Managing Reported Operating Cash Flow: An Empirical Investigation of Fourth Quarter Working Capital Decreases and Benchmark Beating

Abstract

I find non-cash working capital drops significantly in the fourth quarter. This decrease is subsequently reversed in the first quarter of the next fiscal year. This temporary decrease in fourth quarter non-cash working capital remains significant after controlling for seasonal variation in the firm's activity level as proxied by quarterly contemporaneous/lead/lag sales and net income. Consistent with capital market incentives to manage reported cash flows, I find firms attempt to beat benchmarks based on operating cash flow levels, changes, and forecast errors. Examining contracting incentives, I find that firms mentioning working-capital-related compensation targets have larger fourth quarter working capital declines, but these declines are not more likely to reverse.

1. Introduction

An adage is often heard from analysts and seen in the financial press: "Earnings is an opinion; cash is a fact."[1] However, operating cash flow is not necessarily free from manipulation (e.g., Mulford and Comiskey, 2002 and Richardson, et al. 2001). In this paper, I investigate whether firms attempt to increase current reported annual operating cash flow via temporary reductions in fourth quarter non-cash working capital. To support the proposition that firms manage fourth quarter non-cash working capital, I provide evidence that working capital changes (adjusted for sales and income seasonality) are significantly negative in the fourth quarter and significantly positive in the first quarter. To provide evidence that managers have capital market and contracting incentives to manage non-cash working capital and/or reported operating cash flows, I examine the operating cash flow distribution for discontinuities and compare firms that mention working-capital-based compensation targets (e.g., operating cash flow and inventory turnover) in their proxies to those that do not.

Working capital is a component of the invested capital (e.g., Copeland et al., 1994). Therefore, excess holdings of working capital reduce returns on a firm's invested capital—destroying shareholder value. Horngren et al., 2002, succinctly state the reason for eliminating excess working capital. "Each dollar not invested in working capital is a dollar of free cash available for investing in value-adding activities." (p. 147). In pointing to the association between working capital and 'free cash' Horngren et al. imply an important relation: the connection between working capital changes and cash flow. Holding net income constant,

[1] See, for example, Hanke (2004), Glassman (2003), Wallison (2003), and Hopkins (1998). Wild et al. (2001, p. 532) provides a more subtle view. "Accounting accruals determining net income rely on estimates, deferrals, allocations, and valuations. These factors allow more subjectivity than do the determination of cash flows. For this reason we often relate cash flows from operations to net income in assessing its quality."

increases in non-cash working capital lead to lower cash flow from operations. Thus, the maximization of operating cash flow is inextricably linked to the minimization of non-cash working capital. Put another way, firms seeking to increase cash flow inevitably confront the need to revaluate working capital management policies.

Working capital levels are related to operational efficiency. The internet boom of the late 1990's highlighted the need for working capital management as companies sought to establish 'virtual networks' with customers and suppliers to cut inventories, product delivery times, and working capital requirements (Byrnes and Judge, 1999). While internet-centered companies like Dell and Amazon became well known for their efficient management of working capital (e.g., Byrne, 2000), food and beverage companies like Anheuser-Busch and Dean Foods also have negative cash collection cycles. Cash collection cycle is defined as average day's sales in receivables + average day's sales in inventory – average day's sales in payables.

However, managers' ability to manipulate reported working capital is widely acknowledged. For example, according to Stickney and Weil (2003 p. 269), "…management can manipulate the current ratio (i.e., current assets/current liabilities). It can take deliberate steps to produce a financial statement that presents a better current ratio at the balance sheet date than the average, or normal, current ratio."[2] To take one example, managers can allow inventory to fall below optimal levels prescribed by inventory holdings costs and anticipated demand. Managers can forgo cash discounts, allowing the accounts payable balance to increase at year end. According to Robert S. Jaffe, head treasury consultant for Goldstein Golub Kessler & Co., New York, "[S]ome financial managers still deliberately sacrifice discounts to keep a little more

[2] See also, Pratt (2000 p. 235). "…it is clear that managers have discretion over the accounts in the current section of the balance sheet and thus have some control over measures like working capital, the current ratio, and the quick ratio."

cash on the balance sheet as "window dressing" at the end of the financial reporting period" (Gamble, 1996). Alternatively, managers can select fiscal-period ends that coincide with minimum inventory and accounts receivable levels. Managers can also simply expend more effort to make sales and collect from customers to meet certain period-end targets.[3]

Regardless of the means used, the attention given to working capital as a measure of operating efficiency coupled with managers' capabilities suggest both the means and the motive to reduce reported non-cash working capital balances and increase operating cash flow. The following conference call exchange between Ed Pliner, CFO and senior vice president of Raytheon Company, and George Shapiro of Salomon Smith Barney illustrates both the focus on non-cash working capital performance and cash flows as well as the potential for manipulation of year-end account balances.

> Shapiro: On the cash flow, which was talked about earlier, if you look at the comparison of a lot of the balance sheet items from Q3 to Q4, you had receivables down $58m, CIP up $490m, inventories down $87m, payables up $47m, advances up $30m. How much of this is ongoing improvement versus just fourth quarter balance sheet window dressing?
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> Pliner: I wouldn't classify any of it as window dressing, but I will say that we have, at the end of every month and every quarter, a focus on getting your billed receivables collected and getting your unbilled billed. That's happened in the past and that will continue. What was very pleasing to me is that in past years when we've overdriven our 4Q cash performance, our businesses have basically dollar for dollar backed off their next year cash forecast, and that hasn't happened at all this year. So, *there's certainly a timing aspect to it. There's no question about that.* I don't think this was an unusual quarter in terms of getting unusual acceleration. So, I wouldn't characterize it as unusual or window dressing. [emphasis added] (FD Wire, 2004)

Though Pliner does not accept Shapiro's characterization of Raytheon's activities as 'window dressing," Pliner does acknowledge a recurring focus on end-of-period accounts receivable

[3] Oyer, 1998, provides evidence that managers adjust their effort and manipulate the timing of sales to reach quotas thus accentuating fiscal-year seasonality. After controlling for seasonality, he finds firms' sales tend to be higher at the end of the year and lower at the beginning of the year than they are in the middle.

balances and says that the resulting increase in fourth quarter cash flow is usually reversed. Assuming that managers, compensation committees, investors, and/or analysts emphasize *fiscal-year-end* account balances in their assessments of operating efficiency and financial strength, this behavior should be most pronounced in the fourth quarter.

Methodology Non-cash working capital is mechanically linked to operating cash flow. Holding net income constant, higher non-cash working capital implies lower operating cash flows. This link means that abnormal changes in operating cash flow can be measured by deviations of non-cash working capital from predicted values. My approach contrasts with the technique used in the earnings-management literature (e.g., Jones, 1991) whereby accruals are directly modeled and differences between actual accruals and predicted accruals proxy for discretionary accruals. Rather than modeling cash flows directly to provide a proxy for abnormal operating cash flows, I use the intuition that working capital levels are related to prior and anticipated activity levels to model changes in non-cash working capital.

To analyze fourth quarter working capital management behavior, I compute quarterly changes in non-cash working capital. Next, I regress these changes on current, lagged, and future changes in sales and net income. I include variables indicating when a firm quarter is the first quarter or the fourth quarter. Temporary reductions in working capital imply that (1) the fourth-quarter-indicator variable will be significantly negative as firms cut working capital in the fourth quarter and (2) the first-quarter-indicator variable will be significantly positive as these cuts reverse in the first quarter.

I provide evidence of incentives to manipulate operating cash flows in two ways. First, I examine the frequency distributions for operating cash flow levels, changes, and analyst forecast errors for significant discontinuities around zero. Second, I search proxy statements for evidence

that non-cash-working-capital-related targets are used to determine executive pay. I then compare the quarterly variation in working capital of these firms to the general population.

Results Controlling for quarterly changes in sales and net income in cross-sectional regressions, I find firms significantly reduce working capital between the third fiscal quarter and the fourth fiscal quarter. Moreover, firms significantly increase working capital between the fourth quarter and the first quarter. Next, I analyze annual operating cash flow benchmarks for evidence that firms strive for positive operating cash flow levels, changes, and forecast errors. The data suggest a tendency by firms to avoid reporting negative operating cash flow levels, changes, and forecast errors. Given these results I examine whether discontinuities around zero operating cash flows are most pronounced for firms with a high risk of bankruptcy. I find weak evidence for this conjecture. This result suggests that benchmark beating behavior is related to incentives to manage operating cash flows.

Finally, I study the relation between quarterly non-cash working capital management and the existence of working-capital-related compensation targets. I first search proxy statements between 1993 and 2002 for phrases suggesting the board of directors considers operating-cash-flow and/or working-capital measures when it determines executive compensation. I create a firm-specific indicator variable equal to one for such firms and zero for other firms. I find the reduction in fourth quarter working capital is significantly larger for firms that use working-capital-related compensation targets. However, the first quarter reversal is not significantly larger for these firms. Viewing these compensation targets as exogenous, these results suggest that managers with working-capital incentives take additional steps to reduce year-end working capital, but that these actions do not immediately reverse as would be expected if these actions

were merely manipulative. In short, I find evidence that compensation contracts are related to reduction in working capital but not manipulation of working capital.

Contribution to the literature. While academics and practitioners view operating cash flow as an important performance measure, little evidence has been provided on the extent to which operating cash flow is managed by managers. Taken together, the results in this paper suggest three conclusions. First, temporary reductions in fourth-quarter working capital and firms' benchmark beating actions are consistent with managers having a capital market incentive to manage reported operating cash flow. Second, an examination of proxy statements for compensation benchmarks suggests some managers have a contracting incentive to reduce working capital. However, these incentives appear to promote working capital minimization rather than manipulation. Finally, my results suggest that either managers actively attempt to reduce working capital in the fourth quarter to improve annual cash flow performance or that managers time their fiscal-year end, in part, to minimize working capital reported on the annual balance sheet.[4] Regardless of the means by which fourth-quarter non-cash working capital is reduced, the results support the contention that managers place added emphasis on minimizing non-cash working capital in the fourth quarter compared to other quarters. Therefore investors relying solely on year-end working capital as a proxy for a firm's non-cash working capital requirements will tend to understate average working capital requirements.

[4] Research on factors driving fiscal-year-end choice is sparse. Smith and Pourciau, 1988, compare the characteristics of December and non-December year-end companies. They find non-December year-end firms are smaller, have higher betas, and are more likely to be in the retail industry. Huberman and Kandel, 1989, confirm the size and industry affects. These papers offer no explanation for these systematic differences. However, Huberman and Kandel, 1989, note that firms have an incentive to deviate from December fiscal-year ends to reduce costs arising from concentrated demand for the services of auditors and accountants. Foster, 1986, provides evidence on international variation in fiscal-year-end choice.

The remainder of the paper is organized as follows. In section 2, I develop the hypotheses. Section 3 describes the data and presents descriptive statistics. Section 4, contains the results of the empirical tests, and section 5 concludes.

2. Hypotheses

Extensive research examines manipulation of earnings using accruals (e.g., DeFond and Jiambalvo, 1994, McNichols and Wilson, 1988, Jones, 1991, and Healy, 1985) and real activities (e.g., Roychowdhury, 2004, Bushee, 1998, Baber et al., 1991). Work on manipulation of measures that do not necessarily affect earnings has been more limited. Gramlich et al., 2001, examine managers' decision to classify certain short-term obligations as either long-term or short-term debt, and find that managers tend to move current ratios to industry averages and prior year ratios. I extend this research on financial statement management by investigating quarterly working capital levels and thus operating cash flow management. Unlike prior literature on manipulation of earnings (e.g., Jones, 1991), my analysis is conditional on the change in net income. That is, I focus on managers' actions that increase the cash flow component of net income without affecting total net income. Moreover, I do not model operating cash flow directly. Instead, relying on (1) the mechanical relation between changes in non-cash working capital and operating cash flow and (2) the intuitive relation between non-cash working capital and the firm's activity level, I model changes in non-cash working capital. Abnormal changes in non-cash working capital imply abnormal changes in operating cash flow.

This research is motivated by two premises. The first is that non-cash working capital levels and/or operating cash flows are used to measure performance. The second is that managers place additional weight on fiscal-year performance.

The first premise follows from the observation that working capital represents an investment and if this investment does not earn the required cost of capital managers are

destroying firm value. Moreover, non-cash working capital levels are directly linked to the effectiveness of a firm's operations management. For example, working capital requirements will generally be higher if the company cannot efficiently deliver its products to its customers and efficiently acquire materials from suppliers. An example is provided by a statement by Anne Mulcahy, CEO of Xerox, "..we are absolutely focused on making sure in areas of supply chain and manufacturing efficiencies that we stay ahead of that curve. Of course, making sure that we never lose sight of the foundation of our business which is all about strong operating cash flow." (FD Wire, 2003) In addition to its use as a measure of current operational savvy, analysts use working capital as a predictor of future profitability.[5] In sum, if management has an incentive to maximize firm value, it will have an incentive to eliminate excess working capital. Anecdotal evidence suggests managers and investors focus on cash flow and working capital.

As for the second premise, I argue we have reason to believe that managers emphasize fiscal-year performance.[6] Jacob and Jorgensen (2003) compute annual earnings changes and levels using twelve month periods that differ from those chosen by the firm for its fiscal year. Unlike Burgstahler and Dichev (1997), they can find no discontinuities in these distributions and conclude earnings management is more pronounced in fiscal-year earnings. Das and Shroff (2002) find fourth quarter earnings reversals are related to annual earnings management.[7] Descriptions of executive compensation plans suggest that pay is more likely to be a function of annual performance rather than performance in any given quarter.[8] The financial statement data

[5] For example, according to Tergesen (2002), "Management has an incentive to make its operating cash flow look good: Wall Street pays a premium for the stocks of companies whose core businesses generate prodigious amounts of cash." See also Pulliam (2004).

[6] See also Green (1964), "Considered in the large, it appears that business and economic affairs are organized on the basis of an annual planning period." (p. 36)

[7] Similarly, Ronen and Givoly, 1981, find evidence that mangers make adjustments in the fourth quarter to reduce variation in annual earnings.

[8] See Holthausen et al., 1995, for a discussion of executive bonus plans.

provided on Yahoo Finance and in Standard & Poor's and Value Line stock reports is almost exclusively annual financial data. Similarly, the examples and problems presented in widely used financial statement analysis texts such as Penman, 2001, Palepu et al., 2000, and White et al., 2003, are rarely based on quarterly analysis. I do not offer these examples as proof that managers are more concerned with year-end balances. Instead, I cite them to make plausible the prejudice that annual numbers are emphasized.[9]

A recent study by REL Consultancy Group (Reason, 2004) provides descriptive evidence that firms reduce non-cash working capital in the fourth fiscal quarter and increase non-cash working capital in the first fiscal quarter. However, the study provides no significance tests. Nor does it attempt to control for other factors associated with seasonality in working capital. I extend this study by controlling for seasonality in sales and income.

Managers will have a greater incentive to report lower non-cash working capital in the fourth quarter, if high non-cash working capital indicates poor operating performance and managers believe that investors and/or compensation committees focus on annual performance measures and benchmarks.[10] An important question is whether managers maximize their pay by temporarily reducing fourth quarter working capital. After all, such actions would seem to ratchet-up the benchmark, reducing compensation in future periods. However, if, to take one case, compensation contracts are linear in cash flow, managers reducing working capital in the current period will increase the present value of their compensation by shifting pay from future

[9] Note that this discussion focuses on compensation rather that debt contracts. My review of debt contracts provided in exhibits to financial statements suggests that a fiscal-year-end focus on operating cash flow is unlikely to be driven by debt covenants. I could not find a revolving credit agreement or private debt contract employing a cash-flow-based-covenant target that did not measure the target over a rolling four quarter period. Thus, from the point of view of these contracts, each quarter end is equal.

[10] Managers' beliefs on this matter can be incorrect if the costs associated with such a misconception are minimal. As Miller (1977 p. 273) notes, "Neutral mutations that serve no function, but do no harm, can persist indefinitely."

periods into the current period. Moreover, a possibility exists that the managers will not be employed by their current firm in future periods. Alternatively, if managers are given a year-end working capital-based target that they must meet, but which does not ratchet-up over time, temporarily reducing working capital to meet this target provides a way for them to maximize their pay.

A deeper question is how these wealth transfers between managers and owners (or other parties) can exist in equilibrium. If owners compensate managers for actions that do not increase firm value, managers benefit at the expense of owners. Rational owners anticipate this behavior and make the appropriate adjustments when they determine managers' compensation. Managers may even take steps to ensure that "window dressing" will not occur if it has costs, because in the end, such costs reduce organization efficiency and management compensation.

Two answers can be given to this question. The first is that incomplete contracts and transaction costs prevent all window dressing from being eliminated even when contracting parties are fully rational and seek to optimize organization efficiency. The second answer, which comes from the 'opportunistic behavior perspective' (Holthausen, 1990), holds that parties take existing contracts as given and do not explicitly consider future periods.

A temporary reduction in non-cash working capital implies that a working capital reduction in the current quarter will tend to reverse in subsequent quarters. Therefore my first two hypotheses stated in alternative form are as follows:

H1a: Non-cash working capital decreases significantly between the third and fourth fiscal quarters.

H1b: Non-cash working capital increases significantly between the fourth and first fiscal quarters.

An alternative means of measuring whether managers are concerned with reported operating cash flow performance is to examine whether managers manage operating cash flow to attain benchmarks. Managers will attempt to meet operating cash flow benchmarks if information processing costs lead these benchmarks to influence the terms of trade between a firm and its stakeholders. For example, suppliers are less willing to extend credit to firms with negative operating cash flows. Thus, the test of benchmark beating behavior on the part of firms is a joint test of management of reported operating cash flows and the importance of cash flow benchmarks. Three possible benchmarks are positive operating cash flow levels, positive operating cash flow changes, and positive operating cash flow forecast errors. I look for discontinuities in the distributions of these measures to determine whether the data provide evidence that firms attempt to beat these benchmarks. My second hypothesis stated in alternative form is as follows:

H2: Firms attempt to exceed operating cash flow thresholds.

Finally, I explore the compensation motive for manipulating operating cash flow. In some firms, management compensation is more strongly related to changes in annual non-cash working capital. For example, the compensation committee of General Electric rewards the company's CEO, Jeffery Immelt, on the basis of operating cash flow and stock returns relative the Standard & Poor's 500 index.[11] Under these conditions, the manager has an incentive to reduce non-cash working capital in the fourth quarter. Such a reduction in working capital will

[11] From the General Electric March 2004 proxy: "Each of the 125,000 performance share units linked to operating cash flow growth will entitle Mr. Immelt to receive one share of GE stock from the company in 2008 if GE's operating cash flow, adjusted to exclude the effect of unusual events, increases an average of 10% or more per year during the five-year period from 2003 through 2007. These performance share units will be cancelled if GE's operating cash flow growth fails to achieve the specified growth rate…Linking 50% of Mr. Immelt's 2003 equity award directly to the company's cash generation performance underscores GE's commitment to strong operating discipline, our triple-A rating and the GE dividend. The remaining 50% of the equity award is based solely on successfully delivering to GE's shareholders total returns equal to or better than the broader market."

lead to higher operating cash flows and higher current pay. Therefore, my third hypothesis stated in alternative form is as follows:

> **H3:** Temporary reductions in fourth-quarter non-cash working capital will be more pronounced for firms using non-cash working capital related targets to determine their managers' compensation.

3. Data and Results

Data

I begin with all firm quarters in COMPUSTAT between 1990 and 2003 with sufficient data to compute working capital. Two measures of working capital are used. The first, accounts receivable plus inventory minus accounts payable (*WC1*), corresponds to the measure used by the REL study (Reason, 2004).[12] The intuition behind this more narrow measure of working capital is that managers concentrate specifically on minimizing the cash collection cycle (i.e., average days receivables + average days inventory – average days payable).

I also use a broader measure of working capital to provide a proxy for the firm's investment in noninterest-bearing assets net of noninterest-bearing liabilities (*WC2*). The rationale behind this broader measure of working capital is that managers attempting to convince investors that they are maximizing value creation seek to minimize "excess" reported invested capital and maximize operating cash flow.[13] The second measure of working capital is current assets – cash – current liabilities + current portion of long-term debt.[14] This measure is similar to the working capital measure used by Sloan (1996) to compute accruals. However, unlike Sloan

[12] Compustat quarterly data37+data38-data46.
[13] Excess invested capital can be defined as invested capital that does not earn the required rate of return.
[14] Compustat quarterly data40-data36-data49+data45.

my measure is not pretax. Therefore, I do not subtract taxes payable which represent a form of noninterest-bearing debt.[15]

Working capital varies throughout the fiscal year with the operating activity of the firm. For example, firms that have sales concentrated in the fourth quarter are likely to show increased inventory levels at the end of the third quarter and decreased inventories at the end of the fourth quarter. Holding all else constant, these inventory changes imply increases in working capital from the end of the second quarter to the end of the third quarter and decreases in inventory from the end of the third quarter to the end of the fourth quarter. Therefore, I include variables for lagged changes in sales and net income.

The link between income levels and activities that precipitate working capital changes is less clear. However, I include net income for two reasons. First, a direct connection between operating cash flow and non-cash working capital changes is conditional on net income. Second, my purpose in modeling working capital changes is to exclude a broad range of plausible seasonal effects. Adding superfluous variables reduces the power of tests and biases against finding 'abnormal' first and fourth quarter effects.

Descriptive statistics

Table 1 presents descriptive statistics for working capital changes, sales changes, and income changes broken out by quarter. I hypothesize that working capital decreases in the fourth quarter and increases in the first quarter. Changes in both working capital measures support this hypothesis. Recall that the change working capital is expected to be lower than average in quarter 4 and higher than average in quarter 1. Table 1, panel A, shows mean and median $\Delta WC1$

[15] Cash, to the extent that it does not earn a sufficient risk-adjusted return, should be included as a noninterest-bearing asset (Copeland, 1994, Bamoul, 1952). Determining this balance is complicated by the fact the Compustat data item #36 lumps together cash and short-term (i.e., interest bearing) investments. Given the problem of

are lower in the fourth quarter compared to quarters two and three and higher in the first quarter compared to quarters two and three. The same can be said for the mean and median of *ΔWC2*

Panel A of Table 1 provides evidence for seasonality of sales. Sales tend to grow more rapidly in the fourth quarter than in the first quarter. Sales growth in the fourth quarter is similar to sales growth in the second and third quarters.[16] Profitability is also seasonal but its pattern differs from sales. Interestingly, firms' profits grow most in the first quarter and tend to shrink in the fourth quarter. Untabulated results show a similar pattern for operating income (Compustat quarterly data21), suggesting that the fourth quarter reduction in profitability is not solely due to negative special items in the fourth quarter (Francis et al., 1996).

Results in panel B of Table 1 compare the seasonality of sales and working capital changes across industries. Mean and median fourth quarter non-cash working capital changes are negative in 12 (14) of 15 industries when *WC1* (*WC2*) is used to measure non-cash working capital. Sales growth also exhibits a strong seasonal pattern. Mean (median) sales growth is negative in the first quarter in 12 (10) of 15 industries. When measured as the difference between fourth quarter and first quarter sales growth, quarterly sales seasonality is strongest in the retail industry (Ind_12). In the retail industry, mean (median) sales growth in the fourth quarter exceeds mean (median) sales growth in the first quarter by 6.1% (3.1%) of total assets. This first quarter/fourth quarter difference is larger in the retail industry than any other industry. This result is expected given a large fraction of retail sales occur during the Christmas season. In sum, the results in Table 1 suggest that working capital levels vary throughout the year as expected. However, activity level as measured by sales also shows a consistent seasonal pattern.

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measuring this portion of the cash balance and our interest in a measure of working capital that is linked to cash flow from operations, I subtract the entire cash balance.

[16] Untabulated sales turnover results (i.e., $Sales_q/Assets_{q-1}$) also show turnovers in the fourth quarter are similar to those in the second and third quarters and that turnovers are slightly lower in the first quarter.

Thus, I control for changes in seasonal activity level when attempting to measure unexpected working capital variation in the first and fourth fiscal quarters.

Working capital changes regression

To measure changes in working capital in the fourth quarter unrelated to seasonal variation in firm activity level, I estimate the following equation in annual, cross-sectional regressions:

$$\begin{aligned}\Delta WC_q = \quad & \alpha + \beta_1 \Delta SALES_{q-2} + \beta_2 \Delta SALES_{q-1} + \beta_3 \Delta SALES_q + \beta_4 \Delta SALES_{q+1} \\ & + \beta_5 \Delta SALES_{q+2} + \beta_6 \Delta NI_{q-2} + \beta_7 \Delta NI_{q-1} + \beta_8 \Delta NI_q + \beta_9 \Delta NI_{q+1} + \beta_{10} \Delta NI_{q+2} \\ & + \beta_{11} NI_q + \beta_{12} Q4_q + \beta_{13} Q1_q + \varepsilon_q, \end{aligned} \quad (1)$$

where

ΔWC_q is the change in working capital between quarter q-1 and quarter q divided by total assets in quarter q-1,

$\Delta SALES_q$ is the change in sales (data2) between quarter q-1 and quarter q divided by total assets in quarter q-1,

ΔNI_q is the change in net income (data69) between quarter q-1 and quarter q divided by total assets in quarter q-1,

$Q4_q$ is an indicator variable equal to 1 when the quarter is the 4th fiscal quarter and zero otherwise,

$Q1_q$ is an indicator variable equal to 1 when the quarter is the 1st fiscal quarter and zero otherwise.

Both leads and lags of sales are included because working capital can vary as a result of past changes in activity level or in anticipation of future changes in activity level. Each observation is a firm-quarter. Regressions are run across firms by year.

Table 2 presents time-series mean coefficients and t-statistics (Fama and MacBeth, 1973) from 14 cross-sectional regressions between 1990 and 2003. The dummy variable indicating a quarter is the fourth quarter is significantly negative and the dummy variable indicating a quarter is the first quarter is significantly positive. These results indicate that even after controlling for seasonal variation in activity levels, working capital declines in the fourth quarter and a portion

of these reductions are reversed in the first quarter. In sum, the results in Table 2 lead me to reject H1.

Table 2 also shows a strong relation between working capital changes and lead/contemporaneous/lag activity levels. Sales changes are positively associated with working capital changes in the current quarter regardless of whether the sales changes occur in the current, prior, or subsequent quarter. An interesting result, perhaps expected, is that the current quarter working capital change is positively related to future sales. The coefficients on $\Delta SALES_{q+1}$ and $\Delta SALES_{q+2}$ are significantly positive in both models. Thus, seasonal variation in working capital is, at least in this respect, consistent with what one might expect from value optimizing managers. Such managers increase inventories in the current quarter in anticipation of sales in future quarters. Positive coefficients on all leads and lags of sales changes are consistent with the intuition that growing firms have increasing working capital. Interestingly, the coefficient on sales changes is higher when *ΔWC1* is the dependent variable than when *ΔWC2* is the dependent variable. This result suggests that a buildup in inventory and accounts receivable is more strongly related to changes in activity level than other current assets such as prepaid expenses.

Using the coefficients produced by these regressions and the inter-quartile range of sales changes in Table 1, we can compare the economic magnitude of the "fourth-quarter effect" on non-cash working capital to the effects of sales variation on non-cash working capital. We use the inter-quartile range in fourth-quarter sales (i.e., 0.048) as a measure of the difference between a fast growing firm and a slow growing firm. The coefficient on current-quarter sales in the *ΔWC1* regression is 0.222. Thus a fast growing firm can be expected to increase working capital by 1 percent of assets (0.048*0.222) more than a slow growing firm in the fourth quarter.

Holding activity level constant non-cash working capital is expected to decline 0.4 percent of assets in the fourth quarter. Thus the "fourth-quarter effect" is a less than half the effect of current sales on non-cash working capital changes. However, in the *ΔWC2* regression the coefficient on current sales is 0.118 and the coefficient on the fourth quarter indicator variable is 0.009. Therefore, when non-cash working capital is more broadly defined, the fourth-quarter effect on non-cash working capital (0.9 percent of assets) exceeds the effect of current sales (0.6 percent of assets). In sum, the unexpected decline in fourth quarter non-cash working capital is economically significant.

In contrast to sales changes, the sign of the association between net income changes and working capital changes is negative in lead quarters suggesting that increases in working capital in the current quarter are associated with future profitability declines. Working capital increases are positively correlated with accruals. Thus, this result is consistent with Sloan (1996) who finds that the profitability of high accrual firms reverts more quickly than that of low accrual (i.e., high cash flow) firms.

Working capital changes regression—Robustness checks

I assess the robustness of the results in Table 2 in five ways. First, I check for industry effects. Second, I decompose non cash working capital change into its components. Third, I re-estimate model (1) excluding firms-years where the variation in fourth quarter net income is large relative to the first three quarters. Fourth, I re-estimate model (1) excluding December year-end firms. Finally, I re-estimate model (1) excluding firms that changed the fiscal-year-end month between 1990 and 2003.

Industry membership To understand the effects of industry membership, I rerun the results excluding firms in the retail, wholesale, and restaurant industries (Ind_12). Sales for these firms show a strong seasonal pattern increasing the potential for a bias from correlated

omitted variables. For example, large gift sales in December followed by large gift returns in January could create fourth quarter inventory declines followed by first quarter inventory increases. However, after deleting Ind_12 firms the results are similar those in Table 2 suggesting that retailers are not a determinative factor.

As a further test for industry effects, I re-estimate the model shown in equation (1) each year by industry. This procedure produces industry-specific estimates of sales and net income seasonality allowing for potentially better measurement of 'abnormal' variation in first and fourth quarter non cash working capital. The cost of this approach is that the number of observations in each regression is reduced substantially. This reduction is most problematic in agricultural and forest products (Ind_1) where the number of observations is less than 100 per regression. Table 3 panel A displays the time-series means of the coefficients on $Q1_q$ and $Q4_q$. Results more strongly support rejection of H1 when the model uses the broad measure of working capital, *WC2*, as the dependent variable. The coefficients on $Q1_q$ and $Q4_q$ are the expected sign in 14 of 15 industries and are both significantly different from zero at the 1% level in 11 industries. The results weaken when I re-estimate the model using the narrow measure of non cash working capital (i.e., accounts receivable + inventory – accounts payable). In this case, the coefficients on $Q1_q$ and $Q4_q$ are the expected sign in 8 of 15 industries and are both significantly different from zero at the 1% level in 2 industries.

To assess the overall significance of these industry-based coefficient estimates, I estimate the model by year within each industry and then take the average coefficient across industries each year. Next I compute the time-series means of these yearly cross-industry averages.[17]

[17] To control for dependence across observations, I use this procedure rather than simply taking the average of the time-series means shown in Table 3 panel A. The time-series means in Panel A are most likely correlated because they are computed from contemporaneous time periods and the standard error of their average would be therefore be biased.

Table 3 panel B shows the values of these coefficient averages. The overall averages substantiate the intuition provided by Panel A. $Q1_q$ and $Q4_q$ have coefficients that are significantly different from zero at the 1% level when the model includes $\Delta WC2$ as the dependent variable. In the $\Delta WC1$ model, the average $Q4_q$ coefficient is significantly different from zero, but the average $Q1_q$ coefficient has a t-statistic of 1.50, which is only significant in a one-tailed test at the 10% level.

Working capital components Decomposing the change in non-cash working capital into its components allows us to isolate the source of the discrepancy between the results produced by the two non-cash working-capital-change measures. The last five columns of Table 3 panel B display time-series means of coefficients from regressions using the change in the following working-capital components as independent variables: Accounts Receivable, Inventory, other non-cash Current Assets, Accounts Payable, and other current liabilities (excluding the current portion of long-term debt). Note that the expected sign for the coefficients on $Q1_q$ and $Q4_q$ differs depending on whether assets or liabilities are used as the dependent variable because current asset increases increase working capital while increases in liabilities decrease working capital. For example, according to H1, Accounts Payable (Accounts Receivable) is expected to increase (decrease) in Q4 and decrease (increase) in Q1. As shown in Table 3 panel B, the coefficients on each of these components are significant in the expected direction except for those in the accounts payable change regression (ΔAP_q). The coefficient on $Q4_q$ in this regression is negative suggesting managers accelerate payment of accounts payable at the end of the fourth quarter. In contrast, the coefficients on $Q4_q$ in the other models suggest other current liabilities grow significantly in the fourth quarter, while inventory, receivables, and other non-

cash current assets decline. The narrow measure of working capital is more sensitive to this accounts payable effect than the more broad-based measure.

Fourth quarter Net Income Variation Variation in fourth quarter income may be much larger than in other quarters. However, the coefficient on NI_q, is constrained to be constant across quarters. Therefore, the inclusion of NI_q in the regression may not provide adequate control in cross-quarter comparisons. To better control the effects of quarterly income variation, I begin by computing the ratio of fourth quarter income to annual net income, *4qNI_ratio*. If fourth quarter income is similar to that in other quarters the ratio should be equal to 0.25. For my sample, the median *4qNI_ratio* is 0.28. However, the mean is 89,009, because of extreme outliers. This ratio will tend to be large when annual earnings are positive (negative) and the quarter earnings are a large portion of this positive (negative) amount. To understand the sensitivity of my main affects to situations where fourth quarter income variation is large compared to the first three quarters, I delete the 10% of the observations with the highest *4qNI_ratio* and rerun the regression in Table 2. The $Q4_q$ and $Q1_q$ coefficients and their significance are qualitatively similar to that shown in table 2. However, the coefficient on NI_q in the *ΔWC1* regression more than doubles as does its significance. In addition, in both regressions the R-square increases to just over 0.20. These results suggest that the model does a better job explaining quarter changes in working capital when the variation in fourth quarter income relative to the other quarters is reduced, but that abnormal variation in 1st quarter and 4th quarter working capital remains.

December year-end firms To check for additional potentially confounding effects related to seasonality, I rerun the regressions in Table 2 after eliminating all December year-end

firms. The sample size is reduced by 60 percent. However, again the results are similar to those displayed in Table 2.[18]

Fiscal year end changes Managers can minimize reported non cash working capital at the fiscal-year end, by choosing a fiscal-year end that coincides with the low non-cash working capital levels. To estimate how managements' fiscal-year-end choice contributes to the abnormal variation in working capital around fiscal-year end, I re-estimate the regression in Table 2 after eliminating all firms that changed their fiscal-year-end month between 1990 and 2002. Out of 18,883 available firm observations during this period 1,448 or approximately 7.7 percent display changes in fiscal year month between 1990 and 2002. After these firms are removed, the results are similar to those displayed in Table 2. This test does not rule out the possibility that firms initially set their fiscal to minimize non-cash working capital, but it suggests that abnormal changes in non cash working capital documented in Table 2 do not result from firms *changing* their fiscal-year ends.

Working capital changes and operating cash flow benchmarks

In this subsection I investigate whether firms attempt to meet annual operating cash flow performance benchmarks. Using Compustat Annual data between 1990 and 2002 I compute three measures of operating cash flow performance: (1) the level of annual operating cash flows divided by lagged total assets and (2) the change in annual operating cash flow divided by lagged total assets, and (3) analyst cash flow forecast errors. The third measure of operating cash flow performance uses forecasts of operating cash flows collected from I/B/E/S. This sample is far smaller than the samples formed using measures (1) and (2). The I/B/E/S-based sample contains

[18] As an additional robustness check, I re-estimate model (1) using operating income (Compustat quarterly data21) instead of net income under the assumption that operating income provides better control for firms' seasonal activity variation. Again the results are qualitatively similar.

1,305 observations, while the Compustat-based samples contain over 80,000 observations. Table 4 presents descriptive statistics for these measures. The average of the operating cash flow (OCF_t) distribution is negative during this period. However, the positive median indicates cash flow from operations is positive for most firm-year observations. The negative mean is driven by large negative operating cash flows in some firm-year observations. The change in cash flow measure (ΔOCF_t) is centered at 0.6 percent of total assets showing evidence that the approximately half the firm years during this period were characterized by an increase in cash flow. The cash flow level measure is centered at 5.6 percent of total assets. On average analyst forecasts of operating cash flow are optimistic. The average forecast is too high by 8.2 cents. However, this average optimism is driven by large negative forecast errors. The median forecast error is zero.

To provide a picture of whether annual operating cash flow levels, changes, and forecasts act as performance benchmarks, I plot a portion of the frequency distributions of each measure in Figures 1, 2, and 3. Each bar in figures 1 and 2 represents the percentage of the observations in a given interval with a width of 0.5 percent of total assets. Each bar in figure 3 represents the percentage of observations in a $0.01 interval. Figure 1 shows a clear break in the operating cash flow level distribution at the 0.0 to 0.5 percent interval. 17 percent more firms-year observations appear in this interval compared to what would be expected by taking the average of the two neighboring intervals. The Burgstahler and Dichev (1997) test statistic for this unexpected difference is 4.83. The p-value of this statistic is less than 0.01.

I compute a similar statistic for the results displayed in figure 2. In this case the increased number of firms in the 0.000 to 0.005 is not as obvious because the distribution of operating cash flow changes is centered on zero. Using the frequencies in the neighboring

intervals as a proxy for the expected frequency, I find that the number of firm-year observations in the 0.000 to 0.005 interval is 7.1 percent higher than expected. This unexpected difference is significant with a p-value less than 0.01 (z = 3.16). However, the cash flow change results should be interpreted with caution. Given the cash flow distribution is centered around zero, the test is biased toward finding more observations in the 0.000 to 0.005 interval, because more observations are expected in this interval regardless of whether managers manage operating cash flow changes to achieve benchmarks.

Figure 3 displays the frequency distribution for cash flow forecast errors (per share analyst expectation minus per share actual). In this figure the discontinuity is more pronounced. The frequency of firm years just meeting analyst cash flow expectations is dramatically higher than those just missing. Based on the average of frequencies in the $-0.01 interval and the $0.01 interval, the number of observations in the $0.00 interval is over fourth times the frequency expected for a smooth distribution (z=13.56). These results may not be indicative of manipulation of reported cash flow. Like figure 2, the distribution is centered on zero. Second, because the distribution is computed using analyst forecast errors, the discontinuity could arise because of expectation management instead of management of reporting cash flow.

Overall the evidence suggests that managers attempt to meet operating cash flow benchmarks. The results reinforce the interpretation that temporary fourth quarter decreases in non-cash working capital result because managers are concerned about the reported level of operating cash flows. However, the discontinuities are not as large as those found for earnings levels and changes by Burgstahler and Dichev (1997).

Cross sectional variation in the operating cash flow level discontinuity If manipulating to exceed operating cash flow thresholds is costly, a larger discontinuity would be expected

where the benefit of exceeding the threshold is higher. For example, firms with a high likelihood of bankruptcy may have a stronger incentive to report positive operating cash flows to avoid violating covenants and/or to secure short-term financing. Therefore, I investigate the effects of bankruptcy risk on significance of the discontinuity in the operating cash flow distribution. The results are presented in Table 5.

I use Altman's z-score (Altman, 1983) as a proxy for bankruptcy risk.[19] Z-score from the year prior to the measurement of operating cash flow is used so that manipulation of operating cash flow does not contaminate the measure. A higher z-score indicates a lower risk of bankruptcy. Panel B of Table 5 shows the frequency of observations around the zero operating cash flow interval for each z-score quartile. The discontinuity in the operating cash flow frequency distribution is most pronounced for the low z-score (i.e., highest bankruptcy risk) quartile. In fact, the low z-score quartile is the only quartile where the discontinuity around zero is significant. The [0, 0.005) OCF_t interval contains 19 percent more observations that would be expected based on the average frequency in the two adjacent intervals. The unexpected number of additional observations in this interval is significantly greater than 0 with a p-value less than 0.05 (z=2.20).

Working capital changes and management compensation

In this subsection I analyze the relation between management compensation and quarterly changes in working capital. The analysis seeks to identify a sample of firms whose management compensation is tied to minimization of working capital to determine the effects of compensation incentives on seasonally-adjusted changes in working capital. I isolate these sample firms by searching proxy statements for explicit mention of a link between compensation and operating

[19] For details on the computation of this measure please see Table 5.

cash flow. Proxy statements often contain a description of the performance measures used to determine executive pay. For example, the 14 April 2002 proxy statement of Dial Corporation contains the following statement:

> Dial's Annual Incentive Plan for 2001 focused on important key financial measures and supported Dial's business unit model. Company performance goals in 2001 were based upon revenue, earnings, return on invested capital and cash flow. Business unit performance goals in 2001 were based upon revenue, operating income and inventory turnover. Incentive awards to business unit participants in 2001 were based 40% on company performance and 60% on business unit performance. Employees not dedicated to a particular business unit were measured solely on total company performance measures.

Using the Lexis/Nexis SEC filings data base, I searched proxy statements between 1992 and 2003 for the mention of operating cash flow, inventory turnover, or receivable turnover within the same sentence as performance. Observations matching the search criteria are examined to ensure that the terms are used in a performance measurement context. These steps yield a sample of 505 firm-year observations. Compustat firm identifiers can be found for 473 of these observations. The final sample contains 213 firms. I create an indicator variable (*WCIND*) equal to one for each of these firms and zero for all other Compustat firms.

This method of identifying firms whose managers have a greater incentive to maximize reported cash flow is noisy. First, operating cash flow is often one of among many performance measures. Therefore, in some cases, operating cash flow will not be the most significant driver of compensation. Second, firms are not required to disclose measures that provide the basis for determining compensation. Therefore, this procedure misclassifies firms that use operating cash flow as a performance measure but do not disclose it in their proxy statements. The resulting misclassification of firms adds noise to the indicator variable. This noise reduces the significance of the association between seasonally-adjusted working capital changes and cash-flow-related compensation incentives.

I estimate equation (1) including additional interactive variables for *WCIND* and *Q1* and *Q4*. Regressions are run each year and Table 6 provides time-series means of coefficient estimates. If working capital-based performance targets lead managers to temporarily reduce fourth quarter non-cash working capital, I expect the coefficient on *WCIND x Q4* (*WCIND x Q1*) to be significantly negative (positive). Managers of such firms will have relatively larger fourth quarter reductions in non-cash working capital to maximize current-period compensation, but these temporary reductions will reverse thereby causing larger increases in first quarter non-cash working capital.

The results in Table 6 fail to confirm this temporary reduction hypothesis. Firms whose managers have significantly larger working capital-based performance targets have significantly larger reductions in fourth quarter non-cash working capital than other firms. However, they do not display larger first quarter increases. These results are consistent with working capital incentives leading managers to make extra reductions to working capital in the fourth quarter compared to other firms. But these additional reductions do not appear to be temporary. Thus, the results do not indicate that managers are acting opportunistically to maximize current compensation. Nevertheless, these results provide insight into how managers respond to incentives.

I examine the sensitivity of results in Table 6 to industry factors and working capital levels. Table 1 shows that seasonality of sales is more pronounced in the retail/wholesale industry. Firms in the retail/wholesale industry are also more likely to use working capital based performance measures. In the control sample (i.e., firms that do not mention working capital performance targets in their proxies), 11% of firms are in the retail/wholesale industry, while in the experimental sample nearly 14% of firm are in the retail/wholesale industry. Therefore, I

reestimate the model excluding firms in the retail/wholesale industry. The results are qualitatively similar to those shown in Table 6.

4. Conclusions

I investigate quarterly changes in non-cash working capital to provide evidence on whether managers attempt to reduce non-cash working capital in the fourth quarter. I find that non-cash working capital drops significantly in the fourth quarter. This decrease is subsequently reversed in the first quarter of the fiscal year. Moreover, this temporary decrease in fourth-quarter working capital remains significant after controlling for seasonal variation in the firm's activity level. The belief that managers manage reported operating cash flows is reinforced by another result. The distributions of operating cash flows levels, changes, and forecast errors show statistically significant breaks at zero, indicating that firms work to exceed operating cash flow thresholds. Further tests indicate that the occurrence of reported cash flow management is related to incentives. In particular, the discontinuity in the operating cash flow level distribution is most pronounced for firms near bankruptcy.

Finally I provide evidence that managers respond to working capital performance incentives. Firms that base compensation on working capital measures have larger reductions in fourth non-cash quarter working capital. However, these extra reductions are not reversed in the first quarter, suggesting that managers are not temporarily reducing working capital to maximize current compensation.

This research extends the literature on manipulation of numbers reported in financial statements, which has focused on manipulation of income. Given net income, changes in working capital affect cash flow from operations. Thus, managers' concern about working

capital levels can arise directly because compensation committees and investors emphasize the minimization of non-cash working capital or indirectly if these parties a focus cash flow from operations. I provide evidence consistent with managers striving to improve operating cash flow. These results provide an important counter to the notion that reported earnings can be managed, but cash flows cannot.

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Figure 1
Distribution of Operating Cash Flow *Levels*
This figure displays the percentage of firm-year observations in each 0.005 interval of the ratio of operating cash flow (data308) to lagged total assets (data6). Firm-year observations are included if the necessary data was available on Compustat between 1990 and 2003. The total sample is 99,671. The figure displays the segment of the distribution amounting to 49,366 firm-years. The arrow identifies the first positive interval.

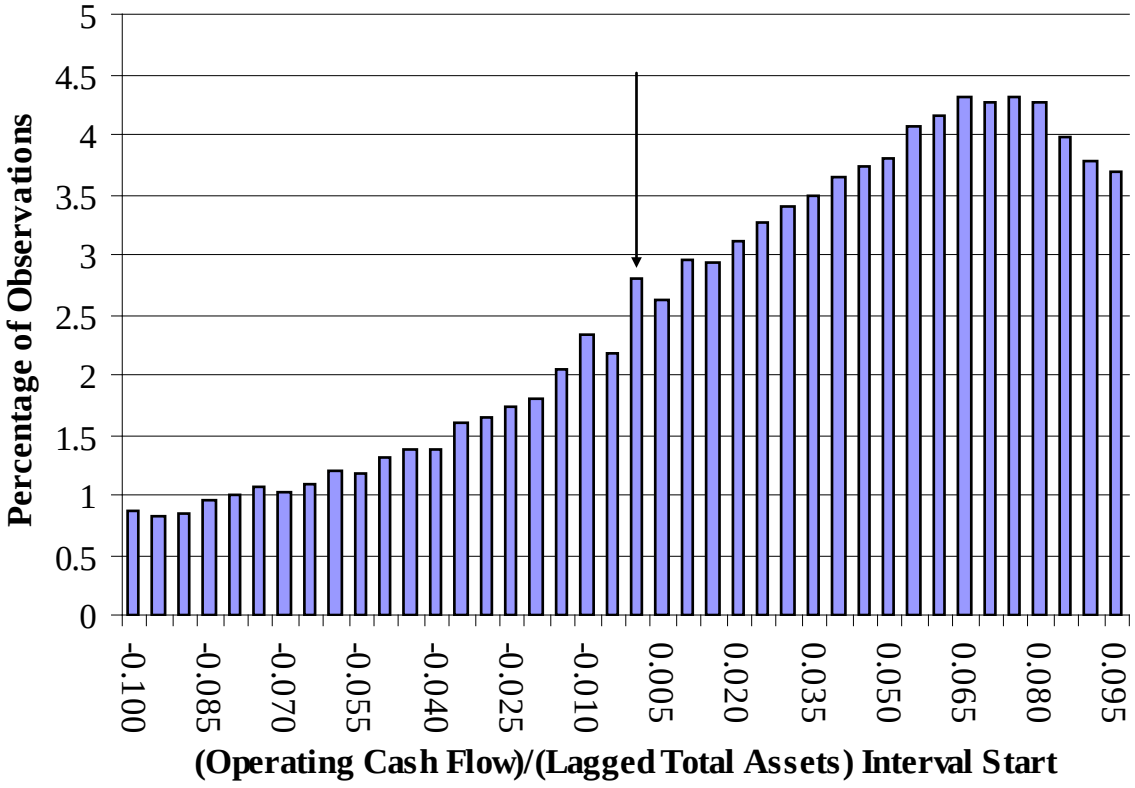

Figure 2
Distribution of Operating Cash Flow *Changes*
This figure displays the percentage of firm-year observations in each 0.005 interval of the ratio of operating cash flow change (data308 – lagged data308) to assets at the end of period t-2 (data6). Firm-year observations are included if the necessary data was available on Compustat between 1990 and 2003. The total sample is 98,534. The figure displays the segment of the distribution amounting to 66,605 firm-years. The arrow identifies the first positive interval.

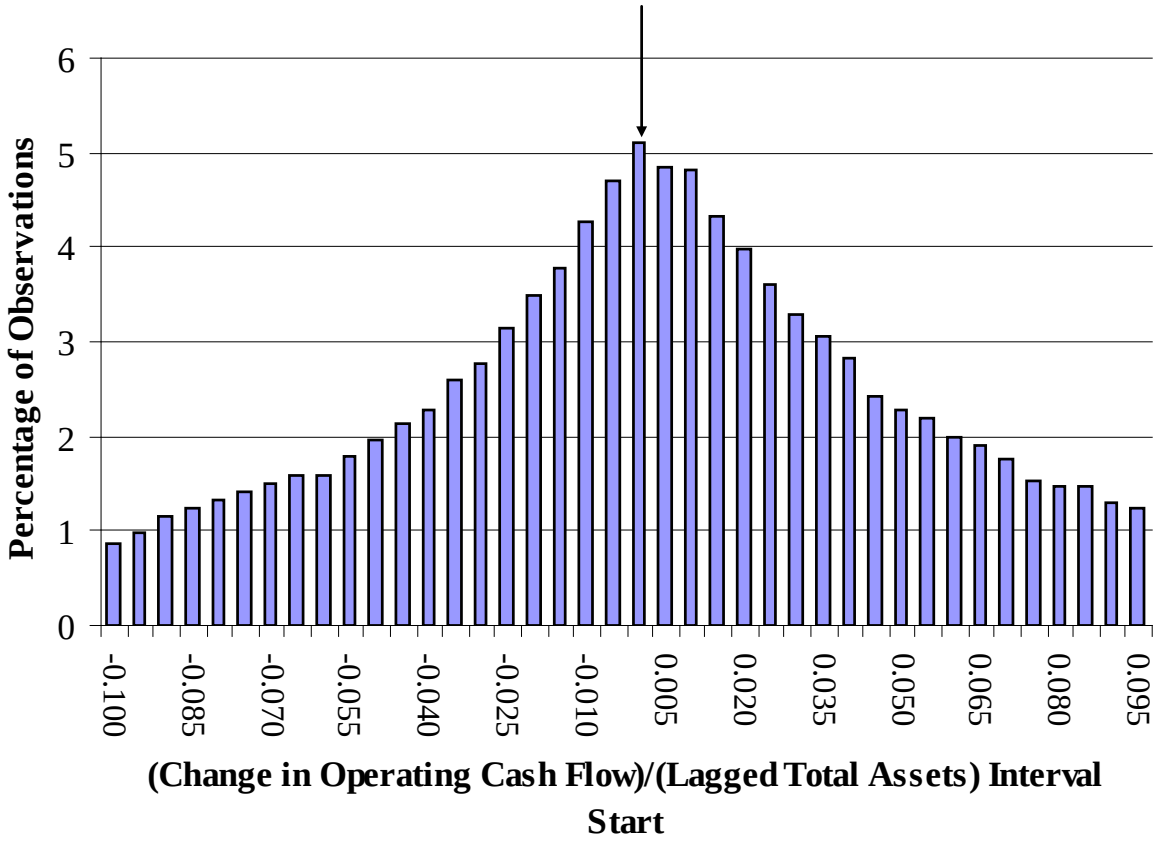

Figure 3
Distribution of Operating Cash Flow *Forecast Errors*
This figure displays the percentage of firm-year observations in each 1 cent interval of the actual operating cash flow per share (CPS) minus forecasted cash flow per share. The forecasted cash flow is the last individual analyst forecast available for the given firm year prior to the earnings announcement. Firm-year observations are included if the necessary data is available on I/B/E/S between 1993 and 2002. The total sample 1,305. The figure displays the segment of the distribution amounting to 705 firm-years. The arrow identifies the first nonnegative interval.

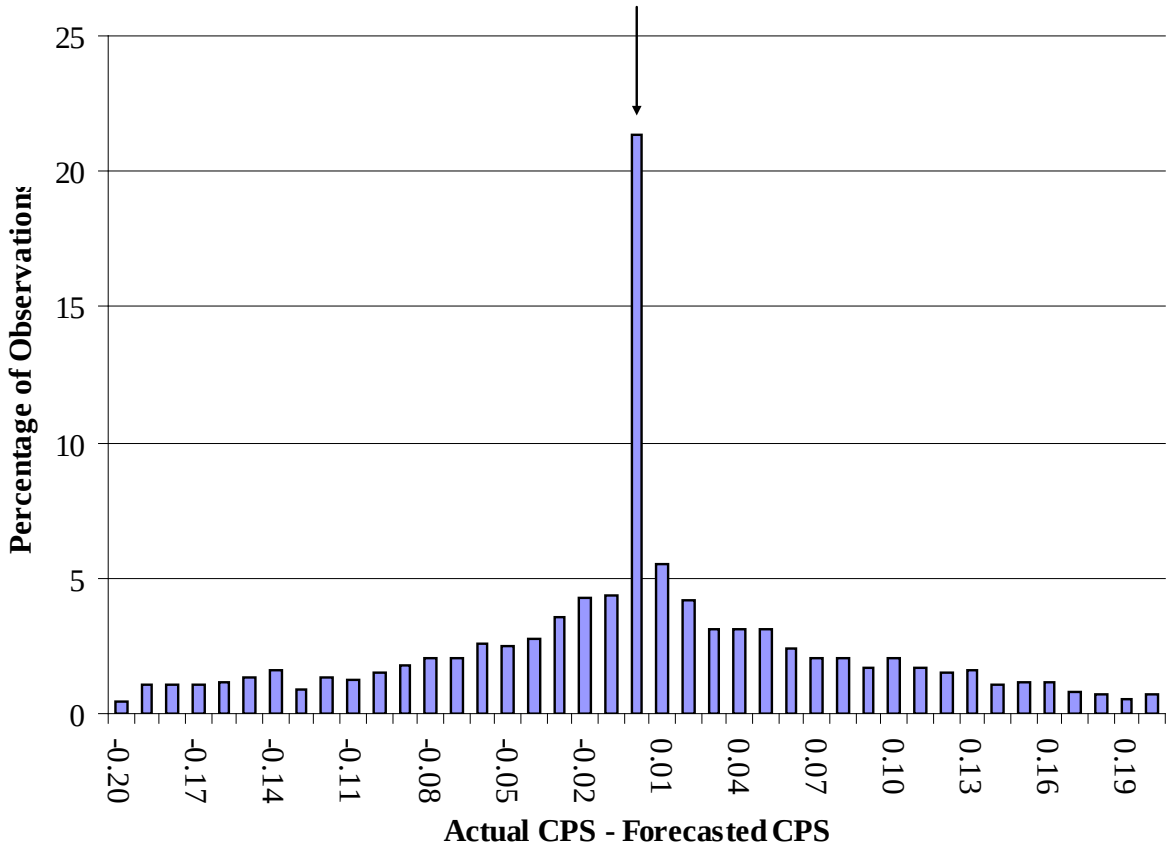

Table 1
Summary Statistics
This table reports pooled cross-sectional, time-series summary statistics for our sample of 232,343 firms-quarters, over the period 1990 to 2003. Q1 is the first fiscal quarter. Q2 is the second fiscal quarter. Q2+Q3 are the second and third fiscal quarters Panel A presents all variables by fiscal quarter. Panel B presents selected variables by fiscal quarter and industry. Extreme 1% observations are deleted

Panel A: Summary Statistics by Fiscal Quarter

	Mean	**25th percentile**	**50th percentile**	**75th percentile**	**Standard deviation**	**Observations**
$\Delta WC1_q$						
Q1	0.005	-0.015	0.005	0.026	0.054	58,751
Q4	-0.002	-0.026	-0.003	0.020	0.062	58,956
Q2+Q3	0.007	-0.012	0.003	0.023	0.049	114,636
$\Delta WC2_q$						
Q1	0.012	-0.011	0.009	0.033	0.054	58,751
Q4	-0.012	-0.035	-0.007	0.016	0.063	58,956
Q2+Q3	0.004	-0.016	0.003	0.023	0.052	114,636
$\Delta SALES_q$						
Q1	-0.008	-0.031	-0.002	0.019	0.074	58,751
Q4	0.011	-0.014	0.006	0.034	0.069	58,956
Q2+Q3	0.012	-0.010	0.007	0.032	0.063	114,636
ΔNI_q						
Q1	0.014	-0.009	0.001	0.017	0.076	58,751
Q4	-0.012	-0.020	-0.001	0.007	0.066	58,956
Q2+Q3	0.000	-0.007	0.001	0.009	0.050	114,636

Panel B: Univariate Statistics by Fiscal Quarter by Industry (selected variables)

cell contents: Mean Median (obs)	**Agr. Forest. Fish. Ind_1**	**Mining Constr. Ind_2**	**Food Tobac. Ind_3**	**Text. Apparl. Ind_4**	**Lumb. Furn. Paper Ind_5**	**Chem. Ind_6**	**Refin. Extract. Ind_7**	**Heavy Manuf. Ind_8**	**Comp. Equiq Serv. Ind_9**	**Trans. Pipe. Comm. Ind_10**	**Util. Ind_11**	**Whole. Retail Resta. Ind_12**	**Serv. Ind_13**	**Bank. Ins. Ind_14**	**Drug Med. Equip. Ind_15**
$\Delta WC1_q$															
Q1	0.003	0.002	0.012	0.019	0.006	0.007	0.002	0.008	0.000	0.000	0.006	0.008	0.005	-0.001	0.005
	0.006	0.003	0.009	0.016	0.006	0.008	0.001	0.008	0.001	0.002	0.004	0.007	0.005	0.000	0.005
	(240)	(1,071)	(1,471)	(960)	(2,412)	(1,705)	(2,671)	(15,184)	(8,755)	(3,668)	(3,664)	(6,595)	(6,199)	(1,629)	(2,527)
Q4	-0.006	-0.002	-0.008	-0.031	-0.003	-0.003	-0.001	-0.006	0.005	0.002	-0.004	-0.006	0.002	-0.002	-0.001
	-0.005	-0.005	-0.008	-0.024	-0.004	-0.006	-0.002	-0.005	0.003	-0.001	-0.005	-0.005	0.000	0.000	-0.002
	(237)	(1,054)	(1,491)	(1,007)	(2,458)	(1,735)	(2,655)	(15,376)	(8,746)	(3,677)	(3,621)	(6,588)	(6,191)	(1,609)	(2,511)
Q2+Q3	0.009	0.007	0.006	0.015	0.005	0.005	0.001	0.010	0.007	0.003	0.001	0.010	0.006	0.002	0.005
	0.006	0.003	0.003	0.010	0.002	0.002	0.001	0.006	0.005	0.002	0.001	0.005	0.003	0.000	0.003
	(464)	(2,013)	(2,888)	(1,867)	(4,723)	(3.313)	(5,143)	(29,643)	(17,233)	(7,290)	(7,126)	(12,758)	(12,008)	(3,169)	(4,998)
$\Delta WC2_q$															
Q1	0.017	0.008	0.018	0.024	0.014	0.015	0.005	0.016	0.009	0.003	0.002	0.017	0.011	0.008	0.012
	0.017	0.006	0.013	0.019	0.011	0.014	0.003	0.014	0.008	0.002	0.000	0.014	0.008	0.006	0.010
	(240)	(1,071)	(1,471)	(960)	(2,412)	(1,705)	(2,671)	(15,184)	(8,755)	(3,668)	(3,664)	(6,595)	(6,199)	(1,629)	(2,527)
Q4	-0.015	-0.009	-0.013	-0.033	-0.011	-0.013	-0.008	-0.014	-0.012	-0.008	0.001	-0.017	-0.012	-0.015	-0.013
	-0.008	-0.007	-0.010	-0.023	-0.006	-0.009	-0.004	-0.009	-0.007	-0.004	0.001	-0.012	-0.006	-0.006	-0.008
	(237)	(1,054)	(1,491)	(1,007)	(2,458)	(1,735)	(2,655)	(15,376)	(8,746)	(3,677)	(3,621)	(6,588)	(6,191)	(1,609)	(2,511)
Q2+Q3	0.005	0.003	0.005	0.011	0.002	0.003	0.000	0.007	0.003	0.001	0.000	0.008	0.003	0.000	0.003
	0.003	0.001	0.003	0.008	0.001	0.002	0.001	0.005	0.003	0.001	0.000	0.005	0.003	0.000	0.002
	(464)	(2,013)	(2,888)	(1,867)	(4,723)	(3.313)	(5,143)	(29,643)	(17,233)	(7,290)	(7,126)	(12,758)	(12,008)	(3,169)	(4,998)
$\Delta SALES_q$															
Q1	-0.012	-0.019	-0.009	-0.022	-0.010	-0.006	-0.003	-0.011	-0.009	-0.001	0.015	-0.028	0.000	0.001	-0.002
	-0.007	-0.009	-0.006	-0.019	-0.007	-0.001	-0.002	-0.006	-0.004	0.000	0.006	-0.012	0.002	0.002	0.000
	(240)	(1,071)	(1,471)	(960)-	(2,412)	(1,705)	(2,671)	(15,184)	(8,755)	(3,668)	(3,664)	(6,595)	(6,199)	(1,629)	(2,527)
Q4	-0.019	0.003	-0.001	-0.008	0.005	0.001	0.008	0.009	0.016	0.006	0.001	0.033	0.009	0.012	0.010
	-0.011	0.000	0.004	-0.004	0.004	0.001	0.005	0.008	0.014	0.003	-0.004	0.019	0.006	0.006	0.005
	(237)	(1,054)	(1,491)	(1,007)	(2,458)	(1,735)	(2,655)	(15,376)	(8,746)	(3,677)	(3,621)	(6,588)	(6,191)	(1,609)	(2,511)
Q2+Q3	0.019	0.017	0.017	0.023	0.014	0.010	0.007	0.013	0.012	0.012	-0.002	0.017	0.014	0.011	0.005
	0.008	0.007	0.013	0.015	0.007	0.006	0.003	0.009	0.010	0.005	0.004	0.012	0.008	0.005	0.002
	(464)	(2,013)	(2,888)	(1,867)	(4,723)	(3.313)	(5,143)	(29,643)	(17,233)	(7,290)	(7,126)	(12,758)	(12,008)	(3,169)	(4,998)

Variables	**Definitions**
$WC1_q$	Working capital measure 1 in firm-quarter q computed as quarterly Compustat data37+data38-data46
$WC2_q$	Working capital measure 2 in firm-quarter q computed as quarterly Compustat data40-data36-data49+data45
$ASSETS_q$	Quarterly Compustat data44 in firm-quarter q
$SALES_q$	Quarterly Compustat data2 in firm-quarter q
NI_q	Quarterly Compustat data69 in quarter q
$\Delta WC1_q$	$(WC1_q - WC1_{q-1})/ASSETS_{q-1}$
$\Delta WC2_q$	$(WC2_q - WC2_{q-1})/ASSETS_{q-1}$
$\Delta SALES_q$	$(SALES_q - SALES_{q-1})/ASSETS_{q-1}$
ΔNI_q	$(NI_q - NI_{q-1})/ASSETS_{q-1}$
Ind_1	SIC codes 0-999
Ind_2	SIC codes 1000-1299 and 1400-1999
Ind_3	SIC codes 2000-2141
Ind_4	SIC codes 2200-2399
Ind_5	SIC codes 2400-2796
Ind_6	SIC codes 2800-2824 and 2840-2899
Ind_7	SIC codes 1300-1399 and 2900-2999
Ind_8	SIC codes 3000-3569, 3580-3669, 3680-3827, and 3860-3999
Ind_9	SIC codes 3570-3579, 3670-3679, and 7370-7379
Ind_10	SIC codes 4000-4899
Ind_11	SIC codes 4900-4999
Ind_12	SIC codes 5000-5999
Ind_13	SIC codes 7000-7369, 7380-9999
Ind_14	SIC codes 6000-6999
Ind_15	SIC codes 2380-2836 and 3829-3851

Table 2
Fama-MacBeth Quarterly Non-cash Working Capital Change Regressions

$$\Delta WC_q = \alpha + \beta_1 \Delta SALES_{q-2} + \beta_2 \Delta SALES_{q-1} + \beta_3 \Delta SALES_q + \beta_4 \Delta SALES_{q+1} + \beta_5 \Delta SALES_{q+2} + \beta_6 \Delta NI_{q-2} + \beta_7 \Delta NI_{q-1} + \beta_8 \Delta NI_q + \beta_9 \Delta NI_{q+1} + \beta_{10} \Delta NI_{q+2} + \beta_{11} NI_q + \beta_{12} Q4_q + \beta_{13} Q1_q + \varepsilon_q \quad (1)$$

This table presents the time-series means of coefficients and adjusted R^2s produced by yearly cross-sectional regressions using variations of model (1). Time-series t-statistics are reported in the parentheses. These results are based on annual regressions using 232,343 firm-quarter observations. This table presents values computed by taking the average over 14 years. The time period is 1990 to 2003. ***, **, and * denote two-tailed significance at the .01, .05, and .1 levels, respectively when "Expected Sign" is a "?" and one-tailed otherwise. Extreme 1% observations for each variable are deleted.

Independent Variables	Expected Sign	Dependent Variable $\Delta WC1_q$	Dependent Variable $\Delta WC2_q$
$Q1_q$	+	0.002*** (2.57)	0.009*** (8.41)
$Q4_q$	-	-0.004*** (-3.55)	-0.009*** (-11.99)
$\Delta SALES_{q-2}$	?	0.041*** (15.87)	0.028*** (9.49)
$\Delta SALES_{q-1}$	?	0.055*** (20.67)	0.023*** (4.32)
$\Delta SALES_q$	?	0.222*** (34.17)	0.118*** (26.85)
$\Delta SALES_{q+1}$	?	0.134*** (20.00)	0.117*** (14.20)
$\Delta SALES_{q+2}$	?	0.016*** (4.86)	0.013*** (3.17)
ΔNI_{q-2}	?	0.003 (1.20)	0.005 (1.21)
ΔNI_{q-1}	?	-0.003 (-0.39)	0.017** (1.94)
ΔNI_q	?	0.008 (0.88)	0.043*** (4.40)
ΔNI_{q+1}	?	-0.087*** (-8.48)	-0.108*** (-10.16)
ΔNI_{q+2}	?	-0.044*** (-6.79)	-0.053*** (-9.30)
NI_q	+	0.028*** (2.53)	0.106*** (9.87)
Adjusted R^2		0.123	0.113

Variables **Definitions**

$WC1_q$ Working capital measure 1 in firm-quarter q computed as quarterly Compustat data37+data38-data46

$WC2_q$ Working capital measure 2 in firm-quarter q computed as quarterly Compustat data40-data36-data49+data45

$\Delta WC1_q$ Change in working capital from quarter q-1 to quarter q computed as $(WC1_q - WC1_{q-1})/ASSETS_{q-1}$ where ASSETS is Compustat data44

$\Delta WC2_q$	Change in working capital from quarter q-1 to quarter q computed as $(WC2_q - WC2_{q-1})/ASSETS_{q-1}$ where ASSETS is Compustat data44
$\Delta SALES_q$	Change in sales in firm-quarter q computed as quarterly Compustat data2 in quarter q minus data2 in quarter q-1 all divided by assets (data44) in quarter q-1
ΔNI_q	Change in net income in firm-quarter q computed as quarterly Compustat data69 in quarter q minus data69 in quarter q-1 all divided by assets (data44) in quarter q-1
NI_q	Net income in firm-quarter q computed as quarterly Compustat data69 divided by assets (data44) in quarter q-1
$Q4_q$	An indicator variable equal to 1 when quarter q is the 4th fiscal quarter and zero otherwise
$Q1_q$	An indicator variable equal to 1 when quarter q is the 1st fiscal quarter and zero otherwise

Table 3
Fama-MacBeth Quarterly Non-cash Working Capital Change Regressions—By Industry

$$\Delta WC_q = \alpha + \beta_1 \Delta SALES_{q-2} + \beta_2 \Delta SALES_{q-1} + \beta_3 \Delta SALES_q + \beta_4 \Delta SALES_{q+1} + \beta_5 \Delta SALES_{q+2} + \beta_6 \Delta NI_{q-2} + \beta_7 \Delta NI_{q-1} + \beta_8 \Delta NI_q + \beta_9 \Delta NI_{q+1} + \beta_{10} \Delta NI_{q+2} + \beta_{11} NI_q + \beta_{12} Q4_q + \beta_{13} Q1_q + \varepsilon_q \quad (1)$$

Panel A of this table presents the time-series means of β_{12} and β_{13} coefficients produced by yearly cross-sectional regressions *by industry* using variations of model (1). Time-series t-statistics are reported in the parentheses. In Panel B, the coefficients produced by yearly cross-sectional regressions by industry are first averaged across industry. The time-series means of the cross-industry averages are reported with t-statistics in parenthesis. These results are based on annual regressions by industry using 232,343 firm-quarter observations. This table displays values computed by taking averages in each industry over 14 years. The time period is 1990 to 2003. ***, **, and * denote two-tailed significance at the .01, .05, and .1 levels, respectively when "Expected Sign" is a "?" and one-tailed otherwise. Extreme 1% observations for each variable are deleted.

Panel A: Time-series means of regression coefficients estimated within industry by year

cell contents: Coeff. (T-stat)	**Agr. Forest. Fish. Ind_1**	**Mining Constr. Ind_2**	**Food Tobac. Ind_3**	**Text. Apparl. Ind_4**	**Lumb. Furn. Paper Ind_5**	**Chem. Ind_6**	**Refin. Extract. Ind_7**	**Heavy Manuf. Ind_8**	**Comp. Equiq Serv. Ind_9**	**Trans. Pipe. Comm. Ind_10**	**Util. Ind_11**	**Whole. Retail Resta. Ind_12**	**Serv. Ind_13**	**Bank. Ins. Ind_14**	**Drug Med. Equip. Ind_15**
Dependent Variable: $\Delta WC1_q$															
$Q1_q$	-0.005 (-0.98)	-0.001 (-0.41)	0.008** (2.58)	0.009 (1.73)	0.005*** (3.03)	0.004** (2.36)	0.000 (0.04)	0.004*** (4.58)	0.000 (-0.16)	-0.001 (-0.68)	0.003*** (3.52)	0.001 (0.64)	0.001 (0.78)	-0.002 (-1.39)	0.002 (1.22)
$Q4_q$	0.008 (1.39)	-0.004** (-2.46)	-0.007*** (-3.17)	-0.021*** (-7.08)	-0.001 (-0.30)	-0.001 (-0.91)	0.000 (0.23)	-0.007*** (-5.64)	0.000 (0.23)	0.002 (1.50)	-0.005*** (-6.72)	-0.008*** (-6.32)	0.000 (0.11)	0.000 (-0.01)	-0.004*** (-2.95)
Dependent Variable: $\Delta WC2_q$															
$Q1_q$	0.008 (1.60)	0.005*** (2.75)	0.012*** (6.33)	0.012 (1.78)	0.014*** (7.77)	0.012*** (7.55)	0.004 (1.76)	0.010*** (4.56)	0.009*** (6.98)	0.003*** (4.08)	0.000 (-0.12)	0.007*** (6.48)	0.007*** (6.41)	0.007*** (3.53)	0.008*** (5.49)
$Q4_q$	0.000 (0.09)	-0.008*** (-2.71)	-0.012*** (-5.22)	-0.022*** (-7.32)	-0.005*** (-4.51)	-0.009*** (-3.81)	-0.011** (-2.26)	-0.011*** (-7.86)	-0.009*** (-5.96)	-0.005*** (-4.90)	-0.002* (-1.90)	-0.014*** (-8.08)	-0.008*** (-7.60)	-0.009*** (-4.19)	-0.009*** (-5.39)

Table 3 (continued)

Panel B: Time-series means of cross-industry average regression coefficients estimated within industry by year

Independent Variables	Expected Sign	Dependent Variable $\Delta WC1_q$	$\Delta WC2_q$	ΔAR_q	ΔINV_q	$\Delta OtCA_q$	ΔAP_q	$\Delta OtCL_q$
$Q1_q$	+/-	0.002 (1.50)	0.008*** (6.44)	0.003*** (6.51)	0.002*** (3.88)	0.001*** (6.74)	**0.004***** **(3.84)**	**-0.005***** **(-4.11)**
$Q4_q$	-/+	-0.003** (-2.45)	-0.009*** (-7.51)	-0.003*** (-4.65)	-0.002*** (4.85)	-0.001*** (-2.99)	**-0.002** **(-1.65)**	**0.005***** **(4.89)**
$\Delta SALES_{q-2}$	?	0.078 (1.33)	-1.159 (-0.99)	0.175 (1.08)	0.106 (1.27)	0.150 (1.04)	0.202 (1.08)	1.388 (1.01)
$\Delta SALES_{q-1}$	?	0.049*** (3.61)	0.216 (1.05)	0.004 (0.15)	0.007 (0.39)	-0.010 (-0.56)	-0.037 (-0.62)	-0.177 (-0.85)
$\Delta SALES_q$	?	0.287*** (5.03)	0.141*** (10.93)	0.377*** (20.33)	0.024* (1.88)	0.014*** (7.36)	0.114** (2.21)	-0.161*** (-3.53)
$\Delta SALES_{q+1}$	?	0.100*** (5.04)	1.037 (1.11)	-0.058 (-0.46)	0.120*** (4.07)	-0.114 (-0.81)	-0.039 (-0.28)	-1.050 (0.96)
$\Delta SALES_{q+2}$	?	-0.016 (-0.47)	1.809 (1.01)	-0.228 (-1.00)	-0.040 (-0.62)	-0.220 (-0.97)	-0.252 (-0.98)	-2.045 (-1.00)
ΔNI_{q-2}	?	0.107 (1.32)	-0.947 (-0.97)	0.150 (1.02)	0.078 (1.10)	0.104 (0.91)	0.122 (0.87)	1.158 (0.99)
ΔNI_{q-1}	?	0.031* (1.84)	-0.737 (-0.96)	0.104 (0.99)	-0.008 (-1.06)	0.077 (0.83)	0.065 (0.75)	0.844 (0.97)
ΔNI_q	?	0.064** (2.44)	-0.106 (-0.62)	0.052 (1.31)	-0.073 (-1.49)	-0.019 (-0.88)	-0.084*** (-3.27)	0.150 (0.75)
ΔNI_{q+1}	?	-0.012 (-0.24)	-0.343 (-1.29)	0.029 (0.59)	-0.108*** (-3.12)	-0.018 (0.60)	-0.068* (-1.99)	0.350 (1.02)
ΔNI_{q+2}	?	0.001 (0.02)	-1.919 (-1.02)	0.227 (0.95)	-0.023*** (3.02)	0.235 (0.99)	0.204 (0.96)	2.155 (1.00)
NI_q	+/-	0.052*** (5.12)	0.407 (1.30)	-0.023 (-0.62)	0.013* (1.77)	-0.030 (-0.73)	**-0.062** **(-1.70)**	**-0.384** **(-1.07)**
Adjusted R^2		0.169	0.152	0.321	0.147	0.072	0.136	0.108

Variables	**Definitions**
$WC1_q$	Working capital measure 1 in firm-quarter q computed as quarterly Compustat data37+data38-data46
$WC2_q$	Working capital measure 2 in firm-quarter q computed as quarterly Compustat data40-data36-data49+data45
AR_q	Accounts Receivable in firm-quarter q, quarterly Compustat data37
INV_q	Inventory in firm-quarter q, quarterly Compustat data38
$OtCA_q$	Other noncash current assets in firm-quarter q, computed as Compustat data40-data36-data37-data38)
AP_q	Accounts Payable in firm-quarter q, quarterly Compustat data46
$OtCL_q$	Other current liabilities in firm-quarter q, quarterly Compustat data49-data45-data46
$\Delta WC1_q$	Change in working capital from quarter q-1 to quarter q computed as $(WC1_q - WC1_{q-1})/ASSETS_{q-1}$ where ASSETS is Compustat data44
$\Delta WC2_q$	Change in working capital from quarter q-1 to quarter q computed as $(WC2_q - WC2_{q-1})/ASSETS_{q-1}$
ΔAR_q	Change in Accounts Receivable from quarter q-1 to quarter q computed as $(AR_q - AR_{q-1})/ASSETS_{q-1}$
ΔINV_q	Change in Inventory from quarter q-1 to quarter q computed as $(INV_q - INV_{q-1})/ASSETS_q$
$\Delta OtCA_q$	Other noncash current assets in firm-quarter q, computed as Compustat data40-data36-data37-data38)
ΔAP_q	Accounts Payable in firm-quarter q, quarterly Compustat data46

$\Delta OtCL_q$ Other current liabilities in firm-quarter q, quarterly Compustat data49-data45-data46

Table 4
Descriptive Statistics for Operating Cash Flow Levels and Changes
This table gives descriptive statistics for annual operating cash flows divided by total lagged total assets (OCF_t), change in annual operating cash flow divided by lagged total assets (ΔOCF_t), and cash flow per share forecast error (*CPS_Ferr*). Extreme 1% values are deleted. The time period is 1990 to 2003.

	Mean	**25th percentile**	**50th percentile**	**75th percentile**	**Standard deviation**	**Observations**
OCF_t	-0.020	-0.037	0.056	0.122	0.339	99,671
ΔOCF_t	-0.003	-0.050	0.006	0.062	0.206	98,534
CPS_Ferr	-0.082	-0.200	0.000	0.130	0.769	1,305

Variables **Definitions**
OCF_t $Data308_t/data6_{t-1}$, where *t* refers to year t
ΔOCF_t $(Data308_t-data308_{t-1})/data6_{t-1}$
CPS_Ferr Actual CPS_t-Forecasted CPS_t where CPS is operating cash flow per share from I/B/E/S. The forecast is the last individual forecast available prior to the earnings announcement for the firm in year *t*.

Table 5
Frequency Distributions of Operating Cash Flow Levels by $AltZ_{t-1}$
This table presents various statistics for Altman's Z-score ($AltZ_{t-1}$) and the frequency distribution of operating cash flow (OCF_t). Panel A presents selected univariate statistics for $AltZ_{t-1}$. Panel B presents the frequency of observations in the zero interval and the two adjacent intervals by $AltZ_{t-1}$ quartile. The expected frequency in panel B is the average of the two adjacent intervals. The Z-stat in this panel is computed according to Burgstahler and Dichev (1997). The time period is 1990 to 2003. ***, **, and * denote one-tailed significance at the .01, .05, and .1 levels. Extreme 1% observations for each variable are deleted.

Panel A – Selected Univariate Statistics for $AltZ_{t-1}$

Variable	Mean	25th percentile	50th percentile	75th percentile	Standard deviation	Observations
$Altz_t$	1.59	0.93	1.98	3.08	3.45	74,278

Panel B – Frequency of Operating Cash Flow (OCF_t) Observations around Zero by $AltZ_{t-1}$ quartile

	High $Altz_t$						Low $Altz_t$	
	actual frequency %	actual frequency / expected frequency	actual frequency %	actual frequency / expected frequency	actual frequency %	actual frequency / expected frequency	actual frequency %	actual frequency / expected frequency
interval								
[-0.005,0)	0.76		1.03		1.28		0.94	
[0,0.005)	0.96	1.11	1.15	1.04	1.39	1.03	1.23	1.19
[0.005,0.01)	0.97		1.18		1.41		1.13	
z-stat	1.17		0.49		0.44		2.20**	
obs	18,569		18,570		18,570		18,569	
Mean $Altz_t$	4.43		2.50		1.46		-2.04	

Variables	Definitions
OCF_t	$Data308_t/data6_{t-1}$, where *t* refers to year t
$AltZ_{t-1}$	Altman's z-score. Z = .717(working capital/assets) + .847(retained earnings/assets) + 3.107(earnings before interest and taxes/assets) + .420(shareholders' equity/assets) + .998(sales/assets) where these variables correspond to the following annual Compustat data items taken from year t-1. Assets=data6, working capital=data4-data5, retained earnings=data36, earnings before interest and taxes=data178, shareholders' equity=data60, and sales=data12.

Table 6
Fama-MacBeth Quarterly Non-cash Working Capital Change Regressions with Cash flow Compensation Indicator

$$\Delta WC_q = \alpha + \beta_1 \Delta SALES_{q-2} + \beta_2 \Delta SALES_{q-1} + \beta_3 \Delta SALES_q + \beta_4 \Delta SALES_{q+1} + \beta_5 \Delta SALES_{q+2} + \beta_6 \Delta NI_{q-2} + \beta_7 \Delta NI_{q-1} + \beta_8 \Delta NI_q + \beta_9 \Delta NI_{q+1} + \beta_{10} \Delta NI_{q+2} + \beta_{11} NI_q + \beta_{12} Q4_q + \beta_{13} Q1_q + \beta_{13} WCIND + \beta_{14} Q1_q \text{ x } WCIND + \beta_{15} Q4_q \text{ x } WCIND + \varepsilon_q \quad (3)$$

This table presents the time-series means of coefficients and adjusted R^2s produced by yearly cross-sectional regressions using variations of model (1). Time-series t-statistics are reported in the parentheses. These results are based on annual regressions using 232,343 firm-quarter observations. This table uses values computed by taking the average over 14 years. The time period is 1993 to 2003. ***, **, and * denote two-tailed significance at the .01, .05, and .1 levels, respectively when "Expected Sign" is a "?" and one-tailed otherwise. Extreme 1% observations for each variable are deleted.

Independent Variables	Expected Sign	Dependent Variable $\Delta WC1_q$	Dependent Variable $\Delta WC2_q$
$Q1_q$	+	0.003***	0.009***
		(2.53)	(12.05)
$Q4_q$	-	-0.004***	-0.009***
		(-3.42)	(-8.39)
WCIND	?	0.003	0.001
		(1.38)	(0.76)
WCIND x $Q1_q$	+	0.000	0.004
		(-0.05)	(1.44)
WCIND x $Q4_q$	-	-0.005***	-0.006***
		(-4.45)	(-3.85)
$\Delta SALES_{q-2}$	?	0.040***	0.028***
		(15.90)	(9.48)
$\Delta SALES_{q-1}$	?	0.055***	0.023***
		(20.61)	(4.30)
$\Delta SALES_q$	?	0.222***	0.119***
		(34.19)	(26.65)
$\Delta SALES_{q+1}$	?	0.134***	0.117***
		(20.02)	(14.22)
$\Delta SALES_{q+2}$	?	0.016***	0.013***
		(4.86)	(3.18)
ΔNI_{q-2}	?	0.003	0.005
		(1.22)	(1.21)
ΔNI_{q-1}	?	-0.003	0.023**
		(-0.37)	(1.95)
ΔNI_q	?	0.008	0.044***
		(0.90)	(4.43)
ΔNI_{q+1}	?	-0.087***	-0.108***
		(-8.50)	(-10.20)
ΔNI_{q+2}	?	-0.044***	-0.053***
		(-6.79)	(-9.28)
NI_q	+	0.062***	0.106***
		(7.02)	(9.87)
Adjusted R^2		0.121***	0.113***
		(26.39)	(19.51)

Variables	**Definitions**
WCIND	An indicator variable equal to 1 if the firm has a proxy statement stating that non-cash working capital is used as a performance measure in determining compensation between 1993 and 2003.