# EARNINGS MANAGEMENT AND LONG-TERM PERFORMANCE: EVIDENCE FROM REVERSE STOCK SPLITS

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**Abstract**

This study investigates earnings management and long-term stock performance surrounding reverse stock splits. It is designed to provide evidence on the role of managerial pessimism and discretionary current accruals. Discretionary current accruals are used to measure earnings management. These discretionary current accruals are measured in our study using the balance sheet approach as well as the cash flow statement approach. We find consistent evidence of negative discretionary current accruals prior to reverse stock splits. Such negative discretionary accruals are consistent with managerial pessimism prior to a reverse stock split. Such pessimism is warranted by the observed negative market reaction to a reverse split announcement and the negative abnormal returns observed after reverse splits. Negative discretionary current accruals are also consistent with smoothing of earnings during difficult and challenging periods for the firm. Our study might provide an alternative to the opportunism explanation. It also provides additional evidence buttressing the role of managerial optimism and pessimism in explaining earnings management.

**Keywords:** Discretionary accruals; Earnings management; Long-term performance; Reverse stock splits

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## 1. Introduction

This study examines earnings management surrounding reverse stock splits and the relationship between pre-reverse split earnings management and post-reverse-split long-term stock performance. Most previous research on earnings management focuses on the tendency of corporate managers to engage in opportunistic behavior designed to raise stock prices when high stock prices are particularly beneficial to the firm. Such opportunistic behavior has been documented for initial public offerings [Teoh, Welch, and Wong (1998a)], seasoned equity offerings [Teoh, Welch, and Wong (1998b) and Shivakumar (2000)], management buyouts [DeAngelo (1986), Perry and Williams (1994), and Wu (1997)], and takeovers [Christie and Zimmerman (1994), Erickson and Wang (1999) and Louis (2004)]. Another line of research considers earnings management as revealing management attitudes toward the future prospects of the firm (Louis and Robinson, 2005). Managerial optimism about future prospects would be revealed in earnings management that would improve current earnings whereas pessimism would be revealed in managing current earnings downwards.

Louis and Robinson (2005) study earnings management prior to stock splits. Their finding of significant positive discretionary current accruals leads them to argue that the abnormal accruals indicate managerial optimism rather than opportunistic earnings management. Since stock splits do not provide cash inflows, no benefit accrues to a higher stock price. Furthermore, they find no evidence that the positive abnormal accruals are associated with post-split stock performance. Our results for reverse splits are the converse of those shown by Louis and Robinson (2005) for forward stock splits. Whereas they find evidence of significant positive discretionary accruals prior to forward splits we find evidence of significant negative discretionary current accruals prior to reverse splits. Their findings are consistent with managerial optimism prior to forward splits. Our findings are consistent with managerial pessimism prior to reverse splits. Like Louis and Robinson (2005), we find no relation between pre-split earnings management and post-split stock performance. They conclude that stock prices already

contain the information about earnings management at the time of the split. We consider an alternative explanation, that managerial optimism, in the case of forward splits, or managerial pessimism, in the case of reverse splits, is unrelated to future stock price performance.

Neither forward nor reverse stock splits are economic events in that no value is created or destroyed from the change in number of shares outstanding. However, both could provide some insight into the firm's future prospects. Forward splits are associated with positive announcement returns [Grinblatt, Masulis, and Titman (1984), Lamoureux and Poon (1987)}, positive abnormal post-split returns and positive earnings forecast revisions by analysts [Klein and Peterson, (1989)]. Forward splits could be associated with improved prospects because managers signal their belief that a permanently higher level of stock price can be maintained indefinitely. Because the higher stock price level can be maintained indefinitely, management adjusts the price to bring a permanently higher price back to what is consider a normal trading range.

Just as a forward split indicates management optimism about a permanently higher price level, a reverse split can indicate management pessimism that a low current stock price is not temporary. A low stock price itself can lead to a vicious circle of decline in firm value. Firms are subject to being delisted from the NYSE or NASDAQ if their stock price remains depressed below a minimum critical level for an extended period. Additionally, pension funds and other large investment firms are often restricted from purchasing stocks whose share price is below a critical level. Some investors may avoid investing in low-priced stocks due to a perception of high price volatility or financial distress. A permanent decline in stock price below the critical level could easily trigger additional declines due to the low stock price itself.

Although management might prefer to avoid sending the negatively signal associated with a reverse split, market exigencies could force the decision. Reverse splits are associated with a negative market reaction according to several studies, including those by Woolridge and Chambers (1983), Peterson and Peterson (1992), and Desai and Jain (1997. This negative market reaction is the price paid for improved stock liquidity following reverse splits demonstrated by Peterson and Peterson (1992) and Han (1995). These studies find that reverse stock splits enhance liquidity by decreasing the bid-ask spread and increasing trading volume.

The negative information effect of a reverse split manifested at the announcement continues after the split is effected. Desai and Jain (1997) examine long-term performance over one- and three-year horizons following reverse splits and find negative abnormal returns, suggesting that the initial market reaction underestimates the information of the firm's poor future prospects. The negative market reaction to the announcement of a reverse split and the poor long-term performance following a reverse split indicate that management and investors are both pessimistic about prospects of a firm whose managers decide to effect a reverse split.

Managerial pessimism, or optimism, about future prospects could always be a factor in earnings management. Managing earnings upwards involves borrowing from future earnings in an effort to improve the level of current earnings. Higher earnings cannot be created indefinitely but must be paid back eventually. In the case of IPOs, Teoh, Welch and Wong (1998a) estimate that earnings management reversal requires approximately three years following the IPO to take effect. Since managed earnings must be repaid, and will probably be repaid in three years or so, management would have to be optimistic about having additional earnings during the repayment period to allow the managed earnings to be recovered.

For forward splits, the positive earnings management shown by Louis and Robinson (2005) is consistent with the managerial optimism about higher stock prices and improved prospects of the firm. Indeed, it could be consistent with the optimistic view that earnings will improve dramatically after the forward split, which would allow some of those dramatically improved expected future earnings to be reported currently. Earnings management when managers are unusually optimistic is just another form of earnings smoothing. Earnings smoothing behavior by managers has been documented extensively and explained as rational behavior by managers. Beidleman (1973) proposes that earnings smoothing has a favorable effect on share value and cost of capital. Gibbins, Richardson, and Waterhouse (1990) point out that investors exhibit a preference for firms with stable earnings streams. Subramanyam (1996) finds a positive relation between stock returns and discretionary accruals and suggests that discretionary accruals are signals of managerial private information to reflect firm's performance. Payne and Robb (2000) show that managers tend to adjust earnings upward (downward) when unmanaged earnings are below (above) analysts' forecasts in order to meet analysts' expectations. Moreover, Sankar and Subramanyam (2001) and Tucker and Zarowin (2006) find that earnings smoothing improves the information content of reported earnings.

The view that earnings management reflects managerial optimism or pessimism about the firm's prospects is not inconsistent with findings of previous studies that attribute earnings management to opportunistic behavior by management. For example, the positive discretionary accruals shown by Christie and Zimmerman (1994) prior to takeovers could result from management opportunism in increasing share price in order to obtain a more favorable exchange ratio. The same positive discretionary current accruals

could also be the result of managerial optimism that is also prevalent prior to mergers. Indeed, extreme managerial optimism, termed, "hubris" has been cited as a motive for mergers. Similarly, the positive discretionary current accruals shown prior to IPOs by Teoh Welch and Wong (1998a) and prior to SEOs by Teoh, Welch, and Wong (1198b) and Rangan (1998) could also be consistent with managerial optimism. To the extent that the proceeds of stock sales are used to finance capital budgeting prospects, the IPO or SEO is indicative of management's optimism in converting its growth opportunities into assets in place.

Just as management should understand that positive discretionary accruals must be repaid with lower future earnings, they should also understand that negative discretionary current accruals allow managers to "save' some current earnings that can be moved into a future period when those earnings might be needed. Because earnings accruals charge no interest to borrowers, nor pay interest to savers, management would not defer current earnings unless their view of the firm's prospects is extremely pessimistic. Our finding of negative discretionary current accruals is consistent with an extreme level of pessimism by managers.

This study examines the patterns of earnings management surrounding 982 reverse stock splits from 1980-2002 based on the balance-sheet approach of Teoh, Welch, and Wong (1998a, 1998b) and the cash-flow-statement approach of Hribar and Collins (2002). The results of the study show no evidence of positive discretionary accruals prior to the reverse stock splits. Instead, we find the negative pre-split accruals, which is consistent with managerial pessimism about the firm's future prospects. The results document significant poor long-term performance following reverse stock splits and show no relation between the pre-split accruals and post-split long-term underperformance.

The remainder of the study is organized as follows. Section 2 describes the sample selection and provides descriptive statistics. Section 3 presents the measures of earnings management and long-term stock performance. We report the results in Section 4, and Section 5 concludes.

## 2. Sample Selection and Descriptive Statistics

We obtain the sample of reverse splits from the CRSP (Center for Research in Security Prices) NYSE/AMEX and NASDAQ Daily Stock Files. We include all firms conducting reverse stock splits over the period 1980-2002, excluding regulated utilities (SIC codes 4910 – 4949) and financial institutions (SIC codes 6000-6999). For inclusion in the final sample, we require stock return data on CRSP and sufficient data on Compustat to compute accounting accruals. To avoid survivorship bias, we do not require that firms have accrual data for the entire period of three years before the splitting year to three years afterward.

We then search business news on Lexis/Nexis Academic to identify the announcement date and other contemporaneous news about the firms. The announcement date (t = 0) used in this study is the earlier of the announcement date on Lexis/Nexis and ex-dividend date on CRSP. If there is no announcement date found from Lexis/Nexis, we use the ex date as the announcement day. The fiscal year in which the split occurs is defined as Year 0 in our subsequent analysis of earnings management. Thus, the fiscal Year -1 ends before the date of the split, and fiscal Year 0 includes both pre-split and post-split information[12]. We exclude multiple observations of reverse stock splits on the same firm that occur within 5 years of the initial observation. Our final sample consists of 961 reverse splits, but the sample size varies depending on the test procedures and accruals measures used.

Table 1 presents the distribution of reverse stock splits by year in Panel A, by exchange listing in Panel B, and by industry in Panel C. Reverse stock splits are more common among NASDAQ firms (83.6%) than those on the NYSE (8.2%) or AMEX (4.9%). The most common industry represented is manufacturing (SIC codes 2000-3999), comprising 35.7% of the sample. Table 2 summarizes the characteristics of firms conducting reverse stock splits. The total market value, total assets, book to market ratio, total debt ratio, return on assets (ROA), and operating cash flows are obtained from Compustat and measured at the fiscal year end prior to the splits, and the split factor is obtained from CRSP. Not surprisingly, reverse splits tend to be initiated by small firms, with a median equity market capitalization of $13.55 million, and a median value of total assets of $17.35 million. The median total debt ratio is 0.23. Reverse-splitting firms are generally not profitable, with a median return on assets of -11.18 percent. The median ratio of operating cash flow to total assets is -3.89 percent. The median absolute value of reverse split factor is 0.80, which represents a 1-for-5 reverse split. In our subsequent analysis of the relationship between pre-split accruals and post-split long-term performance, we use the split factor, firm size (market capitalization), and book-to-market ratio as control variables.

[12] Since the calendar year for the event may be different from fiscal year for the accounting data in Compustat, we adjust the event years to fiscal years by identifying the month-end codes from Compustat for each company's accounting year.

## 3. Methodologies

### 3.1 Measurement of Earnings Management

To identify whether managers use discretionary accruals to opportunistically manipulate earnings or smooth earnings, we measure earnings management by using the balance-sheet approach of Teoh, Welch, and Wong (1998a, 1998b) and the cash-flow-statement approach of Hribar and Collins (2002). We first follow the balance-sheet methodology of Teoh, Welch, and Wong (1998a, 1998b) in the construction of discretionary accrual estimates based on the modified Jones (1991) model. We focus on estimating discretionary current accruals (*DCA*) and discretionary total accruals (*DTAC*) since discretionary current accruals are regarded as the superior proxy for earning management, and discretionary total accruals are proxies for manipulated earnings determined at the discretion of management.[13] To mitigate the effects of outliers and errors in the data, all accrual items are winsorized at the top and bottom one-percentiles.

Following Teoh, Welch, and Wong (1998a, 1998b), we compute current accruals (*CA*) as follows[14]:

*CA = Δ[Current Receivables* (#2) + *Inventory* (#3) + *Other Current Assets* (#68)*] – Δ[Accounts Payable* (#70) + *Tax Payable* (#71) + *Other Current Liabilities* (#72)*]*.(1)

For each firm undertaking a reverse split, the expected level of current accruals (*CA*) is obtained by running the following cross-sectional OLS regression on an estimation sample that includes all other firms (excluding sample firms) with the same two-digit SIC codes as the reverse-splitting sample firms[15].

$$\frac{CA_{j,t}}{TA_{j,t-1}} = \alpha_0 + \alpha_1\left(\frac{1}{TA_{j,t-1}}\right) + \alpha_2\left(\frac{\Delta Sales_{j,t}}{TA_{j,t-1}}\right) + \varepsilon_{j,t}, \quad (2)$$

where $TA_{j,t-1}$ is total assets (#6) for firm *j* in year *t-1*, and $\Delta Sales_{j,t}$ is the change in sales (#12) for firm *j* in year *t*. As in previous studies, all variables in the cross-sectional regression are scaled by beginning-of-year total assets to mitigate heteroskedasticity in residuals. In order to obtain meaningful parameter estimates, we require the estimation sample to have at least ten observations. Following Kothari, Leone and Wasley (2005), we include a constant term in the estimation models for the accruals in order to alleviate additional heteroskedasticity and misspecification.

We use the estimated coefficients from the cross-sectional industry regression model in Equation (2) to compute nondiscretionary current accruals scaled by assets (*NDCA*) as:

$$NDCA_{i,t} = \hat{\alpha}_0 + \hat{\alpha}_1\left(\frac{1}{TA_{i,t-1}}\right) + \hat{\alpha}_2\left(\frac{\Delta Sales_{i,t} - \Delta TR_{i,t}}{TA_{i,t-1}}\right), \quad (3)$$

where $\Delta TR_{j,t}$ is the change in trade receivables (#151) for firm *i* in year *t*. To account for the possibility of credit sales manipulation, we subtract the increase in accounts receivable from sales growth.

The level of asset-scaled discretionary current accruals (*DCA*) is used as our proxy for earnings management. $DCA_{i,t,}$ discretionary current accruals scaled by assets from the balance sheet for the reverse-splitting firm *i* for year *t*, are calculated as follows:

$$DCA_{it} = \frac{CA_{i,t}}{TA_{i,t\ 1}} - NDCA_{it}. \quad (4)$$

Additionally, net income could be partitioned into two components including cash flow from operations and total accruals. Thus, total accruals (*TAC*) are estimated as follows:

*TAC = Net Income* (#172) *– Cash Flow from Operations* (#308) [16]. (5)

We use a similar procedure to estimate total discretionary accruals as we use for discretionary current accruals. We include property, plant, and equipment as an additional regressor since long-term accruals are affected by the amount of long-term assets. In the following cross-sectional OLS regression, the expected level of total accruals (*TAC*) is obtained as follows:

[13] Accruals could be decomposed into four categories based on the associated time horizon (current and long-term) and level of managerial control (discretionary and nondiscretionary). Discretionary accruals can be influenced or manipulated by managers, whereas nondiscretionary accruals are largely free of such manipulation. Generally, managers have more discretion over short-term accruals than over long-term accruals. Thus, the two discretionary accrual measures are proxies for earnings management, and the two nondiscretionary accrual measures are proxies for accrual recognition outside the control of management.

[14] Numbers in parentheses are Compustat item numbers.

[15] Following Kothari, Leone and Wasley (2005), we exclude the observations that are likely to be subject to recording errors from the estimation sample if the absolute value of current accruals scaled by total assets is greater than one.

16 According to the Compustat 1994 manual, cash flow from operations is not available as item (#308) prior to 1987, so it is then calculated as the fund flow from operations (#110) minus current accruals.

$$\frac{TAC_{j,t}}{TA_{j,t-1}} = \beta_0 + \beta_1\left(\frac{1}{TA_{j,t-1}}\right) + \beta_2\left(\frac{\Delta Sales_{j,t}}{TA_{j,t-1}}\right) + \beta_3\left(\frac{PPE_{j,t}}{TA_{j,t-1}}\right) + \varepsilon_{j,t} \quad , \tag{6}$$

where $PPE_{j,t}$ is gross property, plant, and equipment (#7) for firm *j* in year *t*. Again, we use an estimation sample that includes all firms with the same two-digit SIC codes as the reverse-splitting firms, but exclude the reverse-splitting sample firms[17].

Using the estimated coefficients from Equation (6), we calculate the nondiscretionary total accruals scaled by assets (*NDTAC*) for each reverse-splitting firm as follows:

$$NDTAC_{i,t} = \hat{\beta}_0 + \hat{\beta}_1\left(\frac{1}{TA_{i,t-1}}\right) + \hat{\beta}_2\left(\frac{\Delta Sales_{i,t} - \Delta TR_{i,t}}{TA_{i,t-1}}\right) + \hat{\beta}_3\left(\frac{PPE_{i,t}}{TA_{i,t-1}}\right) \cdot \tag{7}$$

The discretionary total accruals scaled by assets (*DTAC*) from the balance sheet for firm *i* in year *t* are calculated as:

$$DTAC_{it} = \frac{TCA_{i,t}}{TA_{i,t-1}} - NDTCA_{it} \quad . \tag{8}$$

Hribar and Collins (2002) show that this "balance-sheet approach" can cause significant error and bias in accrual estimates associated with firm's economic characteristics, and suggest using a method based on the cash flow statement. We compute current accruals (*CACF*) based on the cash flow statement as follows:

*CACF = - [Decrease (Increase) in Accounts Receivable (#302) + Decrease (Increase) in Inventory (#303) + Decrease (Increase) in Accounts Payable (#304) + Decrease (Increase) in Tax Payable* (#305) *+ Depreciation Expense* (#125)*]*. (9)

We estimate discretionary accruals from cash flow statement by using similar cross-sectional regression procedures based on balance-sheet approach in previous Equations (2) and (6). Thus, the expected level of current accruals from cash flow statement (*CACF*) is obtained by running the cross-sectional OLS regression Equation (2) on an estimation sample that includes all other firms with the same two-digit SIC codes as the reverse-splitting firms. We then use the estimated coefficients from the cross-sectional industry regression model to compute nondiscretionary current accruals (*NDCACF*) and discretionary current accruals (*DCACF*) scaled by assets based on Equations (3) and (4), respectively.

We follow Hribar and Collins (2002) in calculating *total* accruals (*TACF*) from cash flow statement as follows:

*TACF = Earnings before Extraordinary Items and Discontinued Operations* (#123) *– Operating Cash Flows from Continuing Operations* (#308 - #124). (10)

We use the cross-sectional OLS regression Equation (6) to estimate total accruals (*TACF*) from the cash flow statement. Using the estimated coefficients, we calculate the nondiscretionary total accruals (*NDTACF*) and discretionary total accruals (*DTACF*) scaled by assets for each reverse-splitting firm based on Equations (7) and (8), respectively.

Kothari, Leone and Wasley (2005) show that the existing methodologies of measuring earnings management are biased and tend to over-reject the null hypothesis of no earnings management for the events associated with performance. To enhance the reliability of accrual measurement, we further estimate the performance-adjusted abnormal accruals relative to a portfolio matched firms by industry (two-digit SIC code) and return on assets for the current year, *ROA* in period *t*.[18] Thus, the performance-adjusted abnormal accruals are estimated as the difference between the accruals of reverse-splitting firms and those of matched firms in the same industry with the ROA that is closest to that of the sample firms.

Previous studies suggest that the levels of gross property, plant, and equipment (i.e. *PPE*; #7) are likely to affect current accruals. Dechow and Dichev (2002) and McNichols (2002) find that accruals are associated with prior year, current year, and subsequent year cash flows from operations (i.e. $CFO_{t-1}$, $CFO_t$, and $CFO_{t+1}$; # 308). We therefore perform additional tests on previous accrual models with adjustments by adding $PPE_t$ as an additional regressor in Equations (2) and (3) and adding $CFO_{t-1}$, $CFO_t$, and $CFO_{t+1}$ as additional regressors in Equations (2), (3), (6) and (7).

## 3.2 Measurement of Long-Term Performance

We measure post-event long-term stock performance starting 21 days after the reverse split over the subsequent period of one to three years. We use the methodology of Barber and Lyon (1997) to measure the buy-and-hold abnormal return (*BHAR*) relative to a benchmark for each reverse-splitting firm over a period of *T* trading days as follows:

[17] Following Kothari, Leone and Wasley (2005), we exclude the observations that are likely to be subject to recording errors from the estimation sample if the absolute value of total accruals scaled by total assets is greater than one.

[18] Kothari, Leone and Wasley (2005) show that performance matching based on ROA in period *t* produces fewer misspecification problems than that based on ROA in period *t-1*.

$$BHAR_i = \prod_{t=1}^{T}(1+R_{i,t}) - \prod_{t=1}^{T}(1+R_{b,t}), \quad (11)$$

where $R_{i,t}$ is the rate of return of firm $i$ on date $t$, and $R_{b,t}$ is the rate of return of the benchmark on date $t$. The abnormal return is the difference in buy-and-hold returns of a reverse-splitting firm and its matched firm. $BHAR_i$ are measured by considering four different matching benchmarks: a size-and-industry-matched portfolio, a size-and-book-to-market-ratio-matched portfolio, the CRSP value-weighted portfolio, and the CRSP equally-weighted portfolio.

To construct the benchmark matched by size and industry, for each firm in our sample we choose a non-splitting firm closest in equity market capitalization among the firms in the same two-digit SIC code. Firm size defined as the total market value of equity is matched one month before the announcement of reverse stock splits. For the benchmark matched by size and book-to-market ratio, we determine the book-to-market ratio at the fiscal year-end prior to the reverse split following Lyon, Barber and Tsai (1999). We then identify non-splitting firms with a market value of equity between 70 percent and 130 percent of the market value of equity of the sample firm. From this set of firms, we then choose the firm with the book-to-market ratio closest to that of the sample firm.

## 4. Empirical Results

### 4.1 Earnings Management prior to Reserve Stock Splits

Table 3 reports two key measures of earnings management, discretionary current accruals and discretionary total accruals expressed as percentage of total assets, surrounding the year of reverse stock splits. Panels A and B contain results based on balance-sheet approach and cash-flow-statement approach, respectively. In Panel A of Table 3, we find that discretionary total accruals are significantly negative in Years -1 and 0. The mean (median) discretionary total accrual is -12.225 (-2.648) percent of total assets in Year -1 and -10.267 (-0.477) percent of total assets in Year 0. However, the discretionary current accruals are insignificantly negative in Years -1 and 0. The performance-matched discretionary current accruals and discretionary total accruals are insignificantly negative in Year 0 but significantly negative in Year -2. In Panel B of Table 3, the findings for the discretionary accruals from the cash-flow-statement are qualitatively similar. The mean (median) values of discretionary total accruals are -13.288 (-3.263) percent of total assets in Year -1 and -9.949 (-0.720) percent of total assets in Year 0. Both the mean and median of discretionary total accruals are significantly negative. The mean (median) discretionary current accrual of -4.441 (-0.630) percent of total assets is statistically significant in Year -1. The performance-matched discretionary current accrual and discretionary total accrual are insignificantly negative in Year 0 but significantly negative in Year -2. Subsequently, the average level of discretionary accruals increases after the reverse split and appears to be positive in general. In Table 4 of Panels A and B based on alternative models including the factors of *PPE*, $CFO_{t-1}$, $CFO_t$, and $CFO_{t+1}$, the discretionary accruals exhibit similar patterns and conclusions.

In sum, the results show no evidence of opportunistic manipulation of discretionary accruals prior to reverse stock splits. Instead, the reverse-splitting firms tend to manage earnings downward prior to reverse splits. The findings suggest that managers have no incentive to opportunistically manage earnings upward to mislead investors since the reverse split is designed to artificially boost the stock price and earnings per share and is a negative event for investors. The negative discretionary accruals are more likely associated with an attempt to smooth earnings and reduce the perceived negative wealth effect.

In Table 5, we sort the sample by the level of asset-scaled discretionary current accruals into four quartiles based on balance-sheet approach in Panel A and cash-flow-statement approach in Panel B, respectively. Table 5 reports sample characteristics for the lowest and highest quartiles. We label the quartile of reverse-splitting firms with the lowest levels of discretionary current accruals as "conservative" firms and the quartile of reverse-splitting firms with the highest levels of discretionary current accruals as "aggressive" firms. The lowest quartiles have negative mean (median) discretionary current accruals of -21.2 (-15.5) percent of total assets in Panel A and -29.5 (-21.6) percent of total assets in Panel B, and thus do not appear to engage in earnings management. The highest quartiles have positive mean (median) discretionary current accruals of 21.1 (13.3) percent of total assets in Panel A and 14.4 (11.6) percent of total assets in Panel B. Earnings management prior to reverse splits appears to be concentrated in a subset of our sample. These firms tend to be relatively larger in terms of equity market capitalization and have a higher return on assets and operating cash flows divided by total assets.

### 4.2 Long-Term Stock Performance after Reverse Stock Splits

Table 6 reports buy-and-hold long-term abnormal returns (*BHARs*) for three years subsequent to reverse stock splits. Panels A, B, C, and D of Table 6 present buy-and-hold long-term abnormal returns constructed using four benchmarks: size and industry matched portfolios, size and book-to-market matched portfolios, the CRSP value-weighted portfolio, and

the CRSP equally-weighted portfolio. Consistent with prior studies, we find both the mean and median *BHARs* are significantly negative for three years following reverse splits. The results systematically show significant underperformance after reverse splits over one-, two- and three-year horizons.

### 4.3 Univariate Analysis of Earnings Management and Long-Term Stock Performance

To study the relation between pre-split accruals and post-split stock performance, Table 7 examines differences in post-split *BHARs* among lowest and highest quartiles grouped by levels of pre-split discretionary current accruals. Panels A and B of Table 7 present similar results based on the balance-sheet approach and cash-flow-statement approach, respectively. The most notable result is the lack of a relation between earnings management and long-term performance. The results show no evidence that the most aggressive quartile firms have lower post-split *BHARs* than conservative quartile firms. The test statistics for testing the difference in the mean and media BHARs between lowest and highest quartiles indicate that stock long-term performance do not differ significantly across the discretionary current accrual quartiles. The results suggest that firms engaging in aggressive earnings management perform no differently than firms exhibiting more conservative behavior. In sum, reverse splits appear to be initiated by firms with poor future prospects, and the level of discretionary current accruals at the firm prior to the reverse split has no bearing on its future performance.

### 4.4 Multivariate Analysis of Earnings Management and Long-Term Stock Performance

To examine the incremental influence of pre-split discretionary accruals on post-split long-term stock underperformance in a multivariate context, we run the following regressions based on balance-sheet approach and cash-flow-statement approach:

$$BHAR = \delta_0 + \delta_1 DCA_{t-1} + \delta_2 DTAC_{t-1} + \delta_3 FACTOR + \delta_4 Ln(MV) + \delta_5 Ln(BV/MV) + \varepsilon \quad (12)$$

$$BHAR = \phi_0 + \phi_1 DCACF_{t-1} + \phi_2 DTACF_{t-1} + \phi_3 FACTOR + \phi_4 Ln(MV) + \phi_5 Ln(BV/MV) + \varepsilon \quad (13)$$

where the dependent variable is the buy-and-hold abnormal return starting 21 days after reverse splits over one-, two- and three-year horizons. The abnormal return is measured using the four different benchmarks described above. The regressions include two key measures of earnings management, discretionary current accruals ($DCA_{t-1}$ from balance sheet; $DCACF_{t-1}$ from cash flow statement) and discretionary total accruals ($DTAC_{t-1}$ from balance sheet; $DTACF_{t-1}$ from cash flow statement) in Year -1. Other independent variables are control variables. *FACTOR* is the absolute value of the reverse stock split factor recorded in CRSP. *Ln(MV)* and *Ln(BV/MV)* are the natural log of equity market capitalization and the book-to-market ratio measured at the fiscal year end before the split.

Panels A and B of Table 8 report the regression results in Years 1, 2, and 3 based on the balance-sheet approach and cash-flow-statement approach. The multivariate results in Table 8 are consistent with the univariate results in Table 7. In general, the coefficients on discretionary current accruals and discretionary total accruals in Year -1 are statistically insignificant across every model specification, indicating no relation between the level of earnings management and subsequent stock price performance for reverse splits.[19] In other words, the lack of significance shows no additional influence of pre-split accruals on post-split stock price performance.

## 5. Conclusions

This study examines earnings management behavior and long-term stock performance of firms undertaking reverse stock splits. For a sample of 961 reverse-splitting firms in the period from 1980-2002, we find that evidence of significant negative discretionary accruals prior to reverse splits. The finding of significant negative discretionary current accruals is robust to estimation by balance-sheet and by cash-flow-statement approaches to measuring discretionary accruals. We interpret the finding of significant negative discretionary accruals as consistent with managerial pessimism regarding the firm's future prospects after the reverse split. The negative pre-split accruals afford management the opportunity to reverse those negative discretionary accruals at some future point when additional reported earnings are more sorely needed. This type of behavior is a form of earnings smoothing that has been widely observed among managers.

Our interpretation of negative discretionary accruals as being indicative of managerial pessimism is consistent with previous research that interprets positive discretionary accruals prior to forward splits as being indicative of managerial optimism. Furthermore, we pint out that positive discretionary current accruals observed prior to IPOs, SEOs or takeovers could be the result of either opportunistic behavior by managers designed to improve investor optimism, or could be the result of managerial optimism that spills over to investor optimism.

Consistent with studies that show no relation between discretionary current accruals and stock returns following forward splits, we also find no relation between discretionary current accruals and

[19] Discretionary current accruals are significantly positive at the 0.05 level only in the cases of value-weighted and equally weighted *BHARs* in year 2 perhaps because of outliers in the data.

stock returns following reverse splits. If discretionary current accruals serve as a proxy for managerial optimism or pessimism, then managerial optimism or pessimism might not be strictly related to the firm's future performance. An alternative explanation is that, although discretionary current accruals might be related to managerial optimism or pessimism, the mapping between accruals and optimism or pessimism might not be sufficiently strict to allow it to serve as an unbiased proxy. Instead, managerial preferences for the timing and smoothing of earnings over time might also play a role in determining the size and timing of accruals.

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## Appendices

**Table 1. Distribution of Reverse Stock Splits during the Period 1980-2002**

The sample consists of 961 reverse-splitting firms in the period from 1980-2002. The initial sample is retrieved from CRSP and identified on Lexis/Nexis Academic. Panel A reports the time distribution by reveres split calendar year. Panel B reports exchange listing distribution. Panel C reports the industry distribution by SIC code.

| **Panel A. Time Distribution** | | |
|---|---|---|
| Split Year | Number of Splits | % of Sample |
| 1980 | 3 | 0.3 |
| 1981 | 4 | 0.4 |
| 1982 | 13 | 1.4 |
| 1983 | 21 | 2.2 |
| 1984 | 14 | 1.5 |
| 1985 | 20 | 2.1 |
| 1986 | 15 | 1.6 |
| 1987 | 36 | 3.8 |
| 1988 | 25 | 2.6 |
| 1989 | 35 | 3.6 |
| 1990 | 54 | 5.6 |
| 1991 | 44 | 4.6 |
| 1992 | 69 | 7.2 |
| 1993 | 46 | 4.8 |
| 1994 | 35 | 3.6 |
| 1995 | 50 | 5.2 |
| 1996 | 47 | 4.9 |
| 1997 | 53 | 5.5 |
| 1998 | 109 | 11.3 |
| 1999 | 61 | 6.4 |
| 2000 | 42 | 4.4 |
| 2001 | 80 | 8.3 |
| 2002 | 85 | 8.8 |
| Total | 961 | 100.0 |
| **Panel B. Exchange Listing Distribution** | | |
| Exchange | Number of Splits | % of Sample |

| | | |
|---|---|---|
| NYSE | 79 | 8.2 |
| Nasdaq | 803 | 83.6 |
| AMEX | 47 | 4.9 |
| Other | 32 | 3.3 |
| Total | 961 | 100.0 |

**Table 1. (Continued)**

**Panel C. Industry Distribution**

| Industry | SIC Codes | Number of Splits | % of Sample |
|---|---|---|---|
| Agriculture, Forestry, and Fishing | 0000 – 0999 | 4 | 0.4 |
| Mining | 1000 – 1499 | 127 | 13.2 |
| Construction | 1500 – 1999 | 14 | 1.5 |
| Manufacturing | 2000 – 3999 | 343 | 35.7 |
| Transportation and Public Utility | 4000 – 4999 | 65 | 6.8 |
| Wholesale Trade | 5000 – 5199 | 58 | 6.0 |
| Retail Trade | 5200 – 5999 | 69 | 7.2 |
| Services | 7000 – 8999 | 261 | 27.2 |
| Nonclassifiable Establishment | 9900 – 9999 | 20 | 2.1 |
| Total | | 961 | 100.0 |

**Table 2. Characteristics of Reverse Stock Splits**

Market value of equity, total assets, book to market ratio, total debt ratio, return on assets, and operating cash flows are obtained from Compustat and measured at the fiscal year end prior to the reverse splits. Book to market ratio is measured as book value of equity divided by market value. Total Debt/Total Assets is total debt ratio and measured as total debt divided total assets. ROA is return on assets and measured as net income divided by total assets. OCF/Total Assets is operating cash flows divided by total assets. Split Factor is the absolute value of split factor reported in CRSP; a value of 0.80 corresponds to a 1-for-5 reverse split.

| | Mean | Std. Dev. | Median | N |
|---|---|---|---|---|
| Market Value ($ Millions) | 51.30 | 125.50 | 13.55 | 848 |
| Total Assets ($ Millions) | 85.80 | 419.41 | 17.35 | 897 |
| Book to Market Ratio | 1.42 | 8.96 | 0.59 | 806 |
| Total Debt/Total Assets | 0.29 | 0.29 | 0.23 | 896 |
| ROA (%) | -48.85 | 207.30 | -11.18 | 825 |
| OCF/Total Assets (%) | -18.27 | 53.81 | -3.89 | 751 |
| Split Factor | 0.79 | 0.15 | 0.80 | 961 |

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**Table 3. Discretionary Accruals around the Year of Reverse Stock Splits**

This table presents the levels of discretionary current accruals and discretionary total accruals of firms undertaking reverse stock splits from three years before to three years after the event. Accruals measures are scaled by beginning-of-period total assets and reported as a percentage of total assets. For performance-matched discretionary accruals, we match firms industry (two-digit SIC code) and ROA in period *t-1*. Panels A and B are based on balance-sheet approach and cash-flow-statement approach, respectively. All accruals are winsorized at the top and bottom one-percentiles. The fiscal year in which the split is announced is defined as Year 0. The t-test is used for testing the mean discretionary accruals and the Wilcoxon signed rank test is used for testing the median discretionary accruals. The t-statistics and Wilcoxon signed rank statistics are reported in parentheses.

| **Panel A. Balance-sheet Approach** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Fiscal Year | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| *Discretionary Current Accruals* | | | | | | | |
| Mean | -1.273 | -0.269 | -0.376 | -0.406 | 1.769 | 0.861 | 0.672 |
| t-stat | (-0.88) | (-0.23) | (-0.52) | (-0.43) | (2.04) ** | (1.41) | (0.79) |
| Median | -0.347 | -0.457 | -0.407 | -0.207 | 0.615 | 0.839 | 1.183 |
| Wilcoxon stat | (0.10) | (-1.35) | (-1.62) | (-0.78) | (1.42) | (1.25) | (2.00) ** |
| N | 586 | 682 | 727 | 669 | 591 | 522 | 466 |
| *Discretionary Total Accruals* | | | | | | | |
| Mean | -12.656 | -26.638 | -12.225 | -10.267 | -1.756 | -1.543 | 0.354 |
| t-stat | (-3.95) *** | (-5.89) *** | (-7.20) *** | (-4.46) *** | (-1.62) | (-1.31) | (0.25) |
| Median | -1.606 | -3.152 | -2.648 | -0.477 | 0.158 | 0.829 | 1.613 |
| Wilcoxon stat | (-2.85) *** | (-5.62) *** | (-6.41) *** | (-2.66) *** | (-1.20) | (0.43) | (1.69) * |
| N | 535 | 630 | 686 | 624 | 566 | 499 | 457 |
| *Performance-matched Discretionary Current Accruals* | | | | | | | |
| Mean | -3.035 | -5.106 | 1.383 | -2.031 | 1.529 | 2.265 | -1.738 |
| t-stat | (-1.12) | (-2.86) *** | (1.05) | (-1.17) | (1.09) | (1.53) | (-0.48) |
| Median | -0.329 | -2.207 | 0.947 | 1.289 | 0.968 | 1.336 | 2.147 |
| Wilcoxon stat | (-0.28) | (-2.78) *** | (1.18) | (0.39) | (1.13) | (1.40) | (2.65) *** |
| N | 281 | 371 | 429 | 514 | 467 | 386 | 309 |
| *Performance-matched Discretionary Total Accruals* | | | | | | | |
| Mean | -1.594 | -30.476 | 0.932 | -1.560 | 3.510 | 10.080 | 7.803 |
| t-stat | (-0.35) | (-4.44) *** | (0.29) | (-0.57) | (1.72) * | (2.73) *** | (1.98) ** |
| Median | -1.421 | -3.737 | -2.019 | 0.837 | -0.864 | 0.479 | 1.485 |
| Wilcoxon stat | (-0.48) | (-3.79) *** | (-1.31) | (0.22) | (0.42) | (0.93) | (1.88) * |
| N | 264 | 342 | 418 | 507 | 454 | 374 | 312 |

**Table 3. (Continued)**

**Panel B. Cash-flow-statement Approach**

| Fiscal Year | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| *Discretionary Current Accruals* | | | | | | | |
| Mean | -7.674 | -7.266 | -4.441 | 1.406 | 1.473 | 0.916 | 2.273 |
| t-stat | (-2.93) *** | (-2.52) ** | (-4.50) *** | (1.11) | (1.51) | (1.03) | (1.81) * |
| Median | -0.599 | 0.077 | -0.630 | 0.405 | 1.647 | 1.178 | 2.572 |
| Wilcoxon stat | (-1.39) | (-0.27) | (-2.90) *** | (-0.13) | (1.85) * | (1.31) | (3.29) *** |
| N | 322 | 383 | 417 | 364 | 330 | 295 | 274 |
| *Discretionary Total Accruals* | | | | | | | |
| Mean | -13.664 | -29.254 | -13.288 | -9.949 | -2.521 | -1.423 | -0.553 |
| t-stat | (-3.97) *** | (-5.54) *** | (-7.49) *** | (-4.52) *** | (-2.42) ** | (-1.32) | (-0.51) |
| Median | -1.434 | -2.132 | -3.263 | -0.720 | 0.143 | 1.187 | 1.975 |
| Wilcoxon stat | (-2.67) *** | (-5.21) *** | (-6.76) *** | (-3.15) *** | (-1.28) *** | (0.78) *** | (2.04) *** |
| N | 496 | 597 | 650 | 600 | 544 | 492 | 450 |
| *Performance-matched Discretionary Current Accruals* | | | | | | | |
| Mean | -11.029 | -16.558 | 8.627 | -0.391 | 5.391 | 6.144 | 24.743 |
| t-stat | (-1.67) * | (-3.02) *** | (1.00) | (-0.16) | (2.44) ** | (1.65) | (1.65) |
| Median | -1.830 | -1.292 | -1.162 | -0.610 | 1.420 | -1.039 | 4.624 |
| Wilcoxon stat | (-0.66) | (-1.64) | (-1.29) | (0.02) | (1.93) * | (0.30) | (3.09) *** |
| N | 102 | 140 | 162 | 182 | 170 | 125 | 91 |
| *Performance-matched Discretionary Total Accruals* | | | | | | | |
| Mean | -0.740 | -29.501 | 6.831 | -1.215 | 2.694 | 7.859 | 34.542 |
| t-stat | (-0.13) | (-3.18) *** | (1.52) | (-0.46) | (1.38) | (2.18) ** | (2.27) ** |
| Median | 1.089 | -2.724 | 0.477 | 0.356 | -0.046 | -0.238 | 1.652 |
| Wilcoxon stat | (-0.00) | (-2.68) *** | (0.27) | (-0.00) | (0.65) | (0.62) | (1.93) * |
| N | 214 | 281 | 348 | 419 | 378 | 317 | 262 |

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

**Table 4. Discretionary Accruals around the Year of Reverse Stock Splits (Alternative Models)**

This table presents the levels of discretionary current accruals and discretionary total accruals of firms undertaking reverse stock splits from three years before to three years after the event. Accruals measures are scaled by beginning-of-period total assets and reported as a percentage of total assets. For performance-matched discretionary accruals, we match firms by industry (two-digit SIC code) and ROA in period *t-1*. Results are estimated by alternative underlying accrual models including gross property, plant, and equipment (*PPE*), and prior year, current year, and subsequent year cash flows from operations ($CFO_{t-1}$, $CFO_t$, and $CFO_{t+1}$). Panels A and B are based on balance-sheet approach and cash-flow-statement approach, respectively. All accruals are winsorized at the top and bottom one-percentiles. The fiscal year in which the split is announced is defined as Year 0. The t-test is used for testing the mean discretionary accruals and the Wilcoxon signed rank test is used for testing the median discretionary accruals. The t-statistics and Wilcoxon signed rank statistics are reported in parentheses.

**Panel A. Balance-sheet Approach**

| Fiscal Year | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| *Discretionary Current Accruals* | | | | | | | |
| Mean | -0.612 | -1.033 | 1.228 | 1.463 | 1.780 | 0.750 | 0.779 |
| t-stat | (-0.33) | (-0.79) | (1.23) | (1.51) | (2.11) ** | (1.10) | (0.83) |
| Median | -0.589 | -0.762 | -0.633 | 0.616 | 0.705 | 0.433 | 1.240 |
| Wilcoxon stat | (-0.27) | (-1.98) ** | (-1.44) | (1.00) | (1.81) * | (0.89) | (2.07)** |
| N | 470 | 568 | 542 | 496 | 449 | 425 | 360 |
| *Discretionary Total Accruals* | | | | | | | |
| Mean | -12.801 | -31.491 | -10.925 | -6.780 | -1.533 | -1.461 | 1.928 |
| t-stat | (-3.78)*** | (-5.51) *** | (-5.69) *** | (-3.03) *** | (-1.48) | (-1.20) | (1.24) |
| Median | -1.550 | -4.268 | -2.466 | 0.324 | 0.535 | 1.173 | 1.832 |
| Wilcoxon stat | (-3.34)*** | (-6.39) *** | (-5.05) *** | (-0.85) | (-0.59) | (0.43) | (1.71)* |
| N | 487 | 581 | 553 | 510 | 459 | 434 | 373 |
| *Performance-matched Discretionary Current Accruals* | | | | | | | |
| Mean | -1.481 | -5.832 | 1.426 | -0.290 | 1.628 | 3.443 | -4.060 |
| t-stat | (-0.41) | (-2.94) *** | (0.92) | (-0.13) | (1.03) | (1.85) * | (-0.96) |
| Median | 0.680 | -3.218 | 1.051 | 1.351 | 0.813 | 1.916 | 3.066 |
| Wilcoxon stat | (0.16) | (-2.97) *** | (0.67) | (1.60) | (1.17) | (1.49) | (2.72)*** |
| N | 229 | 309 | 380 | 360 | 329 | 294 | 212 |
| *Performance-matched Discretionary Total Accruals* | | | | | | | |
| Mean | 1.987 | -35.200 | 0.578 | 2.080 | 4.723 | 11.637 | 0.321 |
| t-stat | (0.44) | (-3.97) *** | (0.17) | (0.72) | (2.05) ** | (2.66) *** | (0.11) |
| Median | -1.062 | -4.082 | -1.704 | 1.328 | -0.581 | 0.546 | 1.563 |
| Wilcoxon stat | (0.00) | (-3.90) *** | (-1.52) | (1.91) * | (0.95) | (1.07) | (1.15) |
| N | 243 | 320 | 398 | 377 | 344 | 306 | 223 |

**Table 4. (Continued)**

| **Panel B. Cash-flow-statement Approach** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Fiscal Year | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| *Discretionary Current Accruals* | | | | | | | |
| Mean | -5.249 | -5.979 | -3.864 | 1.795 | 1.365 | 0.770 | 1.082 |
| t-stat | (-2.57) ** | (-2.15) ** | (-3.83) *** | (1.25) | (1.33) | (0.81) | (0.74) |
| Median | -1.026 | -0.383 | -1.408 | -0.631 | 1.143 | 0.528 | 2.347 |
| Wilcoxon stat | (-1.87) * | (-0.90) | (-2.83) *** | (-0.18) | (1.71) * | (0.95) | (2.13)** |
| N | 311 | 369 | 345 | 297 | 274 | 260 | 226 |
| *Discretionary Total Accruals* | | | | | | | |
| Mean | -12.865 | -31.593 | -10.991 | -7.640 | -1.923 | -1.378 | 0.976 |
| t-stat | (-3.81)*** | (-5.50) *** | (-5.82) *** | (-3.52) *** | (-1.91) * | (-1.20) | (0.73) |
| Median | -1.624 | -3.687 | -2.756 | -0.051 | 0.329 | 1.450 | 1.773 |
| Wilcoxon stat | (-3.06)*** | (-6.10) *** | (-5.12) *** | (-1.82) * | (-0.77) | (0.52) | (1.95)* |
| N | 486 | 581 | 549 | 509 | 458 | 434 | 372 |
| *Performance-matched Discretionary Current Accruals* | | | | | | | |
| Mean | -6.484 | -15.915 | 7.236 | 0.722 | 3.772 | 6.161 | 28.127 |
| t-stat | (-1.14) | (-2.77) *** | (0.87) | (0.22) | (1.40) | (1.68) * | (1.36) |
| Median | -0.218 | -2.574 | -1.967 | 0.744 | 0.767 | 0.182 | 2.420 |
| Wilcoxon stat | (-0.42) | (-2.30) ** | (-1.43) | (0.69) | (1.23) | (0.58) | (1.40) |
| N | 98 | 132 | 153 | 133 | 131 | 97 | 65 |
| *Performance-matched Discretionary Total Accruals* | | | | | | | |
| Mean | 2.986 | -35.004 | 0.755 | 0.269 | 3.808 | 11.411 | 1.529 |
| t-stat | (0.65) | (-3.92) *** | (0.22) | (0.10) | (1.80) * | (2.63) *** | (0.58) |
| Median | 0.459 | -3.914 | -1.834 | 0.831 | -0.560 | 0.465 | 1.426 |
| Wilcoxon stat | (0.36) | (-3.64) *** | (-1.43) | (1.47) | (0.58) | (0.99) | (1.32) |
| N | 243 | 320 | 394 | 376 | 343 | 306 | 223 |

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

**Table 5. Characteristics of Reverse Stock Splits by Discretionary Current Accruals Quartiles**

Market value of equity, total assets, book to market ratio, total debt ratio, return on assets, and operating cash flows are obtained from Compustat and measured at the fiscal year end prior to the reverse splits. Book to market ratio is measured as book value of equity divided by market value. Total Debt/Total Assets is total debt ratio and calculated as total debt divided total assets. ROA is return on assets and measured as net income divided by total assets. OCF/Total Assets is operating cash flows divided by total assets. Factor is the absolute value of split factor reported in CRSP; a value of 0.80 corresponds to a 1-for-5 reverse split. The proxy for earnings management is discretionary current accrual. The initial sample is classified and sorted by the asset-scaled discretionary current accruals into four quartiles. Panels A and B are based on balance-sheet approach and cash-flow-statement approach, respectively. The discretionary current accruals (DCA in Panel A; DCACF in Panel B) in year *t-1* are reported as a percentage of total assets.

**Panel A. Balance-sheet Approach**

| | **DCA 1st Quartile (Conservative)** | | | | **DCA 4th Quartile (Aggressive)** | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Median | N | Mean | Std. Dev. | Median | N |
| Market Value ($ Millions) | 24.57 | 42.79 | 9.44 | 169 | 39.57 | 74.48 | 14.95 | 172 |
| Total Assets ($ Millions) | 53.86 | 117.81 | 13.68 | 182 | 55.11 | 125.15 | 16.34 | 181 |
| Book to Market Ratio | 0.96 | 1.31 | 0.47 | 145 | 2.30 | 19.43 | 0.47 | 165 |
| Total Debt/Total Assets | 0.29 | 0.28 | 0.21 | 182 | 0.28 | 0.23 | 0.24 | 181 |
| ROA (%) | -94.39 | 395.58 | -34.66 | 169 | -25.32 | 72.08 | -1.75 | 175 |
| OCF/Total Assets (%) | -30.92 | 90.70 | -8.52 | 163 | -17.03 | 32.12 | -5.73 | 162 |
| Factor | 0.81 | 0.12 | 0.80 | 182 | 0.80 | 0.14 | 0.80 | 181 |
| $DCA_{t-1}$ (%) | -21.20 | 14.50 | -15.50 | 182 | 21.10 | 19.30 | 13.30 | 181 |

**Panel B. Cash-flow-statement Approach**

| | **DCACF 1st Quartile (Conservative)** | | | | **DCACF 4th Quartile (Aggressive)** | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Median | N | Mean | Std. Dev. | Median | N |
| Market Value ($ Millions) | 24.57 | 38.02 | 9.87 | 100 | 28.41 | 45.41 | 13.57 | 103 |
| Total Assets ($ Millions) | 49.66 | 116.86 | 13.56 | 105 | 42.81 | 84.51 | 13.82 | 104 |
| Book to Market Ratio | 1.13 | 1.96 | 0.44 | 82 | 1.06 | 1.26 | 0.67 | 98 |
| Total Debt/Total Assets | 0.33 | 0.43 | 0.22 | 105 | 0.23 | 0.25 | 0.17 | 104 |
| ROA (%) | -132.38 | 521.51 | -44.99 | 104 | -29.24 | 52.43 | -11.13 | 104 |
| OCF/Total Assets (%) | -30.05 | 100.36 | -12.32 | 104 | -25.85 | 35.64 | -12.29 | 104 |
| Factor | 0.80 | 0.12 | 0.80 | 105 | 0.81 | 0.13 | 0.87 | 104 |
| $DCACF_{t-1}$ (%) | -29.50 | 21.90 | -21.60 | 105 | 14.40 | 9.90 | 11.60 | 104 |

**Table 6. Long-term Performance following Reverse Stock Splits**

Post-split long-term performance is measured starting 21 days after split over subsequent one, two and three years. Buy-and-hold returns (*BHARs*) are measured by considering four different benchmarks including a size-and-industry-market-matched portfolio, a size-and-book-to-market-ratio-matched portfolio, the CRSP value-weighted (VW) portfolio, and the CRSP equally weighted (EW) portfolio, respectively. Mean and median *BHARs* are reported in percent. The t-test is used for testing the mean *BHARs* and the Wilcoxon signed rank test is used for testing the median *BHARs*. The t-statistics and Wilcoxon signed rank statistics are reported in parentheses.

| Holding Period | Mean | t-stat | Median | Wilcoxon Signed Rank stat | N |
|---|---|---|---|---|---|
| **Panel A. BHAR – Size/Industry Matched Benchmark** | | | | | |
| 1 | -20.11 | (-4.12)*** | -24.33 | (7.52)*** | 906 |
| 2 | -25.08 | (-2.67)*** | -31.36 | (7.73)*** | 906 |
| 3 | -19.64 | (-2.25)** | -34.94 | (8.48)*** | 906 |
| **Panel B. BHAR – Size/Book-to-Market Ratio Matched Benchmark** | | | | | |
| 1 | -22.08 | (-2.45)** | -22.39 | (6.21)*** | 718 |
| 2 | -42.11 | (-2.04)** | -27.44 | (5.69)*** | 719 |
| 3 | -35.54 | (-1.73)* | -31.74 | (6.20)*** | 719 |
| **Panel C. BHAR – Value-Weighted Benchmark** | | | | | |
| 1 | -12.93 | (-3.36)*** | -39.27 | (12.41)*** | 954 |
| 2 | -14.35 | (-2.67)*** | -56.06 | (12.51)*** | 954 |
| 3 | -19.03 | (-2.71)*** | -67.34 | (13.95)*** | 954 |
| **Panel D. BHAR – Equally Weighted Benchmark** | | | | | |
| 1 | -29.74 | (-7.91)*** | -56.11 | (16.49)*** | 954 |
| 2 | -50.96 | (-9.61)*** | -83.62 | (17.67)*** | 954 |
| 3 | -78.20 | (-11.12)*** | -100.25 | (20.17)*** | 954 |

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

**Table 7. Long-term Performance following Reverse Stock Splits for the Discretionary Current Accruals Quartiles**

The proxy for earnings management is the level of discretionary current accruals. The sample is sorted by the asset-scaled level of discretionary current accruals into four quartiles, with the first quartile representing the most conservative and the fourth quartile representing the most aggressive level of earnings management. Mean and median buy-and-hold returns (BHARs) are reported in percent and are computed using four different benchmarks including a size-and-industry-market-matched portfolio, a size-and-book-to-market-ratio-matched portfolio, the CRSP value-weighted (VW) portfolio, and the CRSP equally weighted (EW) portfolio. Panels A and B are based on balance-sheet approach and cash-flow-statement approach, respectively. The t-test is used for testing the mean BHARs and the Wilcoxon signed rank test is used for testing the median BHARs. The unpaired t-test is used for testing the difference in mean BHARs and the Wilcoxon rank sum test is used for testing the difference in median BHARs between the first and fourth quartiles. The t-statistics and Wilcoxon statistics are reported in parentheses.

**Panel A. Balance-sheet Approach**

| | DCA 1st Quartile (Conservative) | | | | | DCA 4th Quartile (Aggressive) | | | | | Difference: BHAR(Q1)-BHAR(Q4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Holding Period | Mean | t-stat | Median | Wilcoxon Signed Rank stat | N | Mean | t-stat | Median | Wilcoxon Signed Rank stat | N | Unpaired t-stat | Wilcoxon Rank Sum z-stat |
| *BHAR – Size/Industry Matched Benchmark* | | | | | | | | | | | | |
| 1 | -33.03 | (-2.19) ** | -28.83 | (3.81) *** | 176 | -2.11 | (-0.21) | -23.03 | (2.54) *** | 173 | (-1.71) * | (1.06) |
| 2 | -52.50 | (-1.50) | -38.30 | (4.17) *** | 176 | -1.08 | (-0.06) | -30.26 | (2.70) *** | 173 | (-1.29) | (0.93) |
| 3 | -34.39 | (-1.75) * | -40.62 | (5.07) *** | 176 | -16.21 | (-0.87) | -38.68 | (4.19) *** | 173 | (-0.67) | (0.58) |
| *BHAR – Size/Book-to-Market Ratio Matched Benchmark* | | | | | | | | | | | | |
| 1 | -29.94 | (-1.84) * | -25.65 | (3.00) *** | 130 | -46.79 | (-1.25) | -22.63 | (3.35) *** | 146 | (0.41) | (0.03) |
| 2 | -45.70 | (-1.90) * | -30.31 | (2.94) *** | 130 | -114.36 | (-1.20) | -31.20 | (3.09) *** | 146 | (0.70) | (0.01) |
| 3 | -55.83 | (-2.14) ** | -43.01 | (3.84) *** | 130 | -109.59 | (-1.21) | -30.40 | (3.31) *** | 146 | (0.57) | (-0.39) |
| *BHAR – Value-Weighted Benchmark* | | | | | | | | | | | | |
| 1 | -10.76 | (-1.18) | -46.02 | (5.33) *** | 181 | -4.38 | (-0.37) | -42.53 | (4.68) *** | 181 | (-0.43) | (-0.16) |
| 2 | -20.46 | (-1.89) * | -61.45 | (6.46) *** | 181 | -1.88 | (-0.11) | -53.53 | (5.15) *** | 181 | (-0.91) | (-0.62) |
| 3 | -30.52 | (-1.92) * | -74.00 | (7.05) *** | 181 | -25.77 | (-1.51) | -69.72 | (6.41) *** | 181 | (-0.20) | (-0.38) |
| *BHAR – Equally Weighted Benchmark* | | | | | | | | | | | | |
| 1 | -28.43 | (-3.19) *** | -61.34 | (7.07) *** | 181 | -23.62 | (-2.02) ** | -59.56 | (6.60) *** | 181 | (-0.33) | (0.21) |
| 2 | -56.39 | (-5.39) *** | -87.70 | (8.34) *** | 181 | -42.56 | (-2.45) ** | -88.21 | (7.55) *** | 181 | (-0.68) | (0.27) |
| 3 | -85.63 | (-5.49) *** | -100.82 | (9.24) *** | 181 | -89.04 | (-5.16) *** | -118.53 | (9.30) *** | 181 | (0.15) | (0.57) |

**Table 7. (Continued)**

**Panel B. Cash-flow-statement Approach**

| Holding Period | DCA 1st Quartile (Conservative) | | | | | DCA 4th Quartile (Aggressive) | | | | | Difference: BHAR(Q1)-BHAR(Q4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | t-stat | Median | Wilcoxon Signed Rank stat | N | Mean | t-stat | Median | Wilcoxon Signed Rank stat | N | Unpaired t-stat | Wilcoxon Rank Sum z-stat |
| *BHAR – Size/Industry Matched Benchmark* | | | | | | | | | | | | |
| 1 | -38.46 | (-2.94) *** | -44.11 | (4.41) *** | 102 | -37.09 | (-1.69) * | -23.74 | (2.50) *** | 98 | (-0.05) | (1.10) |
| 2 | -61.83 | (-4.45) *** | -49.53 | (4.83) *** | 102 | -24.80 | (-0.66) | -31.15 | (2.65) *** | 98 | (-0.92) | (1.49) |
| 3 | -62.00 | (-5.03) *** | -50.89 | (5.18) *** | 102 | -10.54 | (-0.25) | -37.95 | (2.66) *** | 98 | (-1.19) | (1.40) |
| *BHAR – Size/Book-to-Market Ratio Matched Benchmark* | | | | | | | | | | | | |
| 1 | -52.35 | (-2.18) ** | -25.97 | (3.24) *** | 71 | -57.43 | (-0.90) | -26.15 | (2.34) *** | 83 | (0.08) | (-0.98) |
| 2 | -88.23 | (-2.66) *** | -61.92 | (3.60) *** | 71 | -150.47 | (-0.90) | -26.25 | (2.04) ** | 83 | (0.37) | (-1.69) * |
| 3 | -99.86 | (-2.91) *** | -57.70 | (3.64) *** | 71 | -111.69 | (-0.70) | -25.23 | (1.55) * | 83 | (0.07) | (-1.90) * |
| *BHAR – Value-Weighted Benchmark* | | | | | | | | | | | | |
| 1 | -28.83 | (-2.96) *** | -50.04 | (5.50) *** | 105 | 1.43 | (0.08) | -40.51 | (3.61) *** | 103 | (-1.45) | (1.70) * |
| 2 | -47.29 | (-5.85) *** | -66.90 | (5.58) *** | 105 | 12.28 | (0.47) | -55.39 | (3.62) *** | 103 | (-2.16) ** | (2.18) ** |
| 3 | -64.11 | (-7.38) *** | -76.01 | (6.48) *** | 105 | 22.06 | (0.70) | -67.75 | (3.14) *** | 103 | (-2.65) *** | (2.45) ** |
| *BHAR – Equally Weighted Benchmark* | | | | | | | | | | | | |
| 1 | -48.07 | (-4.96) *** | -65.54 | (6.71) *** | 105 | -19.70 | (-1.08) | -61.81 | (5.47) *** | 103 | (-1.37) | (1.68) * |
| 2 | -85.70 | (-11.14) *** | -95.60 | (7.50) *** | 105 | -33.27 | (-1.27) | -89.30 | (5.79) *** | 103 | (-1.92) * | (1.43) |
| 3 | -123.64 | (-12.51) *** | -116.77 | (8.05) *** | 105 | -47.70 | (-1.54) | -96.45 | (5.89) *** | 103 | (-2.33) ** | (1.80) * |

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

**Table 8. Cross-sectional Regressions of Post-split Performance on Pre-split Discretionary Accruals**

The dependent variable is the post-split return calculated starting 21 days after a reverse split over the subsequent one-, two-, and three-year periods. The dependent variable is measured by buy-and-hold returns *(BHARs)* using a size-and-industry-market-matched portfolio, a size-and-book-to-market-ratio-matched portfolio, the CRSP value-weighted (VW) portfolio, and the CRSP equally weighted (EW) portfolio, respectively. Panels A and B are based on balance-sheet approach and cash-flow-statement approach, respectively. $DCA_{t-1}$ and $DTAC_{t-1}$ are discretionary current accruals and discretionary total accrual from balance sheet in Year -1, respectively. $DCACF_{t-1}$ and $DTACF_{t-1}$ are discretionary current accruals and discretionary total accrual from cash flow statement in Year -1, respectively. FACTOR is the absolute value of reverse stock split factor recorded in CRSP. Ln(MV) and Ln(BV/MV) are the natural log of the market value and book-to-market ratio measured at the fiscal year end before the reverse split. T-statistics are reported in parentheses.

**Panel A. Balance-sheet Approach**

| | Independent Variables | | | | | | N | F |
|---|---|---|---|---|---|---|---|---|
| | Constant | $DCA_{t-1}$ | $DTAC_{t-1}$ | Factor | Ln(MV) | Ln(BV/MV) | | |
| *Dependent Variable: Post-split 1-year BHAR* | | | | | | | | |
| BHAR – Size/Industry | 0.379 | 0.524 | -0.033 | -0.620 | -0.041 | -0.001 | 567 | 0.78 |
| | (0.85) | (1.44) | (-0.21) | (-1.23) | (-0.79) | (-0.01) | | |
| BHAR – Size/Book-to-Market Ratio | 0.795 | -0.209 | 0.089 | -1.481 | 0.028 | -0.095 | 460 | 0.71 |
| | (0.92) | (-0.29) | (0.26) | (-1.49) | (0.27) | (-0.83) | | |
| BHAR – VW | 0.567 | 0.329 | 0.116 | -0.810 | 0.007 | 0.034 | 578 | 1.55 |
| | (1.59) | (1.14) | (0.92) | (-2.00) ** | (0.17) | (0.75) | | |
| BHAR – EW | 0.438 | 0.354 | 0.072 | -0.875 | -0.002 | 0.024 | 578 | 1.56 |
| | (1.26) | (1.25) | (0.59) | (-2.20) ** | (-0.04) | (0.54) | | |
| *Dependent Variable: Post-split 2-year BHAR* | | | | | | | | |
| BHAR – Size/Industry | -0.075 | 0.982 | 0.082 | -0.197 | 0.001 | 0.157 | 567 | 0.81 |
| | (-0.08) | (1.31) | (0.26) | (-0.19) | (0.01) | (1.35) | | |
| BHAR – Size/Book-to-Market Ratio | 0.378 | 0.033 | 0.399 | -1.919 | 0.173 | -0.167 | 461 | 0.47 |
| | (0.19) | (0.02) | (0.50) | (-0.82) | (0.70) | (-0.61) | | |
| BHAR – VW | 0.151 | 0.810 | 0.270 | -0.374 | 0.071 | 0.177 | 578 | 3.60 *** |
| | (0.31) | (2.05) ** | (1.57) | (-0.67) | (1.23) | (2.86) *** | | |
| BHAR – EW | -0.196 | 0.841 | 0.156 | -0.426 | 0.054 | 0.171 | 578 | 3.13 *** |
| | (-0.41) | (2.15) ** | (0.92) | (-0.78) | (0.94) | (2.78) *** | | |
| *Dependent Variable: Post-split 3-year BHAR* | | | | | | | | |
| BHAR – Size/Industry | -0.274 | 0.317 | -0.006 | -0.202 | 0.100 | 0.166 | 567 | 0.79 |
| | (-0.36) | (0.51) | (-0.02) | (-0.23) | (1.12) | (1.73) * | | |
| BHAR – Size/Book-to-Market Ratio | 0.7215 | 0.2019 | 0.4666 | -2.1845 | 0.1375 | -0.2096 | 461 | 0.58 |
| | (0.37) | (0.12) | (0.61) | (-0.97) | (0.57) | (-0.80) | | |
| BHAR – VW | -0.295 | 0.299 | 0.275 | -0.159 | 0.162 | 0.220 | 578 | 2.86 ** |
| | (-0.50) | (0.63) | (1.32) | (-0.24) | (2.32) ** | (2.94) *** | | |
| BHAR – EW | -0.949 | 0.343 | 0.054 | -0.154 | 0.149 | 0.219 | 578 | 2.29 ** |
| | (-1.60) | (0.71) | (0.26) | (-0.23) | (2.12) ** | (2.90) *** | | |

**Table 8. (Continued)**

**Panel B. Cash-flow-statement Approach**

| | Independent Variables | | | | | | N | F |
|---|---|---|---|---|---|---|---|---|
| | Constant | $DCACF_{t-1}$ | $DTACF_{t-1}$ | Factor | Ln(MV) | Ln(BV/MV) | | |
| *Dependent Variable: Post-split 1-year BHAR* | | | | | | | | |
| BHAR – Size/Industry | 0.408 | 0.119 | 0.141 | -0.727 | -0.016 | 0.001 | 345 | 0.37 |
| | (0.63) | (0.18) | (0.49) | (-0.98) | (-0.20) | (0.01) | | |
| BHAR – Size/Book-to-Market Ratio | 1.272 | 0.437 | 0.115 | -2.337 | 0.086 | -0.097 | 281 | 0.69 |
| | (1.34) | (1.45) | (0.72) | (1.56) | (0.18) | (0.18) | | |
| BHAR – VW | 0.684 | 0.672 | 0.165 | -1.053 | 0.065 | 0.063 | 355 | 2.29 ** |
| | (1.34) | (1.32) | (0.72) | (-1.80) * | (1.04) | (0.98) | | |
| BHAR – EW | 0.486 | 0.603 | 0.135 | -1.064 | 0.064 | 0.057 | 355 | 2.02 * |
| | (0.96) | (1.20) | (0.59) | (-1.84) * | (1.03) | (0.90) | | |
| *Dependent Variable: Post-split 2-year BHAR* | | | | | | | | |
| BHAR – Size/Industry | -0.905 | -0.536 | 0.481 | 0.605 | 0.083 | 0.222 | 345 | 0.40 |
| | (-0.61) | (-0.36) | (0.72) | (0.36) | (0.45) | (1.19) | | |
| BHAR – Size/Book-to-Market Ratio | 0.184 | 1.343 | 0.158 | -2.727 | 0.418 | -0.246 | 281 | 0.53 |
| | (0.06) | (0.37) | (0.09) | (-0.71) | (0.95) | (-0.57) | | |
| BHAR – VW | -0.164 | 0.492 | 0.406 | -0.114 | 0.169 | 0.238 | 355 | 2.52 ** |
| | (-0.22) | (0.65) | (1.19) | (-0.13) | (1.81) * | (2.49) ** | | |
| BHAR – EW | -0.645 | 0.379 | 0.317 | -0.038 | 0.159 | 0.240 | 355 | 2.12 * |
| | (-0.86) | (0.51) | (0.94) | (-0.04) | (1.72) * | (2.54) ** | | |
| *Dependent Variable: Post-split 3-year BHAR* | | | | | | | | |
| BHAR – Size/Industry | 0.089 | 0.104 | 0.199 | -0.373 | -0.023 | 0.108 | 345 | 0.30 |
| | (0.08) | (0.10) | (0.42) | (-0.31) | (-0.18) | (0.81) | | |
| BHAR – Size/Book-to-Market Ratio | 1.220 | 1.629 | 0.385 | -3.564 | 0.273 | -0.345 | 281 | 0.66 |
| | (0.38) | (0.47) | (0.23) | (-0.97) | (0.65) | (-0.83) | | |
| BHAR – VW | 0.031 | 0.879 | 0.344 | -0.399 | 0.121 | 0.189 | 355 | 2.21 * |
| | (0.04) | (1.11) | (0.97) | (-0.44) | (1.24) | (1.90) * | | |
| BHAR – EW | -0.829 | 0.834 | 0.131 | -0.203 | 0.129 | 0.210 | 355 | 1.70 |
| | (-1.05) | (1.06) | (0.37) | (-0.22) | (1.32) | (2.11) ** | | |

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.