Journal of Accounting Research
Vol. 42 No. 3 June 2004
Printed in U.S.A.

Do Accruals Drive Firm-Level Stock Returns? A Variance Decomposition Analysis

JEFFREY L. CALLEN* AND DAN SEGAL*

Received 23 June 2003; accepted 21 January 2004

ABSTRACT

This paper extends the variance decomposition framework of Campbell [1991], Campbell and Ammer [1993], and Vuolteenaho [2002] to address the relative value relevance of accrual news, cash flow news, and expected-return news in driving firm-level equity returns. The extension is based on the Feltham-Ohlson [1995, 1996] clean surplus relations. Using three models, this study shows that *all three* factors, accruals, cash flows, and expected future discount rates are value relevant. Moreover, accrual news is found to significantly dominate expected-return news in driving firm-level stock returns. Operating income news is also found to significantly dominate both expected-return news and free cash flow news in driving firm-level stock returns. Furthermore, after splitting net income into cash flow and accrual earnings components in the Vuolteenaho model, accrual earnings news and cash flow earnings news are found to equally drive firm-level stock returns and to dominate expected-return news. Further disaggregation of the data yields some evidence that accrual earnings news is a more important factor than cash flow earnings news in driving current stock returns. Overall, the three models indicate that changes in expected future accruals are a primary driver, if not the primary driver, of current stock returns.

*University of Toronto. We wish to acknowledge seminar participants at the University of Toronto, the University of Waterloo, and York University and the anonymous referees of this journal for comments on an earlier draft. Most of all we wish to thank Ray Ball for his proactive support of this study.

1. Introduction

The purpose of this paper is to determine the relative impact of accrual news, cash flow news, and expected-return news on unexpected changes in current-period equity returns. The emphasis is on changes rather than levels because we are intent on understanding the relative importance of these three factors in driving current returns.

One of the two primary functions of accruals is to construct an earnings variable that is less noisy than cash flows from operations by matching expenses with the revenues generated by those expenses.[1] Current cash flows from operations are often a noisy measure of the firm's future cash flows because the cash payments in any period may be unrelated to the cash receipts. For example, the sales of goods on credit often require initial cash outlays to suppliers for raw materials, whereas the cash receipts from the sales may come in a later period. The initial negative cash payments are therefore a poor predictor of the positive future cash receipts. In contrast, under generally accepted accounting principles (GAAP), the firm would defer recognizing the expenditures on the raw materials used until the period when the sales revenues are recognized. The resulting earnings measure would then be a better predictor of future net cash flows from sales activity than cash from operations. Indeed, the Financial Accounting Standards Board (FASB) (1978) has taken the position that earnings measured by accrual accounting provide a better indication of firm performance and future cash flows than do current cash flows.

The other primary function of accruals is to allow for the timely recognition of gains and losses due to unanticipated revisions of expected future cash flows, albeit in an asymmetrical fashion.[2] For instance, asset write-downs are an accrual expense that reflects unexpected negative shocks to future cash flows generated from the asset. The asymmetry in the treatment of positive and negative shocks to future cash flows follows from the conservative nature of GAAP, where losses are recognized immediately and the recognition of gains is deferred until realized. The timeliness of accruals relative to cash flows implies that breaking up the net income time series into its accrual and cash flow time series components may yield better predictions of expected future cash flows than either the net income or cash flow series alone.

In short, although current equity returns are ultimately a function of expected future cash flows (and expected future returns), the time series of accruals is potentially value relevant because it may contain information helpful in predicting future cash flows (and the revision of future cash flows) beyond the information contained in the time series of current and

[1] See Dechow [1994], Guay, Kothari, and Watts [1996], and Dechow, Kothari, and Watts [1998].

[2] See Basu [1997], Ball, Robin, and Wu [2000, 2003], Ball, Kothari, and Robin [2000], and Ball and Shivakumar [2003].

past cash flows. Nevertheless, because accruals are subject to managerial discretion and consequently to manipulation, their contribution to measuring cash flow persistence is questionable. To the extent that management opportunistically manipulates earnings through accruals, accrual earnings will be a less reliable measure of firm performance and cash flows could be superior in predicting future performance.[3] Indeed, Sloan [1996] shows that persistence of current earnings performance is decreasing (increasing) in the magnitude of the accrual (cash flow) component of earnings. In addition, Dechow, Sabino, and Sloan [1996] argue that because accruals are not realized but anticipated cash flows, they should impound a higher discount for futurity and risk. Therefore, it is an empirical question as to whether accruals and cash flows are priced differently.

Although the empirical literature is not totally unequivocal, there appears to be a consensus among accounting scholars that both accruals and cash flows are value relevant. In particular, a large number of studies find that both accruals and cash flows are contemporaneously related to equity returns.[4] Furthermore, a few studies provide evidence that future accruals and future cash flows are impounded in equity prices and that current accruals and current cash flows can be used to predict future equity prices.[5] The current debate in the accounting literature is not whether accruals are value relevant but, rather, whether accruals are as value relevant as cash flows or less value relevant.[6]

This study analyzes the value relevance of accruals by (1) determining whether revisions in expected future accruals (accruals news) drive current equity returns and (2) determining the proportion of the total variance in current unexpected equity returns that can be explained by accruals news relative to other factors, such as cash flow news and expected-return news. Although intuition may suggest that cash flow news and accrual news alone suffice to drive security prices, the influential work of Campbell and Shiller [1988a, b] emphasizes that equity returns are also driven by changes in expected future discount rates (expected-return news). In particular, increases in expected future equity returns reduce current equity returns just as increases in expected future interest rates drive down bond prices.

Extending the log-linear dynamic dividend growth model of Campbell and Shiller [1988a, b], Campbell [1991] and Campbell and Ammer [1993]

---

[3] Mitigating the concern about the potential for earnings management to contaminate the information content of accruals is that, even when earnings are managed, accruals eventually turn into cash flows. Also, this paper, as well as others cited later (e.g., Sloan [1996]), deal primarily with the pricing of accruals rather than with their information content. We thank an anonymous referee for these insights.

[4] See Rayburn [1986], Wilson [1986, 1987], Bowen, Burgstahler, and Daley [1987], Bernard and Stober [1989], Dechow [1994], Subramanyam [1996], Pfeiffer and Elgers [1999], and Barth et al. [1999].

[5] See Sloan [1996] and Xie [2001]. There is also a literature showing that current accruals and cash flows can predict future abnormal earnings and cash flows. See, for example, Barth et al. [1999] and Barth, Cram, and Nelson [2001].

[6] See Sloan [1999].

estimate the impact of dividend news and expected-return news on current unexpected returns for aggregate stock return data.[7] They find that expected return-news dominates dividend news in driving equity returns. More recently, Vuolteenaho [2002] extends this variance decomposition framework to the firm level by substituting accounting numbers for dividends via the accounting clean surplus identity. In contradistinction to Campbell and Ammer [1993], Vuolteenaho finds that earnings news—where earnings are defined as net income—dominates expected-return news in driving equity returns.[8] He reconciles his results with those of Campbell and Ammer by showing that the aggregate nature of their data is driving their results. Indeed, because expected-return variations tend to be systematic, in contrast to more idiosyncratic cash flow information, it is to be expected that much of the variation in aggregate index data is due to expected returns.[9]

We further develop the variance decomposition framework to include accruals by incorporating the Feltham-Ohlson [1995, 1996] clean surplus relations.[10] Accruals in the Feltham-Ohlson framework are defined as the change in the firm's operating assets. Defining accruals in this fashion, Feltham and Ohlson [1995] show that an incremental dollar of accruals should theoretically have a greater impact on expected future earnings (and cash flows) than an incremental dollar of current cash flows because operating assets generate (ex ante) returns above the risk-free rate whereas invested cash flows yield the risk-free rate only. This model allows us to compute the relative impact of accrual news and expected-return news on unexpected changes in current returns. In a further extension of this model, we decompose accruals into operating income and free cash flows and determine the relative impact of operating income news, free cash flow news, and expected-return news on unexpected changes in current returns. Finally, we extend the Vuolteenaho [2002] model in a straightforward fashion by decomposing the earnings definition in his model into cash flow and accrual earnings components to compare the relative impact of cash flow earnings news, accrual earnings news, and expected-return news on unexpected changes in current returns.

The empirical results in this study highlight the importance of accrual news in driving stock returns. Specifically, accrual news in the Feltham-Ohlson sense significantly dominates expected-return news in driving firm-level stock returns. Furthermore, operating income news, which includes accrual news in the Feltham-Ohlson sense, significantly dominates both

[7] The Campbell-Shiller model is a dynamic version of the Gordon [1962] dividend growth model. It is described in ch. 7 of Campbell, Lo, and MacKinlay [1997].

[8] Vuolteenaho [2002] uses net income to measure cash flow news. Although both models incorporate the clean surplus relationship, the Vuolteenaho model differs substantively from Ohlson [1995]. In particular, the Vuolteenaho information dynamics are log linear rather than linear and, more important, they are much richer than the Ohlson information dynamics.

[9] See Cochrane [2001], Vuolteenaho [2002], and Cohen, Polk, and Vuolteenaho [2003] on this point.

[10] We adopt the Feltham-Ohlson clean surplus relations but not their dynamics.

expected-return news and free cash flow news in driving firm-level stock returns. Using the Vuolteenaho [2002] model, both accrual earnings news, where accruals are measured in the conventional fashion, and cash flow earnings news significantly dominate expected-return news in driving firm-level stock returns. Furthermore, accrual earnings news and cash flow earnings news are equally significant drivers of stock returns with neither component of net income (significantly) dominating the other. However, upon disaggregating the variance decomposition by such potential control variables as firm size and operating cycle, we find evidence that accrual earnings news is a more important factor than cash flow earnings news in driving current stock returns.

In what follows, section 2 briefly describes the Campbell-Shiller and Vuolteenaho variance decomposition models. This section also extends the variance decomposition model to a Feltham-Ohlson accruals framework. Section 3 describes the data, and section 4 describes the major empirical results. Section 5 concludes. Propositions and their proofs are provided in the appendix.

2. *The Valuation of Accruals*

2.1 THE CAMPBELL-SHILLER AND VUOLTEENAHO MODELS

Because our model builds on the Campbell [1991] and Vuolteenaho [2002] extensions of the Campbell and Shiller [1988a, b] dividend-growth model, we briefly review these models first. Campbell and Shiller develop their model from the definition of a cum dividend equity return:[11]

$$\begin{aligned} r_t^c &= \log\left(\frac{P_t + D_t}{P_{t-1}}\right) \\ &= \log(P_t + D_t) - \log(P_{t-1}) \\ &= p_t - p_{t-1} + \log(1 + \exp(d_t - p_t)), \end{aligned} \tag{1}$$

where:

$r_t^c =$ log cum dividend stock return at time t
$P_t =$ Market value of equity at time t
$D_t =$ dividends at time t
$p_t =$ log market value of equity at time t
$d_t =$ log dividends at time t.

To generate a (log) linear valuation equation, Campbell and Shiller [1988a, b] linearize equation (1) by a Taylor approximation yielding

$$r_t^c \simeq h + \rho p_t + (1 - \rho) d_t - p_{t-1}, \tag{2}$$

[11] Lowercase letters denote the log of uppercase letters.

where h is a constant and ρ is a constant error approximation term. Replacing the approximation symbol by an equality, solving equation (2) forward for price, and taking expectations yields the valuation equation:[12]

$$p_t = \frac{h}{(1-\rho)} + E_t\left[\sum_{j=0}^{\infty} \rho^j \left((1-\rho)\, d_{t+1+j} - r^c_{t+1+j}\right)\right]. \tag{3}$$

This valuation equation says that the current market price of equity is a constant plus the infinite sum of expected (weighted) future dividends less expected (weighted) future returns. This is similar to a standard dividend valuation model except that discount rates (expected returns) are in the numerator, not the denominator and, more important, they are dynamic. In particular, equation (3) shows that if expected future discount rates (dividends) increase, the market value of equity decreases (increases).

Substituting equation (3) into equation (2) yields the unexpected change in current returns (Campbell [1991]):

$$r^c_t - E_{t-1}\left(r^c_t\right) = \Delta E_t \sum_{j=0}^{\infty} \rho^j (\Delta d_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} \rho^j r^c_{t+j}, \tag{4}$$

where Δ denotes the first difference operator, E_t is the expectations operator, and $\Delta E_t = E_t(\cdot) - E_{t-1}(\cdot)$. Campbell [1991] and Campbell and Ammer [1993] use equation (4) to investigate the impact of unexpected changes in future dividends (dividend news) and unexpected changes in future returns (expected-return news) on security returns at the aggregate economywide level.

The stickiness of dividends for dividend paying firms and the fact that many firms do not pay dividends limit the potential usefulness of the Campbell-Shiller [1998a, b] and Campbell [1991] models at the firm level. To attenuate these problems, Vuolteenaho [2002] uses the accounting clean surplus relation to replace dividends with net income. In contrast to the Ohlson [1995] model, direct substitution of the clean surplus identity into the dividend valuation equation does not yield the desired formulation. Instead, Vuolteenaho uses the definition of the book to market ratio and the clean surplus identity to generate a model equivalent to equation (4), namely:

$$r^c_t - E_{t-1}\left(r^c_t\right) = \Delta E_t \sum_{j=0}^{\infty} \rho^j (roe_{t+j} - f_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} \rho^j r^c_{t+j}, \tag{5}$$

[12] The transversality condition $\lim j \to \infty\ \rho^j p_{t+j} = 0$ must hold as well. In general, in the models that follow for which returns are defined as cum dividend (rather than ex dividend), an additional additive error approximation term is required. For simplicity, we suppress additive terms of this sort in the text description of the various models. They are included in the appendix, however.

where:

$$\begin{aligned} roe_t &= \text{log book return on equity in period } t \\ &= \log(1 + \tfrac{X_t}{BV_{t-1}}) \\ BV_t &= \text{book value of equity at time } t \\ X_t &= \text{net income in period } t \\ f_t &= \text{log risk free rate in period } t \\ &= \log(1 + F_t) \\ F_t &= \text{the risk-free rate of interest in period } t. \end{aligned}$$

Ultimately, the significance of this model over other accounting valuation models lies in the fact that it is an empirically implementable firm-level accounting valuation model that incorporates time-varying expected future discount rates.[13]

2.2 A VALUATION MODEL INCORPORATING ACCRUALS

Using the Feltham-Ohlson clean surplus relations, we transform the Campbell [1991] dividend-growth model into an accounting-based valuation model that allows for a meaningful distinction between cash flows and accruals. Formally, we adopt the Feltham-Ohlson clean surplus relations

$$FA_t = FA_{t-1} + i_t - (D_t - C_t) \tag{6}$$

$$OA_t = OA_{t-1} + OX_t - C_t, \tag{7}$$

where:

$$\begin{aligned} FA_t &= \text{net financial assets at time } t \\ i_t &= \text{net interest income received from net financial assets in period } t \\ D_t &= \text{net cash dividends in period } t \\ C_t &= \text{free cash flows (cash from operations less investment in operating} \\ &\quad\ \text{assets) in period } t \\ OA_t &= \text{net operating assets at time } t \\ OX_t &= \text{net operating earnings in period } t.^{14} \end{aligned}$$

In the Feltham-Ohlson framework, financial assets (and financial liabilities), such as cash and marketable securities (short- and long-term debt), are zero net present value investments that earn (pay) the risk-free rate.

[13] The emphasis is on empirically implementable models. There are of course other theoretical accounting valuation models that incorporate time-varying discount rates such as Feltham and Ohlson [1999] and Ang and Liu [2001]. Regarding the importance of incorporating time-varying discount rates in accounting valuation models, one can do no better than cite Beaver's [1999, p. 37] criticism of the accounting literature: "Thirty plus years ago, Miller and Modigliani [1960] spent considerable effort to estimate the cost of capital for one industry for three years. It is remarkable that the assumption of a constant [discount rate] across firms and time is the best we can do."

[14] Net financial assets are financial assets less financial liabilities. Net operating assets are operating assets less operating liabilities. Net interest received is interest revenues less interest expenses. Net dividends are cash dividends paid out less equity capital issued.

On the other hand, operating assets are assumed to be positive net present value investments. Equation (6) asserts that net financial assets increase with net interest received and with free cash flows, and they decrease with net dividends paid out. According to equation (7), net operating assets increase with operating earnings and decrease with free cash flows. The two equations articulate through the free cash flow variable because free cash flows are assumed to be invested in financial assets.[15]

In the context of the Feltham-Ohlson relations, accruals are defined as operating earnings less free cash flows $(OX_t - C_t)$. In normalized log form, accruals, acc_t, are defined as $\log[1 + (OX_t - C_t)/OA_{t-1}]$. It follows from equation (7) that acc_t is also equal to $\log(OA_t/OA_{t-1})$; that is, acc_t is the growth in net operating assets. In the Feltham-Ohlson [1995] model, the single most important variable in determining future returns is the growth in net operating assets because of the conservative nature of GAAP. Our empirical analysis sheds light on this issue because we are able to relate unexpected changes in expected operating asset growth rates to the variability in stock returns.

Using the definition of the operating assets to market value ratio and the Feltham-Ohlson clean surplus relations, we derive a model in the appendix that incorporates accruals and is similar in structure to the models of Campbell [1991] and Vuolteenaho [2002]. More specifically, we decompose the unexpected change in the ex dividend stock return $[r_t - E_{t-1}(r_t)]$ into an expected-return news component and an accruals news component. Formally, Proposition 2 in the appendix shows that:[16]

$$r_t - E_{t-1}(r_t) = \Delta E_t \sum_{j=0}^{\infty} (acc_{t+j} - f_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} r_{t+j}, \tag{8}$$

where:

$$\begin{aligned} r_t &= \text{the ex dividend log stock return at period } t \\ &= \log(1 + R_t + F_t) - f_t \\ R_t &= \text{the simple ex dividend excess stock return in period } t \\ acc_t &= \text{the log accrual growth in period } t \\ &= \log[1 + (OX_t - C_t)/OA_{t-1}] \end{aligned}$$

Defining the unexpected stock return components as expected-return news (N_r) and accruals news (N_{acc}), equation (8) can be expressed as:

$$r_t - E_{t-1}(r_t) = N_{acc,t} - N_{r,t}, \tag{9}$$

[15] Adding equations (6) and (7) yields the standard clean surplus relation:

$$BV_t = BV_{t-1} + X_t - D_t.$$

[16] We also derive a similar relationship for cash flows (Proposition 2), namely:

$$r_t^c - E_{t-1}\left(r_t^c\right) = \Delta E_t \sum_{j=0}^{\infty} \rho^j (cf_{t+j} - f_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} \rho^j r_{t+j}^c.$$

where

$$N_{r,t} = \Delta E_t \sum_{j=1}^{\infty} r_{t+j}, \tag{10}$$

and

$$N_{acc,t} = \Delta E_t \sum_{j=0}^{\infty} (acc_{t+j} - f_{t+j}). \tag{11}$$

Equation (9) shows that the unexpected change in current stock returns increases if the expected-return news decreases or the accrual news increases. This is intuitively appealing. An unanticipated increase in the firm's expected future accruals conveys positive information about the firm's future cash flows, driving up security returns.

Equation (9) can be used to provide a variance decomposition of the unexpected change in returns. Specifically, taking variances of both sides of the equation yields

$$\text{var}\{r_t - E_{t-1}(r_t)\} = \text{var}(N_{r,t}) + \text{var}(N_{acc,t}) - 2\text{cov}(N_{r,t}, N_{acc,t}). \tag{12}$$

In the empirical work that follows, we use equation (12) to assess the relative impact of expected-return news and accrual news in driving equity returns. The greater is the variance (or covariance) of any factor(s) on the right-hand side of equation (12), the more power that factor has in explaining unexpected returns.[17]

In addition to enabling us to study the impact of accrual news on equity returns, the Feltham-Ohlson clean surplus relations underlying equations (8) through (12) provide a beneficial side benefit by comparison to the analogous equations in the Campbell [1991], Campbell and Ammer [1993], and Vuolteenaho [2002] studies. In particular, equations (8) through (12) of this study do not depend on a Taylor series approximation for their validity. In contrast, exact log linearity obtains in the Campbell [1991], Campbell and Ammer [1993], and Vuolteenaho [2002] studies only if the firm pays no dividends. Equations (8) through (12) hold whatever the firm's dividend policy. Intuition suggests the reason. Dividends appear in the Feltham-Ohlson financial asset equation (equation (6)) but play no role in the Feltham-Ohlson operating asset equation (equation (7)). It is the latter equation that generates the accruals variance decomposition.

In an extension of our model, we split acc_t in equation (8) into operating income (ox_t^A) and free cash flow (ocf_t^A) news components. This breakdown facilitates a comparison of these two factors, along with expected-return

[17] In theory, one can also decompose the variance of the unexpected change in current stock returns using the (free) cash flow equation from the prior footnote to obtain:

$$\text{var}\left\{r_t^c - E_{t-1}\left(r_t^c\right)\right\} = \text{var}(N_{r^c,t}) + \text{var}(N_{cf,t}) - 2\text{cov}(N_{r^c,t}, N_{cf,t}).$$

This decomposition often cannot be estimated empirically because cf_t is undefined whenever net financial assets are negative.

news, in explaining unexpected changes in equity returns.[18] Specifically, as shown in Proposition 3 of the appendix, the unexpected change in returns can be written as:

$$r_t - E_{t-1}(r_t) = \Delta E_t \sum_{j=0}^{\infty} \left(ox_{t+j}^A - f_{t+j}\right) - \Delta E_t \sum_{j=0}^{\infty} ocf_{t+j}^A - \Delta E_t \sum_{j=1}^{\infty} r_{t+j}. \tag{13}$$

In this case, the variance decomposition is a function of three news factors:

$$\begin{aligned}\mathrm{var}\{r_t - E_{t-1}(r_t)\} = {} & \mathrm{var}(N_{r,t}) + \mathrm{var}(N_{ox^A,t}) + \mathrm{var}(N_{ocf^A,t}) \\ & - 2\mathrm{cov}(N_{r,t}, N_{ox^A,t}) + 2\mathrm{cov}(N_{r,t}, N_{ocf^A,t}) \\ & - 2\mathrm{cov}(N_{ox^A,t}, N_{ocf^A,t}),\end{aligned} \tag{14}$$

where $N_{ox^A,t} = \Delta E_t \sum_{j=0}^{\infty}(ox_{t+j}^A - f_{t+j})$ and $N_{ocf^A,t} = \Delta E_t \sum_{j=0}^{\infty} ocf_{t+j}^A$.

A third approach is based directly on a simple extension of Vuolteenaho [2002]. It is shown in Proposition 4 of the appendix that splitting Vuolteenaho's net income measure into cash flow earnings (cfe_t) and accruals earnings ($acce_t$) components yields:[19]

$$r_t^c - E_{t-1}\left(r_t^c\right) = \Delta E_t \sum_{j=0}^{\infty} \rho^j acce_{t+j} + \Delta E_t \sum_{j=0}^{\infty} \rho^j (cfe_{t+j} - f_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} \rho^j r_{t+j}^c. \tag{15}$$

The resulting variance decomposition is also a function of three news factors, namely,

$$\begin{aligned}\mathrm{var}\left\{r_t^c - E_{t-1}\left(r_t^c\right)\right\} = {} & \mathrm{var}(N_{r^c,t}) + \mathrm{var}(N_{acce,t}) + \mathrm{var}(N_{cfe,t}) \\ & - 2\mathrm{cov}(N_{r^c,t}, N_{acce,t}) - 2\mathrm{cov}(N_{r^c,t}, N_{cfe,t}) \\ & + 2\mathrm{cov}(N_{acce,t}, N_{cfe,t}),\end{aligned} \tag{16}$$

where $N_{acce,t} = \Delta E_t \sum_{j=0}^{\infty} \rho^j acce_{t+j}$ and $N_{cfe,t} = \Delta E_t \sum_{j=0}^{\infty} \rho^j (cfe_{t+j} - f_{t+j})$.

In what follows, the three variance decomposition methods developed in this section are applied to a large sample of Compustat firms.

3. *The Sample*

The data for this study are obtained from the intersection of annual Compustat and monthly Center for Research in Security Prices (CRSP) files for

[18] This approach is not costless as it requires an approximation of the form $\log(1 + z) \simeq z$. This approximation is reasonable only for small z.

[19] This extension also requires the approximation $\log(1 + z) \simeq z$.

1962 to 2000.[20] Restricting the sample firms to have positive total assets (*DATA6*), nonmissing income before extraordinary items (*DATA18*), and merging the files yields an initial sample of 228,934 firm-years of data.

The following additional data items are used to construct the variables used in this study: cash and cash equivalents (*DATA1*), current assets (*DATA4*), current liabilities (*DATA5*), long-term debt (*DATA9*), depreciation and amortization (*DATA14*), interest expense (*DATA15*), income tax expense (*DATA16*), special items (*DATA17*), preferred dividends (*DATA19*), investments and advancements (*DATA32*), debt in current liabilities (*DATA34*), equity earnings (*DATA55*), interest income (*DATA62*), preferred shares (*DATA130*), pretax income (*DATA170*), short-term investments (*DATA193*), total liabilities (*DATA181*), and notes payable (*DATA206*).

Financial assets, financial liabilities, operating assets, and operating liabilities are computed as in Penman [2000]. Net interest income and operating income are computed as in Begley and Feltham [2002].

More specifically, the variables of interest in this study are computed from the Compustat data items as follows:

Accrual Earnings ($acce_t$) = [(*DATA4* − lagged *DATA4*) − (*DATA1* − lagged *DATA1*)] − [(*DATA5* − lagged *DATA5*) − (*DATA34* − lagged *DATA34*)] − *DATA14*

Cash Earnings (cfe_t) = *DATA18* − Accrual Earnings[21]

Net Interest Income (i_t) = (*DATA62* − *DATA15*) ∗ (1 − *TAX*) − *DATA19* + *DATA55*[22]

Net Operating Earnings (OX_t) = *DATA18* − *DATA17* ∗ (1 − TAX) − *DATA19* − Net Interest Earned

Financial Assets = *DATA32* + *DATA193* + *DATA1*[23]

Financial Liabilities = *DATA9* + *DATA34* + *DATA130* + *DATA206*[24]

Operating Assets = *DATA6* − Financial Assets

Operating Liabilities = *DATA181* + *DATA130* − Financial Liabilities

Net Operating Assets = Operating Assets − Operating Liabilities

Net Financial Assets = Financial Assets − Financial Liabilities

Book Value (BV_t) = Net Operating Assets + Net Financial Assets

Free Cash Flow (C_t) = Net Operating Earnings − Change in Net Operating Assets

---

[20] Compustat data before 1962 are problematic.

[21] Cash flow earnings are measured using a balance sheet approach. Although cash flow earnings extracted from the Statement of Cash Flows are less noisy (Hribar and Collins [2002]), the limited availability of the latter data on Compustat would severely reduced the sample size by 15 years of data.

[22] Net Interest Earned = Net Interest Revenue + Equity Earnings-Preferred Dividends.

[23] Financial Assets = Short-Term Investments + Investments and Advances + Cash.

[24] Financial Liabilities = Long-Term Debt + Debt in Current Liabilities + Preferred Shares + Notes Payable.

Effective Tax Rate (TAX) = $DATA16/DATA170$[25]
Return on Equity (ROE) = $(OX_t + i_t)/BV_{t-1}$

The risk-free rate F_t is the annualized three month Treasury bill rate.

We require nonmissing observations from each of the data items used to compute the preceding variables. We further eliminate observations with negative operating assets, negative operating liabilities, negative financial liabilities, and nonpositive net operating assets. These requirements reduce the Compustat sample to 56,316 firm-year observations. In addition, we require three lags of book values, net operating assets, and net financial assets as well as two lags of net operating earnings, net interest earned, accrual earnings, and cash earnings. These additional requirements further reduce the Compustat sample to (5,497 firms) 27,175 firm-year observations.

Monthly CRSP data are obtained for the latter sample yielding an initial sample of 1,150,002 firm-month observations. Annual returns begin three months after the fiscal year-end and are computed using monthly returns. Firm-years without at least one valid monthly return or missing market value of equity data are eliminated. We require two lags of annual returns and of market values. We eliminate small firms by requiring market values of least $10 million. These requirements result in a CRSP sample of 74,999 firm-year observations. Merging CRSP and Compustat yields a sample of (3,937 firms) 17,859 firm-year observations.

To mitigate data errors and scaling problems, we further truncate the relevant variables in each model by a 1% symmetric filter.[26] Table 1 shows the distribution of the major variables of interest. Mean and median accrual earnings (and net financial assets) are negative. Mean and median book-to-market ratios are less than one. Median cum dividend equity market returns and accounting returns on book value equity are 12% and 13%, respectively. Median market value of equity is $92 million. These numbers are fairly comparable to those of other accounting studies for the period under consideration.

4. *Empirical Results*

To estimate the variance decomposition of equation (12), the dynamics of the variables in equations (8) through (11) have to be specified. Following Campbell [1991], Campbell and Ammer [1993], and Vuolteenaho [2002], the return variance decomposition is implemented using a log-linear vector autoregressive (VAR) model. Define $z_{i,t}$ to be a vector of firm-specific state

[25] The effective tax rate is only relevant for the second model. If either pretax income or income tax expense are negative, we assume that the effective tax rate is zero. If the effective tax rate is greater than the maximum statutory tax rate (for the year in question), we assume that the effective tax rate is the maximum statutory tax rate.

[26] Because each model calls for different accounting variables, the sample size will differ across the models. The exact number of data points used to estimate each model is stated in the relevant tables.

TABLE 1
Descriptive Statistics

	Mean	Std.	Q1	Median	Q3
RETC	0.21	0.51	−0.13	0.12	0.42
RET	0.18	0.51	−0.14	0.09	0.39
BM	0.90	1.25	0.36	0.63	1.04
ROE	0.12	0.14	0.07	0.13	0.19
RET_CSH	0.18	0.22	0.06	0.18	0.29
RET_ACCE	−0.06	0.20	−0.16	−0.07	0.04
ACC	0.17	0.41	−0.04	0.09	0.27
OA	1.35	2.05	0.38	0.81	1.55
LEV	0.67	0.21	0.51	0.67	0.84
RET_FCF	−0.03	0.40	−0.13	0.03	0.15
RET_OXT	0.14	0.18	0.07	0.11	0.19
MV	1,030	6,167	30	92	412

Table 1 shows the sample distribution of several variables where Std. is the standard deviation and Q_i denotes the quartile i. The summary statistics are based on a pooled sample from the CRSP-Compustat databases for 1964 to 2000 inclusive (yielding 17,859 firm-year observations), after eliminating observations from the top and bottom 1% of each the following variables (with the exception of *LEV*), yielding 16,090 firm-year observations:

RETC = annual cum dividend return computed from monthly returns
RET = annual ex dividend return computed from monthly returns
BM = book-to-market ratio
ROE = book return on equity, computed as $(OX_t + i_t)/BV_{t-1}$
RET_CSH = cash earnings scaled by BV_{t-1}
RET_ACCE = accrual earnings scaled by BV_{t-1}
ACC = growth in total accruals, computed as $NOA_t/NOA_{t-1} - 1$
OA = ratio of net operating assets to market value
LEV = leverage ratio defined as the ratio of BV_t to the sum of financial liabilities and BV_t
RET_FCF = ratio of free cash flow to NOA_{t-1}
RET_OXT = ratio of net operating income to NOA_{t-1}
MV = market value of equity in millions of dollars

variables. The firm's state vector is assumed to follow the multivariate log-linear dynamic:

$$z_{i,t} = \Gamma z_{i,t-1} + \eta_{i,t}. \tag{17}$$

The VAR transition coefficient matrix Γ is assumed to be constant over time and over firms. The error terms $\eta_{i,t}$ are assumed to have a variance-covariance matrix Σ and to be independent of everything known at $t-1$. Firms with the same values of the state variable are assumed to behave similarly. Nevertheless, because the error terms are not necessarily correlated across firms, firms that are similar today need not be similar tomorrow.

Both a parsimonious short VAR and richer long VAR specification are estimated. The parsimonious short VAR specification is limited to one lag each of log stock returns, log accruals, and the log operating assets to market value ratio $(oa_{i,t})$.[27]

[27] The log operating-assets-to-market-value ratio is included in the parsimonious VAR because our model is generated from this ratio. Vuolteenaho [2002] similarly includes the book-to-market ratio in his VAR specifications.

Specifically, letting $z_{i,t} = \begin{pmatrix} r_{i,t} \\ acc_{i,t} \\ oa_{i,t} \end{pmatrix}$, $\Gamma = \begin{pmatrix} \alpha_1 & \alpha_2 & \alpha_3 \\ \beta_1 & \beta_2 & \beta_3 \\ \gamma_1 & \gamma_2 & \gamma_3 \end{pmatrix}$ and $\eta_{i,t} = \begin{pmatrix} \eta_{i,1t} \\ \eta_{i,2t} \\ \eta_{i,3t} \end{pmatrix}$ in equation (17) and suppressing the firm subscript, gives rise to the short VAR specification:

$$\begin{aligned} r_t &= \alpha_1 r_{t-1} + \alpha_2 acc_{t-1} + \alpha_3 oa_{t-1} + \eta_{1t} \\ acc_t &= \beta_1 r_{t-1} + \beta_2 acc_{t-1} + \beta_3 oa_{t-1} + \eta_{2t} \\ oa_t &= \gamma_1 r_{t-1} + \gamma_2 acc_{t-1} + \gamma_3 oa_{t-1} + \eta_{3t}, \end{aligned} \tag{18}$$

where the variables are mean adjusted. The long VAR specification allows for a richer lag structure by including two lags for each of the state variables.[28]

The variance decomposition of the accrual model can be implemented empirically by combining the VAR (equation (18) or, more generally, (17)) with equation (8). Formally, the unexpected change in returns is computed as:

$$r_t - E_{t-1}(r_t) = e_1' \eta_{i,t}, \tag{19}$$

where $e_i' = (0, \ldots, 1, \ldots, 0)$ and the 1 is in the ith position.[29] Campbell [1991] simplifies the derivation of the VAR return decomposition by judicious use of vectors of the form:[30]

$$\lambda_i' = e_i' \Gamma (I - \Gamma)^{-1}. \tag{20}$$

In particular, expected-return news and accrual news (equations (10) and (11)) can be expressed conveniently as:[31]

$$\begin{aligned} N_{r,t} &= \Delta E_t \sum_{j=1}^{\infty} r_{t+j} \\ &= \lambda_1' \eta_{i,t} \\ &= e_1' \Gamma (I - \Gamma)^{-1} \eta_{i,t} \end{aligned} \tag{21}$$

---

[28] The long VAR equivalent of equation (18) is:

$$\begin{aligned} r_t &= \alpha_{11} r_{t-1} + \alpha_{12} r_{t-2} + \alpha_{21} acc_{t-1} + \alpha_{22} acc_{t-2} + \alpha_{31} oa_{t-1} + \alpha_{32} oa_{t-2} + \eta_{1t} \\ acc_t &= \beta_{11} r_{t-1} + \beta_{12} r_{t-2} + \beta_{21} acc_{t-1} + \beta_{22} acc_{t-2} + \beta_{31} oa_{t-1} + \beta_{32} oa_{t-2} + \eta_{2t} \\ oa_t &= \gamma_{11} r_{t-1} + \gamma_{12} r_{t-2} + \gamma_{21} acc_{t-1} + \gamma_{22} acc_{t-2} + \gamma_{31} oa_{t-1} + \gamma_{32} oa_{t-2} + \eta_{3t}. \end{aligned}$$

[29] Equation (19) follows directly by premultiplying equation (17) by e_1'.

[30] Because of the need to approximate his system, Campbell actually uses vectors of the form $\lambda_i' = e_i' \rho \Gamma (I - \rho \Gamma)^{-1}$ where ρ is an approximation term. In our model no approximation is required so that $\rho = 1$.

[31] This is the residual formulation of $N_{acc,t}$. Specifically, from equation (9) we have

$$\begin{aligned} N_{acc,t} &= r_t - E_{t-1}(r_t) + N_{r,t} \\ &= e_1' \eta_{i,t} + e_1' \Gamma (I - \Gamma)^{-1} \eta_{i,t} \text{ by equations (19) and (20)} \\ &= e_1' [I + \Gamma (I - \Gamma)^{-1}] \eta_{i,t} \\ &= e_1' (I - \Gamma)^{-1} \eta_{i,t}. \end{aligned}$$

We also estimate $N_{acc,t}$ directly as $e_2' (I - \Gamma)^{-1} \eta_{i,t}$ with qualitatively similar results.

$$
\begin{aligned}
N_{acc,t} &= \Delta E_t \sum_{j=0}^{\infty} (acc_{t+j} - f_{t+j}) \\
&= \left(e_1' + \lambda_1'\right)\eta_{i,t} \\
&= e_1'(I - \Gamma)^{-1}\eta_{i,t}. \qquad (22)
\end{aligned}
$$

An estimate of the variance-covariance matrix $\Sigma = E(\eta_{i,t}\eta_{i,t}')$ is also required to implement the variance decomposition. Specifically, taking variances of both sides of equations (21) and (22) gives the news variances and covariances of equation (12):

$$\mathrm{var}(N_{r,t}) = \lambda_1'\Sigma\lambda_1 \qquad (23)$$

$$\mathrm{var}(N_{acc,t}) = \left(e_1' + \lambda_1'\right)\Sigma(e_1 + \lambda_1) \qquad (24)$$

$$\mathrm{cov}(N_{r,t}, N_{acc,t}) = \lambda_1'\Sigma(e_1 + \lambda_1). \qquad (25)$$

Following Vuolteenaho [2002], the VAR coefficient matrix is estimated by trading off efficiency for robustness and simplicity. The VAR is estimated using weighted least squares on the panel data, with one pooled prediction regression per state variable. Each annual cross-section is weighted equally by deflating the data for each firm-year by the number of firms in the cross-section of that year. Ordinary least squares (OLS) is employed as well, but the results are insensitive to the estimation procedure. Consistent robust standard errors are obtained using the Shao-Rao [1993] jacknife method.[32] Specifically, the VAR is reestimated after dropping one cross-section at a time, thereby yielding a time series of estimates for each parameter. The standard error for each parameter is then computed on the basis of the time series. This jacknife method yields consistent standard errors even in the presence of cross-sectional correlation.

Panel A of table 2 shows the estimated parameters of the short VAR and the robust jacknife standard errors. The significant (two-tailed) parameter estimates imply that returns are high when past one-year accruals are low and past one-year operating-assets-to-market ratios are high. Accruals are high when past returns and past operating-assets-to-market-value ratio are low and past accruals are high. The operating-assets-to-market ratio is high when past accruals and past operating-assets-to-market ratio are high and past returns are low. Using the terminology of Granger causality, accruals and the operating-assets-to-market ratio are directly value relevant in that they Granger-cause returns. Past returns are indirectly value relevant in that they Granger-cause accruals and the operating-assets-to-market ratio and the latter Granger-cause returns. In general, the coefficients of a multilagged VAR are difficult to interpret so that we do not show the parameter estimates for the long VAR.[33]

[32] The Rogers [1983, 1993] robust standard error method was used as well with almost identical results.

[33] These are available from the authors.

TABLE 2

Accruals Only Model Based on the Feltham-Ohlson Clean Surplus Relations

Panel A: Short VAR

	r_{t-1}	acc_{t-1}	oa_{t-1}
r_t	−0.024	−0.053***	0.041***
	(0.022)	(0.017)	(0.009)
acc_t	−0.094***	0.024**	−0.092***
	(0.013)	(0.012)	(0.003)
oa_t	−0.090***	0.073***	0.871***
	(0.025)	(0.020)	(0.011)

Panel B: Variance decomposition

	$\mathrm{var}(N_{total})$	$\mathrm{var}(N_r)$	$\mathrm{var}(N_{acc})$	$\mathrm{cov}(N_r, N_{acc})$	$\mathrm{Diff}(N_{acc}, N_r)$
Short VAR	0.166	0.034***	0.072***	−0.030***	0.038***
		(0.008)	(0.008)	(0.003)	(0.015)
Long VAR	0.163	0.035***	0.069***	−0.029***	0.034**
		(0.009)	(0.008)	(0.004)	(0.015)

Panel C: Relative variance decomposition

	$\frac{\mathrm{var}(N_r)}{\mathrm{var}(N_{total})}$	$\frac{\mathrm{var}(N_{acc})}{\mathrm{var}(N_{total})}$	$\frac{\mathrm{var}(N_r)}{\mathrm{var}(N_{acc})}$
Short VAR	0.203	0.434	0.467
Long VAR	0.217	0.425	0.510

Panel A lists the parameter estimates for the short vector autoregressive model (VAR). The model variables include the mean-adjusted log ex dividend annual excess return r_t (the first element of the state vector z), the mean-adjusted log accruals acc_t (the second element), and the mean-adjusted log operating assets to market value ratio oa_t (the third element). The parameters in the table correspond to the following system:

$$z_{i,t} = \Gamma z_{i,t-1} + \eta_{i,t}, \qquad \Sigma = E\left(\eta_{i,t}\eta'_{i,t}\right).$$

Two numbers are reported for each parameter. The first number is a weighted least squares point estimate of the parameter, where observations are weighted such that each cross-section receives an equal weight. The second number in parentheses is a robust jacknife standard error. The short VAR is based on one lag each of the mean-adjusted log ex dividend annual return r_t, the mean-adjusted log accruals acc_t, and the mean-adjusted log operating assets to market value ratio oa_t. The long VAR is based on two lags each of these variables. The top and bottom 1% of each of the state variables in each VAR specification is deleted to mitigate outliers. The sample for the short (long) VAR is composed of 16,309 (15,794) firm-years.

Panel B lists the variance decomposition for the short VAR and long VAR where the variances are defined as follows:

$$\begin{aligned}
\mathrm{var}(N_{total}) &= \text{total variance of mean-adjusted excess returns} \\
&= \mathrm{var}(N_r) + \mathrm{var}(N_{acc}) - 2\mathrm{cov}(N_r, N_{acc}) \\
\mathrm{var}(N_r) &= \text{variance of expected-return news} \\
\mathrm{var}(N_{acc}) &= \text{variance of accruals news} \\
\mathrm{cov}(N_r, N_{acc}) &= \text{the covariance between the expected-return news and accruals news} \\
\mathrm{Diff}(N_{acc}, N_r) &= \mathrm{var}(N_{acc}) - \mathrm{var}(N_r)
\end{aligned}$$

Panel C lists the relative size of each variance component to the total variance and the relative size of each variance component to the other variance component.

***Significant at the 1% significance level, two-tailed.

**Significant at the 5% significance level, two-tailed.

Panel B of table 2 shows the variance decomposition for both the short and long VARs. In both cases, the variances of the expected-return news and the accrual news are significant at the 1% significance level (two-tailed). Furthermore, the variance of accrual news is about twice the variance of expected-return news, and the difference is significant at the 1% level for the short VAR and the 5% level for the long VAR. Panel C of table 2 shows that accrual news explains about 43% of the total variance of the unexpected

change in returns whereas expected-return news explains only about 21% of the total variance of the unexpected change in returns.[34] The remainder is explained by the joint negative covariance between accrual news and expected-return news (significant at the 1% level). The negative covariance accords with intuition because unexpected increases in discount rates should reduce growth in operating assets. Overall, table 2 indicates that both accrual news and expected-return news are value relevant and that accrual news is far more fundamental than expected-return news in driving current market returns.

In our second model, we break accruals into operating earnings and free cash flow components in a straightforward extension of the previous model (see equation (14)). This allows us to explore the relative impact of operating income news and free cash flow news on changes in current stock returns. The short VAR is now composed of four state variables: log returns (r_t), free cash flows (ocf_t^A), operating income (ox_t^A), and the operating-assets-to-market-value ratio (oa_t). The long VAR specification is composed of two lags of each of these variables.

Panel A of table 3 shows the estimated parameters of the short VAR and the robust standard errors based on the jacknife procedure. The significant parameter estimates imply that returns are high when past one-year free cash flows and past one-year operating-assets-to-market-value ratio are high. Free cash flows are positively affected by all four lagged state variables. Operating income is high when past one-year returns, free cash flows, and operating income are high and the past operating-assets-to-market-value ratio is low. The operating-assets-to-market-value ratio is high when the past operating-assets-to-market-value and past operating income are high and past returns are low. All four variables are value relevant, although past returns and past operating income are only indirectly value relevant because the latter Granger-cause the other two variables.

Panel B of table 3 shows the variance decomposition for both the short and long VARs. In both cases, the variances of expected-return news, free cash flow news, and operating income news are significant at the 1% level. The covariance terms are also significant at the 1% level. The variance of operating income news is significantly greater than the variance of free cash flow news at the 1% significance level in both the short and long VARs. Panel C of table 3 shows that operating earnings news explains about 29% of the total variance of the unexpected change in returns in both the short and long VARs, whereas free cash flow news explains only 16% of the total variance of the unexpected change in returns. Expected-return news explains about 3% of the total variance of the unexpected change in returns. Overall, table 3 indicates that operating income news is a far more important driver of market returns than are free cash flow news or expected-return news.

[34] The total variance is not estimated separately but computed from the other variances as per equation (12).

TABLE 3

Operating Earnings and Free Cash Flow Model Based on the Feltham-Ohlson Clean Surplus Relations

Panel A: Short VAR

	r_{t-1}	ocf^A_{t-1}	ox^A_{t-1}	oa_{t-1}
r_t	−0.015	0.033***	0.056	0.047***
	(0.021)	(0.011)	(0.035)	(0.011)
ocf^A_t	0.167***	0.049***	0.321***	0.096***
	(0.014)	(0.010)	(0.028)	(0.006)
ox^A_t	0.034***	0.069***	0.494***	−0.035***
	(0.009)	(0.004)	(0.016)	(0.003)
oa_t	−0.087***	−0.002	0.204***	0.880***
	(0.022)	(0.016)	(0.057)	(0.013)

Panel B: Variance decomposition

	$\mathrm{var}(N_{total})$	$\mathrm{var}(N_r)$	$\mathrm{var}(N_{ocf^A})$	$\mathrm{var}(N_{ox^A})$	$\mathrm{Diff}(N_{ocf^A}, N_{ox^A})$
Short VAR	1.181	0.036***	0.175***	0.346***	−0.171***
		(0.008)	(0.019)	(0.044)	(0.026)
Long VAR	1.159	0.040***	0.181***	0.322***	−0.140***
		(0.009)	(0.021)	(0.043)	(0.025)

	$\mathrm{cov}(N_r, N_{ocf^A})$	$\mathrm{cov}(N_r, N_{ox^A})$	$\mathrm{cov}(N_{ocf^A}, N_{ox^A})$
Short VAR	0.032***	−0.058***	−0.222***
	(0.006)	(0.009)	(0.029)
Long VAR	0.034***	−0.059***	−0.215***
	(0.007)	(0.010)	(0.029)

Panel C: Relative variance decomposition

	$\frac{\mathrm{var}(N_r)}{\mathrm{var}(N_{total})}$	$\frac{\mathrm{var}(N_{ocf^A})}{\mathrm{var}(N_{total})}$	$\frac{\mathrm{var}(N_{ox^A})}{\mathrm{var}(N_{total})}$	$\frac{\mathrm{var}(N_r)}{\mathrm{var}(N_{ox^A})}$	$\frac{\mathrm{var}(N_{ocf^A})}{\mathrm{var}(N_{ox^A})}$
Short VAR	0.031	0.148	0.293	0.105	0.506
Long VAR	0.034	0.156	0.278	0.124	0.563

Panel A lists the parameter estimates for the short vector autoregressive model (VAR). The model variables include the mean-adjusted log ex dividend annual excess return r_t (the first element of the state vector z), the mean-adjusted free cash flows ocf^A_t (the second element), the mean-adjusted log operating earnings ox^A_t (the third element), and the mean-adjusted operating assets to market value ratio oa_t (the fourth element). The parameters in the table correspond to the following system:

$$z_{i,t} = \Gamma z_{i,t-1} + \eta_{i,t}, \qquad \Sigma = E\left(\eta_{i,t}\eta'_{i,t}\right).$$

Two numbers are reported for each parameter. The first number is a weighted least squares point estimate of the parameter, where observations are weighted such that each cross-section receives an equal weight. The second number in parentheses is a robust jacknife standard error. The short VAR is based on one lag each of the mean-adjusted log ex dividend annual excess returns r_t, the mean-adjusted free cash flows ocf^A, the mean-adjusted operating earnings ox^A_t, and the mean-adjusted log operating assets to market value ratio oa_t. The long VAR is based on two lags each of these variables. The top and bottom 1% of each of the state variables in each VAR specification is deleted to mitigate outliers. The sample for the short (long) VAR is composed of 16,223 (15,701) firm-years.

Panel B lists the variance decomposition for the short VAR and long VAR where the variances are defined as follows:

$$\begin{aligned}
\mathrm{var}(N_{total}) &= \text{total variance of mean-adjusted returns} \\
&= \mathrm{var}(N_r) + \mathrm{var}(N_{ox^A}) + \mathrm{var}(N_{ocf^A}) - 2\mathrm{cov}(N_r, N_{ox^A}) + 2\mathrm{cov}(N_r, N_{ocf^A}) - \\
&\quad 2\mathrm{cov}(N_{ox^A}, N_{ocf^A}) \\
\mathrm{var}(N_r) &= \text{variance of expected-return news} \\
\mathrm{var}(N_{ocf^A}) &= \text{variance of free cash flows news} \\
\mathrm{var}(N_{ox^A}) &= \text{variance of operating earnings news} \\
\mathrm{cov}(N_r, N_{ocf^A}) &= \text{covariance between the expected-return news and free cash flow news} \\
\mathrm{cov}(N_r, N_{ox^A}) &= \text{covariance between the expected-return news and operating income news} \\
\mathrm{cov}(N_{ocf^A}, N_{ox^A}) &= \text{covariance between the free cash flow news and operating income news} \\
\mathrm{Diff}(N_{ocf^A}, N_{ox^A}) &= \mathrm{var}(N_{ocf^A}) - \mathrm{var}(N_{ox^A})
\end{aligned}$$

Panel C lists the percentage contribution of each variance component to the total variance and the relative size of each variance component to the other variance components.

***Significant at the 1% significance level, two-tailed.

Finally, we decompose net income in the Vuolteenaho [2002] model into accruals and cash flow earnings components (see equation (16)). The short VAR is composed of four variables: log returns (r_t), cash flow earnings (cfe_t), accrual earnings ($acce_t$), and the log book-to-market ratio (bm_t). The long VAR specification is composed of two lags of each of these variables.

Panel A of table 4 shows the estimated parameters of the short VAR and the robust standard errors based on the jacknife procedure. The significant parameter estimates imply that returns are high when past book-to-market ratios are high. Cash flow earnings are positively affected by past returns, past cash flow, and past accrual earnings and negatively affected by the past book-to-market ratio. Accrual earnings are positively affected by past cash flow and accrual earnings and negatively affected by the past book-to-market ratio. The book-to-market ratio is high when past cash flow, accrual earnings, and past book-to-market ratios are high. Past book-to-market ratios are directly value relevant (Granger-cause returns) whereas past cash flow earnings, accrual earnings, and returns are indirectly value relevant.

Panel B of table 4 shows the variance decomposition for both the short and long VARs. For both specifications, the variances of expected-return news, accrual earnings news, and cash flow earnings news are significant at the 1% significance level (as are two of the three covariances). Furthermore, in both the short and the long VARs, the variance of cash flow earnings news and the variance of accrual earnings news are not statistically different from each other. Panel C shows that accrual earnings news and cash flow earnings news are essentially equally important in driving market returns, with the variances of accrual earnings news slightly larger than the variances of cash flow earnings news (but not significantly so). Accrual and cash flow earnings news dominate expected-return news in both the short and long VARs.

5. *Comparative Statics Results*

This section of the paper investigates whether our results are robust to alternative specifications of the models, the variables, and the sample. The tables that follow focus on the short VAR variance decomposition of the extended Vuolteenaho [2002] model. Replicating the analysis (not tabulated) using the long VAR gives similar results, except where stated otherwise.

First, we reexamine the variance decomposition controlling for potential correlated omitted variables beginning with firm size. Table 5 shows the variance decomposition ranked by firm size decile portfolios, where size is measured by the market value of equity. Decile 1 contains the smallest firms and decile 10 contains the largest. The variance-covariance matrix Σ and the transition matrix Γ are assumed to be constant across the deciles.[35] All news variances (and most covariances) are uniformly significant at the 1% level and decline almost monotonically with firm size. This accords with

[35] These assumptions follow Vuolteenaho [2002]. We also repeated the analysis with Γ varying across size deciles and obtained qualitatively similar results.

TABLE 4

Cash and Accrual Earnings Model Based on the Ohlson Clean Surplus Relation

Panel A: Short VAR

	r^c_{t-1}	cfe_{t-1}	$acce_{t-1}$	bm_{t-1}
r^c_t	0.007	0.057	−0.021	0.072***
	(0.022)	(0.037)	(0.041)	(0.012)
cfe_t	0.086***	0.351***	0.079***	−0.014***
	(0.012)	(0.020)	(0.018)	(0.004)
$acce_t$	−0.010	0.115***	0.352***	−0.023***
	(0.008)	(0.013)	(0.022)	(0.004)
bm_t	0.000	0.249***	0.345***	0.832***
	(0.022)	(0.059)	(0.057)	(0.016)

Panel B: Variance decomposition

	$\mathrm{var}(N_{total})$	$\mathrm{var}(N_{r^c})$	$\mathrm{var}(N_{cfe})$	$\mathrm{var}(N_{acce})$	$\mathrm{Diff}(N_{cfe}, N_{acce})$
Short VAR	0.161	0.028***	0.100***	0.108***	0.008
		(0.006)	(0.007)	(0.007)	(0.006)
Long VAR	0.157	0.037***	0.126***	0.129***	0.003
		(0.007)	(0.009)	(0.009)	(0.009)

	$\mathrm{cov}(N_{r^c}, N_{cfe})$	$\mathrm{cov}(N_{r^c}, N_{acce})$	$\mathrm{cov}(N_{cfe}, N_{acce})$
Short VAR	−0.002	−0.021***	−0.061***
	(0.004)	(0.004)	(0.004)
Long VAR	0.003	−0.022***	−0.087***
	(0.005)	(0.005)	(0.007)

Panel C: Relative variance decomposition

	$\frac{\mathrm{var}(N_{r^c})}{\mathrm{var}(N_{total})}$	$\frac{\mathrm{var}(N_{cfe})}{\mathrm{var}(N_{total})}$	$\frac{\mathrm{var}(N_{acce})}{\mathrm{var}(N_{total})}$	$\frac{\mathrm{var}(N_{r^c})}{\mathrm{var}(N_{acce})}$	$\frac{\mathrm{var}(N_{cfe})}{\mathrm{var}(N_{acce})}$
Short VAR	0.174	0.622	0.673	0.259	0.924
Long VAR	0.234	0.801	0.820	0.286	0.977

Panel A lists the parameter estimates for the short vector autoregressive model (VAR). The model variables include the mean-adjusted log cum dividend annual excess return r^c_t (the first element of the state vector z), the mean-adjusted cash flow earnings cfe_t (the second element), the mean-adjusted accrual earnings $acce_t$ (the third element), and the mean-adjusted log book to market value ratio bm_t (the fourth element). The parameters in the table correspond to the following system:

$$z_{i,t} = \Gamma z_{i,t-1} + \eta_{i,t}, \qquad \Sigma = E\left(\eta_{i,t}\eta'_{i,t}\right).$$

Two numbers are reported for each parameter. The first number is a weighted least squares point estimate of the parameter, where observations are weighted such that each cross-section receives an equal weight. The second number in parentheses is a robust jacknife standard error. The short VAR is based on one lag each of the mean-adjusted log cum dividend excess annual return r^c_t, the mean-adjusted cash flow earnings cfe_t, the mean-adjusted accrual earnings $acce_t$, and the mean-adjusted log book to market ratio bm_t. The long VAR is based on two lags each of these variables. The top and bottom 1% of each of the state variables for both VAR specifications is deleted to mitigate outliers. The sample for the short (long) VAR is composed of 16,164 (15,625) firm-years.

Panel B lists the variance decomposition for the short VAR and long VAR where the variances are defined as follows:

$$\begin{aligned}
\mathrm{var}(N_{total}) &= \text{total variance of mean-adjusted returns} \\
&= \mathrm{var}(N_{r^c}) + \mathrm{var}(N_{cfe}) + \mathrm{var}(N_{acce}) - 2\mathrm{cov}(N_{r^c}, N_{acce}) - 2\mathrm{cov}(N_{r^c}, N_{cfe}) + \\
&\quad 2\mathrm{cov}(N_{acce}, N_{cfe}) \\
\mathrm{var}(N_{r^c}) &= \text{variance of expected-return news} \\
\mathrm{var}(N_{cfe}) &= \text{variance of cash flow earnings news} \\
\mathrm{var}(N_{acce}) &= \text{variance of accrual earnings news} \\
\mathrm{cov}(N_{r^c}, N_{cfe}) &= \text{covariance between the expected-return news and cash flow earnings news} \\
\mathrm{cov}(N_{r^c}, N_{acce}) &= \text{covariance between the expected-return news and accrual earnings news} \\
\mathrm{cov}(N_{cfe}, N_{acce}) &= \text{covariance between the cash flow earnings news and accrual earnings news} \\
\mathrm{Diff}(N_{cfe}, N_{acce}) &= \mathrm{var}(N_{cfe}) - \mathrm{var}(N_{acce})
\end{aligned}$$

Panel C lists the percentage contribution of each variance component to the total variance and the relative size of each variance component to the other variance components.

***Significant at the 1% significance level, two-tailed.

TABLE 5

Variance Decomposition by Size Decile: Cash and Accrual Earnings Model

Decile	var(N_{total})	var(N_{r^c})	var(N_{cfe})	var(N_{acce})	Diff(N_{cfe}, N_{acce})	$\frac{\text{var}(N_{cfe})}{\text{var}(N_{acce})}$
1	0.204	0.035***	0.125***	0.135***	−0.010	0.92
		(0.003)	(0.010)	(0.010)	(0.008)	
2	0.216	0.039***	0.127***	0.139***	−0.012	0.91
		(0.003)	(0.007)	(0.009)	(0.008)	
3	0.189	0.035***	0.132***	0.140***	−0.008*	0.94
		(0.003)	(0.008)	(0.008)	(0.005)	
4	0.174	0.030***	0.112***	0.117***	−0.005	0.96
		(0.002)	(0.008)	(0.007)	(0.006)	
5	0.178	0.032***	0.110***	0.126***	−0.016***	0.87
		(0.003)	(0.007)	(0.006)	(0.006)	
6	0.164	0.027***	0.100***	0.105***	−0.005	0.95
		(0.002)	(0.006)	(0.006)	(0.005)	
7	0.149	0.025***	0.086***	0.097***	−0.011**	0.89
		(0.002)	(0.005)	(0.007)	(0.005)	
8	0.133	0.023***	0.075***	0.082***	−0.007	0.92
		(0.002)	(0.005)	(0.005)	(0.006)	
9	0.109	0.018***	0.067***	0.074***	−0.007*	0.90
		(0.002)	(0.006)	(0.006)	(0.004)	
10	0.093	0.016***	0.067***	0.067***	−0.000	1.00
		(0.002)	(0.005)	(0.005)	(0.004)	

Decile	cov(N_{r^c}, N_{cfe})	cov(N_{r^c}, N_{acce})	cov(N_{cfe}, N_{acce})
1	−0.002	−0.025***	−0.073***
	(0.002)	(0.003)	(0.008)
2	−0.000	−0.029***	−0.074***
	(0.002)	(0.003)	(0.006)
3	0.001	−0.025***	−0.083***
	(0.003)	(0.004)	(0.006)
4	−0.002	−0.024***	−0.069***
	(0.002)	(0.002)	(0.006)
5	−0.000	−0.026***	−0.071***
	(0.002)	(0.004)	(0.005)
6	−0.004***	−0.022***	−0.060***
	(0.001)	(0.002)	(0.005)
7	−0.003	−0.021***	−0.054***
	(0.002)	(0.003)	(0.005)
8	−0.003***	−0.017***	−0.043***
	(0.001)	(0.003)	(0.003)
9	−0.002**	−0.015***	−0.043***
	(0.001)	(0.002)	(0.005)
10	−0.004**	−0.011***	−0.043***
	(0.002)	(0.002)	(0.004)

Table 5 lists the variance decomposition for the short vector autoregressive model (VAR) of table 4 ranked by size deciles where size is measured by market value of equity. Decile 1 denotes the smallest firms and decile 10 denotes the largest firms. The variance-covariance matrix Σ and the transition matrix Γ are assumed to be constant across the deciles. Variances and covariances are defined as in the notes to table 4.

***Significant at the 1% significance level, two-tailed.

**Significant at the 5% significance level, two-tailed.

*Significant at the 10% significance level, two-tailed.

intuition because larger firms tend to be more stable than smaller firms and, thus, are subject to less variability. More important, no particular pattern characterizes the relative proportions of the cash flow earnings news variances to accrual earnings news variances along size deciles, indicating that size is not a factor in determining whether accrual earnings news or cash flow earnings news drive security returns. However, for all size deciles, the variance of accrual earnings is larger than or equal to the variance of cash flow earnings, although this relationship is significant for only four deciles. This weakly suggests that a major implication of table 4, namely, that cash flow earnings news and accrual earnings news have an equal impact on revisions in equity returns, may be due to aggregation and that accrual earnings may in fact be the primary driver of equity returns.

Dechow [1994] provides empirical evidence that the importance of accrual earnings in explaining stock returns increases (decreases) with the industry operating cycle, with the industry trade cycle, and with the level of short-term (long-term) operating accruals. Therefore, we also estimate the variance decomposition controlling for each of the operating cycle, trade cycle, and changes in short-term accruals (working capital) and long-term operating accruals, where these variables are defined as in Dechow. Specifically, Table 6 provides the variance decomposition for the extended Vuolteenaho [2002] model ranked by the operating cycle.[36] The news variances (and most of the covariances) are uniformly significant at the 1% level. There appears to be no discernible pattern for the relative proportion of cash flow earnings news to accrual earnings news variances, indicating that the operating cycle is not a factor in determining whether accrual earnings news or cash flow earnings news drive security returns. Again, the variance of accrual earnings is larger than or equal to the variance of cash flow earnings for almost all operating cycle deciles, significantly so for half of the deciles, (weakly) suggesting that accrual earnings news is a more important factor in driving equity returns than is cash flow earnings news.

A similar portfolio analysis for other potential correlated omitted variables such as leverage, short-term operating accruals, and long-term operating accruals (not tabulated) yield similar results. In particular, although there are no discernible patterns for the relative proportion of cash flow earnings news to accrual earnings news variances as a function of these variables, accrual earnings are either equal to or greater than cash flow earnings for virtually all deciles, sometimes significantly so.

One potential weakness of the prior analysis is that each control variable is evaluated in isolation. As an alternative robustness test, we include both the size and leverage control variables in the short (and long) VAR along with the state variables. The variance decomposition results (not tabulated) are qualitatively similar to those reported in table 4. As a further robustness

[36] Replacing the operating cycle by the trade cycle yields essentially equivalent results.

TABLE 6

Variance Decomposition by Operating Cycle: Cash and Accrual Earnings Model

Decile	var(N_{total})	var(N_{r^c})	var(N_{cfe})	var(N_{acce})	Diff(N_{cfe}, N_{acce})	$\frac{\text{var}(N_{cfe})}{\text{var}(N_{acce})}$
1	0.145	0.027***	0.102***	0.108***	−0.006	0.94
		(0.002)	(0.006)	(0.008)	(0.007)	
2	0.140	0.024***	0.110***	0.107***	0.003	1.03
		(0.002)	(0.005)	(0.008)	(0.005)	
3	0.157	0.028***	0.091***	0.103***	−0.012**	0.88
		(0.003)	(0.007)	(0.010)	(0.006)	
4	0.144	0.025***	0.090***	0.095***	−0.006	0.94
		(0.002)	(0.007)	(0.008)	(0.006)	
5	0.148	0.028***	0.092***	0.100***	−0.008	0.92
		(0.003)	(0.006)	(0.008)	(0.006)	
6	0.166	0.026***	0.101***	0.110***	−0.010**	0.91
		(0.002)	(0.007)	(0.007)	(0.005)	
7	0.166	0.029***	0.096***	0.109***	−0.013***	0.88
		(0.002)	(0.007)	(0.006)	(0.005)	
8	0.168	0.027***	0.088***	0.107***	−0.019***	0.82
		(0.002)	(0.006)	(0.006)	(0.006)	
9	0.188	0.033***	0.098***	0.116***	−0.018***	0.84
		(0.002)	(0.006)	(0.006)	(0.006)	
10	0.184	0.034***	0.116***	0.119***	−0.002	0.99
		(0.003)	(0.007)	(0.006)	(0.006)	

Decile	cov(N_{r^c}, N_{cfe})	cov(N_{r^c}, N_{acce})	cov(N_{cfe}, N_{acce})
1	0.003	−0.022***	−0.066***
	(0.002)	(0.003)	(0.005)
2	0.002	−0.022***	−0.071***
	(0.002)	(0.002)	(0.006)
3	0.001	−0.021***	−0.053***
	(0.002)	(0.004)	(0.007)
4	−0.001	−0.020***	−0.054***
	(0.002)	(0.002)	(0.005)
5	−0.005***	−0.015***	−0.057***
	(0.001)	(0.002)	(0.005)
6	−0.004**	−0.024***	−0.063***
	(0.002)	(0.002)	(0.006)
7	−0.006***	−0.020***	−0.059***
	(0.002)	(0.003)	(0.006)
8	−0.004**	−0.023***	−0.053***
	(0.002)	(0.003)	(0.004)
9	−0.003	−0.025***	−0.058***
	(0.002)	(0.003)	(0.006)
10	−0.006**	−0.020***	−0.069***
	(0.003)	(0.003)	(0.006)

Table 6 lists the variance decomposition for the short vector autoregressive model (VAR) of table 4 ranked by operating cycle deciles where operating cycle is measured as in Dechow [1994], namely,

$$\left(\frac{(AR_t + AR_{t-1})/2}{Sales/360}\right) + \left(\frac{(INV_t + INV_{t-1})/2}{Cost\ of\ Goods\ Sold/360}\right),$$

where AR_t is accounts receivable at time t and INV_t is inventory at time t. Decile 1 denotes the smallest operating cycle decile and decile 10 denotes the largest. The variance-covariance matrix Σ and the transition matrix Γ are assumed to be constant across the deciles. Variances and covariances are defined as in the notes to table 4.

***Significant at the 1% significance level, two-tailed.

**Significant at the 5% significance level, two-tailed.

check, controls for size, leverage, operating cycle, and changes in short-term accruals (working capital) and long-term operating accruals are all included in the short (and long) VAR. Again, the results are quantitatively similar to those reported in table 4. More specifically, all three variances are significant with both accrual earnings news and cash flow earnings news dominating expected-return news. The variance of cash flow earnings news and the variance of accrual earnings news are not statistically different from each other.

Second, we reestimate the accrual and cash flow earnings model (both with and without controls) after redefining the income variable to be comprehensive income. The clean surplus relation assumes that the balance sheets articulate via the income statement. This is strictly correct only for (properly defined) comprehensive income. Comprehensive income is computed as in Dhaliwal, Subramanyam, and Trezevant [1999], namely, the change in retained earnings (*DATA36*) plus common stock dividends (*DATA21*). We assume that all items composing comprehensive income below net income before extraordinary items and discontinued operations are accruals. The results (not tabulated) confirm the prior evidence.

Third, to mitigate data errors and scaling problems, we truncate the accounting variables by an alternative 0.5% symmetric filter and reestimate the model. This filter yields qualitatively similar results (not tabulated). Kothari, Sabino, and Zach [1999] show that the elimination of outliers by a symmetric percentage filter is likely to bias the test statistics if the underlying variables are skewed (e.g., such as earnings). As an alternative approach, we remove outliers based on a small denominator filter, that is, by removing the 1% smallest book value and net operating asset numbers.[37] The (nontabulated) results are qualitatively similar, except that accrual earnings news now significantly dominates cash flow earnings news in the long VAR with controls, both where size and leverage are the only controls and where all five controls are included.

Fourth, because removing missing Compustat data reduces the sample size substantially, the empirical work was reestimated for a much larger sample obtained by assuming that missing data take on zero values. The results are substantially the same as those reported for the smaller sample.

All of the preceding robustness tests (except, of course, the one incorporating comprehensive income) were also applied to the two models that are based on the Feltham-Ohlson relations. With one exception, the results obtained (not tabulated) are similar to those of tables 2 and 3. Specifically, regarding the first model, both accruals and expected returns are significant, and accruals significantly dominate expected returns in driving equity returns. These results continue to hold for the univariate controls. However, when both size and leverage controls are included in the long VAR, accrual variances are larger than expected-return variances, although the

[37] A further number of observations (less than 20 per model) were deleted by hand because they yielded unreasonable values for some of the state variables.

TABLE 7

Variance Decomposition by Returns: Cash and Accrual Earnings Model

Decile	var(N_{total})	var(N_{r^c})	var(N_{cfe})	var(N_{acce})	Diff(N_{cfe}, N_{acce})	$\frac{\text{var}(N_{cfe})}{\text{var}(N_{acce})}$
1	0.656	0.083***	0.166***	0.217***	−0.051***	0.77
		(0.006)	(0.006)	(0.017)	(0.019)	
2	0.238	0.037***	0.130***	0.134***	−0.004	0.97
		(0.003)	(0.009)	(0.011)	(0.007)	
3	0.114	0.020***	0.109***	0.105***	0.004	1.04
		(0.002)	(0.007)	(0.008)	(0.006)	
4	0.055	0.018***	0.088***	0.086***	0.002	1.02
		(0.002)	(0.006)	(0.006)	(0.004)	
5	0.024	0.012***	0.088***	0.079***	0.009***	1.11
		(0.001)	(0.007)	(0.008)	(0.002)	
6	0.008	0.009***	0.073***	0.063***	0.010***	1.16
		(0.001)	(0.003)	(0.003)	(0.002)	
7	0.011	0.010***	0.076***	0.064***	0.011***	1.18
		(0.001)	(0.004)	(0.004)	(0.002)	
8	0.041	0.014***	0.079***	0.073***	0.006	1.08
		(0.002)	(0.005)	(0.003)	(0.004)	
9	0.119	0.023***	0.098***	0.101***	−0.003	0.97
		(0.002)	(0.007)	(0.007)	(0.006)	
10	0.460	0.067***	0.127***	0.193***	−0.066***	0.66
		(0.005)	(0.007)	(0.009)	(0.010)	

Decile	cov(N_{r^c}, N_{cfe})	cov(N_{r^c}, N_{acce})	cov(N_{cfe}, N_{acce})
1	−0.043***	−0.078***	−0.026***
	(0.006)	(0.008)	(0.009)
2	−0.006**	−0.030***	−0.068***
	(0.003)	(0.005)	(0.006)
3	−0.001	−0.014***	−0.074***
	(0.002)	(0.002)	(0.007)
4	0.008***	−0.007***	−0.067***
	(0.002)	(0.002)	(0.006)
5	0.009***	−0.005***	−0.074***
	(0.002)	(0.001)	(0.007)
6	0.008***	−0.002**	−0.063***
	(0.001)	(0.001)	(0.003)
7	0.007***	−0.000	−0.063***
	(0.001)	(0.001)	(0.004)
8	0.005***	−0.004**	−0.062***
	(0.001)	(0.002)	(0.004)
9	0.001	−0.015***	−0.066***
	(0.002)	(0.003)	(0.005)
10	−0.018***	−0.069***	−0.050***
	(0.004)	(0.006)	(0.005)

Table 7 lists the variance decomposition for the short vector autoregressive model (VAR) of table 4 ranked by (cum dividend) return on equity deciles. Returns are initially divided into negative and positive returns, and then the negative and positive returns are each ranked separately into quintiles. Decile 1 denotes the most negative return and decile 5 denotes the least negative return; decile 6 denotes the least positive return and decile 10 denotes the most positive return. The variance-covariance matrix Σ and the transition matrix Γ are assumed to be constant across the deciles. Variances and covariances are defined as in the notes to table 4.

***Significant at the 1% significance level, two-tailed.

**Significant at the 5% significance level, two-tailed.

differences are not significant. Operating earnings, free cash flows, and expected returns are significant in the second model, and operating earnings significantly dominate free cash flows and expected returns in driving current equity returns. The latter results hold for both the univariate and multivariate controls.[38]

To further investigate the relationship between accounting conservatism and accrual earnings news, table 7 shows the variance decomposition for the extended Vuolteenaho [2002] model as a function of the sign and magnitude of (cum dividend) stock returns. Observations with negative returns are ranked in the first five deciles (deciles 1 to 5) whereas observations with positive returns are ranked in the second five deciles (deciles 6 to 10). Given that accruals allow for the timely recognition of future losses, we conjecture, in the spirit of Basu [1997], that the variability in accrual earnings news drives most of the variability for negative stock returns. The asymmetric treatment of gains and losses under conservative accounting does not allow for a similar prediction regarding future gains. Consistent with this conjecture, table 7 shows that the variance of accrual earnings news is significantly greater than the variance of cash flow earnings news for the lowest negative return decile. However, table 7 also shows an interesting pattern that bears further investigation. For the smallest and largest return deciles (1 and 10), the variance of accrual earnings news is significantly greater than the variance of cash flow earnings news. For the intermediate deciles (5,6, and 7), the variance of cash flow earnings news is significantly greater than the variance of accrual earnings news. For all other deciles, the variance of cash flow earnings news is not significantly different from the variance of accrual earnings news.[39] This inverted U-shaped pattern is consistent with accrual earnings providing more timely information than cash flow earnings about extreme gains, as well as extreme losses, due to unanticipated revisions of expected future cash flows. We leave further analysis of this finding for future research.

6. *Conclusion*

Although the literature appears to have reached a consensus that accruals and cash flows are value relevant, the value relevance of accruals relative to cash flows is very much in contention. Missing from this literature altogether is the potential importance of expected future interest rates in driving security prices. Using three different variance decomposition approaches, two of which are based on the Feltham-Ohlson [1995, 1996] clean surplus relations and one based on the standard clean surplus relation, this study

[38] All results reported in this paragraph hold under the 0.5% symmetric filter and the nonsymmetric filter as well.

[39] A similar inverted U-shaped pattern obtains if all returns are ranked by deciles without first separating returns into negative and positive quantities and if returns are defined as unanticipated returns (the residual η_{1t} of the return equation (18)).

indicates that *all three* factors—accruals, cash flows, and expected future discount rates—are value relevant. Moreover, we find that accrual news (in the Feltham-Ohlson sense) dominates expected-return news in driving current stock returns. In addition, operating income news dominates free cash flow news and expected-return news in driving current stock returns. Finally, when we separate earnings into accrual earnings and cash flow earnings, we find that accrual earnings news and cash flow earnings news dominate expected-return news. Although the preponderance of evidence indicates that accrual earnings news and cash flow earnings news are equally important in driving stock returns, some of the analysis suggests that when the data are disaggregated by control variables or when sufficient controls are included in the VAR estimation, accrual earnings news dominates cash flow earnings news in driving returns. Overall, the three models analyzed in this paper consistently indicate that changes in expected future accruals are a primary driver, if not the primary driver, of current stock returns.

APPENDIX

Variance Decomposition and the Feltham-Ohlson Clean Surplus Relations

The clean surplus relation is defined as[40]

$$BV_t = BV_{t-1} + X_t - D_t, \tag{A1}$$

where:

$BV_t =$ book value of equity at time t
$X_t =$ net income during time t
$D_t =$ dividends at time t.

Feltham and Ohlson [1995, 1996] decompose the clean surplus relation into two separate equations based on the distinction between financial and operating assets. Specifically, they decompose (A1) into

$$FA_t = FA_{t-1} + i_t - (D_t - C_t) \tag{A2}$$

$$OA_t = OA_{t-1} + OX_t - C_t, \tag{A3}$$

where:

$FA_t =$ net financial assets at time t
$OA_t =$ net operating assets at time t
$i_t =$ net interest income during time t
$C_t =$ free cash flow (cash flow from operations less cash investments) during time t
$OX_t =$ operating earnings during time t.

[40] To make the appendix self-contained, all variables are defined once more in the appendix.

The following definitions are used in the proofs that follow:

$$
\begin{aligned}
oa_t &= \log(OA_t) \\
fa_t &= \log(FA_t) \\
d_t &= \log(D_t) \\
mv_t &= \log(MV_t) \\
\Delta MV_t &= MV_t - MV_{t-1} \\
acc_t &= \log[1 + (OX_t - C_t)/OA_{t-1}] \\
cf_t &= \log[1 + (i_t + C_t)/FA_{t-1}] \\
\Delta d_t &= \log(D_t/D_{t-1}) \\
r_t + f_t &= \log[1 + \Delta MV_t/MV_{t-1}] \\
&= \log(MV_t/MV_{t-1}) \\
f_t &= \log(1 + F_t) \\
r_t^c + f_t &= \log[1 + (\Delta MV_t + D_t)/MV_{t-1})] \\
\theta_t^A &= \log(OA_t/MV_t) \\
\theta_t^F &= \log(FA_t/MV_t) \\
\delta_t &= \log(D_t/MV_t) \\
&= d_t - mv_t \\
\beta_t &= \log(D_t/FA_t) \\
&= d_t - fa_t \\
ox_t^A &= OX_t/OA_{t-1} \\
ocf_t^A &= C_t/OA_{t-1}.
\end{aligned}
$$

LEMMA 1. *The operating-asset-to-market-value ratio θ_t^A evolves linearly over time as described by the difference equation*

$$\theta_t^A = acc_t - (r_t + f_t) + \theta_{t-1}^A. \tag{A4}$$

Proof. Using the Feltham-Ohlson equation (A3), the operating-asset-to-market-value ratio can be written as:

$$\frac{OA_t}{MV_t} = \frac{[1 + (OX_t - C_t)/OA_{t-1}]}{[1 + \Delta MV_t/MV_{t-1}]} \frac{OA_{t-1}}{MV_{t-1}}. \tag{A5}$$

Taking logs of both sides of equation (A5) yields the desired result. ■

LEMMA 2. *Assuming $D_t = 0$, the financial-asset-to-market-value ratio θ_t^F evolves linearly over time as described by the difference equation*

$$\theta_t^F = cf_t - (r_t + f_t) + \theta_{t-1}^F. \tag{A6}$$

Proof. If $D_t = 0$, the Feltham-Ohlson equation (A2) becomes

$$FA_t = FA_{t-1} + i_t + C_t, \tag{A7}$$

so that the financial-asset-to-market-value ratio can be written as:

$$\begin{aligned}\frac{FA_t}{MV_t} &= \frac{[FA_{t-1} + (i_t + C_t)]}{MV_t} \\ &= \frac{[1 + (i_t + C_t)/FA_{t-1}]}{[1 + \Delta MV_t/MV_{t-1}]}\frac{FA_{t-1}}{MV_{t-1}}.\end{aligned} \tag{A8}$$

Taking logs of both sides of equation (A8) yields the desired result. ■

LEMMA 3.

$$cf_t = \log(\exp(-\beta_t) + 1) + \Delta d_t + \beta_{t-1}. \tag{A9}$$

$$r_t^c + f_t = \log(\exp(-\delta_t) + 1) + \Delta d_t + \delta_{t-1}. \tag{A10}$$

Proof. We prove (A9). The proof of (A10) is similar and can be found in Vuolteenaho [2002].

$$\begin{aligned}&\log(\exp(-\beta_t) + 1) + \Delta d_t + \beta_{t-1} \\ &\quad = \log(\exp(fa_t - d_t) + 1) + \log(D_t/D_{t-1}) + \log(D_{t-1}/FA_{t-1}) \\ &\quad = \log[(1 + FA_t/D_t)(D_t/D_{t-1})(D_{t-1}/FA_{t-1})] \\ &\quad = \log[(D_t + FA_t)/FA_{t-1}] \\ &\quad = \log[(i_t + C_t + FA_{t-1})/FA_{t-1}] \\ &\quad = cf_t.\end{aligned}$$

■

LEMMA 4. *When $D_t \neq 0$, the financial-asset-to-market-value ratio θ_t^F evolves approximately linearly over time as described by the difference equation*

$$\rho\theta_t^F \simeq cf_t - \left(r_t^c + f_t\right) + \theta_{t-1}^F, \tag{A11}$$

where $0 < \rho \leq 1$ and $\rho = 1$ when $D_t = 0$.

Proof. Subtracting equation (A10) from equation (A9) in Lemma 3 yields:

$$\begin{aligned}cf_t - \left(f_t + r_t^c\right) &= \log[\exp(-\beta_t) + 1] - \log[1 + \exp(-\delta_t)] + \beta_{t-1} - \delta_{t-1} \\ &= \log[\exp(-\beta_t) + 1] - \log[1 + \exp(-\delta_t)] + mv_{t-1} - fa_{t-1} \\ &\simeq -(\alpha + \rho\beta_t) + (\alpha + \rho\delta_t) + mv_{t-1} - fa_{t-1} \\ &= \rho(\delta_t - \beta_t) + mv_{t-1} - fa_{t-1} \\ &= \rho(fa_t - mv_t) - (fa_{t-1} - mv_{t-1}) \\ &= \rho\theta_t^F - \theta_{t-1}^F.\end{aligned}$$

The approximation $\simeq$ obtains from a Taylor's expansion of the two logarithmic expressions linearizing around a convex combination of the means $Z = aE(\beta_t) + (1-a)E(\delta_t)$. The proportionality parameter ρ takes on the value 1 when $D_t = 0$ and the value $\frac{1}{1+\exp^Z}$ when $D_t \neq 0$. ■

PROPOSITION 1.

$$\theta_{t-1}^A = \sum_{j=0}^{\infty} r_{t+j} - \sum_{j=0}^{\infty}(acc_t - f_{t+j}) + M \tag{A12}$$

$$\theta_{t-1}^F = \sum_{j=0}^{\infty} \rho^j r_{t+j}^c - \sum_{j=0}^{\infty} \rho^j (cf_{t+j} - f_{t+j}) + h_{t-1}, \tag{A13}$$

where h_{t-1} is an approximation error term and M is a finite number.

Proof. We first prove (A12). Rewrite equation (A4) of Lemma 1 in the form:

$$\theta_{t-1}^A = (r_t + f_t) - acc_t + \theta_t^A.$$

Iterate forward the one-period difference equation to yield:

$$\theta_{t-1}^A = \sum_{j=0}^{N} r_{t+j} + \sum_{j=0}^{N} f_{t+j} - \sum_{j=0}^{\infty} acc_{t+j} + \theta_{t+N}^A.$$

Taking the limit $N \to \infty$ and assuming that the limit of θ_{t+N}^A is finite yields the desired result.

The proof of (A13) is similar. Specifically, rewrite equation (A11) of Lemma 4 in the form:

$$\theta_{t-1}^F = \left(r_t^c + f_t\right) - cf_t + \rho\theta_t^F + m_t,$$

where m_t is an approximation error term. Iterate forward the one-period approximation to yield:

$$\theta_{t-1}^F = \sum_{j=0}^{N} \rho^j r_{t+j}^c + \sum_{j=0}^{N} \rho^j f_{t+j} - \sum_{j=0}^{\infty} \rho^j cf_{t+j} + \sum_{j=0}^{N} \rho^j m_{t+j} + \rho^{N+1}\theta_{t+N}^F.$$

If $D_t \neq 0$ then $\rho < 1$. Taking the limit as $N \to \infty$ and assuming that the limit of θ_{t+N}^F is finite yields the desired result with h_{t-1} defined as $\sum_{j=0}^{\infty} \rho^j m_{t+j}$.

If $D_t = 0$ then $\rho = 1$. Lemma 2 can be used to show that (A13) holds with the approximation term h_{t-1} equal to zero. ■

PROPOSITION 2. *Let the change in expectation operator $E_t(\cdot) - E_{t-1}(\cdot)$ be denoted ΔE_t. The change in expected returns can be expressed either as:*

$$r_t - E_{t-1}(r_t) = \Delta E_t \sum_{j=0}^{\infty}(acc_{t+j} - f_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} r_{t+j} \tag{A14}$$

or

$$r_t^c - E_{t-1}\left(r_t^c\right) = \Delta E_t \sum_{j=0}^{\infty} \rho^j (cf_{t+j} - f_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} \rho^j r_{t+j}^c - H_t, \quad \text{(A15)}$$

where $H_t (= \Delta E_t h_{t-1})$ *is an error approximation term.*

Proof. We prove (A14). The proof of (A15) is similar. From equation (A12) of Proposition 1, we have that

$$\theta_{t-1}^A = \sum_{j=0}^{\infty} r_{t+j} - \sum_{j=0}^{\infty} (acc_t - f_{t+j}) + M.$$

Rewrite this equation in the form:

$$r_t = \sum_{j=0}^{\infty} (acc_{t+j} - f_{t+j}) - \sum_{j=1}^{\infty} r_{t+j} + \theta_{t-1}^A - M.$$

Apply the expectations operator ΔE_t on both sides of the latter equation to yield the desired result.

PROPOSITION 3. *The change in expected returns can also be expressed as:*

$$r_t - E_{t-1}(r_t) = \Delta E_t \sum_{j=0}^{\infty} \left(ox_{t+j}^A - f_{t+j}\right) - \Delta E_t \sum_{j=0}^{\infty} ocf_{t+j}^A$$
$$- \Delta E_t \sum_{j=1}^{\infty} r_{t+j}, \quad \text{(A16)}$$

where $ox_t^A = OX_t / OA_{t-1}$, *and* $ocf_t^A = C_t / OA_{t-1}$. ■

Proof.

$$\begin{aligned} acc_t &= \log[1 + (OX_t - C_t)/OA_{t-1}] \\ &\simeq (OX_t - C_t)/OA_{t-1} \text{(using the approximation } \log(1+z) \simeq z) \\ &= OX_t/OA_{t-1} - C_t/OA_{t-1} \\ &= ox_t^A - ocf_t^A. \end{aligned}$$

Substituting $(ox_t^A - ocf_t^A)$ for acc_t in equation (A14) of Proposition 2 generates the desired result. ■

PROPOSITION 4. *The change in expected returns can also be expressed as:*

$$r_t^c - E_{t-1}\left(r_t^c\right) = \Delta E_t \sum_{j=0}^{\infty} \rho^j acce_{t+j} + \Delta E_t \sum_{j=0}^{\infty} \rho^j (cfe_{t+j} - f_{t+j})$$
$$- \Delta E_t \sum_{j=1}^{\infty} \rho^j r_{t+j}^c - G_t, \quad \text{(A17)}$$

where G_t is an error approximation term, $acce_t = ACC_t/BV_{t-1}$, $cfe_t = COP_t/BV_{t-1}$, BV_t is book value of equity, ACC_t is accrual earnings, and COP_t is cash flow from operations.

Proof. From Vuolteenaho [2002], we have that

$$r_t^c - E_{t-1}\left(r_t^c\right) = \Delta E_t \sum_{j=0}^{\infty} \rho^j (roe_{t+j} - f_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} \rho^j r_{t+j}^c - G_t, \quad \text{(A18)}$$

where

$$\begin{aligned} roe_t &= \log(1 + X_t/BV_{t-1}) \simeq X_t/BV_{t-1} \\ &\quad \text{(using the approximation } \ln(1+z) \simeq z) \\ &= (ACC_t + COP_t)/BV_{t-1}. \end{aligned}$$

Substituting the latter expression back into equation (A18) yields the desired result. ■

REFERENCES

ANG, A., AND J. LIU. "A General Affine Earnings Valuation Model." *Review of Accounting Studies* 6 (2001): 397–425.

BALL, R.; S. P. KOTHARI; AND A. ROBIN. "The Effect of International Institutional Factors on Properties of Accounting Earnings." *Journal of Accounting and Economics* 29 (2000): 1–51.

BALL, R.; A. ROBIN; AND J. S. WU. "Accounting Standards, the Institutional Environment and Issuer Incentives: Effect on Timely Loss Recognition in China." *Asia Pacific Journal of Accounting and Economics* 7 (2000): 71–96.

BALL, R.; A. ROBIN; AND J. S. WU. "Incentives versus Standards: Properties of Accounting Income in Four East Asian Countries and Implications for Acceptance of IAS." *Journal of Accounting and Economics* 36 (2003): 235–70.

BALL, R., AND L. SHIVAKUMAR. "Earnings Quality in U.K. Private Firms." Working paper, University of Chicago, 2003.

BARTH, M. E.; W. E. BEAVER; J. R. M. HAND; AND WAYNE R. LANDSMAN. "Accruals, Cash Flows, And Equity Values." *Review of Accounting Studies* 4 (1999): 205–29.

BARTH, M. E.; D. P. CRAM; AND K. K. NELSON. "Accruals and the Prediction of Future Cash Flows." *Accounting Review* 76 (2001): 27–58.

BASU, S. "The Conservatism Principle and Asymmetric Timeliness of Earnings." *Journal of Accounting and Economics* 24 (1997): 3–37.

BEAVER, W. H. "An Empirical Assessment of the Residual Income Valuation Model: Comment." *Journal of Accounting and Economics* 26 (1999): 35–42.

BEGLEY, J., AND G. A. FELTHAM. "The Relation between Market Values, Earnings Forecasts, and Reported Earnings." *Contemporary Accounting Research* 19 (2002): 1–48.

BERNARD, V. L., AND T. L. STOBER. "The Nature and Amount of Information in Cash Flows and Accruals." *Accounting Review* 64 (1989): 624–52.

BOWEN, R. M.; D. BURGSTAHLER; AND L. A. DALEY. "The Incremental Information Content of Accrual versus Cash Flows." *Accounting Review* 62 (1987): 723–47.

CAMPBELL, J. Y. "A Variance Decomposition for Stock Returns." *Economic Journal* 101 (1991): 157–79.

CAMPBELL, J. Y., AND J. AMMER. "What Moves the Stock and Bond Markets? A Variance Decomposition for Long-Term Asset Returns." *Journal of Finance* 48 (1993): 3–38.

CAMPBELL, J. Y.; A. W. LO; AND A. C. MACKINLAY. *The Econometrics of Financial Markets*. Princeton, NJ: Princeton University Press, 1997.

CAMPBELL, J. Y., AND R. J. SHILLER. "Stock Prices, Earnings and Expected Dividends." *Journal of Finance* 43 (1988a): 661–67.

CAMPBELL, J. Y., AND R. J. SHILLER. "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors." *Review of Financial Studies* 1 (1988b): 195–228.

COCHRANE, J. H. *Asset Pricing*. Princeton, NJ: Princeton University Press, 2001.

COHEN, R. B.; C. POLK; AND T. VUOLTEENAHO. "The Value Spread." *Journal of Finance* 58 (2003): 609–41.

DECHOW, P. M. "Accounting Earnings and Cash Flows as Measures of Firm Performance: The Role of Accounting Accruals." *Journal of Accounting and Economics* 18 (1994): 3–42.

DECHOW, P. M.; S. P. KOTHARI; AND R. L. WATTS. "The Relation Between Earnings and Cash Flows." *Journal of Accounting and Economics* 25 (1998): 133–68.

DECHOW, P. M.; J. S. SABINO; AND R. G. SLOAN. "Implications of Nondiscretionary Accruals for Earnings Management and Market-Based Research." Working paper, University of Pennsylvania, 1996.

DHALIWAL, D.; K. R. SUBRAMANYAM; AND R. TREZEVANT. "Is Comprehensive Income Superior to Net Income as a Measure of Firm Performance?" *Journal of Accounting and Economics* 26 (1999): 43–67.

FELTHAM, G. A., AND J. A. OHLSON. "Valuation and Clean Surplus Accounting for Operating and Financial Activities." *Contemporary Accounting Research* 11 (1995): 689–731.

FELTHAM, G. A., AND J. A. OHLSON. "Uncertainty Resolution and the Theory of Depreciation Measurement." *Journal of Accounting Research* 34 (1996): 209–34.

FELTHAM, G. A., AND J. A. OHLSON. "Residual Earnings Valuation with Risk and Stochastic Interest Rates." *Accounting Review* 74 (1999): 165–83.

FINANCIAL ACCOUNTING STANDARDS BOARD (FASB). *Objectives of Financial Reporting by Business Enterprises*. Statement of Financial Accounting Concepts No. 1. Stamford, CT: FASB, 1978.

GORDON, M. *The Investment, Financing, and Valuation of the Corporation*. Homewood, IL: Irwin, 1962.

GUAY, W.; S. P. KOTHARI; AND R. L. WATTS. "A Market-Based Evaluation of Discretionary Accruals." *Journal of Accounting Research* 24 (Supplement 1996): 83–115.

HRIBAR, P., AND D. W. COLLINS. "Errors in Estimating Accruals: Implications for Empirical Research." *Journal of Accounting Research* 40 (2002): 105–34.

KOTHARI, S. P.; J. S. SABINO; AND T. ZACH. "Implications of Data Restrictions on Performance Measurement and Tests of Rational Pricing." Working paper, Massachusetts Institute of Technology, 1999.

OHLSON, J. A. "Earnings, Book Values, and Dividends in Security Valuation." *Contemporary Accounting Research* 11 (1995): 661–87.

PENMAN, S. H. *Financial Statement Analysis and Security Valuation*. New York: McGraw-Hill, 2000.

PFEIFFER, R. J., AND P. T. ELGERS. "Controlling for Lagged Stock Price Responses in Pricing Regressions: An Application to the Pricing of Cash Flows and Accruals." *Journal of Accounting Research* 37 (1999): 239–48.

RAYBURN, J. "The Association of Operating Cash Flow and Accruals with Security Returns." *Journal of Accounting Research* 24 (1986): 112–33.

ROGERS, W. H. "Analyzing Complex Survey Data." Memorandum, Rand Corporation, 1983.

ROGERS, W. H. "Regression Standard Errors in Clustered Samples." *Stata Technical Bulletin Reprints* STB-13-STB-18, 88–94, 1993.

SHAO, J., AND J. N. K. RAO. "Jacknife Inference for Heteroscedastic Linear Regression Models." *Canadian Journal of Statistics* 21 (1993): 377–85.

SLOAN, R. G. "Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings?" *Accounting Review* 71 (1996): 289–315.

SLOAN, R. G. "Accruals, Cash Flows, and Equity Values: Comment." *Review of Accounting Studies* 4 (1999): 231–34.

SUBRAMANYAM, K. R. "The Pricing of Discretionary Accruals." *Journal of Accounting and Economics* 22 (1996): 249–81.

VUOLTEENAHO, T. "What Drives Firm-Level Stock Returns." *Journal of Finance* 57 (2002): 233–64.

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* 24 (1986): 165–200.

WILSON, G. P. "The Incremental Information Content of the Accrual and Funds Components of Earnings after Controlling for Earnings." *Accounting Review* 62 (1987): 293–322.

XIE, H. "The Mispricing of Abnormal Accruals." *Accounting Review* 76 (2001): 357–73.