimé (2012) finds the probability of announcing an ASR is greater for firms likely to be concerned about a poor reputation due to low completion rates following prior open market program announcements. A drawback with ASRs is that they reduce a company's flexibility to adjust share repurchases as economic conditions change. We hand-collect ASR announcements from 10-K and 10-Q filings and then re-run model 1 without ASR transactions. As reported in Table 6, column 5, the coefficient on the change in short interest remains positive and highly significant, although slightly smaller. The other variables change very little.

The 2008 ban on short selling of "financial stocks" caused a sizable decline in short sales across a wide range of companies, and the need to preserve capital during the financial crisis considerably reduced corporate share repurchases. Our results therefore include some quarters with highly unusual market conditions, so we reran the model including only quarters that end before September 2008. In untabulated results, the overall model is somewhat stronger, and the only noteworthy change is a greater weight on the current quarter's return, with less weight on the book-to-market ratio.

In summary, we find the association between changes in share repurchases and changes in short interest remains positive and highly significant: 1) in bull and bear market years, 2) during all four fiscal quarters, 3) without accelerated share repurchase transactions, and 4) without quarters affected by the 2008 short selling ban. The next section reports on results using alternative measures of repurchases and short selling.

5.3 Robustness Tests

In model 1, short interest is deflated by common shares outstanding at the end of the quarter. Repurchases reduce the denominator, outstanding shares, thereby increasing deflated

short interest which could be creating a positive association. We therefore deflate short interest by the average number of shares outstanding in preceding quarters, and the results are very similar to those reported. We also measure the change in short interest in two different ways: First, we convert our short interest change variable into deciles and use the resulting ranks. Second, we calculate short interest in each quarter as the average for the three months, rather than the amount reported in the last month of the quarter. We find the change in short interest is positively associated with the change in repurchases and highly significant in each specification. We also separately run the model for increasing versus decreasing short interest. The sign on the change in short interest is positive and highly significant for quarters in which short interest increases (indicating equity is overvalued), but only marginally significant when short interest decreases. This suggests that the sample-wide positive association between quarterly changes in share repurchases and contemporaneous changes in short interest is mostly driven by companies with increases in both quarterly share repurchases and short interest. Later in the paper, we will examine these firms more closely.

Prior studies estimate share repurchases in several ways. For instance, Stephens and Weisbach (1998) use quarterly decreases in shares outstanding, quarterly purchases of common and preferred stock from the cash flow statement, and quarterly changes in treasury stock. They conclude that none of those proxies measure share repurchases without error. More recently, Banyi, Dyl,and Kahle (2008) and Blouin and Krull (2009) show that purchases of common stock can be calculated fairly accurately using data from the Statement of Cash Flows, and we use their estimation method in our models. As a robustness test, we reran Model 1 using each of the other quarterly measures in Stephens and Weisbach (1998). In addition, we used a measure of abnormal change in share repurchases (AbRepur8), calculated as the difference between

repurchases in the current quarter and the average repurchases for the preceding eight quarters. In untabulated analyses, the association between changes in repurchases and changes in short selling is always positive and statistically significant.

Stephens and Weisbach (1998) also use monthly decreases in shares outstanding to approximate repurchases. Using monthly data narrows the time period over which we compare changes in repurchases and short interest, which helps to establish a direct relation. However, measurement error in estimating repurchases increases because the number of shares outstanding changes when stock is issued, rather than only when stock is repurchased. Using monthly data collected from CRSP and Compustat, the repurchases dependent variable is measured as the change in common shares outstanding (SHROUT) from month m-1 to month m, scaled by common shares outstanding at the end of month m-1. The change in short interest is also calculated monthly. The other variables are quarterly measures, which results in an identical amount being used for each month in the quarter. We expect the coefficient on the monthly change in short interest to be *negative*, since the dependent variable is the change in shares outstanding. That is, a reduction in shares outstanding indicates share repurchases. The analysis has 204,739 observations. Using this model, we find the coefficient on the change in short interest is negative and highly significant, supporting the findings previously reported.

Using monthly data, we also calculate two alternative measures of abnormal changes in share repurchases (AbShrOut12 and AbShrOut24) and changes in short interest (AbShoInt12 and AbShoInt24). AbShrOut12 is abnormal common shares outstanding, calculated as the difference between the current month's common shares outstanding and the average amount for the preceding 12 months. AbShrOut24 is defined similarly but based on the average number of common shares outstanding over 24 months. AbShoInt12 (AbShoInt24) is defined as the

difference between the current month's short interest and average short interest for the past 12 (24) consecutive months. Using these measures, we find that the coefficients on the monthly change in short interest are always negative and statistically significant.

Lastly, we include firms in regulated industries and financial services, and the main results do not change. In sum, we conducted numerous robustness tests because our study is the first to test for a relation between changes in share repurchases and changes in short interest, the latter used as a measure of equity overvaluation.

6. Future Stock Prices and Operating Performance

Situations in which highly informed parties – like corporate managers and short sellers – trade in a conflicting manner are intriguing but relatively uncommon. Managers are acting as agents when they repurchase company stock, so they may not always act in the best interests of stockholders. Short sellers trade with their own funds, so they have "skin in the game." In this section, we examine future stock prices and operating results for companies that experience an increase in short selling when they increase share repurchases. The objective is to provide descriptive evidence about whether future results support our assumption that increases in short interest indicate the stock is overvalued.

Figure 1 reports average levels of short interest, repurchases, and stock prices around quarter 0, the quarter when repurchases and short interest both increase. In quarter 0, repurchases increase to more than double the average for the four preceding quarters (2.36% to 1.07%). Repurchases then decline over subsequent quarters, returning to earlier levels. Prior to quarter 0, shorts were not targeting these firms because short interest averages 4.33%, which is slightly below the sample mean of 4.63% (Table 2). In quarter 0, short interest increases to 5.46%, which is 28.7 percent higher than the average of 4.33% for the four preceding quarters. After quarter 0,

short interest remains high and even increases slightly, averaging 5.8% over the next eight quarters. Examining stock prices, the average price declines by 1.7 percent in quarter 0 compared to the preceding quarter (from $30.40 to $29.89), increases by 0.8 percent from quarter 0 to quarter 1 ($29.89 to $30.14), but then declines for six straight quarters before recovering somewhat. This decline in stock prices indicates that the company overpaid when repurchasing stock in quarter 0 and the short interest increase in quarter 0 is an ex ante indicator of overvaluation.

Next, we examine corporate operating performance. Managers have a more direct influence on operating performance than on stock prices, and it is possible that the observed decline in stock prices occurs despite an improvement in operations. We use three components of an overall measure of financial condition originally developed by Zmijewski (1984): return on assets, debt-to-assets, and liquidity (the current ratio) to gauge firms' operating performance. In Figure 2, we report on each component separately because the components are familiar to readers and more intuitive than the aggregate Z-score.[11] We standardize each ratio from quarter -4 through quarter +8 by dividing by the quarter 0 amount. Standardization facilitates comparisons among the three financial ratios and for each ratio over time.

Examining the quarters leading up to quarter 0, profitability (ROA) is especially high in quarters -3 and -2, before declining steeply in quarters -1 and 0. Debt and liquidity are initially stable, but debt increases and liquidity declines from quarter -1 to quarter 0. Financial ratios therefore show that these companies increased share repurchases in quarter 0 as corporate profitability and financial condition began to deteriorate. The stock price also declined in quarter

---

[11] We do not report the aggregate measure, although readers can calculate the Z-Score from the following formula: ZDistress = -4.336 + (-4.512)*ROA + 5.679*(Debt/Assets) + 0.004*(Current Ratio). Note that this measure has continued to be used in recent research (e.g., Carcello and Palmrose 1994; and Kaplan and Williams 2013), even though the coefficients were fit in a much earlier period.

0, after increasing from quarter -4 to quarter -1. The increase in repurchases appears to be timed to offset a decline in financial ratios and stock price.

Examining the eight quarters after quarter 0 (Figure 2), return on assets (ROA) drops 36.1 percent, debt-to-assets increases 10.2 percent, and liquidity decreases 8.4 percent. This decline in operations is so severe that increased share repurchases do not prevent the stock price from declining. In retrospect, the managers appear overly optimistic -- even naïvely optimistic – their attempt to support the stock price by repurchasing stock will be successful.

7. Extension to Consider Insider Trades

In this section, we extend our investigation of the relation between corporate share repurchases and short selling to also consider insider trades. Prior studies have examined the relation between announcements of a repurchase program and insider trades (e.g., Babenko, Tserlukevich, and Vedrashko 2012, Chan, Ikenberry, Lee and Wang 2012) and between actual share repurchases and insider trades (e.g., Bonaimé and Ryngaert 2013). The relation of the three types of informed trading -- corporate share repurchases, insider trades, and short selling -- has not been previously studied and is worthy of a separate paper. Our objective is limited to providing evidence on whether managers who increase actual share repurchases when equity is overvalued (based on an increase in short interest) make consistent trades with their personal capital. An agency relationship exists when insiders invest corporate capital to buy shares, but not when they invest their own capital, so those stock trades could conflict. Although buying shares with personal capital would indicate insiders believe that the stock is undervalued, insider buying is relatively unusual[12], and we do not condition our sample on the existence of insider trades. We view insiders who hold onto their shares as also indicating optimism about the current

---

[15] While we were working on this study, Tesla CEO Elon Musk announced plans to buy $100 million of stock with personal funds. Short interest was in excess of 40 percent, so shorts viewed the stock as overvalued. Musk's announcement triggered a major short squeeze (LeBeau, May 15, 2013, CNBC online).

valuation. Pessimism would be indicated by insider selling, and this would raise the possibility

the share price was being supported by repurchases to allow insiders to benefit personally.

We use the following model for insider trades:

$QInsNetSell_{i,t} = \beta_0 + \beta_1 \Delta ShoIntQ_{i,t} + \beta_2 \Delta Repurchase_{i,t} + \beta_3 BTM_{i,t} + \beta_4 AbReturn_{i,t}$

$\qquad + \beta_5 AbReturn_{i,(t+1,t+4)} + \beta_6 QOpGnt_{i,t} + \beta_7 Size_{i,t} + \beta_8 PctOperAccrual_{i,t}$

$\qquad + \Sigma \beta_m Industry_m + \Sigma \beta_n Year\text{-}Qtr_n + e_{i,t}$ \hfill (2)

$QInsNetSell_{i,t}$ is the ratio of insider sales less insider purchases during quarter t, divided by the

sum of those two amounts. We use the sell version of the trading ratio because sales of stock by

insiders are much more frequent than are purchases. Other studies that use variations of a trading

ratio as the dependent variable include Rozeff and Zaman (1988), Lakonishok and Lee (2001),

Frankel and Li (2004), Piotroski and Roulstone (2005), Rogers and Stockton (2005), and Core et

al. (2006).

$\Delta ShoIntQ$ is the change in short interest between consecutive quarters. We do not predict

a sign for $\Delta ShoIntQ$ because short interest could be negatively related, positively related, or

unrelated to insider net selling. Our model includes several control variables that have been

shown by prior research to influence insider trades. Rozeff and Zaman (1988) and Piotroski and

Roulstone (2005) find that insider selling increases (decreases) in response to recent stock price

increases (decreases). We extend their research by using quarterly, rather than annual, returns

and we expect a positive association between insider net sales and *Rank of AbReturn_{i,t}*. Prior

research shows insiders at value firms tend to purchase more stock, possibly because the stock of

value firms is more often undervalued based on fundamental information (Piotroski 2000). We

expect a negative coefficient, which would indicate less selling *Rank of BTM* is high. Consistent

with Piotroski and Roulstone (2005), we include the one-year-ahead, abnormal, buy-and-hold

return, $AbReturn_{t+1\ to\ t+4}$, since insiders may have better information for predicting future returns than the market. We expect a negative sign because insiders would reduce current selling when they expect positive future returns. Abnormal returns are characteristic-based and benchmark-adjusted as in Daniel et al. (1997).[13] We include stock option grants (*QOpGnt*) and expect a positive sign, reasoning that insiders receiving large option grants would sell shares to diversify their investment portfolio. We include *Size* and expect the coefficient to be positive, as prior research indicates that insiders of larger firms sell more stock than those at smaller firms (Seyhun 1986, Rozeff and Zaman 1988). Finally, Core et al. (2006) suggest that insiders sell more shares when accruals are high, which supports a positive sign on $PctOperAccrual_{i,t}$. Based on the study by Hafzalla et al. (2011) which shows accruals better predict future returns when deflated by earnings, we use the percent operating accrual (i.e., scaling accruals by the absolute value of net income).

We find that insiders trade somewhat infrequently, with a buy or sell transaction occurring in about 25 percent of the sample quarters. To provide a point of comparison, Table 7, Panel A, reports results for quarters with both insider trades and a change in short interest but without a change in corporate share repurchases. We find that insider net selling is then significantly positively associated with short selling. Insiders tend to sell when shorts increase short sales and to buy when shorts reduce an existing short position. To our knowledge, this is a new finding in the insider trading literature. Table 7, Panel B, presents the results for quarters with insider trades, a change in short selling, and a change in corporate repurchases. We find that the coefficients on both repurchases and short interest are statistically insignificant. Therefore, when the company is repurchasing more shares, insiders trade differently by not selling their

---

[13] The DGTW benchmarks are available via http://www.smith.umd.edu/faculty/rwermers/ftpsite/Dgtw/coverpage.htm.

shares. This behavior is consistent with managerial hubris or overconfidence that corporate share repurchases will prevent a price decline (Chen and Wang 2012). However, insiders could hold onto shares to avoid sending a sell signal or because they are concerned about insider trading laws.

The results reported are obtained after including three highly significant control variables. Following prior research, we use ranks for each of the three variables and find results consistent with earlier studies. We find that net insider selling is greater when (1) the book-to-market rank is lower (glamour firms), (2) the rank of current-quarter abnormal returns is higher, and (3) the rank of size is greater.

8. Conclusion

Our study contributes to a line of research that attempts to understand the motives for corporate share repurchases. Understanding these motives is important and timely because companies are continuing to allocate large amounts of capital to repurchasing their stock. To illustrate, companies in the S&P 500 index repurchased $148 billion of stock in the first quarter of 2015, which is well in excess of the record dividends of $93.4 billion paid in 2014 (Murphy and Cherney 2015). Those authors quote Laurence Fink, CEO Blackrock Inc., as saying: "While delivering immediate shareholder returns, executives are 'underinvesting in innovation, skilled workforces or essential capital expenditures necessary to sustain long-term growth."

We update prior research by including an extensive set of explanatory variables. Our primary contribution, however, is to provide evidence that a significant motive for corporate share repurchases is to support overvalued equity. This practice can be costly to long-term shareholders because an agency cost arises when a company overpays to acquire stock and this cost reduces long-term shareholder value. By using changes in short interest as proxy for

whether equity is overvalued, we also contribute to a line of research investigating when short

selling provides information that can be relied on by less informed investors.[14] Our study shows

that short interest can be used to determine when corporate share repurchases are not a signal for

investors to buy stock.

---

[14] The role of short sellers as information intermediaries is especially evident in a study by Drake, Rees and Swanson 2011) that finds that trading with the shorts is especially profitable when the level of short interest conflicts with the consensus analyst recommendation. The importance of an information intermediary role for short sellers is further reinforced by recent studies which find that accurate earnings forecasts and profitable stock recommendations have relatively little direct impact on analysts' compensation (Brown, Call, Clement, and Sharp 2013; Groysberg, Healy, and Maber 2011).
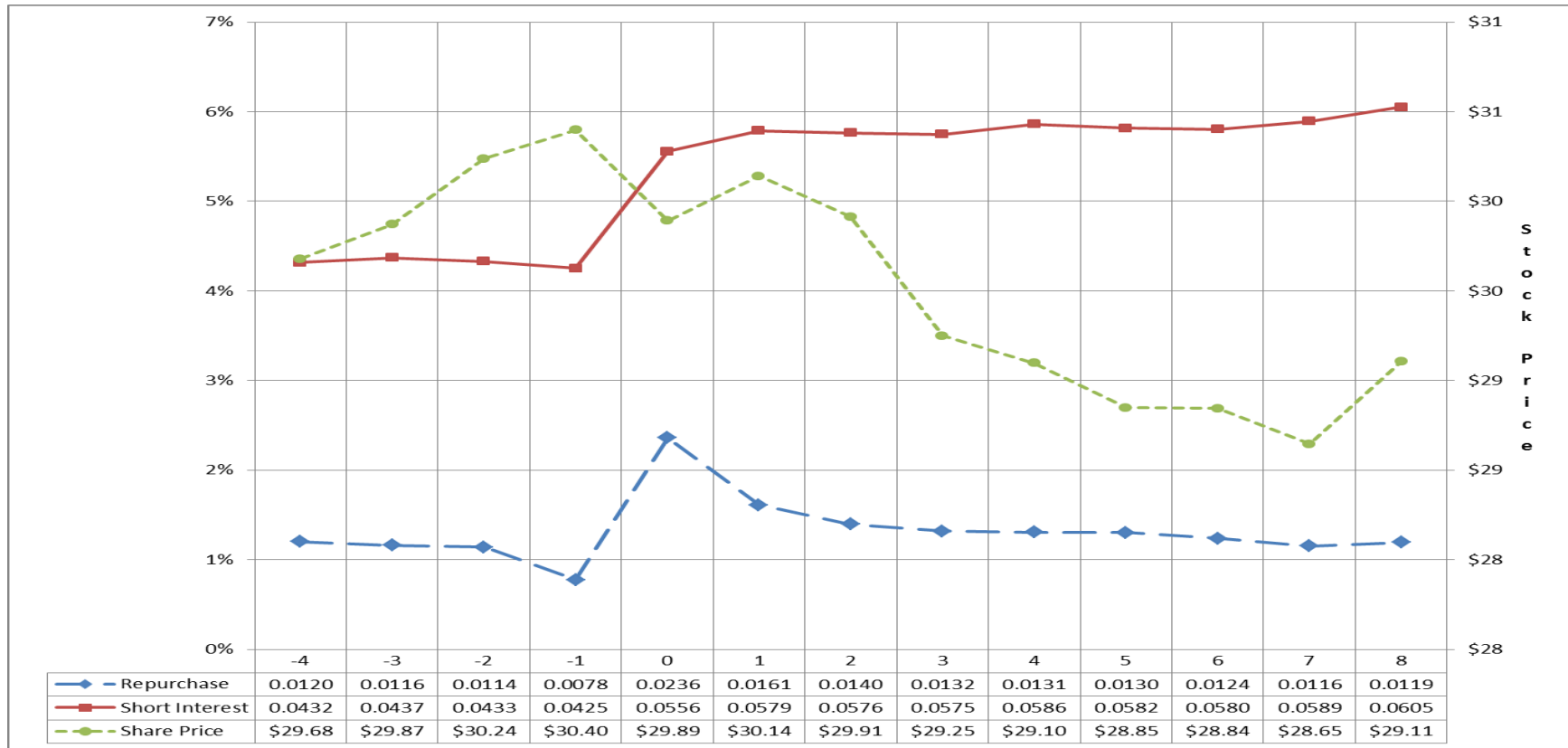
REFERENCES

Babenko, I., Tserlukevich, Y., Vedrashko, A. 2012. The Credibility of Open Market Share Repurchase Signaling. *Journal of Financial and Quantitative Analysis*. (47): 1059–1088.

Bagwell, Laurie S. 1991. Share Repurchase and Takeover Deterrence. *RAND Journal of Economics* 22: 72-88.

Baker, M., and J. Wurgler. 2002. Market Timing and Capital Structure. *Journal of Finance* 57 (1): 1-32.

Banyi, M. L.; E. A. Dyl; and K. M. Kahle. 2008. Errors in Estimating Share Repurchases. *Journal of Corporate Finance* (14): 460–474.

Bargeron, L.; M. Kulchania; and S. Thomas. 2011. Accelerated Share Repurchases. *Journal of Financial Economics* (101): 68–89.

Ben-David, Itzhak, Michael S. Drake, and Darren T. Roulstone. 2015. Acquirer Valuation and Acquisition Decisions: Identifying Mispricing Using Short Interest. *Journal of Financial and Quantitative Analysis* 50 (1-2): 1-32.

Bens, D. A., V. Nagarb, D. J. Skinner, M.H. F. Wong. 2003. Employee Stock Options, EPS Dilution, and Stock Repurchases. *Journal of Accounting and Economics* (36): 51–90.

Blouin, J., and L. Krull. 2009. Bringing It Home: A Study of the Incentives Surrounding the Repatriation of Foreign Earnings Under the American Jobs Creation Act of 2004. *Journal of Accounting Research* 47 (4): 1027-1059.

Boehmer, E., C. M. Jones, and X. Zhang. 2008. Which Shorts Are Informed? *Journal of Finance* 63 (2): 491-527.

Boehmer, E., Z. R. Huszar, and B. D. Jordan. 2010. The good news in short interest. *Journal of Financial Economics* 96 (1): 80-97.

Bonaimé, Alice Adams. 2012. Repurchases, Reputation and Returns. *Journal of Financial and Quantitative Analysis* 47 (2): 469-491.

Bonaimé, Alice Adams, and M. D. Ryngaert. 2013. Insider trading and Share Repurchases: Do Insiders and Firms Trade in the Same Direction? *Journal of Corporate Finance* 22 (0): 35-53.

Brav, A., J. R. Graham, C. R. Harvey, and R. Michaely. 2005. Payout Policy in the 21st Century. *Journal of Financial Economics* 77: 483-527.

Brown, L. D., A. C. Call, M. Clement, and N. Y. Sharp. 2015. Inside the "Black Box" of Sell-Side Financial Analysts. *Journal of Accounting Research* (forthcoming).

Carcello, J., and Z.-V. Palmrose. 1994. Auditor litigation and modified reporting on bankrupt clients. *Journal of Accounting Research* 32 (Supplement): 1–30.

Chen, S. and C. Huang. 2013. The Sarbanes-Oxley Act, Earnings Management, and Post-Buyback Performance of Open-Market Repurchasing Firms. *Journal of Financial and Quantitative Analysis* 48 (6): 1847-1876.

Chen, S. and Y. Wang. 2012. Financial Constraints and Share Repurchases. *Journal of Financial Economics* (105): 311-331.

Cook, D. O., L. Krigman, and J. C. Leach. 2003. An Analysis of SEC Guidelines for Executing Open Market Repurchases. *Journal of Business* 76 (2): 289-315.

_____2004. On the Market Timing and Execution of Open Market Repurchases. *The Review of Financial Studies* 17 (2): 463-498.

Core, J., W. Guay, S. Richardson, and R. Verdi. 2006. Stock Market Anomalies: What Can We Learn from Repurchases and Insider Trading? *Review of Accounting Studies* 11 (1):49-70.

Credit Suisse. 2012. *Share Buybacks and Beyond*. Credit Suisse Securities Research & Analytics (June 19, 2012).

Daniel, K., M. Grinblatt, S. Titman, and R. Wermers. 1997. Measuring Mutual Fund Performance with Characteristic-Based Benchmarks. *The Journal of Finance* 52 (3):1035-1058.

DeAngelo, H., L. DeAngelo, and D. J. Skinner. 2008. Corporate Payout Policy, *Foundations and Trends in Finance*, Vol. 3, Nos. 2-3, available on ssrn.

De Cesari, A., S. Espenlaub, A. Khurshed, and M. Simkovic. 2012. The effects of ownership and stock liquidity on the timing of repurchase transactions. *Journal of Corporate Finance* 18 (5):1023-1050.

Diamond, D. W., and R. E. Verrecchia. 1987. Constraints on Short Selling and Asset Price Adjustment to Private Information. *Journal of Financial Economics* 18: 277-311.

Dickinson, V., P. Kimmel, and T. Warfield. 2012. The Accounting and Market Consequences of Accelerated Share Repurchases. *Review of Accounting Studies* 17 (1): 41-71.

Dittmar, A. K. 2000. Why Do Firms Repurchase Stock? *Journal of Business* 73 (3):331-355.

Drake, M., L. Rees, and E. P. Swanson. 2011. Should Investors Follow the Prophets or the Bears? Evidence on the Use of Public Information by Analysts and Short Sellers. *The Accounting Review* (January): 101-130.

Fenn, G. W., and N. Liang. 2001. Corporate payout policy and managerial stock incentives. *Journal of Financial Economics* 60 (1):45-72.

Frankel, R., and X. Li. 2004. Characteristics of a Firm's Information Environment and the Information Asymmetry between Insiders and Outsiders. *Journal of Accounting and Economics* 37 (2):229-259.

Fu, F., S. Huang, and H. Lin. 2015. The Persistence of Long-Run Abnormal Stock Returns: Evidence from Repurchases and Offerings. *Management Science* (forthcoming). .

Gow, I., G. Ormazabal, and D. Taylor. 2010. Correcting for Cross-Sectional and Time-Series Dependence in Accounting Research. *The Accounting Review* 85 (2):483.

Griffin, P. A., and N. Zhu. 2010. Accounting rules? Stock Buybacks and Stock Options: Additional Evidence. *Journal of Contemporary Accounting & Economics* 6 (1):1-17.

Groysberg, B., Healy, P.M., Maber, D.A. 2011. What drives sell-side analyst compensation at high-status investment banks? *Journal of Accounting Research* 49 (4), 969-1000.

Hafzalla, N., R. Lundholm, and E. M. Van Winkle. 2011. Percent Accruals. *The Accounting Review* 86 (1):209-236.

Hribar, P., N. T. Jenkins, and W. B. Johnson. 2006. Stock Repurchases as an Earnings Management Device. *Journal of Accounting and Economics* 41 (1-2):3-27.

Hsieh, J, and Q. Wang. 2009. Stock Repurchases: Theory and Evidence. *Kolb Series in Finance: Dividends and Dividend Policy,* edited by H. Kent Baker, available on ssrn.

Jagannathan, M. and C. P. Stephens. 2003. "Motives for Multiple Open-Market Repurchase Programs." *Financial Management,* 32 (2003), 71–91.

Jensen, Michael C. 1986. Agency costs of free cash flow. *American Economic Review* 76: 323-29.

Jensen, M. C. 2005. Agency Costs of Overvalued Equity. *Financial Management* 34 (1): 5-19.

Ikenberry, D., J. Lakonishok, and T. Vermaelen. 1995. Market Underreaction to Open Market Share Repurchases. *Journal of Financial Economics* 39 (2-3):181-208.

Jategaonkar, S. 2010. If It's Good for the Firm, It's Good for Me: Insider Trading and Repurchases Motivated by Undervaluation. SSRN eLibrary.

Kahle, K. M. 2002. When a Buyback Isn't a Buyback: Open Market Repurchases and Employee Options. *Journal of Financial Economics* 63 (2): 235-261.

Kaplan, K. E., D. D. Williams. 2013. Do Going Concern Audit Reports Protect Auditors from Litigation? A Simultaneous Equations Approach. *The Accounting Review* 88 (1): 199-232.

Kecskés, A., S. A. Mansi, and A. Zhang. 2013. Are Short Sellers Informed? Evidence from the Bond Market. *The Accounting Review* 88 (2):611-639.

Lamont, O. A., and J C. Stein. 2004. Aggregate Short Interest and Market Valuations. *American Economic Review.*

Lakonishok, J., and I. Lee. 2001. Are insider trades informative? *Review of Financial Studies* 14 (1): 79-111.

LeBeau, Philip. 2013. Tesla Offering More Stock; Musk Investing $100 Million, CNBC, http://www.cnbc.com/id/100740934.

Marquardt, C., C. Tan, and S. M. Young. 2011. Accelerated Share Repurchases, Bonus Compensation, and CEO Horizons. *SSRN eLibrary.*

Milano, G. V. and J. R. Cryan (2012). Why to Choose Growth Over Buybacks. *CFO.com*, July 3, 2012.

Monga, Vipal, David Benoit, and Theo Francis. 2015. Companies Send More Cash Back to Shareholders *The Wall Street Journal* (May 26, 2015).

Murphy, Maxwell, and Mike Cherney. 2015. Bond-Funded Dividends, Buybacks Draw Skeptics. *The Wall Street Journal* (CFO Journal, June 15, 2015).

Petersen, M. A. 2009. Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *Review of Financial Studies* 22 (1):435-480.

Peyer, U. and T. Vermaelen (2009). The Nature and Persistence of Buyback Anomalies. *Review of Financial Studies* 22 (4): 1693-1745.

Piotroski, J. D. 2000. Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers. *Journal of Accounting Research* 38:1-41.

Piotroski, J. D., and D. T. Roulstone. 2005. Do Insider Trades Reflect Both Contrarian Beliefs and Superior Knowledge about Future Cash Flow Realizations? *Journal of Accounting and Economics* 39 (1):55-81.

Rogers, J. L. and P. C Stocken. 2005. Credibility of Management Forecasts. *The Accounting Review* 80 (4): 1233.

Rozeff, M. S., and M. A. Zaman. 1988. Market Efficiency and Insider Trading: New Evidence. *Journal of Business* 61 (1):25-44.

SEC. 1982. 17 CFR Part 240. Purchases of Certain Equity Securities by the Issuer and Others; Adoption of Safe Harbor, edited by SEC. Washington, D. C.: Federal Register, Vol. 47, pp 53333.

SEC. 2003. 17 CFR Parts 228, et al. Purchases of Certain Equity Securities by the Issuer and Others; edited by SEC. Federal Register: National Archives and Records Administration, Vol. 68, No. 221, p. 64951-64976.

SEC. 2004. Short Sales. In 17 CFR Parts 240, 241 and 242, edited by SEC. Federal Register: National Archives and Records Administration, Vol. 69, No. 151, p. 48007-48031.

Seyhun, H. N. 1986. Insiders' Profits, Costs of Trading, and Market Efficiency. *Journal of Financial Economics* 16, 189-212.

Shleifer, A. and R. Vishny. 1997. The Limits of Arbitrage. *The Journal of Finance* 52, 35-55.

Skinner, D.J. 2008. The Evolving Relation Between Earnings, Dividends, and Stock Repurchases. *Journal of Financial Economics* 87, 582-609.

Stephens, C. P., and M. S. Weisbach. 1998. Actual Share Reacquisitions in Open-Market Repurchase Programs. *The Journal of Finance* 53 (1):313-333.

Zmijewski, M. 1984. Methodological issues related to the estimation of financial distress prediction models. *Journal of Accounting Research* 22 (Supplement): 59–82.

Figure 1
Time Series for Repurchases, Short Interest, and Stock Prices

	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8
Repurchase	0.0120	0.0116	0.0114	0.0078	0.0236	0.0161	0.0140	0.0132	0.0131	0.0130	0.0124	0.0116	0.0119
Short Interest	0.0432	0.0437	0.0433	0.0425	0.0556	0.0579	0.0576	0.0575	0.0586	0.0582	0.0580	0.0589	0.0605
Share Price	$29.68	$29.87	$30.24	$30.40	$29.89	$30.14	$29.91	$29.25	$29.10	$28.85	$28.84	$28.65	$29.11

Repurchase is purchase of common and preferred stock from the Statement of Cash Flows (PRSTKCY) minus decreases in preferred stock (PSTKQ and PSTKRQ), scaled by total assets (ATQ) at the beginning of quarter t, and multiplied by 100. Repurchases are measured in dollars and short interest is measured in shares, so the magnitude of the percentages are not directly comparable.

Short Interest is the short interest ratio (short interest/ common shares outstanding) collected at mid-month (SHORTINT) for the last month of quarter t.

Quarter 0 is a quarter when both repurchases and short interest increase.

Figure 2
Time Series for ROA, Debt, and Liquidity (Current Ratio) Relative to Quarter 0

	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8
Return on Assets	1.035	1.133	1.145	1.061	1.000	0.986	0.954	0.815	0.778	0.767	0.696	0.713	0.639
Debt	0.972	0.968	0.973	0.962	1.000	1.014	1.032	1.047	1.058	1.066	1.079	1.094	1.102
Liquidity	1.035	1.025	1.022	1.032	1.000	1.005	0.969	0.960	0.952	0.943	0.930	0.920	0.916

Quarter 0 is when short interest and share repurchases both increase. To facilitate comparisons across time, the amount for each quarter is divided by the quarter 0 amount. All amounts are therefore expressed as a proportion of quarter 0.

TABLE 1
Sample Selection

	Number of Firms	Number of Quarterly Observations
Firm-quarters with data from Compustat/CRSP/TFN/ExecuComp	7,948	136,484
Delete: Missing short interest	*(371)*	*(9,310)*
Delete: Missing data for main variables	*(493)*	*(17,122)*
Delete: Financial services or regulated industries	*(2,076)*	*(29,695)*
Delete: Observations with stock prices lower or equal to $1.00	*(69)*	*(3,906)*
Final quarterly sample, covering 2003 – 2009	4,939	76,451

TABLE 2
Descriptive Statistics

	Obs.	Mean	P90	Q3	Median	Q1	P10
Repurchase$_t$	76,451	0.5427	1.3348	0.0023	0	0	0
ΔRepurchase$_t$	76,451	-0.0141	0.2801	0	0	0	-0.3078
ShoIntQ$_t$	76,451	0.0463	0.1160	0.0652	0.0275	0.0073	0.0008
ΔShoIntQ$_t$	76,451	0.0011	0.0205	0.0064	0.0001	-0.0046	-0.0174
QInsNetSell$_t$	23,141	0.5793	1	1	1	1	-1
Return$_t$	76,451	0.0373	0.3404	0.1576	0.0164	-0.1177	-0.2625
AbReturn$_t$	67,201	0.0169	0.2746	0.1154	-0.0103	-0.1280	-0.2479
PctOperAccrual$_{t-1}$	76,428	-3.0300	1.6740	0.2204	-0.5765	-1.8103	-4.7481
QOpGt$_t$	76,451	0.0018	0	0	0	0	0
Cash$_{t-1}$	76,451	0.2304	0.6270	0.3544	0.1325	0.0372	0.0118
BTM$_{t-1}$	76,451	0.5739	1.1123	0.7086	0.4358	0.2540	0.1285
DivYld$_{t-1}$	76,451	0.0014	0.0052	0.0008	0	0	0
Size$_{t-1}$	76,451	5.8681	8.4462	7.1800	5.7764	4.4605	3.3983
ΔFCF$_t$	76,451	-0.0012	0.0623	0.0249	0.0001	-0.0254	-0.0646
ROA$_{t-1}$	76,451	-0.0080	0.0361	0.0216	0.0093	-0.0092	-0.0727
ΔROA$_t$	76,451	0.0001	0.0294	0.0083	0.0000	-0.0096	-0.0332
Debt$_{t-1}$	76,451	0.1849	0.4537	0.2972	0.1361	0.0023	0

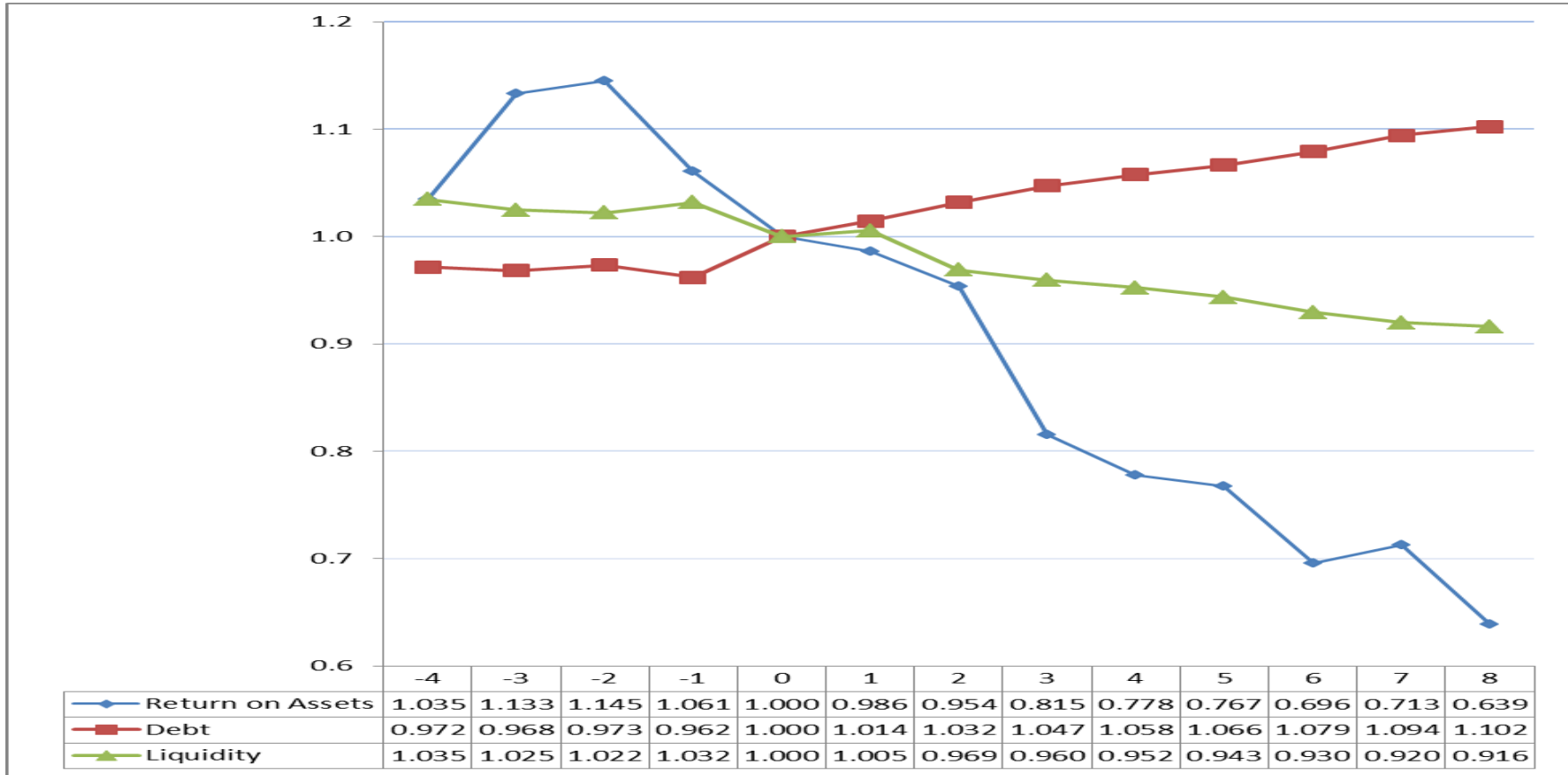‡ indicates two-tailed statistical significance at the 1% level. In Panel B, the number of observations are in parentheses and italics. Repurchase$_t$ is purchase of common and preferred stock from the Statement of Cash Flows (PRSTKCY) minus decreases in preferred stock (PSTKQ and PSTKRQ), scaled by total assets (ATQ) at the beginning of quarter t, and multiplied by 100. ΔRepurchase$_t$ is the change in shares repurchased from quarter t-1 to quarter t. ShoIntQ$_t$ is the short interest ratio (short interest/ common shares outstanding), using mid-month short interest (SHORTINT) for the last month of quarter t. ΔShoIntQ is the change in short interest ratio from quarter t-1 to quarter t. QInsNetSell$_t$ is net stock sales by insiders during quarter t, calculated as insider stock sales less purchases during quarter t, scaled by the sum of those two amounts. Cash$_{t-1}$ is the ratio of cash and short term-investment (CHEQ) to total assets (ATQ) at the beginning of quarter t. BTM$_{t-1}$ equals the ratio of book value of equity (CEQQ) to market value of equity (PRCCM*SHROUT) at the end of quarter t-1. DivYld$_{t-1}$ equals dividends per share (DVPSXQ) for quarter t-1, divided by stock price (PRCCM) at the beginning of quarter t. Size$_{t-1}$ equals the natural log of total assets (ATQ) at the beginning of quarter t. ΔFCF$_t$ equals the change in free cash flow [operating cash flow less capital expenditure] from quarter t-1 to quarter t, scaled by total assets at the beginning of quarter t. ROA$_{t-1}$ equals the ratio of net income (NIQ) to total assets at the beginning of quarter t. ΔROA$_t$ equals the change in ROA from quarter t-1 to quarter t. Debt$_{t-1}$ equals the ratio of current plus long term debt (DLCQ+DLTTQ) to total assets at the beginning of quarter t. Return$_t$ is the quarterly raw stock return. QOpGt$_t$ is the total number of stock options granted to top executives (GRNTNUM) during quarter t scaled by number of shares outstanding. PctOperAccrual$_{t-1}$ is the percent of operating accruals of quarter t-1, and is calculated as the difference between net income (NIQ) and operating cash flow (from cash flow statement, OANCFY) of quarter t-1, scaled by the absolute value of net income (NIQ). AbReturn$_t$ is the characteristic-based, benchmark-adjusted returns for quarter t, and it is calculated based on Daniel et al. (1997). Year to-date variables, such as PRSTKCY and OANCFY are adjusted to reflect the quarterly change.

TABLE 3
Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
$\Delta Repurchase_t$ (1)		**0.044**	0.001	**-0.027**	**0.019**	**-0.027**	**0.010**	-0.003	**0.011**	-0.001	**-0.012**	**0.009**	**-0.406**
$\Delta ShoIntQ_t$ (2)	**0.027**		**-0.051**	**0.050**	**0.013**	-0.004	-0.001	**0.019**	**0.010**	-0.001	**-0.008**	-0.003	**0.014**
BTM_{t-1} (3)	**-0.013**	**-0.063**		**0.123**	**-0.192**	**-0.034**	**0.008**	**0.044**	**-0.035**	**0.065**	**0.063**	**-0.026**	-0.005
$Return_t$ (4)	**-0.043**	**0.039**	**0.085**		**-0.030**	**0.018**	**-0.022**	**0.056**	**0.039**	**-0.008**	0.000	**0.025**	**0.008**
$Cash_{t-1}$ (5)	**0.019**	-0.002	**-0.257**	**-0.035**		**-0.369**	**-0.069**	**-0.330**	**-0.017**	**-0.378**	**-0.179**	**-0.015**	**0.008**
$Debt_{t-1}$ (6)	**-0.018**	0.001	0.007	**0.023**	**-0.544**		**0.038**	**-0.034**	**0.031**	**0.280**	**0.076**	0.002	**-0.008**
ΔFCF_t (7)	**0.009**	0.003	**0.010**	**-0.018**	**-0.085**	**0.041**		**0.008**	**0.092**	**0.023**	-0.004	**-0.009**	**-0.011**
ROA_{t-1} (8)	0.000	**0.034**	**-0.140**	**0.111**	**-0.151**	**-0.059**	**-0.034**		**-0.393**	**0.329**	**0.129**	**0.039**	**0.008**
ΔROA_t (9)	**0.014**	**0.007**	**-0.026**	**0.056**	**-0.037**	**0.034**	**0.150**	**-0.261**		**-0.011**	0.001	0.002	-0.007
$Size_{t-1}$ (10)	-0.005	**0.011**	**0.065**	**0.047**	**-0.355**	**0.377**	**0.018**	**0.287**	**0.019**		**0.255**	**0.066**	-0.001
$DivYld_{t-1}$ (11)	**-0.018**	**0.009**	**0.039**	**0.028**	**-0.253**	**0.128**	0.000	**0.247**	0.005	**0.395**		-0.007	**-0.011**
$OpGnt_t$ (12)	**0.008**	-0.006	**-0.042**	**0.039**	**-0.017**	**0.024**	**-0.017**	**0.075**	0.007	**0.152**	**0.057**		-0.004
$\Delta Repurchase_{t-1}$ (13)	**-0.243**	**0.017**	**-0.011**	0.005	**0.010**	**-0.007**	**-0.014**	**0.013**	-0.005	-0.002	**-0.014**	**0.008**	

Correlation coefficients on bold indicate two-tailed statistical significance at 5% or lower level. $\Delta Repurchase_{t-1}$ is the change in shares repurchased from quarter t-2 to quarter t-1. All other variables are constructed as described in Table 2. Pearson correlations are reported in the upper triangle and Spearman in the lower triangle.

TABLE 4
Multivariate Test of Relation Between Short Interest and Corporate Share Repurchases

$$\Delta Repurchase_{i,t} = \beta_0 + \beta_1 \Delta ShoIntQ_{i,t} + \beta_2 BTM_{i,t-1} + \beta_3 Return_{i,t} + \beta_4 Cash_{i,t-1} + \beta_5 Debt_{i,t-1} + \beta_6 \Delta FCF_{i,t}$$
$$+ \beta_7 ROA_{i,t-1} + \beta_8 \Delta ROA_{i,t} + \beta_9 Size_{i,t-1} + \beta_{10} DivYld_{i,t-1} + \beta_{11} QOpGnt_{i,t}$$
$$+ \beta_{12} \Delta Repurchase_{i,t-1} + \Sigma\beta_m Industry_m + \Sigma\beta_n Year\text{-}Qtr_n + e_{i,t} \qquad (1)$$

	Predictions	(1)	(2)	(3)	(4)
Short Selling Activity					
$\Delta ShoIntQ_t$	?	2.984‡	3.078‡	3.528‡	3.665‡
		(7.76)	(7.99)	(9.64)	(10.27)
Market Valuation					
BTM_{t-1}	+		0.036‡	0.041‡	0.018*
			(8.36)	(8.81)	(1.76)
$Return_t$	-		-0.167‡	-0.137‡	-0.145‡
			(8.60)	(7.90)	(4.73)
Financial statement Variables					
$Cash_{t-1}$	+		0.107‡	0.127‡	0.127‡
			(7.22)	(7.48)	(4.55)
$Debt_{t-1}$	-		-0.19‡	-0.206‡	-0.211‡
			(8.43)	(7.81)	(4.67)
ΔFCF_t	+		0.233‡	0.125*	0.134†
			(2.41)	(1.63)	(1.76)
ROA_{t-1}	+		0.003	0.047	0.167†
			(0.07)	(0.84)	(1.81)
ΔROA_t	+		0.333‡	0.321‡	0.337‡
			(3.76)	(4.15)	(3.02)
$Size_{t-1}$	+		0.01‡	0.012‡	0.009*
			(7.50)	(7.63)	(1.50)
$DivYld_{t-1}$	-		-4.435‡	-6.07‡	-7.85‡
			(4.12)	(5.45)	(3.90)
$OpGnt_t$	+		0.951†	0.566	1.163†
			(1.73)	(1.13)	(1.95)
$\Delta Repurchase_{t-1}$	?			-0.400‡	-0.399‡
				(57.04)	(26.83)
Intercept		-0.072*	-0.073	-0.065	-0.006
		(1.52)	(1.41)	(1.28)	(0.12)
Industry Dummies		Yes	Yes	Yes	Yes
Time Dummies		Yes	Yes	Yes	No
Cluster on		Firm	Firm	Firm	Firm and Time
Number of Observations		76,451	76,451	76,451	76,451
Adj. R^2		0.0074	0.0096	0.1753	0.1691

† and ‡ indicate one-tailed statistical significance at 5% and 1% levels, respectively. The t-value for each coefficient is presented below the coefficient in parentheses. The variables are constructed as described in Table 2.

TABLE 5
Multivariate Test of Relation Between Short Interest and
Corporate Share Repurchases, excluding Quarters with Zero Repurchases

$$\Delta Repurchase_{i,t} = \beta_0 + \beta_1 \Delta ShoIntQ_{i,t} + \beta_2 BTM_{i,t-1} + \beta_3 Return_{i,t} + \beta_4 Cash_{i,t-1} + \beta_5 Debt_{i,t-1} + \beta_6 \Delta FCF_{i,t}$$
$$+ \beta_7 ROA_{i,t-1} + \beta_8 \Delta ROA_{i,t} + \beta_9 Size_{i,t-1} + \beta_{10} DivYld_{i,t-1} + \beta_{11} QOpGnt_{i,t}$$
$$+ \beta_{12} \Delta Repurchase_{i,t-1} + \Sigma \beta_m Industry_m + \Sigma \beta_n Year\text{-}Qtr_n + e_{i,t} \qquad (1)$$

	Predictions	(1)	(2)	(3)	(4)
Short Selling Activity					
$\Delta ShoIntQ_t$	?	10.783‡	10.705‡	11.519‡	11.406‡
		(8.36)	(8.44)	(10.07)	(10.50)
Market Valuation					
BTM_{t-1}	+		0.048†	0.049†	-0.014
			(2.07)	(2.05)	(0.51)
$Return_t$	-		-0.731‡	-0.61‡	-0.582‡
			(7.53)	(6.89)	(4.85)
Financial statement Variables					
$Cash_{t-1}$	+		0.909‡	1.069‡	1.067‡
			(9.07)	(9.85)	(8.23)
$Debt_{t-1}$	-		-0.792‡	-0.855‡	-0.893‡
			(6.72)	(6.59)	(5.28)
ΔFCF_t	+		0.943‡	0.455	0.48*
			(2.41)	(1.37)	(1.61)
ROA_{t-1}	+		0.983†	1.412‡	2.156‡
			(2.14)	(2.85)	(3.53)
ΔROA_t	+		2.437‡	2.331‡	2.508‡
			(4.14)	(4.40)	(3.42)
$Size_{t-1}$	+		-0.005	-0.01	-0.007
			(0.6)	(1.14)	(0.62)
$DivYld_{t-1}$	-		-23.069‡	-26.198‡	-31.829‡
			(5.39)	(5.90)	(6.42)
$OpGnt_t$	+		3.163†	2.302*	4.577‡
			(1.80)	(1.49)	(2.45)
$\Delta Repurchase_{t-1}$	?			-0.42‡	-0.418‡
				(43.93)	(23.62)
Intercept		-0.084	0.267	0.407†	0.307
		(0.52)	(1.45)	(2.14)	(1.94)*
Industry Dummies		Yes	Yes	Yes	Yes
Time Dummies		Yes	Yes	Yes	No
Cluster on		Firm	Firm	Firm	Firm and Time
Number of Observations		19,873	19,873	19,873	19,873
Adj. R^2		0.023	0.0383	0.1874	0.1728

† and ‡ indicate one-tailed statistical significance at 5% and 1% levels, respectively. The t-value for each coefficient is presented below the coefficient in parentheses. The variables are constructed as described in Table 2.

TABLE 6
**Subsample Analysis of Relation Between Short Interest and
Corporate Share Repurchases**

	Predict	(1) Bull Years 2003-2006	(2) Bear Years 2007-2009	(3) 1st Fiscal Quarter	(4) 2nd~4th Fiscal Quarters	(5) Without Accelerated Share Repurchases
Short Selling Activity						
$\Delta ShoIntQ_t$	?	3.255‡	3.779‡	2.693‡	3.739‡	2.985‡
		(6.89)	(7.48)	(4.1)	(9.16)	(8.63)
Market Valuation						
BTM_{t-1}	+	0.027‡	0.050‡	0.057‡	0.036‡	0.045‡
		(3.33)	(8.86)	(4.34)	(6.03)	(9.18)
$Return_t$	-	-0.132‡	-0.144‡	-0.090‡	-0.154‡	-0.139‡
		(5.86)	(5.67)	(2.70)	(7.94)	(8.05)
Financial statement Variables						
$Cash_{t-1}$	+	0.080‡	0.177‡	0.119†	0.129‡	0.127‡
		(3.58)	(6.47)	(2.40)	(5.73)	(7.43)
$Debt_{t-1}$	-	-0.239‡	-0.172‡	-0.196‡	-0.211‡	-0.196‡
		(7.04)	(4.41)	(3.51)	(7.32)	(7.39)
ΔFCF_t	+	-0.052	0.349‡	-0.057	0.174*	0.125
		(0.52)	(2.87)	(0.42)	(1.94)	(1.64)
ROA_{t-1}	+	0.101	-0.001	-0.303*	0.167†	0.049
		(1.28)	(0.01)	(1.83)	(2.37)	(0.86)
ΔROA_t	+	0.384‡	0.250†	0.084	0.369‡	0.303‡
		(3.24)	(2.60)	(0.44)	(4.32)	(3.95)
$Size_{t-1}$	+	0.019‡	0.005*	0.025‡	0.008‡	0.008‡
		(8.19)	(1.68)	(3.85)	(3.37)	(4.57)
$DivYld_{t-1}$	-	-5.669‡	-5.970‡	-9.510‡	-4.914‡	-6.100‡
		(3.42)	(4.05)	(3.10)	(4.10)	(5.40)
$OpGnt_t$	+	0.373		0.183	0.804	0.562
		(0.74)		(0.19)	(1.42)	(1.15)
$\Delta Repurchase_{t-1}$	?	-0.431‡	-0.372‡	-0.417‡	-0.394‡	-0.400‡
		(40.08)	(38.66)	(22.42)	(42.57)	(56.67)
Intercept		-0.123†	-0.105	-0.251	0.008	-0.031
		(2.11)	(1.01)	(1.06)	(0.14)	(0.59)
Industry Dummies		Yes	Yes	Yes	Yes	Yes
Time Dummies		Yes	Yes	Yes	Yes	Yes
Cluster on		Firm	Firm	Firm	Firm	Firm
Number of Observations		42,142	34,309	18,793	57,658	76,312
Adj. R^2		0.189	0.162	0.199	0.168	0.177

_____

† and ‡ indicate one-tailed statistical significance at 5% and 1% levels, respectively. The t-value for each coefficient is presented below the coefficient in parentheses. The variables are constructed as described in Table 2.

_____

TABLE 7
Trading by Insiders

$$QInsNetSell_{i,t} = \beta_0 + \beta_1\Delta ShoIntQ_{i,t} + \beta_2\Delta Repurchase_{i,t} + \beta_3 BTM_{i,t} + \beta_4 AbReturn_{i,t}$$
$$+ \beta_5 AbReturn_{i,(t+1,t+4)} + \beta_6\Delta ROA_{i,t} + \beta_7 QOpGnt_{i,t} + \beta_8 Size_{i,t} + \beta_9 PctOperAccrual_{i,t}$$
$$+ \Sigma\beta_m Industry_m + \Sigma\beta_n Year\text{-}Qtr_n + e_{i,t} \qquad (2)$$

Panel A: Quarters with Insider Trades but without Changes in Stock Repurchases
(Tobit Regression)

	Prediction	(1)	(2)
Constant	?	-0.718	0.142
		(1.32)	(1.11)
$\Delta ShoIntQ_t$	?	1.986‡	3.267‡
		(4.59)	(3.03)
Rank of BTM_t	-	-0.168‡	-0.179‡
		(12.52)	(8.75)
Rank of $AbReturn_t$	+	0.091‡	0.096‡
		(11.93)	(6.57)
$AbReturn_{t+4}$	-	-0.079‡	-0.081†
		(2.85)	(2.08)
$QOpGnt_t$	+	-1.048	0.556
		(1.35)	(0.72)
Rank of $Size_t$	+	0.011‡	0.011‡
		(14.50)	(21.21)
Rank of $PctOperAccrual_t$	+	0.001*	0.001‡
		(1.72)	(2.72)
Industry Dummies		Yes	Yes
Time Dummies		Yes	No
Cluster on		Firm	Firm & Time
Number of Obs.		9,952	9,952
Log Pseudo likelihood		-12,698.8	-12,960.0

Panel B: Quarters with Insider Trades and Changes in Stock Repurchases
       (Tobit Regression)

	Prediction	(1)	(2)
Constant	?	0.169	-0.226
		(0.84)	(0.66)
ΔShoIntQ$_t$	?	-0.683	0.272
		(1.33)	(0.23)
ΔRepurchase$_t$	-	-0.002	-0.002
		(0.89)	(0.60)
Rank of BTM$_t$	-	-0.112‡	-0.123‡
		(9.27)	(5.73)
Rank of AbReturn$_t$	+	0.077‡	0.077‡
		(10.21)	(6.31)
AbReturn$_{t+4}$	-	-0.026	-0.026
		(0.80)	(0.64)
QOpGnt$_t$	+	0.178	1.825†
		(0.29)	(2.32)
Rank of Size$_t$	+	0.007‡	0.007‡
		(9.60)	(8.81)
Rank of PctOperAccural$_t$	+	0.001*	0.001
		(1.83)	(1.37)
Industry Dummies		Yes	Yes
Time Dummies		Yes	No
Cluster on		Firm	Firm & Time
Number of Obs.		7,520	7,520
Log Pseudo likelihood		-8,245.0	-8,524.2