The Usefulness of Core and Non-Core Cash Flows in Predicting Future Cash Flows

by

C. S. Agnes Cheng
University of Houston
Houston, Texas 77204-4852

Dana Hollie*
University of Houston
Houston, Texas 77204-4852

First Draft: January 2004
This Draft: January 2005

*Contact Author

University of Houston
C. T. Bauer College of Business
Department of Accountancy & Taxation
334 Melcher Hall, Ste 390-F
Houston, Texas 77204-4852
Phone: (713) 743-4830
Email: dhollie@uh.edu

Acknowledgments: The authors appreciate the comments of Mary Geddie, K. (Shiva) Sivaramakrishnan, Scott Whisenant, accounting brown bag participants at the University of Houston and an anonymous reviewer.
The Usefulness of Core and Non-Core Cash Flows in Predicting Future Cash Flows

Abstract: We extend the Barth, Cram, and Nelson (2001) model with disaggregated accruals by investigating whether cash flow components (core and non-core cash flows) improve cash flow predictability. BCN investigate the role of accrual components in predicting future cash flows while this study extends their study by investigating the role of cash flow components. We propose a cash flow prediction model that decomposes cash flows into cash flow components that parallel the presentation and format of operating net income from the income statement. Consistent with the AICPA’s and financial analysts' recommendations, and as predicted, we find that cash flow components do reflect different information relating to future cash flows. We also find that the disaggregation of cash flow into the BCN Model significantly enhances cash flow prediction. Hence, the inclusion of cash flow components and accrual components provide significant improvement in cash flow prediction than aggregate cash flows and accrual components alone.

Keywords: Cash Flows, Accruals, Cash Flow Prediction, Core Cash Flows, Cash Flow Variability.

Data Availability: Data used in this study are available from public sources identified in the paper.
The Usefulness of Core and Non-core Cash Flows in Predicting Future Cash Flows

I. Introduction and Motivation

Although earnings remain a widely used metric for profitability on Wall Street, investors are looking more closely at cash flow metrics than ever before. However, despite the importance and increasing demand for such information companies still do not generally report their statement of cash flows with their quarterly earnings announcements. Moreover, financial analysts continue to state the importance for firms to provide cash flow information – more specifically, core and non-core cash flow information. For example, Kyle Loughlin, an analyst at Standard & Poor and head of its chemical industry team states:

“I would always favor more information [over] less. Transparency and clear information about the cash flow generated from core business activities is part and parcel to good credit analysis…. So, if the details are made available in a timely manner, it is an important consideration, especially in this environment (Chang, 2002).”

Furthermore, the Special Committee on Financial Reporting formed by the American Institute of Certified Public Accountants (AICPA) was very critical about certain aspects of financial statements, recommending that, in order to achieve a closer mapping between disclosures and the underlying transactions and events, firms should distinguish between the financial effects of a company’s core (major or central operations) and non-core (peripheral or incidental activities) cash flows, thereby, presenting the best possible information in which to analyze trends in a firm without the potential distortive effects of non-core activities.

The objective of this study is two-fold. First, we replicate Barth et al. (2001) to determine whether accrual components reflect different information relating to future cash flows using our sample and time period. Second, we investigate whether cash flow components reflect different

---

1 Throughout this paper, cash flow is defined as cash flows from operations. The inclusion of accrual components to cash flow components equals aggregate earnings.
information relating to future cash flows beyond that of accrual components. Core and non-core cash flows have not been clearly defined by the profession or academics. In this paper, we define cash flows by functional properties that parallel earnings (e.g., operating income). We define core cash flows as cash flows related to sales, cost of goods sold, and operating expenses and non-core cash flows as cash flows related to interest, taxes, and other expenses.

Prior research has shown that (1) current period cash flows are more persistent than current period accruals in predicting earnings (e.g., Sloan 1996) and (2) aggregate cash flows and accrual components persist differently than aggregate cash flows and aggregate accruals in predicting future cash flows (e.g., Dechow 1994; Dechow et al. 1998; Barth, Cram, and Nelson (hereafter referred to as BCN) (2001). However, these studies do not explicitly examine the usefulness of cash flow components in predicting future cash flows. We extend prior research by examining the role of cash flow components in predicting future cash flows, which includes analyzing multiple cash flow prediction models with aggregated accruals, with accrual components as examined in the BCN model, and then we extend prior research and our analyses by including cash flow components.

BCN show that aggregate cash flows and accrual components enhance cash flow prediction beyond aggregate cash flows and aggregate accruals. That is, they find that accrual components contribute to predicting next period’s cash flows. To determine whether cash flow components significantly enhance cash flow prediction beyond aggregate cash flows and accrual components using existing cash flow prediction models, we first replicate BCN. Our overall findings are robust to their empirical findings. We then extend the BCN Model by decomposing cash flows into core and non-core cash flow components, as previously described. This procedure increases the adjusted $R^2$ significantly from the BCN Model suggesting greater predictability. This result indicates that the

---

2 For example, should core and non-core cash flows be determined by functional properties (e.g., parallel to the income statement – core earnings), or should they be determined based on their persistence levels (e.g., components that persist more are classified as core cash flows and those that do not are classified as non-core cash flows).
disaggregation of cash flows into core and non-core cash flows in our prediction model significantly enhance the predictive ability of cash flow prediction models.

Our empirical findings also show that core and non-core cash flow components reflect different information in predicting future cash flows. Specifically, we find that core cash flows related to sales, cost of goods sold and operating expenses have similar persistence and persist more than non-core cash flows related to taxes and other expenses. Based on pair-wise comparisons, we find that the persistence of the coefficients for non-core cash flow components is significantly less than those for core cash flow components – they are also less stable across years. Our findings are consistent with the AICPA’s and financial analysts’ reasoning for the recommendation on distinguishing between the effects of core and non-core operating activities from cash flows.

Our findings are relevant to academic researchers using cash flow prediction models to measure financial reporting quality. They are also relevant to financial statement users interested in better predicting a firm’s future cash flows and thereby, its firm value.

The remainder of this paper is organized as follows. Section II provides a review of the related literature. Section III describes the research design. Section IV presents the sample selection criteria and discusses our empirical findings. Section V summarizes and concludes the paper.

II. Related Prior Literature

While prior research on cash flows generally finds that earnings are superior to cash flows in explaining stock returns, evidence also suggests that cash flows are incrementally useful in valuing securities (Bowen, et al. 1987; Ali 1994; Dechow 1994; Cheng et al. 1996). Additionally, DeFond and Hung (2003) document an increasing trend of market participants demanding—and financial analysts making—cash flow forecasts. Their findings further validate the increasing importance of

3 For example, Cohen (2004) uses the BCN cash flow prediction model because it has the highest predictive ability compared to other models. In Cohen’s study, the use of the residual from the cash flow prediction model is used to proxy for the quality of financial reporting.
financial statement users’ ability to adequately predict future cash flows. Furthermore, BCN argue that cash flow prediction is fundamental to assessing firm value and that cash flow is a primitive valuation construct.

Previous literature also examines the association between current period earnings, cash flows and accruals on future cash flows. To date most of these studies have focused on the relation between current period aggregate earnings, aggregate cash flows, and accrual components and future cash flows. For example, Greenberg, et al. (1986) find evidence that agrees with the FASB’s (1978) contention that current earnings are a better predictor of future cash flows than current cash flows. In contrast, more recent studies (e.g., Finger, 1994; and Burgstahler et al., 1998) document that current cash flows have more predictive ability when predicting future cash flows than current earnings in the short-horizon. In these studies, the short horizon is based on next-period-ahead cash flow predictions, which is consistent with the forecast horizon in our study. So, although the empirical findings in this area of research are mixed with regards to whether current period earnings or current period cash flows are superior to predicting future cash flows, these studies combined suggest that both earnings and cash flows are important determinants in predicting future cash flows.

Prior research that examines the association between current period earnings components (e.g., accruals and cash flows) on future cash flows include Dechow et al. (1998) (hereafter referred to as DKW), which models cash flows and accruals to derive predictions for the relative abilities of earnings and cash flows to predict future cash flows. They show that firm-specific variation in cash flow forecast errors based on aggregate earnings is significantly lower than that based on aggregate cash flows. In addition, DKW provide evidence that aggregate earnings and aggregate cash flow on future cash flows both have incremental explanatory power.

A more recent study (Barth et al. 2001) examines the association between current period cash flows and current period accrual components on future cash flows. They disaggregate accruals and show that earnings superiority for predicting future cash flows stems from disaggregating earnings
into aggregate cash flows and components of accruals. They argue that various accrual components of earnings capture different information about delayed cash flows related to past transactions, which affect cash flow prediction. Their findings also reveal that the components of accruals do play a significant role in the prediction of future cash flows. Our study contributes to the literature by examining what role components of cash flows play in predicting future cash flows.

In 1991, the AICPA formed a Special Committee on Financial Reporting to address concerns about the relevance and usefulness of business reporting (AICPA). Standard-setters, regulators, and many others have devoted considerable resources to maintaining and improving the relevance and reliability of financial reporting. Given the central importance of core earnings to financial statement users (e.g., Beaver, 1981; Revsine et al., 1999; Jonas and Blanchet, 2000; and Wild et al., 2000), and the recommendations of the AICPA Committee and financial analysts, distinguishing between core and non-core cash flows should also be of central importance to financial statement users. Hence, we examine the role of core and non-core cash flow components in predicting future cash flows. We focus on a key dimension of relevance to users of financial statements – whether core and non-core components of cash flows significantly enhance predictive ability relative to aggregate cash flows. In other words, we predict that components of cash flows (core and non-core) reflect different information in predicting future cash flows and improve cash flow predictability.

III. Research Design

Consistent with prior research (e.g., DKW, BCN), we examine various cash flow prediction models by using goodness of fit test across models: models with aggregate cash flows versus models with cash flow components. We analyze two sets of cash flow prediction models, one set focusing

---

4 This was part of the AICPA’s broad initiative to improve the value of business information and the public’s confidence in it.
only on cash flow information and the other focusing on extending BCN’s model by disaggregating cash flows. Equation (1) constrains the coefficients on the components of cash flows to be equal and equation (2) relaxes the constraint and disaggregates total cash flows into six components. As previously mentioned, one purpose of this study is to investigate whether the components (core and non-core) of cash flows on future cash flows reflect different levels of information; comparing the coefficients in equation (2) will provide empirical evidence to support this question. Another purpose is to test if this disaggregation improves predictability; by contrasting model performance between equation (1) and (2).

Equations (1) and (2) are expressed as follows:

\[ \text{CFO}_{t+1} = \alpha + \beta \text{CFO}_t + \mu_t \]  
\[ \text{CFO}_{t+1} = \alpha + \beta \text{C_SALES}_t + \beta \text{C_COGS}_t + \beta \text{C_OE}_t + \beta \text{C_INT}_t + \beta \text{C_TAX}_t + \beta \text{C_OTHER}_t + \mu_t \]  

Also written as: \[ \text{CFO}_{t+1} = \alpha + \beta \Sigma \text{CFO}_t + \mu_t \]

The variables are defined as:
- CFO = net cash flow from operating activities (#308) less the accrual portion of extraordinary items and discontinued operations reported on the statement of cash flows (#124);
- C_SALES = cash flows from sales are calculated as sales (#12) minus change in accounts receivable – trade (#151);
- C_COGS = cash flow from cost of goods sold is calculated as cost of goods sold (#41) minus [change in inventory (#3) minus change in accounts payable (#70)];
- C_OE = cash flow from operating and administrative expenses are calculated as operating expenses minus change in Net Operating Working Capital excluding changes in accounts receivable-trade, inventory, tax payable and interest payable;

---

5 The term components of cash flows and sources of cash flows are used synonymously throughout the paper.
6 To keep our model expression simple, we use \( \beta \) indicating the coefficient and \( \mu \) the error term for every variable and every model. Consistent with prior research, our use of realized future cash flows as a proxy for future cash flows assumes rational expectations (McNichols and Wilson, 1988; Penman and Sougiannis, 1998; Aboody et al., 1999; Barth, et al., 2001). All variables are scaled by average total assets.
7 Some firm-year observations report changes in accounts receivable from the cash flow statement. We also use the reported changes and the results are similar.
8 Compustat item 303 reports changes in inventory and item 304 reports changes in accounts payable and accrued expenses from the cash flow statement. Accrued expense is related to operating expense, we focus on accounts payable to measure cash flows related to cost of goods sold.
9 Operating expenses are calculated as sales (#12) minus cost of goods sold (#41) minus operating income before depreciation (#13).
C_INT = cash flow related to interest payment (#315)\textsuperscript{11};
C_TAX = cash flow related to tax payments (#317)\textsuperscript{12};
C_OTHER = cash flows related to other revenue/expenses items including special and
extraordinary items are calculated as cash flow from operations (#308) minus all other cash flow
components (i.e., cash flows related to sales, COGS, operating expenses, interest and taxes).

The core cash flow components are cash flows from: sales (C_SALES), cost of goods sold
(C_COGS), and operating and administrative expenses (C_OE). The non-core cash flow components
are interest (C_INT), taxes (C_TAX), and other expenses (C_OTHER). We have identified these six
components, similar to the definitions of core and non-core earnings, as the primary components of
cash flows from operation. We predict that sales, cost of goods sold, and operating expenses have
similar and more persistence among them than interest, taxes, and other expenses. The core cash flow
components are generally seen as being more related to future cash flows than are the non-core
components. The relation suggests that these core cash flow components should persist more than
non-core cash flow components. Interest should contribute less to predicting future operating cash
flows since interest expense is related to financing activities rather than operating activities and
financing activities are not deemed ‘core’ operating activities. Hence, we define cash flows related to
interest as non-core. Taxes are related to all aspects of the business including both operating and non-
operating activities. Unlike other cash flow components which are affected by managers’ operating,
financing and investment activities, taxes are determined mostly by tax policies and firms’ tax
strategies which can be quite different from firms’ other ongoing business activities. In the income
statement, tax expenses are allocated between continuing and discontinuing activities. While

\textsuperscript{10} The Net Operating Working Capital (NOWC) which includes operating current assets such as accounts receivable and
inventory minus operating current liabilities such as accounts payable, interest payable, and tax payable. NOWC is
calculated as current assets (#4) minus cash (#162) minus [current liabilities (#5) minus debt in current liabilities (#34)].
\textsuperscript{11} We assign zero if item #315 is missing to maintain our sample size. We also run analysis for a restricted sample by
deleting observations with missing #315. Our results are not altered.
\textsuperscript{12} Compustat item #16 is income taxes, #71 is income taxes payable and #305 reports changes in taxes payable from the
cash flow statement. We also calculate taxes paid as #16 minus change in #71 (or just #305). Our results are not altered by
these two alternate variables.
companies do not allocate taxes between operating and non-operating income, researchers (e.g. Penman and Zhang, 2002) often allocate taxes to find net operating income. We do not allocate taxes between core and non-core cash flows due to data constraints but we predict that we will not find a systematic persistence for taxes. Other expenses may consist of one-time charges such as restructuring and special charges that could have differing and unpredictable effects on cash flow predictability and are deemed a non-core component of cash flows.

Due to data availability and companies’ reporting patterns (most companies report under the indirect method\(^\text{13}\)); the cash flow components are mainly derived from the income statement and the comparative balance sheets (except taxes and interest paid are available for some firm-year observations from the cash flow statement. When they are not available, we assign values of zero).

Equation (1) and (2) do not have accruals – their purpose is to focus on the effect of ‘disaggregating’ cash flows. We then replicate the BCN model to ensure that our results with respect to cash flow prediction are not data or time specific. We compute accruals consistent with BCN in order to make comparisons with the BCN Model.\(^\text{14}\) Therefore, Equation (3) is written as follows:

\[
\text{CFO}_{t+1} = \alpha + \beta \text{CFO}_t + \beta \Delta \text{AR}_t + \beta \Delta \text{AP}_t + \beta \Delta \text{INV}_t + \beta \text{DEPR}_t + \beta \text{OTHER}_t + \beta \text{AMORT}_t + \mu_t
\]  

Also written as: \(\text{CFO}_{t+1} = \alpha + \beta \Sigma \text{ACC}_t + \mu_t\)

The variables are defined as:

\begin{align*}
\text{EARN} &= \text{income before extraordinary items and discontinued operation} \ (\#18); \\
\Delta \text{AR} &= \text{change in accounts receivable per the statement of cash flows} \ (\#302); \\
\Delta \text{AP} &= \text{change in accounts payable and accrued liabilities per the statement of cash flows} \ (\#304); \\
\Delta \text{INV} &= \text{change in inventory per the statement of cash flows} \ (\#303); \\
\text{DEPR} &= \text{depreciation expense} \ (\#103); \\
\text{AMORT} &= \text{amortization expense} \ (\#65); \\
\text{OTHER} &= \text{net of all other accruals, calculated as EARN – (CF + \Delta \text{AR} + \Delta \text{INV} - \Delta \text{AP} – \text{DEPR} – \text{AMORT}).}
\end{align*}

\(^\text{13}\) Most firms (approximately 97% of firms) continue to report cash flows using the indirect method because it is allegedly more practical and cost effective to do so.

\(^\text{14}\) We measure accruals directly from the statement of cash flows to eliminate possible measurement errors that arise from measuring accruals from the balance sheet (Hribar and Collins, 2002).
We then extend the BCN model, which focuses on accrual components, by focusing on cash flow components. We then investigate whether core and non-core components of cash flows reflect different information and improve cash flow prediction. To determine whether the components of cash flows enhance cash flow predictability we investigate whether the role of cash flow components is additive to the role of accrual components when predicting future cash flows. BCN uses cash flows and accruals to generate predictions for the relative abilities of aggregate cash flows and accrual components to predict future cash flows. Equation (4) extends the BCN model by disaggregating cash flows into core and non-core cash flow components.

\[ \text{CFO}_{t+1} = \alpha + \beta \Sigma \text{CFO}_t + \beta \Sigma \text{ACC}_t + \mu \]  

Equation (3) and (4) provide evidence as to whether cash flow components are incrementally informative beyond accrual components and aggregated cash flows alone in predicting future cash flows.

**IV. Sample Selection and Empirical Findings**

We obtain all data from the 2002 Compustat Annual Industrial, Research, and Full Coverage files. For comparability purposes, we use criteria similar to BCN. Our sample excludes financial services firms (SIC codes 6000-6999) because the cash flow predictability model was not developed to reflect their activities and the financial statement components and disclosure requirements differ for these industries. Our time period begins with 1988 since this is the implementation year of FASB Statement No. 95. Like BCN, we exclude observations with sales less than $10 million, share price less than $1, missing Compustat data, and earnings or cash flows in the extreme upper and lower one percent of their respective distributions. We construct two samples for our analyses. The first sample (Sample A) used for Equations (1) and (2) are constrained by the data available for calculating aggregate cash flows before extraordinary items and its components. This sample selection criterion
yields a final sample of 45,942 firm-year observations from 1988 to 2002. Our second sample (Sample B) used for Equations (3) and (4) is constrained by the addition of accrual component variables and their data availability. This sample selection criterion yields a final sample of 20,828 firm-year observations for the same time-period. We use two samples for two reasons. First, since our primary interest is in evaluating the persistence of cash flow components, we restrict the sample availability based on those key variables only for sample A. Second, we can compare results across both samples as a robustness check.

{Insert Table 1 about here}

Panel A and Panel B of Table 1 reports descriptive statistics for the regression variables in Sample A and Sample B, respectively. The total number of observations for our full sample is 45,942; out of this sample, a number of observations are missing for other variables with AMORT (a total of 27,938) and OTHER (a total of 20,828) being the most restrictive variables as to the data availability. Comparing the descriptive statistics between Panel A and Panel B, we find that the statistics are very similar, with a few exceptions. Panel A has lower standard deviations for the cash flow variables but higher Std for the EARN and ACC variables. For example, the standard deviation for EARN is 0.272 for sample A, but reduced to 0.167 for sample B. Similarly, the Std for ACC is 0.250 for sample A and reduced to 0.120 for sample B. Contrast of the medians with the means show CFO is skewed to the left (median is 0.071 and mean is 0.054 for both samples) and similarly, EARN and ACC are also skewed to the left for both samples. The skewness of all other variables is similar across both samples.

---

15 Note that once we restrict the sample by the availability of the accruals components, our sample is reduced by almost one-half.

16 We include distributional statistics for both our full (Panel A, Sample A) and restricted (Panel B, Sample B) samples. The restricted sample is consistent with those of BCN. However, the additional variable requirements for estimating cash flow sources for some of the cash flow prediction models further restricts our sample size.
Sample B follows BCN’s data selection criteria closely. BCN has 10,164 observations across 1987 to 1996. We have 20,828 observations from 1988 to 2002.\textsuperscript{17} Comparing our statistics of sample with BCN, we find that the means of our EARN, CFO, and ACC are smaller than BCN’s (they report 0.08 for each of the variables);\textsuperscript{18} however, our Std for EARN and ACC are higher while our Std for CFO stays the same (we report 0.167 and 0.120 for EARN and ACC and 0.808 for CFO). Another apparent difference is the variable OTHER. BCN has a mean of −0.01 and a Std of 0.05, and our sample reports a mean of −0.018 (or -0.02) and a Std of 0.083. Since our sample includes accounting data from subsequent years, this comparison implies more negative accruals for subsequent years.\textsuperscript{19}

Note that all our measures of cash flows are based on inflows (positive) and outflows (negative). Hence, we have positive means and medians for C_SALES and negative means and medians for C_COGS, C_OE, C_INT, and C_TAX, since they are all expenses. C_OTHER is positive, which suggests more ‘other’ sources of revenues than expenses. Another interesting observation is that the total short term accruals (from Panel B: $\Delta AR + \Delta INV - \Delta AP = 0.019 + 0.012 - 0.013 = 0.018$ has smaller means than the long-term accruals $DEPR + AMORT = 0.046$ and approaching zero when including OTHER). This suggests that total accruals, on average, are heavily affected by long-term accruals.

\textit{(Insert Table 2 about here)}

Table 2 report Pearson and Spearman correlation for all regression variables. We report correlations for sample B only. The correlation coefficient between C_Sales and C_COGS is

\textsuperscript{17} We delete the observations for 1987 due to its lack of previous year’s data.\textsuperscript{18} Note that the magnitude of our ACC should be higher than BCN’s. BCN report their statistics using only two digits, therefore, the difference between our numbers and theirs may be affected by rounding errors. For example, we report ACC as −0.047 and they report −0.04. It is likely that our number has a larger magnitude than theirs since rounding up our number will lead to −0.05. When we check the sum of accruals of the means as reported (i.e. ACC = $\Delta AR + \Delta INV - \Delta AP - DEPR - AMORT + OTHER: 0.019+0.012+-0.013+-0.042+-0.004+-0.018+ (-0.046)$), we get −0.046 (a rounding error of 0.001); however, when we check the sum of accruals of BCN’s, we get $\text{ACC}=0.01+0.01-0.01-0.05-0.01+(-0.01) =-0.06$ while they report −0.04 (a rounding error of 0.02)\textsuperscript{19} Since BCN only reports two digits, our results are not completely comparable with theirs because of potential rounding errors. However, a quick examination seems to be that our differences mainly come from $\Delta AR$ and OTHER. When we analyze our Sample B for 1988-1996, our statistics are very similar to BCN’s.
particularly high (-0.939 and -0.907 for Pearson and Spearman, respectively). The correlation coefficient between EARN and CFO is 0.704 for Pearson coefficient and 0.541 for Spearman – this correlation is typical for these two variables and do not in general cause problems if they are in the same model.

{Insert Table 3 about here}

Regression summary statistics from equation (1) are presented in Panel A of Table 3. We Again, we only report results for Sample B in the table. The inferences for Sample A are similar to those in Sample B. We use mean analysis of regression to test the significance of the coefficients. Equation (1) serves as a benchmark to assess the relative predictive ability of aggregate cash flows to cash flow components. Consistent with prior research, we find that aggregate cash flows in equation (1) are significantly positive in the prediction equation. CFO explains 28.69% of the variation in next-period cash flows. We find that the coefficient for CFO has an average of .529 with a t-statistics of 27.34 for sample B and an average of .540 with a t-statistic of 35.7 for sample A. Since sample B is prepared for the full model, we only report regression results for sample B in the tables. This indicates that more than 50% of current year’s cash flows will persist to next year’s cash flows.

Panel B of Table 3, which disaggregates cash flows into sources of cash flow components, indicates that all of the core and non-core cash flow components are significant in predicting future cash flows. The adjusted $R^2$ increased from 28.69% for Equation (1) to 31.97% for Equation (2), an

\[ 20 \] This may cause some multicollinearity problems in the regression. The best way to deal with multicollinearity is to enlarge the sample size. We have a large sample size and our coefficients on C_Sales and C_COGS are all significant. Hence, we do not feel this should be of great concern. However, we did contact regression analyses by combining C_Sales and C_COGS to one cash flow component – our model performance decreases a bit and the coefficient of the combined variable is very similar to those from the uncombined variables. Since the high correlation between C_Sales and C_COGS does not create problems, we keep them separate.

\[ 21 \] To avoid the problem of cross-sectional dependence, we examine the mean coefficients from the annual regressions using Fama-MacBeth statistics that are equal to the mean of the estimated coefficients across 15 regressions divided by the standard error of the coefficients (Fama and MacBeth, 1973). Because the Fama-Macbeth statistics are based on the coefficients from the annual regressions, they are unaffected by the potentially inflated t-statistics in the annual regressions. We apply similar analysis of the difference in coefficients to DeFond and Hung, (2003).

\[ 22 \] BSN reports 24% for the model with CFO only. This may be due to sample differences. When we analyze our sample focusing on the observations prior to 1997, we get similar adjusted $R^2$. 

13
11% increase in explaining its variation.\textsuperscript{23} We also find that all of the six cash flow components (C\_SALES, C\_COGS, C\_OE, C\_INT, and C\_OTHER) are positive and significant, except C\_TAX which is significantly negative.

For core cash flows, the coefficients for C\_SALES and C\_COGS are nearly .5 with a t-statistic around 26. The coefficient for C\_OE has a slightly higher average (.501) but a lower t-statistics (25.06). This suggests that the persistence of C\_OE has greater variability over time than C\_SALES and C\_COGS. For non-core cash flows, the coefficients on C\_INT and C\_OTHER have a value of .468 and .412 respectively; C\_INT has a t-statistic of 8, while C\_OTHER has a t-statistic of 17. This indicates greater variability across years than core items, especially for C\_INT, and suggests C\_OTHER is less persistent than C\_INT. This finding is consistent with C\_OTHER being composed of various other expenses/revenues that can vary greatly from year-to-year. Interestingly, interest expense is significant and is highly persistent in predicting next-period cash flows. In deciding on the reporting of the statement of cash flows (Statement of Financial Accounting Standards No. 95), the FASB choose to include cash flows related to interest in the operating section. Our results showing high persistence of C\_INT concur with this decision. The coefficient and t-statistic on TAX is -.187 and -2.99, respectively. This result implies that C\_TAX does not persist much to next period.\textsuperscript{24} This concurs with the characteristics of taxes. Two factors may affect the persistence of cash flow from taxes. First, persistence of taxes depends on the sources of income that the taxes are levied on. The cash flow statement does not provide taxes paid for operating and non-operating activities separately. It is also difficult to estimate how taxes should be distributed to operating and non-operating activities based on the income statement and balance sheet data. Second, C\_TAX is affected by firms’ tax strategy. Firms would like to defer taxes as much as possible, and the amount of taxes that

\textsuperscript{23} In contrasting model performance, we conduct analysis of yearly results on adjusted R-squares in addition to pooled analysis, we also conduct Vuong test to test the model performance. Testing results from Vuong test is similar to what we conclude based on mean analysis of the adjusted R-squared.

\textsuperscript{24} It actually has a negative coefficient, when we analyze our full model, equation (4), the coefficient on C\_Tax is still negative but insignificant.
a company defers depends on the timing of their real transactions. The fact that the coefficient is negative suggests that firms that pay high taxes now will tend to pay lower taxes next year. To determine whether core cash flows persist differentially from non-core cash flows, we use a pair-wise test of the differences in coefficients for equation 2. Panel C of Table 3 provides the results. Each row reports the difference between the column title and the row title. A negative value for the mean pair-wise comparison suggests that the cash flow components given in the column title are less persistent than the cash flow components given in the row title. For example, a comparison of C_SALES and C_TAX reveal a mean difference of -.679, a t-statistic of -11.62, and a p-value of <.0001. This suggests that current period cash flows from taxes are less persistent than current period cash flows from sales in predicting next year’s cash flows.

The coefficients for comparing C_INT, C_TAX, and C_OTHER with C_SALES, C_COGS, and C_OE are all negative. The significance level is less than 0.0001 for C_TAX and C_OTHER but not significant for C_INT (p-value = .77, .73, and .69, respectively). The comparisons among the core items (i.e., the row and column titles containing C_SALES, C_COGS and C_OE ) show positive coefficients. However, the differences are not significant. The comparisons among the non-core items (i.e., the row and column titles containing C_INT, C_TAX and C_OTHER) show negative values for the row of C_INT and positive values for the row of C_TAX. This means C_INT is more persistent than all other non-core items and C_TAX is less persistent than C_OTHER. The difference between C_INT and C_OTHER is not significant. To summarize, consistent with our expectations, we find that core cash flow components persist similarly among each other but persist more than non-core cash flows and cash flows related to taxes have no persistence on future cash flows. The persistence of C_INT and C_OTHER is similar with the former having slightly higher persistence.

Regression summary statistics for equation (3) are presented in Panel A of Table 4. This equation, which replicates BCN and serves as a robustness check in our study, is used to assess the predictive ability of aggregate cash flows and accrual components. Our findings reveal an adjusted
R-square of 34.27%, which is consistent with that of BCN.\textsuperscript{25} We find that the coefficient for CFO has an average of .592 (0.59 in BCN) with a t-statistic of 28.16. This indicates that almost 60% of current period cash flows will persist to next year’s cash flows once effects of the accrual components are controlled. The coefficients of the accrual components reported in Panel A have the same signs as BCN. The magnitudes are also similar except for ∆INV and OTHER. We (BCN) have a coefficient of 0.245 (0.35) and 0.44 (0.15) for ∆INV and OTHER. This implies a smaller inventory effect and greater effect on OTHER for our sample. AMORT is not significant in our sample.

\{Insert Table 4 about here\}

Equation (4) assesses whether cash flow components reflect different information in predicting future cash flows with accrual components in the model. Panel B of Table 4, presents the summary statistics for equation (4). The adjusted $R^2$ increased from 34.7% for Equation (3) to 36.3% for Equation (4), an increase of almost 5% in explaining the variation of next year’s cash flows. We find that all components of cash flows and components of accruals are significant, except C_TAX and AMORT. The coefficients on cash flow components have the same signs to those reported for equation (2) in Table 3, which does not incorporate accrual components into the model. When we add accrual components, all coefficients get larger. For example, coefficients of the core items (C_Sales, C_COGS and C_OE) increase from (0.493, 0.497 and 0.501) to (0.547, 0.550 and 0.553), a 10% increase, coefficients of C_INT and C_OTHER increase from (0.468 and 0.412) to (0.624 and 0.481). The Fama-Macbeth t-statistics also increase for all variables except the coefficient on C_TAX becomes insignificant.\textsuperscript{26}

\textsuperscript{25} Barth et al. (2001) reports an adjusted r-square of 35%, while we present one of 34.27%.

\textsuperscript{26} Adding omitted variables should improve model performance, however, the impact on the coefficients of the original variables can be either positive or negative depending on whether the significance of the original variables from the original model is due to their correlation to the added omitted variables. When adding the omitted variables (the accrual components) into a model (equation 1) increases the value of the original coefficients (on the cash flow components), this means that the significance of the original variables (i.e. the cash flow components) is not due to their correlation to the omitted variables (i.e. the accrual components).
Comparing the coefficients for the accrual components between equation (3) and (4) reveals that magnitudes of the coefficients of $\Delta AR$, $\Delta INV$, $\Delta AP$ and OTHER decrease from (0.428, 0.245, 0.503 and 0.144) to (0.396, 0.190, 0.456 and 0.102) with OTHER having a highest relative decrease (about 30%). However, the coefficients of DEPR and AMORT increase from (0.472, 0.081) to (0.507, 0.108). This implies the significance of short-term accruals and OTHER in equation 3 is partly due to their correlations to cash flows while this is not the case for long-term accruals.

To check if our finding of differential persistence among cash flow components exists after controlling for accrual components, Panel C of Table 4 provides a pair-wise test of the differences between core and non-core cash flows with the inclusion of accruals into Equation 2. This tests whether the cash flow components continue to persist when accrual components are added to the equation. In contrast to Panel C in Table 3 and Panel C in Table 4, we find the results are very similar except that the coefficients in the row of C_INT become positive, however, the difference in persistence between C_INT and C_OTHER become significant (i.e. C_INT is more persistent than C_OTHER). Our adjusted $R^2$ increased from 28.69% (equation 1) to 31.97% (equation 2), to 34.27% (equation 3) and to 36.33% (equation 4). These differences are significant.

Table 5 presents a pair-wise comparison test between each model’s adjusted R-square. The improvement from equation 1 to equation 2 and from equation 2 to equation 3 and equation 3 to equation 4 are around 2% to 3% (2.86, 2.81 and 2.06 respectively) with high t-statistics (6.05, 4.93 and 7.21 respectively). We conclude that disaggregating cash flows into components enhances cash flow prediction.

V. Summary and Conclusions

27 We also conducted Voung tests for pooled regression and the model performance is significantly different between these models.
In summary, this study investigates whether core and non-core cash flow components reflect
different information relating to future cash flows. We define our core and non-core cash flows based
on their relation to core and non-core earnings as defined in practice and the literature. Using mean
analysis of coefficients, we find that cash flows related to sales, cost of goods sold and operating
expenses are more persistent than cash flows related to taxes and other expenses. However, cash
flows related to interest (non-core) are similar in persistence as the core components, which may
indicate that interest should be defined as a core rather than a non-core component. We find that the
coefficient on cash flow from taxes is negative but often insignificant. This is consistent with our
expectation that taxes should be affected by all business activities – not just operating activities. Tax
strategies affect cash paid for taxes – less taxes paid today will tend to generate more taxes owed in
the future, but may not be in the immediate future (one-year ahead).

Consistent with our expectations, we find that core cash flow components do reflect different
information relating to future cash flows. And, core components persist similarly amongst
themselves but differently from non-core cash flow components, which are not similar in persistence
amongst non-core components. We also find that the disaggregation of cash flow components into
the BCN Model significantly enhances cash flow prediction. Hence, the inclusion of cash flow
components and accrual components provide significant improvement in cash flow prediction than
aggregate cash flows and accrual components alone.

Overall, the empirical findings are consistent with the AICPA’s and financial analysts’
reasoning and recommendations that firms should distinguish between the financial effects of a
company’s core and non-core cash flows. Our findings are also relevant to financial statement users
interested in improving cash flow prediction, and thereby, firm value. They are also relevant to
academic researchers using cash flow prediction models to assess the financial reporting quality of a
firm.
References


Table 1
Descriptive Statistics on Earnings, Cash Flows, Components of Cash Flows and Accruals

Panel A: Sample A for Equations (1) and (2)

<table>
<thead>
<tr>
<th>STATS</th>
<th>CFO</th>
<th>C_SALES</th>
<th>C_COGS</th>
<th>C_OE</th>
<th>C_INT</th>
<th>C_TAX</th>
<th>C_OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.054</td>
<td>1.162</td>
<td>-0.808</td>
<td>-0.280</td>
<td>-0.018</td>
<td>-0.019</td>
<td>0.017</td>
</tr>
<tr>
<td>Std</td>
<td>0.125</td>
<td>0.753</td>
<td>0.647</td>
<td>0.265</td>
<td>0.018</td>
<td>0.021</td>
<td>0.105</td>
</tr>
<tr>
<td>Median</td>
<td>0.071</td>
<td>1.027</td>
<td>-0.659</td>
<td>-0.228</td>
<td>-0.014</td>
<td>-0.013</td>
<td>0.007</td>
</tr>
<tr>
<td>N</td>
<td>45,942</td>
<td>45,942</td>
<td>45,942</td>
<td>45,942</td>
<td>45,942</td>
<td>45,942</td>
<td>45,942</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATS</th>
<th>EARN</th>
<th>ACC</th>
<th>ΔAR</th>
<th>ΔINV</th>
<th>ΔAP</th>
<th>DEPR</th>
<th>AMORT</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.003</td>
<td>-0.051</td>
<td>0.019</td>
<td>0.012</td>
<td>0.012</td>
<td>0.044</td>
<td>0.006</td>
<td>-0.018</td>
</tr>
<tr>
<td>Std</td>
<td>0.272</td>
<td>0.250</td>
<td>0.062</td>
<td>0.048</td>
<td>0.051</td>
<td>0.038</td>
<td>0.030</td>
<td>0.083</td>
</tr>
<tr>
<td>Median</td>
<td>0.038</td>
<td>-0.039</td>
<td>0.011</td>
<td>0.002</td>
<td>0.008</td>
<td>0.037</td>
<td>0.000</td>
<td>-0.006</td>
</tr>
<tr>
<td>N</td>
<td>45,941</td>
<td>45,941</td>
<td>43,203</td>
<td>42,377</td>
<td>35,982</td>
<td>45,173</td>
<td>27,938</td>
<td>20,828</td>
</tr>
</tbody>
</table>

Panel B: Sample B for Equations (3) and (4)

<table>
<thead>
<tr>
<th>STATS</th>
<th>CFO</th>
<th>C_SALES</th>
<th>C_COGS</th>
<th>C_OE</th>
<th>C_INT</th>
<th>C_TAX</th>
<th>C_OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.054</td>
<td>1.210</td>
<td>-0.841</td>
<td>-0.297</td>
<td>-0.018</td>
<td>-0.020</td>
<td>0.020</td>
</tr>
<tr>
<td>Std</td>
<td>0.137</td>
<td>0.808</td>
<td>0.700</td>
<td>0.283</td>
<td>0.019</td>
<td>0.024</td>
<td>0.120</td>
</tr>
<tr>
<td>Median</td>
<td>0.071</td>
<td>1.062</td>
<td>-0.682</td>
<td>-0.243</td>
<td>-0.013</td>
<td>-0.012</td>
<td>0.008</td>
</tr>
<tr>
<td>N</td>
<td>20,828</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATS</th>
<th>EARN</th>
<th>ACC</th>
<th>ΔAR</th>
<th>ΔINV</th>
<th>ΔAP</th>
<th>DEPR</th>
<th>AMORT</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.007</td>
<td>-0.047</td>
<td>0.019</td>
<td>0.012</td>
<td>0.013</td>
<td>0.042</td>
<td>0.004</td>
<td>-0.018</td>
</tr>
<tr>
<td>Std</td>
<td>0.167</td>
<td>0.120</td>
<td>0.060</td>
<td>0.047</td>
<td>0.051</td>
<td>0.031</td>
<td>0.009</td>
<td>0.083</td>
</tr>
<tr>
<td>Median</td>
<td>0.039</td>
<td>-0.039</td>
<td>0.011</td>
<td>0.002</td>
<td>0.009</td>
<td>0.036</td>
<td>0.000</td>
<td>-0.006</td>
</tr>
</tbody>
</table>

This table presents descriptive statistics for each of the regression variables and is based on pooled data. The regression variables are defined as follows (Compustat data items in parentheses):

CFO = net cash flow from operating activities (#308)
C_SALES = cash flows from sales are calculated as sales (#12) minus change in accounts receivable – trade (#151);
C_COGS = cash flow from cost of goods sold is calculated as cost of goods sold (#41) minus [change in inventory (#3) minus change in accounts payable (#70)];
C_OE = cash flow from operating and administrative expenses are calculated as operating expenses minus Net Operating Working Capital excluding changes in accounts receivable-trade, inventory, tax payable and interest payable;
C_INT = cash flow related to interest payment (#315);
C_TAX = cash flow related to tax payments (#317);
C_OTHER = cash flows related to other revenue/expenses items including special and extraordinary items are calculated as cash flow from operations (#308) minus all other cash flow components (i.e., cash flows related to sales, COGS, operating expenses, interest and taxes).
EARN = income before extraordinary items and discontinued operation (#18);
ΔAR = change in accounts receivable per the statement of cash flows (#302);
ΔINV = change in inventory per the statement of cash flows (#303);
ΔAP = change in accounts payable and accrued liabilities per the statement of cash flows (#304);
DEPR = depreciation expense (#103);
AMORT = amortization expense (#65);
OTHER = net of all other accruals, calculated as EARN – (CF + ΔAR + ΔINV - ΔAP – DEPR – AMORT).
ACC=EARN – CFO or alternatively ACC = ΔAR + ΔINV – ΔAP - DEPR – AMORT + OTHER

Operating expenses are calculated as sales (#12) minus cost of goods sold (#41) minus operating income before depreciation (#13).
Table 2
Pearson (Spearman) above (below) the diagonal Correlation Table

<table>
<thead>
<tr>
<th></th>
<th>EARN</th>
<th>ACC</th>
<th>CFO</th>
<th>C_SALES</th>
<th>C_COGS</th>
<th>C_OE</th>
<th>C_INT</th>
<th>C_TAX</th>
<th>C_OTHER</th>
<th>ΔAR</th>
<th>ΔINV</th>
<th>ΔAP</th>
<th>DEPR</th>
<th>AMORT</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARN</td>
<td>0.588</td>
<td>0.704</td>
<td>0.071</td>
<td>-0.023</td>
<td>0.232</td>
<td>0.084</td>
<td>-0.344</td>
<td>-0.031</td>
<td>0.124</td>
<td>0.121</td>
<td>-0.065</td>
<td>-0.203</td>
<td>-0.133</td>
<td>0.565</td>
<td></td>
</tr>
<tr>
<td>ACC</td>
<td>0.334</td>
<td>-0.161</td>
<td>-0.015</td>
<td>-0.035</td>
<td>0.085</td>
<td>0.099</td>
<td>-0.174</td>
<td>-0.064</td>
<td>0.415</td>
<td>0.420</td>
<td>-0.039</td>
<td>-0.414</td>
<td>-0.137</td>
<td>0.720</td>
<td></td>
</tr>
<tr>
<td>CFO</td>
<td>0.541</td>
<td>-0.483</td>
<td>0.100</td>
<td>0.002</td>
<td>0.208</td>
<td>0.016</td>
<td>-0.267</td>
<td>0.019</td>
<td>-0.213</td>
<td>-0.220</td>
<td>-0.045</td>
<td>0.115</td>
<td>-0.042</td>
<td>0.057</td>
<td></td>
</tr>
<tr>
<td>C_SALES</td>
<td>0.147</td>
<td>0.017</td>
<td>0.111</td>
<td>-0.939</td>
<td>-0.405</td>
<td>-0.120</td>
<td>-0.168</td>
<td>-0.137</td>
<td>-0.043</td>
<td>0.014</td>
<td>0.006</td>
<td>0.058</td>
<td>-0.012</td>
<td>0.026</td>
<td></td>
</tr>
<tr>
<td>C_COGS</td>
<td>-0.069</td>
<td>-0.079</td>
<td>0.007</td>
<td>-0.907</td>
<td>0.150</td>
<td>0.139</td>
<td>0.095</td>
<td>0.096</td>
<td>0.007</td>
<td>-0.054</td>
<td>-0.010</td>
<td>-0.014</td>
<td>0.040</td>
<td>-0.033</td>
<td></td>
</tr>
<tr>
<td>C_OE</td>
<td>0.007</td>
<td>-0.053</td>
<td>0.101</td>
<td>-0.458</td>
<td>0.186</td>
<td>-0.083</td>
<td>0.051</td>
<td>-0.268</td>
<td>-0.022</td>
<td>-0.010</td>
<td>-0.052</td>
<td>-0.026</td>
<td>-0.067</td>
<td>0.097</td>
<td></td>
</tr>
<tr>
<td>C_INT</td>
<td>0.222</td>
<td>0.108</td>
<td>0.056</td>
<td>-0.147</td>
<td>0.213</td>
<td>-0.135</td>
<td>-0.220</td>
<td>0.096</td>
<td>0.115</td>
<td>0.097</td>
<td>0.107</td>
<td>-0.175</td>
<td>-0.103</td>
<td>-0.004</td>
<td></td>
</tr>
<tr>
<td>C_TAX</td>
<td>-0.581</td>
<td>-0.188</td>
<td>-0.333</td>
<td>-0.235</td>
<td>0.163</td>
<td>0.070</td>
<td>-0.151</td>
<td>-0.006</td>
<td>-0.048</td>
<td>-0.107</td>
<td>-0.021</td>
<td>0.118</td>
<td>0.044</td>
<td>-0.122</td>
<td></td>
</tr>
<tr>
<td>C_OE</td>
<td>0.056</td>
<td>-0.046</td>
<td>0.082</td>
<td>-0.142</td>
<td>0.117</td>
<td>-0.179</td>
<td>0.104</td>
<td>-0.052</td>
<td>0.047</td>
<td>0.001</td>
<td>0.079</td>
<td>-0.108</td>
<td>-0.033</td>
<td>-0.122</td>
<td></td>
</tr>
<tr>
<td>ΔAR</td>
<td>0.193</td>
<td>0.437</td>
<td>-0.232</td>
<td>-0.036</td>
<td>0.026</td>
<td>-0.076</td>
<td>0.146</td>
<td>-0.046</td>
<td>0.040</td>
<td>0.229</td>
<td>0.466</td>
<td>-0.157</td>
<td>-0.033</td>
<td>-0.028</td>
<td></td>
</tr>
<tr>
<td>ΔINV</td>
<td>0.196</td>
<td>0.459</td>
<td>-0.230</td>
<td>0.069</td>
<td>-0.106</td>
<td>-0.070</td>
<td>0.075</td>
<td>-0.127</td>
<td>0.008</td>
<td>0.222</td>
<td>0.347</td>
<td>-0.140</td>
<td>-0.058</td>
<td>0.028</td>
<td></td>
</tr>
<tr>
<td>ΔAP</td>
<td>0.076</td>
<td>0.006</td>
<td>0.009</td>
<td>0.017</td>
<td>-0.004</td>
<td>-0.082</td>
<td>0.134</td>
<td>-0.016</td>
<td>0.075</td>
<td>0.448</td>
<td>0.293</td>
<td>-0.077</td>
<td>-0.047</td>
<td>-0.011</td>
<td></td>
</tr>
<tr>
<td>DEPR</td>
<td>-0.114</td>
<td>-0.456</td>
<td>0.280</td>
<td>0.136</td>
<td>-0.102</td>
<td>0.049</td>
<td>-0.210</td>
<td>0.078</td>
<td>-0.128</td>
<td>-0.196</td>
<td>-0.144</td>
<td>-0.117</td>
<td>-0.074</td>
<td>-0.093</td>
<td></td>
</tr>
<tr>
<td>AMORT</td>
<td>-0.066</td>
<td>-0.029</td>
<td>-0.029</td>
<td>0.036</td>
<td>-0.011</td>
<td>-0.070</td>
<td>-0.126</td>
<td>-0.027</td>
<td>-0.068</td>
<td>-0.003</td>
<td>-0.040</td>
<td>-0.075</td>
<td>-0.138</td>
<td>-0.093</td>
<td></td>
</tr>
<tr>
<td>OTHER</td>
<td>0.171</td>
<td>0.448</td>
<td>-0.168</td>
<td>0.059</td>
<td>-0.097</td>
<td>0.022</td>
<td>-0.027</td>
<td>-0.157</td>
<td>-0.120</td>
<td>-0.077</td>
<td>0.037</td>
<td>-0.006</td>
<td>-0.040</td>
<td>-0.025</td>
<td></td>
</tr>
</tbody>
</table>

*All variables are defined in Table 1. ^Significant at 0.05, ! Insignificant at 0.01, All others are significant.
Table 3
Summary Statistics from Regressions of Future Cash Flow on Current Cash Flow and Components of Cash Flow from Operations

Eq. (1): $CFO_{t+1} = \alpha + \beta \Sigma CFO_t + \mu_{t+1}$

Eq. (2): $CFO_{t+1} = \alpha_{t+1} + \beta C_{SALES_t} + \beta C_{COGS_t} + \beta C_{OE_t} + \beta C_{INT_t} + \beta C_{TAX_t} + \beta C_{OTHER_t} + \mu_{t+1}$

**Panel A: Regression Results for Equation (1)**

<table>
<thead>
<tr>
<th>Adj. R²</th>
<th>Intercept</th>
<th>CFO_t</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly Avg.</td>
<td>28.69%</td>
<td>.039</td>
<td>.529</td>
<td>13.32</td>
</tr>
</tbody>
</table>

**Panel B: Regression Results for Equation (2)**

<table>
<thead>
<tr>
<th>Adj. R²</th>
<th>Intercept</th>
<th>C SALES_t</th>
<th>C COGS_t</th>
<th>C OE_t</th>
<th>C INT_t</th>
<th>C TAX_t</th>
<th>C OTHER_t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly Avg.</td>
<td>31.97%</td>
<td>.035</td>
<td>.493</td>
<td>.497</td>
<td>.501</td>
<td>.468</td>
<td>-0.187</td>
</tr>
<tr>
<td>t-statistic</td>
<td>7.04</td>
<td>26.68</td>
<td>27.28</td>
<td>25.06</td>
<td>5.67</td>
<td>5.67</td>
<td>-2.99</td>
</tr>
<tr>
<td>p-value</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>0.0098</td>
</tr>
</tbody>
</table>

*We report the mean of yearly regression coefficients and the Fama-Macbeth statistics (Fama and MacBeth, 1973).

* The regression variables are defined as follows (Compustat data items in parentheses):
- CFO = net cash flow from operating activities (#308)
- C SALES = cash flows from sales calculated as sales (#12) minus change in accounts receivable – trade (#151); C COGS = cash flow from cost of goods sold is calculated as cost of goods sold (#41) minus [change in inventory (#3) minus change in accounts payable (#70)]; C OE = cash flow from operating and administrative expenses are calculated as operating expenses\(^{29}\) minus change in Net Operating Working Capital excluding changes in accounts receivable-trade, inventory, tax payable and interest payable;
- C INT = cash flow related to interest payment (#315);
- C TAX = cash flow related to tax payments (#317);
- C OTHER = cash flows related to other revenue/expenses items including special and extraordinary items are calculated as cash flow from operations (#308) minus all other cash flow components (i.e., cash flows related to sales, COGS, operating expenses, interest and taxes).

---

\(^{29}\) Operating expenses are calculated as sales (#12) minus cost of goods sold (#41) minus operating income before depreciation (#13).
### Panel C: Pair-wise Test of Differences in the Coefficients for Equation (2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>C_SALES</th>
<th>C_COGS</th>
<th>C_OE</th>
<th>C_INT</th>
<th>C_TAX</th>
<th>C_OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.004</td>
<td>0.008</td>
<td>-0.025</td>
<td>-0.679</td>
<td>-0.081</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.85</td>
<td>1.36</td>
<td>-0.30</td>
<td>-11.62</td>
<td>-7.85</td>
<td></td>
</tr>
<tr>
<td>C_SALES</td>
<td>0.0862</td>
<td>0.1969</td>
<td>0.7693</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.004</td>
<td>-0.029</td>
<td>-0.684</td>
<td>-0.085</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.70</td>
<td>-0.36</td>
<td>-11.68</td>
<td>-7.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_COGS</td>
<td>0.4983</td>
<td>0.7274</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.033</td>
<td>-0.688</td>
<td>-0.089</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.40</td>
<td>-11.19</td>
<td>-7.92</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_OE</td>
<td>0.6942</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.654</td>
<td>-0.056</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-7.85</td>
<td>-0.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_INT</td>
<td>&lt;.0001</td>
<td>0.5095</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.599</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_TAX</td>
<td>&lt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*We report the mean difference, t-statistic, and p-value respectively. The regression variables are defined as follows (Compustat data items in parentheses):

- **C_SALES** = cash flows from sales are calculated as sales (#12) minus change in accounts receivable – trade (#151);
- **C_COGS** = cash flow from cost of goods sold is calculated as cost of goods sold (#41) minus [change in inventory (#3) minus change in accounts payable (#70)];
- **C_OE** = cash flow from operating and administrative expenses are calculated as operating expenses\[30\] minus change in Net Operating Working Capital excluding changes in accounts receivable-trade, inventory, tax payable and interest payable;
- **C_INT** = cash flow related to interest payment (#315);
- **C_TAX** = cash flow related to tax payments (#317);
- **C_OTHER** = cash flows related to other revenue/expenses items including special and extraordinary items are calculated as cash flow from operations (#308) minus all other cash flow components (i.e., cash flows related to sales, COGS, operating expenses, interest and taxes).

---

\[30\] Operating expenses are calculated as sales (#12) minus cost of goods sold (#41) minus operating income before depreciation (#13).
Table 4  
Summary Statistics from Regressions of Future Cash Flow on Current Cash Flow and Accrual Components and Regressions of Future Cash Flow on Current Cash Flow and Accrual Components

Eq. (3): \( \text{CFO}_{t+1} = \alpha + \beta \Sigma \text{CFO}_t + \beta \Delta \text{AR}_t + \beta \Delta \text{AP} + \beta \Delta \text{INV}_t + \beta \text{DEPR}_t + \beta \text{AMORT}_t + \beta \text{OTHER}_t + \mu_t \)

Eq. (4): \( \text{CFO}_{t+1} = \alpha + \beta \text{C}_\text{SALES} + \beta \text{C}_\text{COGS} + \beta \text{C}_\text{OE} + \beta \text{C}_\text{INT} + \beta \text{C}_\text{TAX} + \beta \text{C}_\text{OTHER} + \beta \Sigma \text{ACC}_t + \mu \)

**Panel A: Tests of Persistence and Predictability of Future Cash Flows for Equation (3)**

<table>
<thead>
<tr>
<th>Adj.-R²</th>
<th>Intercept</th>
<th>CFO₂</th>
<th>∆AR</th>
<th>∆INV</th>
<th>∆AP</th>
<th>DEPR</th>
<th>AMORT</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly Avg.</td>
<td>34.27%</td>
<td>0.013</td>
<td>0.592</td>
<td>0.428</td>
<td>0.245</td>
<td>-0.503</td>
<td>0.472</td>
<td>0.081</td>
</tr>
<tr>
<td>t-statistic</td>
<td>4.29</td>
<td>28.16</td>
<td>16.57</td>
<td>7.28</td>
<td>-13.99</td>
<td>7.42</td>
<td>0.63</td>
<td>4.38</td>
</tr>
<tr>
<td>p-value</td>
<td>0.0007</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>0.5390</td>
<td>0.0006</td>
</tr>
</tbody>
</table>

**Panel B: Tests of Persistence and Predictability of Future Cash Flows for Equation (4)**

<table>
<thead>
<tr>
<th>Adj.-R²</th>
<th>Intercept</th>
<th>C_SALES</th>
<th>C_COGS</th>
<th>C_OE</th>
<th>C_INT</th>
<th>C_TAX</th>
<th>C_OTHER</th>
<th>∆AR</th>
<th>∆INV</th>
<th>∆AP</th>
<th>DEPR</th>
<th>AMORT</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly Avg.</td>
<td>36.33%</td>
<td>.010</td>
<td>.547</td>
<td>.550</td>
<td>.624</td>
<td>-0.050</td>
<td>.481</td>
<td>.396</td>
<td>.190</td>
<td>-.456</td>
<td>.507</td>
<td>.108</td>
<td>.102</td>
</tr>
<tr>
<td>t-statistic</td>
<td>2.19</td>
<td>30.14</td>
<td>28.7</td>
<td>25.75</td>
<td>8.4</td>
<td>-.85</td>
<td>21.61</td>
<td>16.46</td>
<td>5.48</td>
<td>-14.56</td>
<td>8.37</td>
<td>.79</td>
<td>3.36</td>
</tr>
<tr>
<td>p-value</td>
<td>0.0456</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>.4094</td>
<td>0.0001</td>
<td>&lt;.0001</td>
<td>0.0001</td>
<td>&lt;.0001</td>
<td>0.0001</td>
<td>0.0047</td>
<td>0.4432</td>
<td>0.0047</td>
</tr>
</tbody>
</table>

*The regression variables are defined as follows (Compustat data items in parentheses):

CFO = net cash flow from operating activities (#308)
C_SALES = cash flows from sales are calculated as sales (#12) minus change in accounts receivable – trade (#151);
C_COGS = cash flow from cost of goods sold is calculated as cost of goods sold (#41) minus [change in inventory (#3) minus change in accounts payable (#70)];
C_OE = cash flow from operating and administrative expenses are calculated as operating expenses\(^{31}\) minus change in Net Operating Working Capital excluding changes in accounts receivable-trade, inventory, tax payable and interest payable;
C_INT = cash flow related to interest payment (#315);
C_TAX = cash flow related to tax payments (#317);
C_OTHER = cash flows related to other revenue/expenses items including special and extraordinary items are calculated as cash flow from operations (#308) minus all other cash flow components (i.e., cash flows related to sales, COGS, operating expenses, interest and taxes).
\( \Delta \text{AR} = \) change in accounts receivable per the statement of cash flows (#302);
\( \Delta \text{AP} = \) change in accounts payable and accrued liabilities per the statement of cash flows (#304);
\( \Delta \text{INV} = \) change in inventory per the statement of cash flows (#303);
DEPR = depreciation expense (#103);
OTHER = net of all other accruals, calculated as EARN – (CF + \( \Delta \text{AR} + \Delta \text{INV} - \Delta \text{AP} - \text{DEPR} - \text{AMORT} \).

\(^{31}\) Operating expenses are calculated as sales (#12) minus cost of goods sold (#41) minus operating income before depreciation (#13).
Table 4 (Cont’d)
Summary Statistics from Regressions of Future Cash Flow on Current Cash Flow and Accrual Components
and Regressions of Future Cash Flow on Current Cash Flow and Accrual Components

**Panel C: Pair-wise Test of Differences in the Coefficients for Equation (4)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>C_SALES</th>
<th>C_COGS</th>
<th>C_OE</th>
<th>C_INT</th>
<th>C_TAX</th>
<th>C_OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.003</td>
<td>0.006</td>
<td>0.077</td>
<td>-0.597</td>
<td>-0.066</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.54</td>
<td>0.94</td>
<td>1.06</td>
<td>-11.58</td>
<td>-5.91</td>
<td></td>
</tr>
<tr>
<td>C_SALES</td>
<td>0.1448</td>
<td>0.3630</td>
<td>0.3051</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.003</td>
<td>0.073</td>
<td>-0.600</td>
<td>-0.070</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.50</td>
<td>1.03</td>
<td>-11.77</td>
<td>-5.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_COGS</td>
<td>0.6265</td>
<td>0.3194</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.070</td>
<td>-0.604</td>
<td>-0.073</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.98</td>
<td>-11.33</td>
<td>-6.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_OE</td>
<td>0.3419</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.674</td>
<td>-0.143</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-8.95</td>
<td>-2.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_INT</td>
<td>&lt;.0001</td>
<td>0.0639</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.531</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_TAX</td>
<td></td>
<td>&lt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*We report the mean difference, t-statistic, and p-value respectively. The regression variables are defined as follows (Compustat data items in parentheses):
C_SALES = cash flows from sales are calculated as sales (#12) minus change in accounts receivable – trade (#151);
C_COGS = cash flow from cost of goods sold is calculated as cost of goods sold (#41) minus \([\text{change in inventory (#3)} - \text{change in accounts payable (#70)}]\);
C_OE = cash flow from operating and administrative expenses are calculated as operating expenses\(^{32}\) minus change in Net Operating Working Capital excluding changes in accounts receivable-trade, inventory, tax payable and interest payable;
C_INT = cash flow related to interest payment (#315);
C_TAX = cash flow related to tax payments (#317);
C_OTHER = cash flows related to other revenue/expenses items including special and extraordinary items are calculated as cash flow from operations (#308) minus all other cash flow components (i.e., cash flows related to sales, COGS, operating expenses, interest and taxes).

\(^{32}\) Operating expenses are calculated as sales (#12) minus cost of goods sold (#41) minus operating income before depreciation (#13).
Table 5  
Pair-wise Test of Differences in Adjusted R-squares for Equations 1, 2, 3 and 4

<table>
<thead>
<tr>
<th>Equation</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.86%</td>
<td>5.68%</td>
<td>7.74%</td>
</tr>
<tr>
<td></td>
<td>6.05</td>
<td>10.38</td>
<td>11.75</td>
</tr>
<tr>
<td></td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>2</td>
<td>2.81%</td>
<td>4.87%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.93</td>
<td>10.22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>2.06%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

*We report the difference in adjusted r-square (in %), the t-statistic, and the p-value (italicized).

Eq. (1): $\text{CFO}_{t+1} = \alpha + \beta \Sigma \text{CFO}_t + \mu_{t+1}$

Eq. (2): $\text{CFO}_{t+1} = \alpha_{t+1} + \beta \text{C_SALES}_t + \beta \text{C_COGS}_t + \beta \text{C_OE}_t + \beta \text{C_INT}_t + \beta \text{C_TAX}_t + \beta \text{C_OTHER}_t + \mu_{t+1}$

Eq. (3): $\text{CFO}_{t+1} = \alpha + \beta \Sigma \text{CFO}_t + \beta \Delta \text{AR}_t + \beta \Delta \text{AP}_t + \beta \Delta \text{INV}_t + \beta \text{DEPR}_t + \beta \text{AMORT}_t + \beta \text{OTHER}_t + \mu_{t+1}$

Eq. (4): $\text{CFO}_{t+1} = \alpha + \beta \text{C_SALES}_t + \beta \text{C_COGS}_t + \beta \text{C_OE}_t + \beta \text{C_INT}_t + \beta \text{C_TAX}_t + \beta \text{C_OTHER}_t + \beta \Sigma \text{ACC}_t + \mu_{t+1}$