

# Informativeness And Predictability Of Cash Flows

Zheming Wang, North Dakota State University  
John Eichenseher, (jeichen@bus.wisc.edu), University of Wisconsin-Madison

## Abstract

*This study investigates the relationship between the informativeness and the predictability of cash flow data. Predictability is defined as the ability of an accounting variable to predict future cash flows. Using a two-signal capital asset pricing model, this study predicts that the incremental informativeness of cash flows is an increasing function of its predictability and a decreasing function of the predictability of earnings. The empirical evidence is consistent with this prediction. This study contributes to the cash flow/earnings literature in that it identifies a context in which cash flow data possess significant incremental information content beyond that reflected in earnings. The research findings of this study also have methodological implications for other incremental information content studies. Specifically, it suggests that the informativeness of alternative information is an important factor in examining the incremental information of an accounting variable.*

## 1. Introduction

This study examines the relationship between the informativeness and the predictability of cash flow data using a two-signal capital asset pricing model (CAPM). Predictability is defined as the ability of an accounting variable to predict future cash flows. The primary objective of the research is to identify contexts in which cash flow data are expected to exhibit incremental information content beyond that reflected in accrual earnings.

Research has addressed the issue of incremental information content of cash flows [see Bowen et al. (1987), Rayburn (1986), Wilson

(1986 & 1987), and Bernard and Stober (1989), among others]. The empirical evidence regarding the incremental information content of cash flows beyond that provided by earnings as reflected in security prices in these studies is weak and conflicting [see Bernard (1990) and Jennings (1990)]. As Bernard (1990) has concluded: "the recurring lesson from this research is that bottom-line historical cost earnings is not only 'hard to beat', but that it is difficult to demonstrate convincingly that other data convey any information beyond that reflected in earnings." The lack of information content of cash flow data beyond that reflected in bottom-line earnings is not intuitive given the increasing emphasis on cash flow reporting in the accounting profession and the widespread belief in the usefulness of

---

*Readers with comments or questions are encouraged to contact the authors via e-mail.*

cash flow information in the investing community.

Bernard and Stober (1989) offered two potential explanations for the lack of evidence regarding the incremental information content of cash flows: (1) a short event window may not represent important events for pricing because the essential information may have been made available to the market through alternative channels, and (2) the relationship between security price and the two accounting signals is too contextual to draw any general conclusions. In light of the suggested potential shortcomings of a short event window in this research context, this study adopts an annual event window in the empirical design. In responding to the second suggestion, this study identifies specific contexts in which the relationship between the two accounting signals and the security price is expected to vary. Specifically, instead of assuming that the relative informativeness of earnings and cash flows in terms of their ability to predict future cash flows is constant across all firms, this study recognizes explicitly that the relative ability of the two accounting variables in terms of predicting future cash flows varies across firms and, consequently, the magnitude of market reaction to the two accounting variables is expected to vary with respect to their relative predictability.

The focus on the relative predictability of the two accounting signals is motivated by the insights of recent analytical models developed by Holthausen and Verrecchia (1988) and Lipe (1990). Holthausen and Verrecchia (1988) use an information economics model to demonstrate that the relationship between stock prices and a given source of information depends on the availability of other useful information. While Holthausen and Verrecchia (1988) modeled the sequential information releases, Lipe (1990) models the relationship between security prices and multi-informational events released simultaneously, and suggests that the market reaction to a given source of information depends not only on the quality of that information but also on the quality of the alternative information that is available to the market.

In order to formally examine the incremental information content of cash flow information given that accrual earnings are also available to the market, this study develops a two-signal CAPM similar to that used by Lipe (1990). Two testable hypotheses regarding the relationship between stock prices and cash flows are derived. The first hypothesis is that the cash flow response coefficient which measures the stock return response to a one-dollar cash flow innovation is an increasing function of the predictability of cash flows. The predictability of cash flows is defined as the ability of past cash flows to predict future cash flows, and is reflected in the variance from an univariate time-series regression. As the variance decreases, the predictability of cash flows increases. Consequently, the current cash flow information becomes more useful in predicting future cash flows and, therefore, the response coefficient increases. The second hypothesis is that the cash flow response coefficient is negatively related to the predictability of earnings. The predictability of earnings is defined as the ability of past earnings to predict future cash flows, and is reflected in the variance from regressing cash flows on lagged earnings. As the predictability of earnings increases, *ceteris paribus*, the relative weight assigned to cash flow data decreases and, consequently, the response coefficient of cash flow decreases.

The two hypotheses are tested empirically. The evidence is consistent with the prediction that the cash flow response coefficient is an increasing function of the predictability of cash flows and a decreasing function of the predictability of earnings. In addition, the evidence indicates that cash flow data are particularly incrementally informative when the predictability of earnings is low. Finally, the findings suggest that when the predictability of earnings is high, cash flow data contribute little incremental information even if the predictability of cash flows is high. This may explain why previous cash flow studies examining a broad section of firms failed to document consistent evidence regarding the incremental information in cash flows. The research findings of this study also have meth-

odological implications for other incremental information content studies in that it suggests that the informativeness of alternative information is an important factor in examining the incremental information of an accounting variable.

The rest of the study is organized as follows. Section 2 develops the theoretical model and formulates the hypotheses. Section 3 presents the research design, including the sample selection procedure and the computation of unsystematic stock returns, unexpected earnings and unexpected cash flows. Section 4 presents the empirical tests and the results. Section 5 discusses the implications of the results.

## 2. Theory Development and Hypotheses Formulation

Since the 1970s, double-digit inflation and record interest rates have resulted in an increased concern over the inadequacy of accrual earnings and more emphasis on cash flow data. For example, Harold Williams, the former chairman of the SEC, advocated the disclosure of cash flow information and suggested that cash flows might be more useful than EPS in evaluating business. Analysts and creditors began to focus more upon cash flows and less upon EPS [e.g., Backer and Gosman (1978), and Thomas (1982), among others]. Heath (1978) commented in his accounting research monograph No. 3 "Financial Reporting and the Valuation of Solvency":

*Beginning in the mid 70s a big trend (developed) on the part of financial analysts to look at cash flows. And the reason for that was because accrual accounting was getting so bizarre and so removed from the company's cash flows that you almost had to look to that statement in order to figure out what the company was doing. There began to be a bigger focus on cash flows.*

Despite the increased emphasis on cash flow information, numerous research studies examining the incremental information content of cash flows generally failed to document consistent evidence that cash flow data possess infor-

mation content beyond that reflected in earnings [see Bernard (1990), among others]. These studies generally assumed that the relative informativeness of earnings and cash flows is constant across all companies. Suspecting that this unrealistic assumption may contribute to the failure in documenting empirical evidence regarding the incremental informativeness of cash flow data, Bernard and Stober (1989) considered several contexts under which cash flow data may possess incremental information content. While Bernard and Stober's study was well designed, their study did not consider a potentially very important factor, i.e., the relative predictability of earnings and cash flows. A subsequent study by Lipe (1990) offered significant insight for the investigation of the incremental information of accounting variables. Specifically, Lipe suggests that the informativeness of an accounting variable is a function of both its predictability and the predictability of other accounting variables that are also available to the market [Lipe (1990)]. In light of Lipe's suggestion, this study attempts to investigate the incremental informativeness of cash flows beyond that reflected in earnings by focusing on the relative predictability of the two accounting variables. Given investors' concern over earnings manipulation (e.g., see the National Commission on Fraudulent Financial Reporting, 1987), it seems logical to expect cash flow information to be incrementally informative for some firms even if accrual earnings are in general more informative than cash flows. More specifically, cash flow disclosure is expected to be more informative for firms whose earnings are less informative in predicting future cash flows, and alternatively, be less informative for firms whose earnings are highly informative.

To formally model the relation between security prices and the relative ability of cash flows versus earnings to predict future cash flows, the following three assumptions are necessary. First, the unexpected return on common stock is a function of accrual earnings and cash flow information. Specifically,

$$R_t = \sum_{s=0}^S \beta^s \frac{E_t(CF_{t+s}|E_t, CF_t) - E_{t-1}(CF_{t+s}|E_{t-1}, CF_{t-1})}{P_{t-1}} \quad (1)$$

This assumption implies that the unexpected stock return in period  $t$  is associated with changes in expectations of current and future cash flows discounted at a constant rate. For simplicity, this assumption restricts the information that is available to the market to only earnings and cash flows. It can be shown that the major properties of the model hold even if information other than earnings and cash flows is available to the market.

The two remaining assumptions describe the information structure. The first is that cash flows are generated under the following first-differenced, finite-order autoregressive process:

$$\Delta CF_t = \sum_{i=1}^N b_i \Delta CF_{t-i} + e_t \quad (2)$$

where the shock term  $e_t$  is assumed to be distributed normal with zero mean and a variance of  $\sigma_e^2$ . The second is that accrual earnings provide information about future cash flows. Specifically,

$$E_t = CF_{t+1} + v_{t+1} \quad (3)$$

where  $v_{t+1}$  is distributed  $N(0, \sigma_v^2)$ , and  $e$  and  $v$  are assumed to be independent. In addition, it is implicitly assumed that cash flow and earnings are observed simultaneously because this study uses an annual event window.

Given the assumptions above, equation 1 can be rewritten as:

$$R_t = \left( 1 + \sum_{s=1}^{\infty} \beta^s \theta_s \right) \frac{E_t(e_t) - E_{t-1}(e_{t-1})}{P_{t-1}} + \beta \left( 1 + \sum_{s=1}^{\infty} \beta^s \theta_s \right) \frac{E_t(e_{t+1}) - E_{t-1}(e_{t+1})}{P_{t-1}} \quad (4)$$

where  $\theta$  coefficients come from inverting equation 2 into a moving-average process. The two terms in equation 4 represent the information reflected in cash flow and earnings information. Specifically, the revision in expectations of  $e_t$  and  $e_{t+1}$  are as follows:

$$E_t(e_t) - E_{t-1}(e_t) = e_t - \frac{\sigma_e^2(e_t + v_t)}{\sigma_e^2 + \sigma_v^2} \quad (5)$$

$$E_t(e_{t+1}) - E_{t-1}(e_{t+1}) = \frac{\sigma_e^2(e_{t+1} + v_{t+1})}{\sigma_e^2 + \sigma_v^2} \quad (6)$$

Equation 4 can be further rewritten as:

$$R_t = \left( 1 + \sum_{s=1}^{\infty} \beta^s \theta_s \right) \frac{e_t - \frac{\sigma_e^2(e_t + v_t)}{\sigma_e^2 + \sigma_v^2}}{P_{t-1}} + \beta \left( 1 + \sum_{s=1}^{\infty} \beta^s \theta_s \right) \frac{\frac{\sigma_e^2(e_{t+1} + v_{t+1})}{\sigma_e^2 + \sigma_v^2}}{P_{t-1}} \quad (7)$$

From equation 7, it is evident that the usefulness of cash flow data is determined by its ability, relative to that of earnings, to predict future cash flows.

The first hypothesis examines the relationship between the cash flow response coefficient and the predictability of cash flows. It can be demonstrated by differentiating cash flow response coefficient ( $b_{CF}$ ) with respect to  $\sigma_e^2$ :

$$\frac{\partial b_{CF}}{\partial \sigma_e^2} = - \frac{\left( 1 + \sum_{s=1}^{\infty} \beta^s \theta_s \right) \sigma_v^2}{\left( \sigma_e^2 + \sigma_v^2 \right)^2} < 0 \quad (8)$$

Since the derivative is negative, the cash flow response coefficient is a decreasing (increasing) function of  $\sigma_e^2$  (the predictability of cash flows). Intuitively, as the predictability of cash flows increases, current cash flow information becomes more useful in assessing future cash flows and, therefore, the cash flow response coefficient increases. The first hypothesis can be formally stated as follows:

**H1<sub>a</sub>:** Cash flow response coefficient is an increasing function of the predictability of cash flows.

The second hypothesis examines how the cash flow response coefficient changes with respect to the predictability of earnings. The relationship between the cash flow response coefficient and the predictability of earnings can be demonstrated by differentiating  $b_{CF}$  with respect

to  $\sigma_v^2$ :

$$\frac{\partial b_{CF}}{\partial \sigma_v^2} = \frac{\beta(1 + \sum_{s=1}^{\infty} \beta^s \theta_s) \sigma_e^2}{(\sigma_e^2 + \sigma_v^2)^2} > 0 \quad (9)$$

Equation 9 indicates that as the predictability of earnings increases (or as  $\sigma_v^2$  decreases) while holding the predictability of cash flows constant, the market relies more on earnings information and less on cash flow information in predicting future cash flows. Consequently, the second hypothesis can be stated as:

**H2<sub>a</sub>:** The cash flow response coefficient decreases as the predictability of earnings increases.

To summarize, theory predicts that the cash flow response coefficient is positively related to the predictability of cash flows and is negatively related to the predictability of earnings. It is expected that cash flow data contribute little incremental information when earnings predictability is high, and contribute significant incremental information when the predictability of earnings is low.

### 3. Research Design

This study uses a test period of ten years from 1977 to 1986. The criteria used to select sample firms for this study are: (1) the firm must have a December 31 year end; (2) the firm must have complete monthly securities return data on the 1987 CRSP file for the period May 1972 through April 1986; (3) the firm must have complete data on the 1987 Compustat file for the computation of earnings and cash flows from operations for the years 1975 through 1986; and (4) the firm must be a non-banking and non-utility firm.

The data in item 2 are required for estimating market model parameters. Since parameters in the market model are estimated using ordinary least square regression over the 60-month period preceding the testing period starting from 1977 for which the expected secu-

urity returns are estimated, returns data for the period 1972 through 1986 are required to calculate unexpected returns for the testing period 1977 to 1986.

The data in item 3 are required for obtaining earnings and cash flow information over the ten year period from 1977 through 1986. Two years of data preceding the test period are required to calculate unexpected earnings and unexpected cash flows from operations.

Finally, financial institutions and utility firms were excluded from the sample because they were regulated during the sample period. In addition, in order to reduce the impact of outliers on the test result, firms with extreme values in unexpected earnings and unexpected cash flows (+300%) were excluded from the sample. Applying the above sample selection criteria resulted in a sample size of 3010 firm/year observations.

This study adopts an annual event window for the measurement of unsystematic stock returns. An annual event window instead of a shorter window is chosen in this study because the exact date in which both earnings and cash flows become available to the market is usually difficult to identify. In a related study by Bernard and Stober (1990) using a 9-day event window, Bernard and Stober suggested that the "financial statement release date may not represent important events for pricing because the essential information included has already been made available through alternative channels". The unexpected stock returns are calculated in a way consistent with prior cash flow studies [see Bowen et al. (1987)]. Market model regression summary descriptive statistics are presented in Table 1.

The computation of unexpected earnings (UE) and unexpected cash flows from operations (UCFO) in this study are also consistent with previous cash flow studies [see Bowen et al. (19987)]. Specifically, this study uses Compustat item No. 18 (earnings before extraordinary items and discontinued operation) for earnings.

**Table 1**  
**Market Model Summary Statistics**

Variable	Mean	Standard Deviation	Maximum	Minimum
$\alpha$	0.003	0.011	0.043	-0.051
$\beta$	1.139	0.406	3.381	-0.640
R <sup>2</sup>	0.308	0.133	0.783	0.000
CAR	-0.045	0.321	2.150	-2.068

Unexpected cash flows from operations are computed using the indirect approach [see Bowen et al. (1987) and Rayburn (1986)]. That is, the computation began with earnings and adjusted for the following accrual adjustments: (1) depreciation and amortization (Compustat No. 14); (2) deferred taxes and ITC liability (Compustat No. 35); (3) change in net trade receivables (Compustat No.151); (4) change in inventories (Compustat No. 3); (5) change in other current assets (Compustat No. 68); (6) change in accounts payable (Compustat No. 70); (7) change in income taxes payable (Compustat No. 71); and (8) change in other current liabilities (Compustat No. 72). Summary descriptive statistics of accounting variables are presented in Table 2.

**4. Empirical Tests and Results**

**Table 2**  
**Summary Statistics of Accounting Variables <sup>a</sup>**

Variable	Mean	Standard Deviation	Maximum	Minimum
E	175.441	544.102	6,992.000	-1,654.500
CFO	369.816	1,238.848	18,953.500	-24,648.600
UE	0.004	0.133	0.902	-0.978
UCF	0.012	0.263	2.772	-2.524
MV	1,659.149	4,591.529	95,774.430	6.872

<sup>a</sup>Earnings from operations (E), cash flow from operations (CFO) and market value (MV) are in million dollars.

**4.1 Cash Flow Response Coefficient and the Predictability of Cash Flows**

The first hypothesis developed in Section 2 predicts that the cash flow response coefficient is an increasing

function of the predictability of cash flows. To test this hypothesis, the following time-series regression is estimated for each of the 301 firms in our sample to obtain the residual variance ( $\sigma_e^2$ ) for each firm:

$$CFO_t = a_0 + a_1 CFO_{t-1} + e_t \tag{10}$$

Second, the cash flow response coefficient for each of the sample firms is obtained from the following regression:

$$CAR_t = b_0 + b_1 UCFO_t + \epsilon_t \tag{11}$$

The coefficient  $b_1$  is the cash flow response coefficient. Summary statistics for the two regressions are presented in Table 3.

The cash flow response coefficient,  $b_1$ , is hypothesized to be an increasing function of the predictability of the cash flow series. Predictability is reflected in the variance of the cash flow shock,  $\sigma_e^2$ . As the variance of  $e$  (estimated from equation 10) increases, the predictability decreases. Therefore,  $\sigma_e^2$  and  $b_1$

**Table 3**  
**Time-Series Model Summary Statistics**  
(N=301)

Variable	Mean	Standard Deviation	Maximum	Minimum
$\sigma_{ei}^2$ <sup>a</sup>	85.31	197.91	1,691.77	0.78
$\sigma_{vi}^2$ <sup>a</sup>	166.28	612.57	9,548.32	0.69
$b_i$ <sup>a</sup>	0.87	3.73	30.04	-19.35

<sup>a</sup>  $\sigma_{vi}^2$ ,  $\sigma_{ei}^2$ , and  $b_i$  are estimated for each of the 301 firms using equations 10, 12, and 11, respectively.

are expected to be negatively related if the alternative hypothesis is true, and unrelated if the null is true. The correlation coefficients between  $\sigma_e^2$  and  $b_i$  are presented in Table 4. The Spearman correlation coefficient between  $\sigma_e^2$  and  $b_i$  for the 301 sample firms is -.16 at individual firm level and is significant at .005 significance level (see Panel A). This result confirms the hypothesized inverse relationship between  $\sigma_e^2$  and  $b_i$ , and is consistent with the alternative hypothesis that the cash flow response coefficient is an increasing function of its predictability. Because the relationship between  $\sigma_e^2$  and  $b_i$  may be nonlinear, the Kendall rank correlation coefficient was also computed and the result is presented in Panel B of Table 4. The null is rejected at .006 significance level in favor of the alternative.

**4.2 Cash Flow Response Coefficient and the Predictability of Earnings**

The second hypothesis developed in Section 2 is that the market response to cash flows is a decreasing function of the predictability of earnings. As the predictability of earnings in-

creases, keeping the predictability of cash flows constant, the market relies more on earnings in predicting future cash flows and, therefore, the magnitude of the market reaction to cash flows decreases. Intuitively, this hypothesis predicts that cash flow disclosure

will be more informative for firms whose earnings quality is low. To test this hypothesis, the following three steps are performed:

**Table 4**  
**Kendall and Spearman Correlation Coefficients**

Panel A:	Spearman Correlation Coefficient <sup>a</sup> (N=301)	
	Corr( $\sigma_{ei}^2$ , CFRC) (Prob >  R )	-.160 (.005)
Panel B:	Kendall Rank Correlation Coefficient <sup>a</sup> (N=301)	
	Corr( $\sigma_{ei}^2$ , CFRC) (Prob >  R )	-.106 (.006)

<sup>a</sup> The residual variance from cash flow time-series auto-regression ( $\sigma_{ei}^2$ ) and the cash flow response coefficient (CFRC<sub>i</sub>),  $b_i$ , are estimated for each of the 301 firms using equations 10 and 11, respectively.

(1). The predictability of earnings (the ability of earnings to predict future cash flows) is estimated for each firm using the following regression equation:

$$CFO_t = a_0 + a_1 E_{t-1} + u_t \tag{12}$$

(2). The sample firms are then divided into two groups based on the variance of  $u_{i,t}$  (estimated from equation 12),  $\sigma_u^2$ ; and

(3).  $b$  and  $\beta$  coefficients are estimated for each of the two groups using the following two equations, respectively:

$$CAR_{i,t} = \beta_0 + \beta_1 UE_{i,t} + \beta_2 UCFO_{i,t} + \epsilon_{i,t} \quad (13)$$

$$CAR_{i,t} = b_0 + b_1 UCFO_{i,t} + b_2 UAC_{i,t} + \epsilon_{i,t} \quad (14)$$

where UAC is unexpected accruals (accruals are defined as the difference between earnings and cash flows). It is expected that for the group of firms with high earnings predictability, the null hypothesis that cash flow data contribute little incremental information will not be rejected because earnings are highly informative in predicting future cash flows. Specifically, the prediction for the high earnings predictability group is

$$\beta_2 = b_1 - b_2 = 0 \quad (15)$$

where  $\beta_2$ ,  $b_1$  and  $b_2$  are the coefficient estimates from equation 13 and equation 14 respectively [For a detailed discussion of the relationship between  $\beta_2$ ,  $b_1$  and  $b_2$ , see Jennings (1990)].

For the group of firms with low earnings predictability, the null hypothesis is expected to be rejected. More specifically, since earnings predictability is low for this group of firms, it is reasonable to expect the market to rely more on cash flow information:

$$\beta_2 = b_1 - b_2 > 0 \quad (16)$$

The regression results are presented in Table 5. When earnings predictability is high, the null hypothesis that cash flow disclosure contributes no incremental information can not be rejected at any significance level (see Panel A). The cash flow response coefficient after controlling for earnings,  $\beta_2$ , is only .02 with a t-statistic of .638. This evidence indicates that cash flow information adds little to the information provided by earnings when earnings predictability is high. This evidence may explain why previous cash flow studies examining a broad section of firms have failed to document incre-

mentally information content for cash flow data. That is, the predictability of earnings and cash flows was generally assumed to be constant across all firms in those studies.

When earnings predictability is low, the null hypothesis that cash flow disclosure contributes no incremental information above that reflected in earnings is rejected at .03 significance level in favor of the alternative (see Panel B). The cash flow response coefficient after controlling for earnings,  $\beta_2$ , is .08 with a t-statistic of 2.197. Clearly, for this group of firms, cash flow data contribute significant incremental information content beyond that reflected in accrual earnings.

Since equation 13 can be rewritten as [see Jennings (1990)]:

$$CAR_{i,t} = \beta_0 + \beta_1 UAC_{i,t} + (\beta_1 + \beta_2) UCFO_{i,t} + \epsilon_{i,t} \quad (17)$$

it is evident that for a given amount of earnings, a significantly positive  $\beta_2$  implies that the market reacts more favorably the larger are cash flows, and less favorably the larger are accrual adjustments [see Wilson (1987)]. However, the evidence in Table 5 seems to suggest that cash flows are preferred to accruals for a given amount of earnings is true only for the low predictability earnings, and not true for the high predictability earnings.

The evidence that cash flow is preferred to accruals for firms whose earnings' predictability is low seems consistent with the increasing concern of investors over management manipulation of reported earnings. The evidence in Table 5 suggests that investors put less weight on accrual information and more on cash flow information when accrual earnings do not predict future cash flows. For this group of firms, the unusually low ability of earnings to predict future cash flows may signal to the market that the reported earnings may have been manipulated by the management. Or it may signal to the market that certain accrual procedures adopted by those firms do not reflect (or distort) the firms' economic reality. Consequently, investors rely



**Table 5**  
**Test Results: The Cash Flow Response Coefficient**  
**and the Predictability of Earnings<sup>a</sup>**

Panel A: The Predictability of Earnings is High<sup>b</sup>

$$\text{Model: } \text{CAR}_{i,t} = b_0 + b_1\text{UCFO}_{i,t} + b_2\text{UAC}_{i,t} + e_{i,t} \quad (1)$$

$$\text{CAR}_{i,t} = \beta_0 + \beta_1\text{UE}_{i,t} + \beta_2\text{UCFO}_{i,t} + e_{i,t} \quad (2)$$

$\beta_2 = b_1 - b_2$	Adjusted R <sup>2</sup>	F Value
(T value)	(from Equ.2)	(Prob > F)
.022	.038	30.851
(.638)		(.0001)

Panel B: The Predictability of Earnings is Low<sup>b</sup>

$$\text{Model: } \text{CAR}_{i,t} = b_0 + b_1\text{UCFO}_{i,t} + b_2\text{UAC}_{i,t} + e_{i,t} \quad (1)$$

$$\text{CAR}_{i,t} = \beta_0 + \beta_1\text{UE}_{i,t} + \beta_2\text{UCFO}_{i,t} + e_{i,t} \quad (2)$$

$\beta_2 = b_1 - b_2$	Adjusted R <sup>2</sup>	F Value
(T value)	(from Equ.2)	(Prob > F)
.080**	.010	8.784
(2.197)		(.0002)

<sup>a</sup> CAR, UE and UCFO are cumulative abnormal returns, unexpected earnings and unexpected cash flows, respectively. CAR is estimated using an annual event window. A \*(\*\*/\*\*\*) designates statistical significance at the 0.10 (0.05/0.01) level.

<sup>b</sup> Earnings predictability is high if the residual variance from regressing cash flows on lagged earnings is in the lower fifty percentile, and is low if the residual variance from regressing cash flows on lagged earnings is in the higher fifty percentile.

**Proposition 1:** Cash flow data contribute little incremental information content beyond that reflected in accrual earnings when earnings predictability is high even if the predictability of cash flows is high.

**Proposition 2:** Cash flow data contribute significant incremental information to that reflected in earnings when earnings predictability is low even if the predictability of cash flows is low.

To test these two propositions, the sample firms are first divided into two groups based on their earnings predictability (the inverse of  $\sigma_u^2$  estimated from equation 12). Next, the firms in each of the two groups are further divided into three subgroups based on the predictability of cash flows. Finally, the  $b$  and  $\beta$  coefficients are estimated using equation 13 and equation 14 for each of the six sub-groups.

The three subgroups of firms with high predictability earnings are

more on the cash flow information than on earnings.

#### 4.3 Cash Flow Response Coefficient and the Predictability of Cash Flows after Controlling for the Predictability of Earnings

This subsection tests the relationship between the cash flow response coefficient and the predictability of cash flows conditional on the predictability of earnings. Specifically, the following two propositions are tested in this subsection:

used to test the first proposition that cash flow data contribute little incremental information when earnings predictability is high even if the predictability of cash flow is high. Since the earnings predictability of the three subgroups of firms is high, if the popular belief that earnings is generally superior to cash flow data is true, then, cash flow data will contribute little incremental information to that reflected in accrual earnings regardless of the predictability of cash flows. Therefore, for all the three subgroups of firms with high, medium and low cash flow predictability, the prediction is that the cash flow re-

response coefficient after controlling for earnings,  $\beta_2$ , will not be significantly different from zero. Formally, this can be expressed as:

$$\beta_{2H} = b_{1H} - b_{2H} = 0 \tag{18}$$

$$\beta_{2M} = b_{1M} - b_{2M} = 0 \tag{19}$$

$$\beta_{2L} = b_{1L} - b_{2L} = 0 \tag{20}$$

where  $\beta_{2H}$ ,  $\beta_{2M}$  and  $\beta_{2L}$  are the cash flow response coefficient after controlling for earnings for the high, medium and low cash flow predictability subgroups, respectively.

The test results for the first proposition are presented in Table 6, Panel A. All firms in these three groups have a high earnings predictability. The  $\beta_2$  estimates for all three subgroups of firms are not significantly different from zero. The cash flow response coefficients after controlling for earnings,  $\beta_{2H}$ ,  $\beta_{2M}$  and  $\beta_{2L}$ , for the high, medium and low predictability of cash flows are .001, -.01 and -.29 with a significance level of .45, .44 and .52, respectively. The null hypothesis that cash flow data contribute no incremental information when earnings predictability is high can not be rejected even for the subgroup with high cash flow predictability. The evidence in Panel A is consistent with the first proposition that cash flow data contribute little incremental information when the predictability of earnings is high regardless the predictability of cash flows. This result provides further explanations regarding the lack of empirical evidence on the incremental informativeness of cash flow data in previous studies in which the predictability of earnings and cash flows was generally assumed to be constant across all firms.

The second proposition is that cash flow data contribute significant incremental information when earnings pre-

**Table 6**  
**Test Results: The Cash Flow Response Coefficient and the Predictability of Cash Flows After Controlling for the Predictability of Earnings<sup>a</sup>**

Panel A: The Earnings Predictability is High<sup>b</sup>

- (1) The Cash flow predictability is High<sup>c</sup>  
 $\beta_2 = b_1 - b_2$  .001  
 (T value) (.45)
- (2) The Cash flow predictability is Medium<sup>c</sup>  
 $\beta_2 = b_1 - b_2$  .010  
 (T value) (.44)
- (3) The Cash flow predictability is Low<sup>c</sup>  
 $\beta_2 = b_1 - b_2$  -.290  
 (T value) (.52)

Panel B: The Earnings Predictability is Low<sup>b</sup>


- (1) The Cash flow predictability is High<sup>c</sup>  
 $\beta_2 = b_1 - b_2$  2.186\*\*  
 (T value) (2.15)
- (2) The Cash flow predictability is Medium<sup>c</sup>  
 $\beta_2 = b_1 - b_2$  .295\*\*\*  
 (T value) (3.14)
- (3) The Cash flow predictability is Low<sup>c</sup>  
 $\beta_2 = b_1 - b_2$  .06\*\*  
 (T value) (2.35)

<sup>a</sup> CAR, UE and UCFO are cumulative abnormal returns, unexpected earnings and unexpected cash flows, respectively. CAR is estimated using an annual event window. A (\*\*/\*\*\*\*) designates statistical significance at the 0.10 (0.05/0.01) level.

<sup>b</sup> Earnings predictability is high if the residual variance from regressing cash flows on lagged earnings is in the lower fifty percentile, and is low if the residual variance from regressing cash flows on lagged earnings is in the higher fifty percentile.

<sup>c</sup> Cash flow predictability is high if the residual variance from the time-series autoregression of cash flows is in the lowest one-third, and is medium if the residual variance is in the medium one-third, and is low if the residual variance is in the highest one-third.

## 6. Suggestions for Future Research

Given the research findings of this study, future studies examining the incremental information content of accounting variables should control for the informativeness of earnings. That is, an accounting variable which may not appear incrementally informative when examined across all companies, may actually contribute significant incremental information for companies whose earnings are less informative. Another way to extend this research would be to examine the relationship between the informativeness of the two accounting variables examined in this study and the companies' significant accounting choices. Such research would provide further insights with respect to the informativeness of accounting information and accounting choices. 

## Acknowledgment

*The authors would like to thank Tom Williams, John Wild, Terry Warfield, and Werner Frank for their comments on earlier versions of this paper. The financial support from Robert Beyer Center for Accounting Research is gratefully acknowledged. Data used for this research are available from the authors upon request.*

## References

1. Backer, M., and M. L. Gosman, *Financial Reporting and Business Liquidity*, New York: NAA, 1978.
2. Bernard, V. L., "Capital Markets Research in Accounting During the 1980s: A Critical Review," *The State of Accounting Research as We Enter the 90s*, Edited by T. Frecka, 1990.
3. Bernard, V. L., and R. S. Stober, "The Nature and Amount of Information Reflected In Cash Flows and Accruals," *Journal of Accounting Research*, Supplement 1989.
4. Bowen, R., D. Burgstahler, and L Daley, "The Incremental Information Content of Accrual Versus Cash Flows," *The Accounting Review*, Vol. 62, No. 4, pp. 723-747, 1987.
5. \_\_\_\_\_, "Evidence on the Relationships Between Earnings and Various Measures of Cash Flow," *The Accounting Review*, Vol. 61, No. 4, pp. 713-725, 1986.
6. Heath, L.C., *Financial Reporting and the Evaluation of Solvency*, Accounting Research Monograph No. 3, New York: AICPA, 1978.
7. Holthausen, R. W., and R. E. Verrecchia, "The Effect of Sequential Information Releases on the Variance of Price Changes in an Intertemporal Multi-Asset Market," *Journal of Accounting Research*, Vol. 26 (1), pp. 82-106, 1988.
8. Jennings, R., "A Note on Interpreting 'Incremental Information Content,'" *The Accounting Review*, Vol. 65, No. 4, pp. 925-932, 1990.
9. Lipe, R. C., "The Relations Between Stock Returns, Accounting Earnings, and Alternative Information," *The Accounting Review*, Vol. 65, No. 1, pp. 49-71, 1990.
10. Rayburn, J., "The Association of Operating Cash Flows and Accruals with Security Returns," *Journal of Accounting Research*, pp. 112-133, Supplement 1986.
11. Thomas, B. S., "Reporting Cash Flow Information," *Journal of Accountancy*, Vol. 154, No. 5, pp. 98-102, 1982.
12. Wilson, G. P., "The Relative Information Content of Accruals and Cash Flows: Combined Evidence at the Earnings Announcement and Annual Report Release Date," *Journal of Accounting Research*, pp. 165-203, Supplement 1986.
13. \_\_\_\_\_, "The Incremental Information Content of the Accrual and Funds Components of Earnings After Controlling for Earnings," *The Accounting Review*, Vol. 62, No. 2, pp. 293-322, 1987.