Rev Account Stud (2016) 21:768–807
DOI 10.1007/s11142-016-9360-4

What do accruals tell us about future cash flows?

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Published online: 14 June 2016

Abstract Our model, which is adapted from Feltham and Ohlson (Contemp Account Res 11:689–731, 1995) and Ohlson (Contemp Account Res 11:661–687, 1995) and extends Dechow and Dichev (Account Rev 77:35–59, 2002), characterizes the information about future cash flows reflected in accruals. It reveals investors can extract from accruals information about next period's economic factor and the transitory part of one component of next period's cash flow. The extent to which each accrual provides this information depends on whether the accrual aligns future or past cash flows and current period economics and whether it relates to the current or prior period. Thus each type of accrual has a different coefficient in valuation and forecasting cash flows or earnings. Each coefficient combines an information weight reflecting the information that accrual type provides and a multiple reflecting how that information is used in valuation and cash flow and earnings forecasting. The empirical evidence supports our main insight, namely that partitioning accruals based on their role in cash-flow alignment increases their ability to forecast future cash flows and earnings and explain firm value.

Keywords Accruals · Cash flows · Equity valuation · Cash flow forecasting · Valuation model

JEL Classifications C13 · C51 · E37 · G17 · M41

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1 Introduction

The question we address is what accounting accruals tell us about a firm's future cash flows and thus how they help in forecasting the firm's future cash flows and earnings and thereby in valuing the firm's equity. Earnings is designed to reflect current period economics, not current period cash flow. Thus a key role of accrual accounting is to align a firm's cash flows and the economics generating the cash flows, which can occur in periods before or after the cash flow occurs. Accruals recognized in the statement of financial position reflect this alignment and, as a result, reflect information about the firm's future cash flows. Prior research recognizes that changes in accruals included in earnings reflect information about future cash flows but does not characterize the nature of the information or identify how it differs depending on the role the accrual plays in cash-flow alignment.[1] We characterize the information about future cash flows reflected in accruals and show that it depends on the accrual's role in cash-flow alignment—that is, whether the accrual aligns future or past cash flows and current period economics and whether it relates to the current or prior period. We also provide empirical evidence that partitioning accruals based on their role in cash-flow alignment increases their ability to forecast cash flows and earnings and explain firm value.

Our insights derive from our model that expresses firm value as a function of the firm's expected future cash flows. Our model's premise is that investors use accounting information to help forecast the firm's future cash flows and thus value the firm. The model is adapted from the models in Feltham and Ohlson (1995) and Ohlson (1995)—but with a key difference. Specifically, we assume that a firm's cash flows are generated by an economic factor that persists, with innovations, over time and by transitory cash flows unrelated to the economic factor. We assume that the current period economic factor can generate cash flows in the current period as well as in the prior and next periods, which is consistent with the accrual process. Thus our model distinguishes two types of accruals: those that align cash flow in the current period and the next period's economic factor—such as inventory and deferred revenue—and those that align cash flow in the next period and the current period's economic factor—such as accounts receivable and warranty accruals. Our model restricts neither the magnitudes nor the signs of the relations between the current period economic factor and the cash flows it generates in the current, prior, and next periods; whether a relation is positive or negative depends on the nature of the firm's business. Although we model accruals as the accounting mechanism for aligning cash flows and the period of the economic factor that generates the cash flows, we assume it does so with error.

To forecast cash flows and value the firm, investors must form expectations about the economic factor for future periods that generate future cash flows and about the transitory part of future cash flows unrelated to the economic factor. The accruals process provides accounting information that helps with both of these tasks. In our

[1] Throughout, we use "accruals" to refer to amounts recognized on the statement of financial position and "change in accruals" to refer to the difference between earnings and cash flow from operations. Prior research often refers to the difference between earnings and cash flow from operations as accruals (e.g., Dechow et al. 1998), and we do as well when describing that research.

model, investors combine accounting information—cash flow and the two types of accruals—with knowledge of the accrual process to estimate the distribution of future cash flows and value the firm. In particular, the model shows that investors can extract from accruals information about the economic factor expected next period and about one of the three modelled components of the transitory part of next period's cash flow. Although investors would like to have information about all three components, the accounting system provides information about only one.

Current period cash flow also contains information about the economic factor expected next period. However, that information is noisy because only one component of current period cash flow aligns with next period's economic factor and that component is not observable. Investors can use accruals to reduce the noise; different accruals aid investors in doing so differently. First, accruals that align current period cash flow and next period's economic factor, such as inventory, provide investors additional noisy information about next period's economic factor. Second, prior period accruals that align current period cash flow and the prior period's economic factor, such as beginning of period accounts receivable, aid investors in removing some of the noise in current period cash flow regarding next period's economic factor. In addition, current period accruals that align next period's cash flow and the current period's economic factor, such as end-of-period accounts receivable, provide information about the transitory part of one component of next period's cash flow.

As a result, the extent to which each accrual aids investors in their forecasting and valuation tasks differs depending on its type and whether the accrual relates to the current or prior period. For example, end-of-period inventory and beginning- and end-of-period accounts receivable each provides different information helpful for forecasting cash flows. These insights are apparent only because we distinguish accruals by the role they play in aligning cash flows and the pertinent economic factor. They are not apparent by distinguishing accruals according to their classification on the statement of financial position, such as inventory and warranty accruals.

Analysis of the model reveals that each accounting amount—cash flow and accruals associated with the prior and next periods' cash flows—has a different coefficient in valuation, forecasting future cash flows, and forecasting earnings. Each coefficient combines a weight that reflects the information role the accounting amount plays and multiples that reflect how that information is used differently in forecasting cash flows and earnings and in valuation. Because the information about future cash flows each accounting amount reflects does not vary across the tasks, its information weight is the same for valuation and forecasting. However, the information weight differs across the accounting amounts because each amount provides different information relevant for valuation and forecasting. The three accounting amounts that provide information about next period's economic factor have valuation and forecasting multiples that differ from those for the accounting amount that provides information about the transitory part of one component of next period's cash flow. The valuation multiple for each accounting amount differs from its cash flow and earnings forecasting multiples because of the different time horizons relevant to valuation and forecasting. In addition, the multiples for cash flow and earnings forecasting differ from each other because accruals that align current (next) period cash flow and the next (current) period's economic factor are helpful in cash flow (earnings) forecasting but not vice versa.

Accruals aid in valuation and forecasting because they reveal relevant information. Thus the valuation and forecasting coefficients for each accrual depend on the magnitude of the error in the accrual relative to the cash flow it is designed to align with the current period economic factor and the extent to which cash flow is generated by the economic factor or is transitory. The coefficients also depend on the magnitudes and signs of the relations between the economic factor and the cash flows it generates in the current, prior, and next periods. Without assuming the signs and magnitudes of these relations, it is not possible to make predictions regarding the relative magnitudes—and even some signs—of the accrual coefficients. Regardless, the model reveals that the valuation and forecasting accrual coefficients differ depending on the accrual's role in cash-flow alignment.

We provide evidence on the empirical validity of the insights we obtain from the model. First, we provide evidence regarding the reasonableness of our assumptions relating to the magnitudes and signs of the relations between the economic factor and the cash flows the factor generates. We provide evidence that these model parameters vary across industries and over time, which is consistent with our model not restricting their signs or magnitudes. Second, and more important for our research question, we provide evidence that partitioning accruals depending on their role in cash-flow alignment aids in forecasting cash flows and earnings and in valuation. Specifically, we compare the explanatory powers from four equations for each of current-year market value of equity, next period's cash flow from operations, and next period's operating earnings; the equations differ in how we partition accruals. The evidence for all three sets of equations supports the model's main insight that partitioning accruals based on their role in cash-flow alignment increases the ability of accruals to forecast future cash flows and operating earnings and explain firm value.

Our model is consistent with that of Dechow and Dichev (2002) in that a firm's cash flow in a particular period comprises three components that relate to the economic factor from the prior, current, and next periods. Our model extends the Dechow and Dichev (2002) model by partitioning accruals based on their roles in cash-flow alignment and showing empirically that this partition provides incremental ability to forecast cash flows and earnings and explain equity value. The model explains why the partition does so. Dechow and Dichev (2002) do not estimate the relation between cash flow and accruals depending on the period of the cash flow giving rise to the accruals, and thus their model is not designed to reveal the insights that our model is designed to reveal.

Two other studies closely related to ours are those by Dechow et al. (1998) and Barth et al. (2001). Dechow et al. (1998) model cash flow and the accrual process related to short-term accruals and predict and find that earnings better forecasts future cash flow than past cash flow. Barth et al. (2001) extend the Dechow et al. (1998) model and show that earnings' greater predictive ability for cash flows is enhanced by disaggregating earnings into cash flow and the components of change in accruals. There are two key differences between these two models and ours. First, in both prior models, cash flows and change in accruals reflect only information about current and past economic factors but not future economic factors. Cash flows and change in accruals do not convey useful information beyond what is available from knowing current and past economic factors. In contrast, a key element of our model is that accruals reflect information about future economic factors and transitory cash flows that is not available from current and past economic factors. Second, because the prior models focus on income accruals, they do not countenance the possibility that the beginning and ending balances of the associated statement of financial position accruals contain different information relevant for cash flow forecasting. Our model and empirical findings show that both of these matter in revealing the information in accruals that is useful for forecasting cash flows as well as estimating value and forecasting earnings.

The remainder of the paper is organized as follows. Section 2 provides background for our inquiry and outlines related research. Section 3 describes the model and derives equilibrium equity price. Section 4 investigates the valuation and forecasting implications of the model, and Sect. 5 provides evidence on the empirical validity of the model's insights. Section 6 concludes.

2 The role of accruals in financial reporting and related research

2.1 Accruals and financial reporting

The *Conceptual Framework* underlying financial reporting (FASB 2010) states that the objective of financial reporting is to provide financial information about the firm that is useful to current and potential investors, lenders, and other creditors in deciding whether to provide resources to the firm. The *Conceptual Framework* explains that investors' expectations about returns on their investments depend on their assessment of the amount, timing, and uncertainty of the firm's future net cash inflows. Consequently, investors need information to help them assess the prospects for those future cash flows. Financial reports also are designed to provide information to help investors to estimate the value of the firm and thereby make more informed decisions about their buy, sell, and hold decisions relating to their investments in the firm.

Accruals are fundamental to financial reporting. As the *Conceptual Framework* explains, accrual accounting depicts the effects of transactions and other events and circumstances on a firm's economic resources, i.e., assets, and claims against those resources, i.e., liabilities and equity, in the periods in which those effects occur, even if the resulting cash receipts and payments occur in a different period. This is important because the *Conceptual Framework* expresses the belief that information about a firm's economic resources and claims at the end of, and changes in them during, a period provides a better basis for assessing the firm's past and future performance than information solely about cash receipts and payments during that period. Accruals is the mechanism by which current cash flow is modified to create a more predictive performance measure, namely earnings. Thus financial reporting has evolved to enhance performance measurement by using accruals to alter the timing of cash flow recognition in earnings (Dechow 1994; FASB 2010).

2.2 Related research

Several studies address whether accruals help predict cash flows by examining the relative predictive ability for future cash flows of past aggregate earnings and past cash flow, but they report mixed findings. Greenberg et al. (1986), Burgstahler et al. (1998), and Barth et al. (2001) find that aggregate annual earnings has more predictive ability for future cash flow than past cash flow, and Lorek and Willinger (1996) find similar results using quarterly changes in accruals. But Bowen et al. (1986) do not. Finger (1994) finds that cash flow has marginally more predictive ability for future cash flow than aggregate earnings for short horizon predictions but that earnings and cash flow have the same predictive ability for longer horizons.

Other studies examine whether disaggregating total change in accruals, i.e., the difference between earnings and cash flow, into its components enhances the predictive ability of the accruals for future cash flows incremental to current cash flow. Dechow et al. (1998) model cash flow and the accrual process related to short-term accruals—accounts receivable, accounts payable, and inventory—and, based on the model, find that earnings better predicts future cash flows. Consistent with this prediction, Dechow et al. (1998) report that cash-flow forecast errors based on aggregate earnings are significantly lower than those based on cash flow and that, in a regression of future cash flow on current period earnings and current period cash flow, both have incremental explanatory power.

Barth et al. (2001) extend the Dechow et al. (1998) model to show that earnings' greater predictive ability for future cash flows is enhanced by disaggregating earnings into cash flow and the components of change in accruals. The authors find that disaggregated earnings has significantly more predictive ability than several lags of aggregate earnings and that changes in long-term accruals, not just working capital accruals, aid in predicting cash flows. They also find that cash flow and the major accrual components of earnings—related to accounts receivable, inventory, accounts payable, depreciation, amortization, and other accruals—have predictably different multiples in cash flow prediction.

The prior models resemble ours in some respects but differ in ways that matter to our inferences. Regarding similarities, the prior models assume sales is the factor that generates the firm's cash flows; this assumption is analogous to our assumption that the firm's cash flows are generated by an economic factor, which we label as θ. To model how sales results in cash flows and earnings and affects receivables, inventory, and payables, the prior models contain current period cash flow components that map into current and prior period sales; our model also contains these components, assuming θ in our model is sales as in the prior models.

Our model differs in two key ways from those of Dechow et al. (1998) and Barth et al. (2001). First, their models do not contain a current cash flow component that corresponds to next period's sales, which is a key element of our model. For example, our model incorporates the fact that some accruals, e.g., inventory and deferred revenue, result from cash flows in the current period that relate to next period's economic factor. Theirs include such accruals, but these are modelled as relating to current period sales, not next period's. This means that their models do not permit these accruals to provide information about future sales, whereas our model shows how these accruals provide that information. In addition, their models focus on income accruals and thus do not countenance the possibility that the beginning and ending balances of the associated statement of financial position accruals contain different information relevant for cash flow forecasting. This is appropriate given that the objective of the prior models is to understand whether current period earnings, and its accrual components, is a better predictor of future cash flow than current period cash flow. In contrast, we aim to understand what information investors can obtain from accruals to help them to forecast cash flows, in the context of the information available to them. Our model and empirical findings show that distinguishing statement of financial position accruals according to their role in cash-flow alignment, including separate consideration of beginning and ending balances of the accruals, provides information useful for forecasting cash flows and earnings as well as estimating equity value.

Extending the research of Ou and Penman (1989) and Ou (1990), Ou and Penman (1990) find that financial statement variables, including accruals, aid in predicting future earnings incremental to current earnings. Brochet et al. (2009) also find that changes in accruals improves upon current cash flow in predicting future cash flow, particularly positive changes. Lev et al. (2010) focus on accounting estimates embedded in accruals and examine their usefulness in the prediction of cash flow and earnings. These authors find that accounting estimates beyond those in working capital do not improve the prediction of cash flows but do improve the prediction of next year's earnings. However, prior studies do not investigate the differential predictive ability for future cash flow or earnings of accruals that differ depending on whether the accrual is associated with past or next period's cash flow. Our model reveals that this distinction matters.[2]

Cash flow prediction closely relates to assessing firm value because equity value is the present value of expected future cash flows. To examine the relevance of accruals for assessing equity value, prior research compares the abilities of earnings and cash flow to explain equity value or changes in it, i.e., returns. Some studies (e.g., Ball and Brown 1968; Beaver and Dukes 1972; Dechow 1994) find that aggregate earnings is more highly associated with equity returns than is cash flow, whereas Penman and Yehuda (2009) find that earnings has a positive relation with equity value but, incremental to earnings, more free cash flow, i.e., cash flow from operations minus cash investment, has no association with equity returns. Other studies (e.g., Rayburn 1986; Wilson 1986, 1987; Bowen et al. 1987; Ali 1994; Cheng et al. 1996; Pfeiffer et al. 1998) find that aggregate earnings and cash flow are incrementally informative for returns. Some studies find that components of earnings, including accruals and their components, have different equity valuation multiples that are consistent with differences in the components' persistence (e.g.,

[2] Francis and Smith (2005) re-examine the persistence of accruals after distinguishing accruals based on whether the accrual is associated with past or next period's cash flow and find that incorporating this distinction substantially reduces the previously documented differential persistence of accruals and cash flows.

Lipe 1986; Barth et al. 1990, 1992, 1999, 2005). Barth et al. (2001) find that cash flow and the major accrual components of earnings have predictably different valuation multiples.[3]

In developing a measure of the quality of working capital accruals and earnings, Dechow and Dichev (2002) incorporate the observation that the accrual component of current period earnings reflects some cash flows that occurred in the prior period and some that will occur in the next period (Dechow 1994). Dechow and Dichev (2002) also observe that, when the cash flow occurs after the corresponding accrual is recognized, managers must estimate the cash flow and thus the accrued amount includes estimation error. Their accrual-quality measure is based on the residuals from a regression of the change in working capital accruals on current, prior, and next periods' cash flows. The notion is that residuals are larger when the change in working capital is less closely aligned with the three periods' cash flows, regardless of whether the misalignment is systemic or the result of accrual estimation errors. Our model is consistent with that of Dechow and Dichev (2002) in that a firm's cash flow in a particular period comprises three components that relate to the economic factor from the prior, current, and next periods. Our model extends theirs by partitioning accruals based on their roles in cash-flow alignment. Because Dechow and Dichev (2002) do not separately estimate the relation between cash flow and the accruals depending on the period of the cash flow giving rise to the accruals, their study is not designed to reveal the insights that our model is designed to reveal.

We contribute to this literature primarily by showing that, in predicting future cash flows and earnings and assessing equity value, the role of accruals depends on their origin, i.e., whether the cash flow associated with the accrual has occurred or will occur, which reflects the fundamental role of accruals in financial reporting that largely has been overlooked in prior research. Thus our model provides new insights into the role of accruals in predicting cash flows and earnings and assessing equity value. In particular, our model reveals that accruals have different relations with future cash flows, future earnings, and equity value depending on the role they play in cash-flow alignment. Our empirical evidence supports the inference that distinguishing accruals based on their role in cash-flow alignment provides incremental explanatory power in the forecasting and valuation tasks.

3 The model

3.1 Cash flows and economic fundamentals

We model a single firm whose cash flows are generated by an economic factor, θ, and an accounting system that creates accruals to align the firm's cash flows and the economic factor. The economic factor can be thought of as, for example, demand

[3] Sloan (1996), Fairfield et al. (2003), and Richardson et al. (2005), among others, also disaggregate earnings into cash flow and components of change in accruals. These studies test whether the components have different levels of persistence with respect to future earnings and whether the different levels of persistence are fully reflected in current stock prices. That is, they focus on the accruals mispricing anomaly, not on what information accruals reflect about future cash flows, which is our focus.

for the firm's products or services. We assume θ_t is observed at time t and is known to evolve according to a first-order autoregressive process, with known parameter γ:

$$\theta_t = \gamma\theta_{t-1} + \varepsilon_t. \tag{1}$$

ε represents an independent shock to the firm's economics, where $\varepsilon \sim \mathrm{N}(0, \sigma_\varepsilon^2)$. As is standard for first-order autoregressive models, we assume $0 \leq \gamma < 1$.

To model accruals, we employ Dechow and Dichev's (2002) assumption that the firm's current period cash flow from operations, CFO, comprises cash flows related to economic factors in three periods—the prior, current, and next periods. That is,

$$CFO_t = CF_t^A + CF_t^C + CF_t^B, \tag{2}$$

where CF_t^i denotes a component of cash flow from operations. t denotes the period in which the cash flow occurs. The A, C, and B superscripts indicate that the cash flow occurs after, concurrent with, and before the period of the economic factor to which the cash flow relates. Thus CF_t^A, CF_t^C, and CF_t^B are the period t cash flow components related to θ_{t-1}, θ_t, and θ_{t+1}. We assume that, even though CFO_t is observable, its components are not. This assumption is consistent with accounting standards and practice.

We assume the cash flow components evolve according to the following dynamics:

$$\begin{aligned} CF_t^A &= \lambda^A\theta_{t-1} + e_t^A, \\ CF_t^C &= \lambda^C\theta_t + e_t^C, \quad \text{and} \\ CF_t^B &= \lambda^B\theta_{t+1} + e_t^B. \end{aligned} \tag{3}$$

e^A, e^C, and e^B are transitory parts of the cash flow components that are unrelated to θ. We also assume that each $e^i \sim \mathrm{N}(0, \sigma_{e^i}^2)$ and is independent of other random variables in the model, including themselves over time. However, the firm has some information about next period's cash flow that investors do not have, i.e., information about one or more e_{t+1}^i, which the firm uses in determining accruals. Thus, as explained below, investors can use accruals to obtain some of this information. Figure 1a shows the relation between the three cash flow components and the underlying economic factors.

Equation (3) reveals that the cash flow components can have different parameters linking them to the economic factors: λ^A, λ^C, and λ^B. We do not restrict the signs of the λs; whether a particular λ is positive or negative depends on the nature of the firm's business. For example, if the current cash flow component relating to the prior period's economic factor, CF_t^A, is predominantly cash inflows—e.g., cash receipts from customers this period relating to sales in the prior period—then λ^A is positive. If that cash flow component is predominantly cash outflows—e.g., cash payments this period related to expenses incurred in the prior period—then λ^A is negative. To ensure that the net present value of future cash flows associated with each θ_t is positive, we require $\frac{\lambda^A}{R} + \lambda^C + R\lambda^B > 0$, where $R > 1$ is one plus the risk free discount rate.

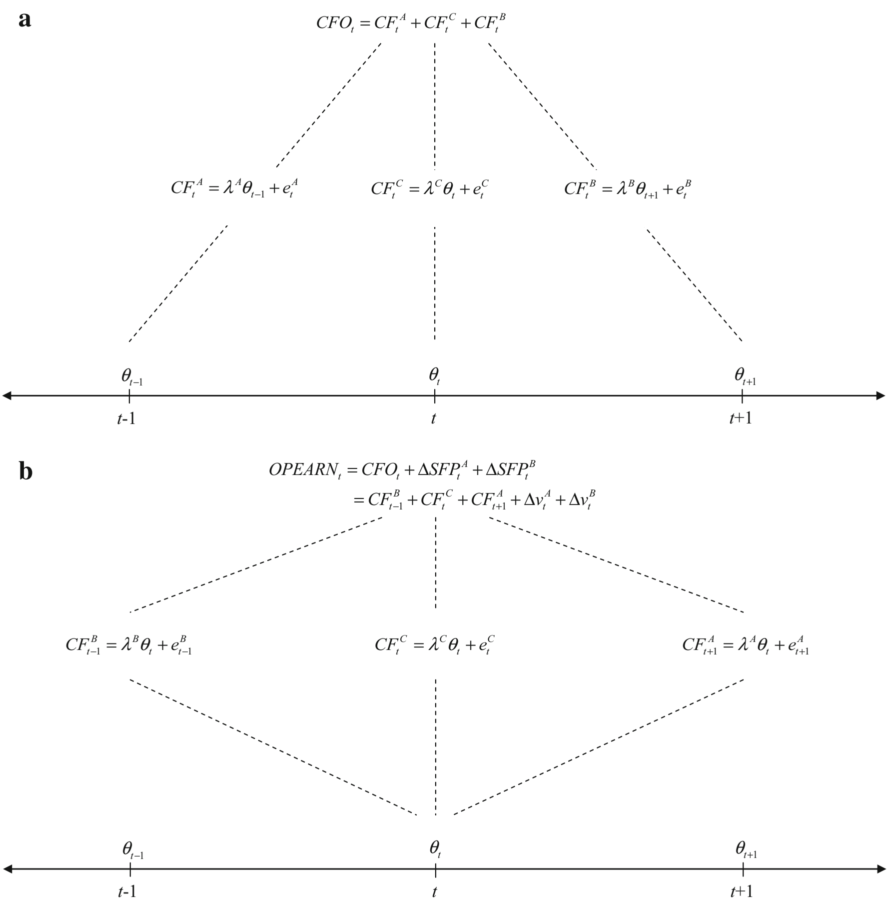

Fig. 1 **a** The link between the components of cash flow from operations, CFO_t, and the economic factor, θ_t. CFO_t comprises three components: CF_t^A, which is associated with the period $t-1$ economic factor, θ_{t-1}; CF_t^C, which is associated with the period t economic factor, θ_t; and CF_t^B, which is associated with the period $t+1$ economic factor, θ_{t+1}. **b** The link between the accrual-based performance measure, $OPEARN_t$, and the economic factor, θ_t. $OPEARN_t = CFO_t + \Delta SFP_t^A + \Delta SFP_t^B$, is an accrual-based performance measure that aligns cash flow components with the economic factor, θ_t, but with error. SFP_t^A is statement of financial position accruals relating to next period's cash flows driven by the current period's economic factor, CF_{t+1}^A. SFP_t^B is statement of financial position accruals relating to last period's cash flows driven by the current period's economic factor, CF_{t-1}^B

3.2 Accruals

Modelling the current period economic factor, θ_t, as being associated with cash flows in three periods leads to cash flow from operations in period t comprising cash flows generated by economic factors occurring in three periods—the prior, current, and next periods—but with error. That is, a consequence of Eqs. (2) and (3) is:

$$CFO_t = CF_t^A + CF_t^C + CF_t^B$$
$$= \lambda^A \theta_{t-1} + \lambda^C \theta_t + \lambda^B \theta_{t+1} + e_t^A + e_t^C + e_t^B. \quad (4)$$

Thus our model captures the feature of accrual accounting that re-aligns cash flow so that only cash flows that relate to the current period's economic factor are recognized as income in the current period—other cash flows are recognized as accruals in the statement of financial position, i.e., as assets and liabilities.

This key feature of the accrual accounting system leads to two types of accruals. The first type, which we denote SFP^A, comprises accruals on the statement of financial position that arise from the CF^A cash flow component. That is, SFP^A represents assets and liabilities for which the associated cash flow occurs after the period of the economic factor to which the cash flow relates. Accounts receivable and accrued liabilities, e.g., warranty, restructuring, and pension liabilities, are examples of SFP^A because they represent statement of financial position amounts whose associated cash flow occurs in the period after the economic events to which they relate. The second type of accrual, which we denote SFP^B, comprises accruals for which the associated cash flow, CF^B, occurs before the period of the economic factor. Deferred revenue and operating assets other than cash and accounts receivable, e.g., purchased inventory, prepaid expenses, and property, plant, and equipment, are examples of SFP^B.

We model the statement of financial position accruals as follows:

$$SFP_t^A = CF_{t+1}^A + v_t^A \quad \text{and}$$
$$SFP_t^B = -CF_t^B + v_t^B, \quad (5)$$

where v_t^A and v_t^B denote error in SFP_t^A and SFP_t^B in capturing the cash flow components to which they relate. We assume that each $v^i \sim$ N(0, $\sigma_{v^i}^2$) and is independent of other random variables in the model. That is, when the firm determines accruals, it does so with noise, v^i. For the sake of parsimony, in our model, the firm has one accrual of each type.

SFP_t^A has a positive relation with CF_{t+1}^A because SFP_t^A relates to cash flow in the period following the accrual. For example, accounts receivable (warranty liabilities) in period t is a positive (negative) accrual that reflects anticipated cash inflows (outflows) in period $t+1$ that relate to the economic factor in period t. As we show below, SFP_t^A's role is to incorporate into the firm's current period accrual-based operating performance measure, $OPEARN_t$, cash flow that relates to the current period economic factor but does not occur until the next period. SFP_t^B has a negative relation with CF_t^B because SFP_t^B is associated with period t cash flow generated by the period $t+1$ economic factor. For example, purchased inventory (deferred revenue) in period t is a positive (negative) accrual that reflects cash outflow (inflow) in period t that relates to period $t+1$'s economic factor.[4]

[4] Modeling the accruals as in Eq. (5) implicitly assumes that accruals reverse. For example, modeling SFP_t^A as $CF_{t+1}^A + v_t^A$ means that SFP_{t-1}^A is reversed.

These accruals provide the mechanism by which cash flows are aligned with the economic factor to which they relate. Specifically, using Eq. (5) and the usual definition of operating earnings as cash flow from operations plus changes in net operating assets yields:

$$\begin{aligned} OPEARN_t &= CFO_t + \Delta SFP_t^A + \Delta SFP_t^B \\ &= (CF_t^A + CF_t^C + CF_t^B) + (CF_{t+1}^A - CF_t^A + \Delta v_t^A) + (-CF_t^B + CF_{t-1}^B + \Delta v_t^B) \\ &= CF_{t+1}^A + CF_t^C + CF_{t-1}^B + \Delta v_t^A + \Delta v_t^B, \end{aligned}$$

which re-aligns cash flows so that $OPEARN_t$ reflects only cash flows relating to period t's economic factor, although it does so with error equal to $\Delta v_t^A + \Delta v_t^B$, i.e., the error in accruals in earnings. Figure 1b shows the relation between operating earnings and the three cash flow components.

3.3 Investors and equilibrium price

Our model assumes risk-neutral investors who value the firm in period t as the expected present value of future dividends given all information available to them at time t, i.e., $\{\theta_\tau, CFO_\tau, Cash_\tau, SFP_\tau^A, SFP_\tau^B\}, \tau \leq t$, where $Cash_\tau$ is the firm's cash balance.[5] The following proposition describes equilibrium price in period t. (Proofs are in Appendix 1)

Proposition 1 Equilibrium price is given by:

$$P_t = Cash_t + a\theta_t + b\mathrm{E}_t(\theta_{t+1}) + c\mathrm{E}_t(e_{t+1}^A), \quad (6)$$

where

$$\begin{aligned} a &= R^{-1}\lambda^A, \\ b &= (R-\gamma)^{-1}\left(\frac{\lambda^A}{R} + \lambda^C + \gamma\lambda^B\right), \\ c &= R^{-1}, \end{aligned}$$

and $\mathrm{E}_t(.)$ denotes expected value conditional on all information available at time t.

There are two notable features of Proposition 1. First, as stipulated by Ohlson (1995), price does not directly depend on dividends. This is because the cash account satisfies a cash-based version of the clean surplus relation, i.e., $Cash_{t+1} = Cash_t + (R-1)Cash_t + CFO_{t+1} - Div_{t+1}$, which allows us to replace dividends in investors' expectations with $CFO_{t+1} + Cash_t + (R-1)$ $Cash_t - Cash_{t+1}$.[6] Second, the accounting amounts, CFO_t, SFP_t^A, and SFP_t^B, do

[5] Effectively, we assume that investors see the history of the firm's statements of financial position, $Cash_\tau$, SFP_τ^A, and SFP_τ^B; statements of cash flows, CFO_τ; and the economic factors, θ_τ. Given this information, operating earnings, $OPEARN_\tau$, is redundant.

[6] Our model implicitly assumes that cash flow from operations does not include interest earned or paid on the beginning cash balance. This results in CFO_t playing a role similar to that of abnormal earnings in Ohlson (1995). More generally, our model assumptions are consistent with those of Ohlson (1995). For

not appear directly in the pricing expression. Their role is in providing information that investors can use to form expectations relating to next period's realizations of θ_{t+1} and e^A_{t+1}. Specifically, the price in Eq. (6) equals the expected present value of future dividends. Thus Eq. (6) can be interpreted as showing that price depends on the current cash available to pay dividends plus investors' expectations regarding future cash available to pay dividends.

Proposition 1 indicates that accounting amounts play an information role in valuing the firm because they help investors assess the factors that generate the firm's future cash flows and thus dividend-paying ability. Specifically, accruals and other accounting information reveal information that aids investors in forming better expectations of $E_t(\theta_{t+1})$ and $E_t(e^A_{t+1})$. The accounting system does not reveal information regarding $E_t(e^B_{t+1})$ and $E_t(e^C_{t+1})$.

4 The role of accruals in valuation and forecasting

4.1 Accruals and valuation

To obtain expressions for $E_t(\theta_{t+1})$ and $E_t(e^A_{t+1})$, we recalibrate the information at time t into the following variables with equivalent information for forecasting θ_{t+1} and e^A_{t+1}. The variables in Eq. (7) are a reformulation of the information available from the accounting amounts, CFO_t, SFP^B_t, SFP^A_{t-1}, and SFP^A_t, incremental to current and past realizations of the economic factor, θ, that is useful in forecasting θ_{t+1} and e^A_{t+1}.

$$
\begin{aligned}
z1_t &= \frac{1}{\lambda^B}\left(CFO_t - \lambda^A\theta_{t-1} - \lambda^C\theta_t\right) &&= \theta_{t+1} + \frac{1}{\lambda^B}\left(e^A_t + e^C_t + e^B_t\right),\\
z2_t &= -\frac{1}{\lambda^B}SFP^B_t &&= \theta_{t+1} + \frac{1}{\lambda^B}\left(e^B_t - v^B_t\right),\\
z3_t &= \frac{1}{\lambda^B}\left(SFP^A_{t-1} - \lambda^A\theta_{t-1}\right) &&= \frac{1}{\lambda^B}\left(e^A_t + v^A_{t-1}\right), \text{ and}\\
z4_t &= SFP^A_t - \lambda^A\theta_t &&= e^A_{t+1} + v^A_t.
\end{aligned}
\tag{7}
$$

The first three variables—$z1_t$, $z2_t$, and $z3_t$—assist in forecasting next period's economic factor, θ_{t+1}, and the fourth—$z4_t$—assists in forecasting e^A_{t+1}, the transitory part of next period's cash flow.[7] For example, the definition of $z1_t$ in Eq. (7) shows

Footnote 6 continued
example, like the Ohlson (1995) model, ours assumes the dividend displacement property and thus dividends have no informational role for investors' valuation decisions, even though Clubb (2013) shows that this property is not necessary in the Ohlson (1995) framework.

[7] Because the period t accounting amounts reflect the firm's information about e^A_{t+1}, $E_t(e^A_{t+1})$ conditional on that information likely differs from zero, and thus $E_t(e^A_{t+1})$ appears in the valuation expression in Eq. (6). The other two transitory components—e^B_{t+1} and e^C_{t+1} —retain their unconditional expectation of zero and therefore do not appear in the valuation expression. The period t accounting amounts also reflect the firm's information about θ_{t+1} beyond its unconditional expectation of $\gamma\theta_t$ that is known to investors, i.e., information about ε_{t+1}.

that CFO_t provides information about next period's economic factor, θ_{t+1}. This is because CFO_t contains CF_t^B, the cash flow component linked to θ_{t+1}, as per Eq. (3). But this information is masked because CFO_t also includes cash flow components unrelated to θ_{t+1}, i.e., CF_t^A and CF_t^C. Similarly, the accrual SFP_t^B provides imperfect information about θ_{t+1}. Although SFP_{t-1}^A does not provide direct information about θ_{t+1}, it provides information about the "error" in CFO_t in providing information about θ_{t+1}. Thus SFP_{t-1}^A provides indirect information that, in conjunction with CFO_t, is useful for forecasting θ_{t+1}.[8] In contrast, SFP_t^A provides information that is useful in forecasting next period's transitory component of CF_{t+1}^A, i.e., e_{t+1}^A.[9]

Because of our normality assumptions, it is straightforward to derive the following lemma that details the relevant expectations.

Lemma $\mathrm{E}_t(\theta_{t+1})$ and $\mathrm{E}_t(e_{t+1}^A)$ are given by:

$$\mathrm{E}_t(\theta_{t+1}) = (1-\beta_1-\beta_2)\gamma\theta_t + \beta_1 z1_t + \beta_2 z2_t + \beta_3 z3_t \tag{8}$$

$$\mathrm{E}_t(e_{t+1}^A) = \beta_4 z4_t, \tag{9}$$

where the βs are different functions of $(\lambda^B)^2$ and the variances of the error terms in the model, i.e., σ_ε^2, $\sigma_{v^A}^2$, $\sigma_{v^B}^2$, $\sigma_{e^A}^2$, $\sigma_{e^B}^2$, and $\sigma_{e^C}^2$. Thus they differ from one another. In addition, β_1, β_2, and β_4 are positive and β_3 is negative.[10] See Appendix 1 for details.

The lemma, in conjunction with Eq. (6) and the definitions in Eq. (7), indicates how each accounting amount is associated with the firm's value. In each case, the association is the product of a valuation multiple from Eq. (6) and an information weight from the lemma. Table 1 summarizes the results from the lemma in panel A and specifies the resulting valuation multiples and coefficients in panel B.

An immediate implication of the lemma is that the coefficients on the accounting amounts generally differ. This is for two main reasons. First, the accounting amounts provide information relating to different underlying generators of future cash flows. CFO_t, SFP_t^B, and SFP_{t-1}^A contain information about the future economic factor, θ_{t+1}. This helps investors assess future cash flows that are generated by economic factors. SFP_t^A contains information about the transitory part of next

[8] Using receivables as an illustration, the beginning balance of receivables, SFP_{t-1}^A, provides information that helps investors remove the effect of cash received from customers, CF_t^A, from the current period's cash flow from operations, CFO_t. Removing this effect makes the adjusted CFO_t a more precise information variable for forecasting next period's economic factor.

[9] Again using receivables as an illustration, the ending balance of receivables, SFP_t^A, which is net of the firm's estimate of uncollectible amounts, provides information about the component of next period's CF^A cash flow that is unrelated to the economic factor, i.e., e_{t+1}^A. For example, although the period t economic factor would generate revenue in t and cash flow in $t+1$ for the amount of the related gross receivable, an estimated uncollectible amount would affect $t+1$ cash flow but could be unrelated to $t+1$'s economic factor.

[10] The negative sign for β_3 reflects its role as removing some measurement error with respect to forecasting θ_{t+1}.

Table 1 Role of accounting amounts, CFO_t, SFP_t^B, SFP_{t-1}^A, and SFP_t^A, in valuation and forecasting

Panel A: Role in informing expectations of θ_{t+1} and e_{t+1}^A

Accounting amount	Information about	Information weight (A)
CFO_t	$E_t(\theta_{t+1})$ (applies to CFO_t, SFP_t^B, SFP_{t-1}^A)	$\frac{1}{\lambda^B}\beta_1$
SFP_t^B		$-\frac{1}{\lambda^B}\beta_2$
SFP_{t-1}^A		$\frac{1}{\lambda^B}\beta_3$
SFP_t^A	$E_t(e_{t+1}^A)$	β_4

Panel B: Valuation coefficients, i.e., in explaining MVE_t

Accounting amount	Valuation multiple (B)	Valuation coefficient (A × B)
CFO_t	$(R-\gamma)^{-1}\left(\frac{\lambda^A}{R}+\lambda^C+\gamma\lambda^B\right)$ (applies to CFO_t, SFP_t^B, SFP_{t-1}^A)	$\frac{1}{\lambda^B}\beta_1(R-\gamma)^{-1}\left(\frac{\lambda^A}{R}+\lambda^C+\gamma\lambda^B\right)$
SFP_t^B		$-\frac{1}{\lambda^B}\beta_2(R-\gamma)^{-1}\left(\frac{\lambda^A}{R}+\lambda^C+\gamma\lambda^B\right)$
SFP_{t-1}^A		$\frac{1}{\lambda^B}\beta_3(R-\gamma)^{-1}\left(\frac{\lambda^A}{R}+\lambda^C+\gamma\lambda^B\right)$
SFP_t^A	R^{-1}	$\beta_4 R^{-1}$

Panel C: Coefficients for forecasting CFO_{t+1}

Accounting amount	Forecasting multiple (B)	Forecasting coefficient (A × B)
CFO_t	$(\lambda^C+\gamma\lambda^B)$ (applies to CFO_t, SFP_t^B, SFP_{t-1}^A)	$\frac{1}{\lambda^B}\beta_1(\lambda^C+\gamma\lambda^B)$
SFP_t^B		$-\frac{1}{\lambda^B}\beta_2(\lambda^C+\gamma\lambda^B)$
SFP_{t-1}^A		$\frac{1}{\lambda^B}\beta_3(\lambda^C+\gamma\lambda^B)$
SFP_t^A	1	β_4

Panel D: Coefficients for forecasting $OPEARN_{t+1}$

Accounting amount	Forecasting multiple (B)	Forecasting coefficient (A × B)*
CFO_t	$(\lambda^A+\lambda^C)$ (applies to CFO_t, SFP_t^B, SFP_{t-1}^A)	$\frac{1}{\lambda^B}\beta_1(\lambda^A+\lambda^C)$
SFP_t^B		$-\frac{1}{\lambda^B}\beta_2(\lambda^A+\lambda^C)-1$
SFP_{t-1}^A		$\frac{1}{\lambda^B}\beta_3(\lambda^A+\lambda^C)$
SFP_t^A	1	β_4-1

* Includes accrual reversal, if applicable. See Appendix 2 for variable definitions

period's A-type cash flow, e_{t+1}^A, i.e., those that lag the economic factor, such as future cash receipts from current credit sales. Because the economic factor and e_{t+1}^A have different persistence, information about them has different implications for future cash flows. This is reflected in the valuation multiples in Table 1, panel B, differing across the accounting amounts. Second, the accounting amounts have different levels of error relative to the underlying construct for which each provides information, which result from various combinations of accrual estimation errors and transitory parts of the cash flow components. These differences are reflected in the information weights in Table 1, panel A.[11]

4.2 Forecasting cash flows and earnings

Using the definitions in Sect. 3.1, the forecast of next period's operating cash flow, CFO_{t+1}, can be written as:

$$E_t(CFO_{t+1}) = \lambda^A\theta_t + \lambda^C E_t(\theta_{t+1}) + \lambda^B E_t(\theta_{t+2}) + E_t(e^A_{t+1}) + E_t(e^C_{t+1}) + E_t(e^B_{t+1}).$$

Because, by assumption, the information, including the accounting amounts, in period t is not useful for forecasting beyond one period ahead for θ_t and e^A_t or even one period ahead for e^C_t and e^B_t, the forecasting expression for CFO_{t+1} reduces to:[12]

$$E_t(CFO_{t+1}) = \lambda^A\theta_t + (\lambda^C + \gamma\lambda^B)E_t(\theta_{t+1}) + E_t(e^A_{t+1}). \tag{10}$$

Thus, as with valuation, the role of accruals and other accounting information for forecasting future cash flows is embedded in $E_t(\theta_{t+1})$ and $E_t(e^A_{t+1})$. Also, as with valuation, the total effect of each accounting amount on the cash flow forecast comprises a cash flow forecasting multiple multiplied by an information weight. These are presented in Table 1, panel C. However, the cash flow forecasting multiples in panel C are not the same as the valuation multiples in panel B. The differences reflect that valuation requires forecasting cash flows for all future periods and discounting them to the present, whereas the cash flow forecast is only for one future period.[13]

[11] Table 1, panels B through D, also reveals that the coefficients are not necessarily positive. For example, in panel B, it is possible for the coefficient on CFO_t to be negative if λ^B is negative. Similarly, the coefficients on SFP^B_t, e.g., inventory, and SFP^A_{t-1}, e.g., lagged receivables, also can be negative, but the coefficient on SFP^A_t, e.g., receivables, is always positive.

[12] Specifically, the information available at time t, $\{\theta_\tau, CFO_\tau, Cash_\tau, SFP^A_\tau, SFP^B_\tau\}, \tau \le t$, is only useful for forecasting θ_{t+1} and e^A_{t+1}. Thus $E_t(\theta_{t+2}) = \gamma E_t(\theta_{t+1})$, $E_t\left(e^C_{t+1}\right) = 0$, and $E_t\left(e^B_{t+1}\right) = 0$. In real firms, this assumption is unlikely to hold, which would mean that greater lags of accruals could provide additional information relevant for forecasting and valuation.

[13] It is possible for the valuation and cash flow forecasting multiples on $E_t(\theta_{t+1})$ to have different signs. That is, for example, a higher $E_t(\theta_{t+1})$ can lead to higher valuation but a lower forecast for next period's cash flow, and vice versa. Thus lower anticipated one-period-ahead cash flow need not be associated with lower firm value. This can happen, for example, if λ^B is so negative that the cash flow forecasting multiple, $(\lambda^C + \gamma\lambda^B)$, is negative but the valuation multiple, $(R-\gamma)^{-1}\left(\frac{\lambda^A}{R} + \lambda^C + \gamma\lambda^B\right)$, is positive, e.g., λ^A is sufficiently positive. Economically, this could occur when cash flows that lead economic factors are negative, e.g., current investment in inventory in anticipation of better future economic factors, but most of the cash inflows relating to next period's economic factors are deferred, i.e., λ^A is large and positive. Our empirical results in Sect. 5 reveal that this situation is not common, in large part because λ^C is positive and much larger than λ^A or λ^B. Thus, as a practical matter, both $(\lambda^C + \gamma\lambda^B)$ and $\left(\frac{\lambda^A}{R} + \lambda^C + \gamma\lambda^B\right)$ are positive.

Regarding the forecast of next period's earnings, $\mathrm{E}_t(OPEARN_{t+1})$, it is straightforward to calculate that:

$$\mathrm{E}_t(OPEARN_{t+1}) = \lambda^A\theta_t + (\lambda^A + \lambda^C)\mathrm{E}_t(\theta_{t+1}) + \mathrm{E}_t(e^A_{t+1}) - SFP^A_t - SFP^B_t. \quad (11)$$

Thus, again, the total effect of each accounting amount comprises an earnings forecasting multiple multiplied by an information weight. However, there is an additional effect for SFP^A_t and SFP^B_t—the final two terms in Eq. (11)—that results from the fact that accruals reverse. The forecasting multiples and forecasting coefficients are presented in Table 1, panel D.

5 Empirical validity of model insights

5.1 Nature of the evidence

Our model is stylized and simplified and thus does not incorporate all of the complexities inherent in financial reporting by real firms. Nonetheless, we provide some empirical evidence as support that the main insights from the model guide us in obtaining incremental explanatory power when forecasting future cash flows and earnings and valuing equity of real firms.

We first estimate Eq. (12) to obtain estimates of λ^A, λ^C, and λ^B, the parameters linking the economic factors to cash flows occurring after, concurrent with, and before the period to which the economic factor relates.

$$CFO_t = \alpha_0 + \lambda^A REV_{t-1} + \lambda^C REV_t + \lambda^B REV_{t+1} + \varepsilon_t. \quad (12)$$

Equation (12) is an aggregation of the three relations comprising Eq. (3), using total revenues, REV, as a proxy for θ; θ is not observable (Dechow et al. 1998; Barth et al. 2001).[14] We aggregate these relations because, as noted in Sect. 3.1, the separate components of CFO_t are not observable. Following Nissim and Penman (2001, 2003), CFO is cash flow from operations from the statement of cash flows plus after tax net interest paid.[15] Allowing different λs for the three types of cash flow, CF^A, CF^C, and CF^B, depending on the firm's business underlies the main insights from our model. Thus descriptive statistics revealing such differences would support this aspect of our model. We estimate Eq. (12) and all equations that follow by year pooling firms from all industries (hereafter, "pooled") and, because

[14] Figure 1b shows that in expectation $OPEARN_t$ is a linear function of θ_t and λ^B, λ^C, and λ^A, which suggests $OPEARN$ also could be a proxy for θ. However, Fig. 1b also shows that realized $OPEARN$ contains realizations of the model error terms, i.e., e^B, e^C, e^A, Δv^A, and Δv^B, which results in CFO and $OPEARN$ being correlated across years. This correlation induces unknown effects on our estimates of λ^B, λ^C, and λ^A from Eq. (12). REV is not subject to these concerns. Regardless, we do not use a proxy for θ when estimating Eqs. (13a) through (15d), which are the basis for our inferences regarding the main insights from the model.

[15] Also following Nissim and Penman (2001) to adjust income amounts for taxes, we use the top statutory federal tax rate, which was 34 % from 1990 to 1992 and 35 % thereafter during our sample period, plus 2 % to reflect state taxes.

we expect the signs and the magnitudes of the model parameters to differ depending on the characteristics of the firm's business, separately by industry-year.

Our primary empirical tests aim at providing evidence on the extent to which partitioning accruals based on their role in cash-flow alignment increases their ability to forecast cash flows and operating earnings and explain firm value. To this end, we estimate Eqs. (13a) through (13d) for valuation, Eqs. (14a) through (14d) for future cash flow forecasting, and Eqs. (15a) through (15d) for earnings forecasting. We test for differences in adjusted R^2s across equations (a) through (d) for each set of equations; we use adjusted R^2s because the equations have different numbers of explanatory variables. Each set of equations includes somewhat different explanatory variables. However, this has no effect on the comparisons of adjusted R^2s within each set of equations, which are the basis of our evidence.

$$MVE_t = \alpha_1 + \alpha_2 NI_t + \alpha_2 BVE_t + \varepsilon_t \tag{13a}$$

$$MVE_t = \alpha_1 + \alpha_2 CFO_t + \alpha_3 ACC_t + \alpha_4 BVE_t + \varepsilon_t \tag{13b}$$

$$MVE_t = \alpha_1 + \alpha_2 CFO_t + \alpha_3 \Delta SFP_t^A + \alpha_4 \Delta SFP_t^B + \alpha_5 OACC_t + \alpha_6 BVE_t + \varepsilon_t \tag{13c}$$

$$MVE_t = \alpha_1 + \alpha_2 CFO_t + \alpha_3 SFP_t^A + \alpha_4 SFP_{t-1}^A + \alpha_5 SFP_t^B + \alpha_6 SFP_{t-1}^B + \alpha_7 OACC_t + \alpha_8 BVE_t + \varepsilon_t \tag{13d}$$

$$CFO_{t+1} = \alpha_1 + \alpha_2 CFO_t + \varepsilon_t \tag{14a}$$

$$CFO_{t+1} = \alpha_1 + \alpha_2 CFO_t + \alpha_3 ACC_t + \varepsilon_t \tag{14b}$$

$$CFO_{t+1} = \alpha_1 + \alpha_2 CFO_t + \alpha_3 \Delta SFP_t^A + \alpha_4 \Delta SFP_t^B + \alpha_5 OACC_t + \varepsilon_t \tag{14c}$$

$$CFO_{t+1} = \alpha_1 + \alpha_2 CFO_t + \alpha_3 SFP_t^A + \alpha_4 SFP_{t-1}^A + \alpha_5 SFP_t^B + \alpha_6 SFP_{t-1}^B + \alpha_7 OACC_t + \varepsilon_t \tag{14d}$$

$$OPEARN_{t+1} = \alpha_1 + \alpha_2 OPEARN_t + \varepsilon_t \tag{15a}$$

$$OPEARN_{t+1} = \alpha_1 + \alpha_2 OPEARN_t + \alpha_3 ACC_t + \varepsilon_t \tag{15b}$$

$$OPEARN_{t+1} = \alpha_1 + \alpha_2 OPEARN_t + \alpha_3 \Delta SFP_t^A + \alpha_4 \Delta SFP_t^B + \alpha_5 OACC_t + \varepsilon_t \tag{15c}$$

$$OPEARN_{t+1} = \alpha_1 + \alpha_2 OPEARN_t + \alpha_3 SFP_t^A + \alpha_4 SFP_{t-1}^A + \alpha_5 SFP_t^B + \alpha_6 SFP_{t-1}^B + \alpha_7 OACC_t + \varepsilon_t \tag{15d}$$

MVE is market value of equity at fiscal year-end. Following Nissim and Penman (2001, 2003), *OPEARN* is net income before extraordinary items plus after tax net interest expense. *BVE* is book value of equity at fiscal year-end. *NI* is net income before extraordinary items and discontinued operations, and *ACC* is *NI* minus *CFO*. Thus *ACC* is operating accruals. SFP^A (SFP^B) is the statement of financial position operating assets and liabilities for which cash is received or paid after (before) the period of the economic factor to which they relate. Specifically, SFP^A is total receivables plus deferred tax assets minus the sum of accounts payable, accrued expenses, pension liability, income taxes payable, and deferred tax liability; SFP^B is the sum of inventories, prepaid expenses, income tax refund, property, plant, and equipment, intangible assets, deferred charges, investments and advances-equity, and long-term pension assets minus deferred revenues. *OACC*, accruals other than those relating to changes in SFP^A and SFP^B, is *ACC* minus the sum of ΔSFP^A and ΔSFP^B. We include SFP^B_{t-1} in the equations because, even though Table 1 reveals that in our model SFP^B_{t-1} does not provide information about $E_t(\theta_{t+1})$, this likely is a result of the model assuming accruals align cash flows in the prior and next periods, not before or after that, as would be the case for real firms with long-term accruals (see Sect. 5.4.2).

Equation (a) provides a baseline for our comparisons. It includes variables commonly included in such a specification, i.e., *NI* and *BVE* when the dependent variable is *MVE* (Ohlson 1995), CFO_t when the dependent variable is CFO_{t+1}, and $OPEARN_t$ when the dependent variable is $OPEARN_{t+1}$. Also, we include *BVE* in Eqs. (13a) through (13d), but not the cash flow and operating earnings forecasting equations, because *BVE* plays the role of *Cash* in our model; Eq. (6) includes *Cash*, but Eqs. (10) and (11) do not. In addition, *BVE* includes financing liabilities and financial investments, which are outside of our model. We estimate Eqs. (13b) and (14b) because a large body of prior research disaggregates *NI* into *CFO* and *ACC*; Eq. (15b) accomplishes this by including *ACC* as a separate explanatory variable. Based on the overall findings in prior research, for each set of equations, we expect the adjusted R^2 of equation (b) to be higher than that of equation (a).

Equation (c) partitions *ACC* into changes in accruals depending on the role of the accrual in the cash flow alignment process, i.e., ΔSFP^A and ΔSFP^B. This permits us to test the extent to which disaggregating change in accruals into these components adds explanatory power to the change in total accruals. However, equation (c) constrains the coefficients on the period t and $t-1$ accruals to be the same. Although this is commonly assumed in prior research when focusing on income accruals, our model reveals that this constraint can be binding. In particular, our model reveals that the beginning- and end-of-period accrual amounts contain different information relevant to valuation and to forecasting cash flows and earnings. Thus our model leads us to predict that, for each set of equations, the adjusted R^2 from equation (c) is higher than that of equation (a) or (b) but lower than that of equation (d).

Finally, we estimate equation (d), which not only partitions accruals according to their type—SFP^A and SFP^B—but also permits the beginning and ending balances to have different coefficients, as our model indicates. If partitioning accruals depending on their role in cash-flow alignment provides incremental information about future cash flows, as our model indicates, then, for each set of equations, we predict that equation (d) has a higher adjusted R^2 than any of the other equations.

Finding evidence of this would confirm the main insight from our model, namely that partitioning accruals based on their role in cash-flow alignment increases their ability to forecast cash flows and earnings and explain firm value.

5.2 Sample and data

Our sample comprises all firms on the Compustat annual industrial files for 1989 to 2013 with data necessary to estimate all of our equations. 1989 is when cash flow from operations disclosed under Statement of Financial Accounting Standards No. 95 (FASB 1987) becomes available for a large number of firms (Hribar and Collins 2002) and 2013 is the most recent year of available data. Because some of our estimating equations require one-year lead and lagged variables, our evidence relates to 1990–2012. To avoid the influence of small firms, as in prior research (e.g., Barth et al. 2001; Nissim and Penman 2003) we require market value of equity, total assets, and total revenues to exceed $10 million. To mitigate the effects of our inability to identify a firm's assets and liabilities as an SFP^A or SFP^B accrual or as financing, we eliminate observations for which the sum of assets (liabilities) we can identify divided by total assets (total liabilities) is less than 25 %.[16] We measure all variables as of the firm's fiscal year-end and deflate them by average total assets (Sloan 1996; Givoly and Hayn 2000; Dichev and Tang 2008; McNichols and Stubben 2014; Srivastava 2014).

We define industries following Barth et al. (1999, 2005). To mitigate the effects of outliers, we winsorize each regression variable at the top and bottom 1 percentiles of its distribution by industry over the sample period (Barth et al. 2005, Chen et al. 2008).[17] As in Barth et al. (2005) we exclude insurance and real estate firms and financial institutions because our model was not developed with these types of firms in mind. Because we estimate our regressions separately for each industry, we exclude two industries with fewer than 100 firms during the sample period. After eliminating those two industries, no industry-year regression has fewer than 30 observations.

Table 2 presents descriptive statistics for the sample, which comprises 39,114 firm-year observations for 4265 firms in 15 industries from 1990 to 2012. Panel A presents the industry composition of the sample and reveals that the sample is not dominated by a single industry. The by-industry percentage of sample firms ranges from 2.80 % for the rubber/plastic industry to 19.29 % for the computers industry.

Table 2, panel B, presents across-year by-industry means and standard deviations for the variables we use in our analyses. Relating to our key variables, panel B reveals that SFP^A exhibits more across-industry variation than SFP^B. In particular, mean SFP^A is positive in nine industries and negative in six, with a pooled mean of 0.00, whereas mean SFP^B is positive in all 15 industries, with a pooled mean of 0.57. However, panel B reveals that SFP^B exhibits more across-year variation

[16] Our variable definitions result in unidentified accruals being included in other accruals, *OACC*. Nonetheless, untabulated findings reveal that our inferences are unaffected by using 50 % and 75 % as the elimination threshold.

[17] Untabulated findings reveal that our inferences are unaffected if we measure market value of equity three months after the firm's fiscal year-end or do not winsorize the regression variables.

Table 2 Descriptive statistics

Panel A: Industry composition of sample

Industry	Primary SIC codes	Firms #	Firms %	Observations #	Observations %
Chemicals	2800–2824, 2840–2899	155	3.63	1694	4.33
Computers	7370–7379, 3570–3579, 3670–3679	981	23.00	7546	19.29
Electrical Equip.	3600–3669, 3680–3699	225	5.28	2253	5.76
Extractive	2900–2999, 1300–1399	310	7.27	2795	7.15
Food	2000–2111	137	3.21	1524	3.90
Instruments	3800–3899	359	8.42	3214	8.22
Machinery	3500–3569, 3580–3599	181	4.24	2093	5.35
Metal	3300–3499	163	3.82	1721	4.40
Misc. Retail	5200–5799, 5900–5999	295	6.92	3057	7.82
Pharmaceuticals	2830–2836	234	5.49	1828	4.67
Rubber/Plastic	3000–3299	106	2.48	1095	2.80
Services	7000–8999, excluding 7370–7379	576	13.51	4440	11.35
Transportation Equip.	3700–3799	119	2.79	1391	3.56
Textiles, Print, Pub.	2200–2780	247	5.79	2743	7.01
Wholesale	5000–5199	177	4.15	1720	4.40
Total		4265	100.00	39,114	100.00

Table 2 continued

Panel B: Across-year industry means and standard deviations for regression variables

Industry	*CFO*		SFP^A		SFP^B		*OPEARN*		*MVE*		*REV*		*BVE*		*NI*	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Chemicals	0.11	0.07	–0.02	0.09	0.67	0.15	0.07	0.08	1.18	0.94	1.18	0.48	0.42	0.22	0.05	0.08
Computers	0.10	0.12	0.04	0.11	0.35	0.24	0.01	0.16	2.15	2.20	1.00	0.54	0.64	0.25	0.01	0.16
Electrical Equip.	0.08	0.10	0.04	0.10	0.50	0.20	0.03	0.13	1.54	1.59	1.11	0.43	0.60	0.23	0.02	0.13
Extractive	0.16	0.08	–0.08	0.10	0.83	0.17	0.05	0.09	1.04	0.70	0.74	0.61	0.48	0.20	0.04	0.09
Food	0.12	0.08	–0.07	0.09	0.73	0.17	0.08	0.07	1.41	1.19	1.34	0.67	0.47	0.23	0.06	0.07
Instruments	0.08	0.11	0.05	0.09	0.51	0.21	0.04	0.13	2.03	1.73	0.97	0.36	0.67	0.22	0.04	0.13
Machinery	0.09	0.08	0.04	0.11	0.57	0.17	0.06	0.09	1.32	1.01	1.13	0.39	0.53	0.23	0.05	0.09
Metal	0.10	0.06	0.00	0.09	0.68	0.15	0.06	0.06	0.92	0.72	1.21	0.46	0.49	0.21	0.05	0.06
Misc. Retail	0.12	0.08	–0.13	0.18	0.74	0.20	0.06	0.08	1.36	1.32	2.26	0.93	0.50	0.22	0.05	0.08
Pharmaceuticals	0.05	0.18	–0.01	0.10	0.44	0.30	0.00	0.21	2.91	2.34	0.77	0.53	0.59	0.30	–0.01	0.21
Rubber/Plastic	0.12	0.08	0.01	0.09	0.64	0.16	0.07	0.07	1.20	1.00	1.27	0.44	0.55	0.24	0.06	0.07
Services	0.12	0.10	0.03	0.15	0.58	0.29	0.05	0.09	1.36	1.36	1.19	0.82	0.49	0.26	0.04	0.09
Transport Equip.	0.10	0.07	0.02	0.15	0.59	0.18	0.06	0.07	1.01	0.89	1.32	0.57	0.45	0.23	0.05	0.07
Textiles, Print, Pub.	0.12	0.08	–0.01	0.11	0.67	0.18	0.06	0.07	1.08	0.87	1.31	0.56	0.48	0.22	0.05	0.07
Wholesale	0.08	0.08	0.02	0.13	0.60	0.19	0.06	0.06	0.99	0.84	2.51	1.57	0.47	0.20	0.05	0.06
Pooled	0.11	0.10	0.00	0.13	0.57	0.26	0.04	0.12	1.55	1.59	1.24	0.81	0.54	0.25	0.04	0.12

Table 2 continued

Panel C: Across-year means (standard deviations) of Pearson correlations above the diagonal and Spearman correlations below the diagonal pooled across industries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) *CFO*		–0.09	0.07	0.58	0.33	0.21	0.12	0.58
		(0.13)	(0.12)	(0.12)	(0.14)	(0.14)	(0.07)	(0.12)
(2) SFP^A	–0.09		–0.29	0.07	0.03	0.08	0.25	0.08
	(0.11)		(0.15)	(0.11)	(0.08)	(0.19)	(0.10)	(0.11)
(3) SFP^B	0.06	–0.29		0.10	–0.13	–0.05	–0.09	0.06
	(0.11)	(0.14)		(0.11)	(0.09)	(0.24)	(0.13)	(0.12)
(4) *OPEARN*	0.59	0.05	0.07		0.43	0.28	0.28	0.99
	(0.11)	(0.12)	(0.10)		(0.17)	(0.13)	(0.08)	(0.01)
(5) *MVE*	0.37	0.05	–0.11	0.58		0.13	0.41	0.47
	(0.11)	(0.09)	(0.12)	(0.14)		(0.11)	(0.11)	(0.18)
(6) *REV*	0.18	0.04	–0.04	0.24	0.10		0.01	0.24
	(0.13)	(0.19)	(0.21)	(0.12)	(0.10)		(0.15)	(0.11)
(7) *BVE*	0.13	0.26	–0.11	0.29	0.49	0.04		0.36
	(0.05)	(0.09)	(0.12)	(0.09)	(0.11)	(0.16)		(0.08)
(8) *NI*	0.57	0.07	0.01	0.98	0.62	0.29	0.39	
	(0.11)	(0.12)	(0.11)	(0.01)	(0.15)	(0.12)	(0.09)	

Sample of firms from 15 industries from 1990 to 2012. See Appendix 2 for variable definitions within industries than SFP^A. The across-year SFP^B standard deviation ranges from 0.15 in the chemicals and metal industries to 0.30 in the pharmaceuticals industry, with a pooled standard deviation of 0.26. For SFP^A it ranges from 0.09 in four industries to 0.18 in the miscellaneous retail industry, with a pooled standard deviation of 0.13.

Table 2, panel C, presents across-year by-industry means and standard deviations for the Pearson and Spearman correlations between the variables in panel B. Panel C reveals that, although SFP^A and SFP^B both are positively correlated with *OPEARN* and *NI*, SFP^A (SFP^B) is positively (negatively) correlated with *REV*, *MVE*, and *BVE* and negatively (positively) correlated with *CFO*. Consistent with these oppositely signed correlations, panel C also reveals that SFP^A and SFP^B are negatively correlated (Pearson and Spearman correlation $= -0.29$). Our regression tests are aimed at determining the extent to which these differences between SFP^A and SFP^B indicate their different abilities to predict cash flows and earnings and explain equity market value.

5.3 The evidence

Table 3 presents regression summary statistics from estimations of Eq. (12). Table 3 reveals that λ^A, λ^B, and λ^C differ from each other and exhibit across-industry variation. These statistics are consistent with our model permitting the λs to differ by type of accrual and conceptualizing them as differing across firms depending on the firm's business. The table reveals that mean λ^A is positive in nine industries and negative in six, whereas mean λ^B (λ^C) is negative (positive) in all 15 industries.[18] The mean of λ^A ranges from −0.066 in the extractive industry to 0.102 in the pharmaceuticals industry. The mean of λ^C ranges from 0.013 in the wholesale industry to 0.163 in the pharmaceuticals industry. The mean of λ^B ranges from −0.151 in the instruments industry to −0.010 in the wholesale industry. Although, for parsimony, our model assumes λ^A, λ^B, and λ^C are constant over time, panel B reveals that they are not. For example, the within-industry across-year standard deviation of λ^A (λ^B) ranges from 0.02 (0.03) in the wholesale industry to 0.16 (0.15) in the pharmaceuticals industry; λ^C exhibits more variation—the standard deviation of λ^C ranges from 0.04 in the wholesale industry to 0.26 in the pharmaceuticals industry. In addition, Table 3 reveals that the adjusted R^2 from Eq. (12) ranges across industries from 0.006 to 0.226 and the pooled adjusted R^2 is 0.036.

As explained in Sect. 3.1, to ensure that the net present value of future cash flows associated with each θ_t is positive, the model requires that $\frac{\lambda^A}{R} + \lambda^C + R\lambda^B > 0$, where $R > 1$ is one plus the risk-free discount rate. This requirement only applies when cash flows only relate to economic factors from the current year, the prior year, and the subsequent year, which is unlikely to be the case for real firms. Nonetheless, the estimates of λ^A, λ^C, and λ^B, together with an assumed risk-free

[18] Although mean λ^B is negative in all industries and Table 1, panel B, reveals that mean SFP^B is positive in all industries, there is no comparable pattern for λ^A and SFP^A. The industries for which λ^A is positive and negative are not the same as the industries for which SFP^A is negative and positive.

Table 3 Descriptive statistics for λ^A, λ^B, and λ^C

Industry	λ^A Mean	SD	# years +/–	# sign. +/–	λ^C Mean	SD	# years +/–	# sign. +/–	λ^B Mean	SD	# years +/–	# sign. +/–	Mean adjusted R^2
Chemicals	0.020	0.06	14/9	2/1	0.056	0.10	16/7	5/0	–0.048	0.08	6/17	1/9	0.060
Computers	0.019	0.05	15/8	5/2	0.131	0.08	22/1	18/0	–0.134	0.06	0/23	0/19	0.080
Electrical Equip.	0.039	0.08	16/7	4/0	0.106	0.09	21/2	9/0	–0.067	0.07	4/19	0/10	0.173
Extractive	–0.066	0.06	2/21	0/10	0.125	0.09	23/0	9/0	–0.078	0.07	1/22	0/11	0.059
Food	–0.039	0.08	9/14	1/7	0.106	0.10	19/4	8/0	–0.048	0.07	6/17	0/6	0.070
Instruments	0.074	0.13	17/6	8/0	0.124	0.15	19/4	11/0	–0.151	0.14	4/19	0/12	0.113
Machinery	0.007	0.05	13/10	0/1	0.112	0.08	21/2	9/0	–0.054	0.07	7/16	0/8	0.129
Metal	0.004	0.06	12/11	5/3	0.067	0.10	18/5	11/2	–0.050	0.06	3/20	0/10	0.087
Misc. Retail	0.003	0.03	11/12	1/0	0.038	0.06	17/6	4/0	–0.035	0.05	6/17	0/6	0.041
Pharmaceuticals	0.102	0.16	17/6	5/0	0.163	0.26	17/6	6/0	–0.129	0.15	5/18	0/6	0.226
Rubber/Plastic	0.025	0.09	15/8	5/2	0.082	0.09	19/4	6/0	–0.063	0.07	3/20	0/6	0.113
Services	–0.005	0.06	9/14	4/4	0.090	0.10	19/4	10/1	–0.074	0.07	3/20	0/9	0.050
Transport Equip.	–0.022	0.07	8/15	1/3	0.072	0.07	18/5	6/0	–0.021	0.07	8/15	0/4	0.066
Textiles, Print, Pub.	–0.024	0.07	9/14	1/5	0.108	0.09	21/2	8/0	–0.064	0.07	3/20	1/6	0.088
Wholesale	–0.004	0.02	13/10	0/2	0.013	0.04	15/8	2/1	–0.010	0.03	7/16	2/2	0.006
Pooled	0.000	0.03	10/13	4/7	0.080	0.03	23/0	20/0	–0.070	0.04	0/23	0/20	0.036

Statistics are based on across-year estimates from industry-year and pooled by-year estimations of $CFO_t = \alpha_0 + \lambda^A REV_{t-1} + \lambda^C REV_t + \lambda^B REV_{t+1} + \varepsilon_t$. # sign. denotes the number of years in which the coefficient estimates are different from zero, using a 10 % significance level of a well-specified test. See Appendix 2 for variable definitions rate, enable us to determine whether this requirement holds in our sample. Untabulated findings based on assuming R equals one plus the annual risk-free rate, based on US Treasury bills, which we obtain from Kenneth French's website through CRSP and using an F test to test for significance of the constraint based on coefficient estimates in Eq. (12) reveal that the expression above is significantly negative—i.e., the condition does not hold—in only eight of 345 (23 years times 15 industries) industry-years. Of these eight, seven are in the extractive industry.

Table 4, panels A, B, and C, presents results from our comparisons of adjusted R^2s from Eqs. (13a) through (13d), (14a) through (14d), and (15a) through (15d) when MVE_t, CFO_{t+1}, and $OPEARN_{t+1}$ are the dependent variables. These comparisons provide evidence that partitioning accruals based on their role in cash-flow alignment increases the ability of accruals to forecast cash flows and operating earnings and explain firm value. Table 4 also presents, as descriptive statistics, t-statistics associated with paired t tests, each of which is based on the across-year mean of the paired differences in adjusted R^2 for the particular comparison and the across-year standard deviation of the paired differences. Untabulated p-values based on the Wilcoxon signed-rank test reveal inferences consistent with those implied by the tabulated t-statistics.[19]

Regarding explaining firm value, as expected, Table 4, panel A, reveals that partitioning NI into CFO and ACC results in Eq. (13b) having greater explanatory power than Eq. (13a) for 12 of the 15 industries and the pooled estimation (t-stats. > 1.70 range from 1.88 to 7.60). Panel A also reveals that partitioning ACC into ΔSFP^A, ΔSFP^B, and $OACC$ results in Eq. (13c) having greater explanatory power than Eq. (13b) for three industries and the pooled estimation (t-stats. > 1.70 range from 1.77 to 4.05). Recall that although Eq. (13c) disaggregates accruals into ΔSFP^A, ΔSFP^B, and $OACC$, it constrains the coefficients on the t and $t-1$ accruals to be the same, which is not consistent with our model.[20]

[19] Because the tabulated paired t tests and untabulated Wilcoxon tests are based on differences in adjusted R^2s from annual cross-sectional regressions, the tests are unaffected by cross-sectional correlation of the adjusted R^2 differences we compare but could be affected by serial correlation. Thus we construct two additional statistics for comparing the differences for the pooled estimation. First, we follow Abarbanell and Bernard (2000, p. 228) to correct the standard errors used to construct the paired t tests for serial correlation evidenced by the slope coefficient of an AR(1) regression of the adjusted R^2 difference in year t on the adjusted R^2 difference in year $t-1$. Second, we use the t-statistic associated with the intercept in the AR(1) regression, which can be interpreted as the mean adjusted R^2 difference after controlling for the lagged adjusted R^2 difference and thus the serial correlation in the adjusted R^2 difference. The untabulated statistics associated with these tests reveal the same inferences as those revealed by the tabulated t-statistics. We thank Dan Taylor for suggesting these additional tests.

[20] As Sect. 5.2 explains, we obtain CFO from the statement of cash flows and construct ACC as NI – CFO. However, we construct ΔSFP^A and ΔSFP^B from statement of financial position amounts and define $OACC$ as $ACC - (\Delta SFP^A + \Delta SFP^B)$. Thus any effects on ΔSFP^A and ΔSFP^B associated with non-articulating events, e.g., mergers and acquisitions, are reflected in $OACC$. To determine whether this variable construction affects our inferences, we re-estimate all equations in Table 4, panels A though C, after eliminating the top and bottom 5 % of observations from each industry based on the difference between ACC and total accruals estimated using change in statement of financial position amounts as in Sloan (1996). We select the 5 % cutoffs based on Hribar and Collins's (2002) finding that 40 % of observations have non-articulating events and 25 % of those are substantial: 40 % times 25 % = 10 %, which is the percentage of observations we eliminate. Untabulated findings based on this reduced sample reveal the same inferences as our tabulated findings.

Table 4 Comparisons of explanatory power

Panel A: Adjusted R^2 from valuation equations

$$MVE_t = \alpha_1 + \alpha_2 NI_t + \alpha_2 BVE_t + \varepsilon_t \quad \text{(a)}$$
$$MVE_t = \alpha_1 + \alpha_2 CFO_t + \alpha_3 ACC_t + \alpha_4 BVE_t + \varepsilon_t \quad \text{(b)}$$
$$MVE_t = \alpha_1 + \alpha_2 CFO_t + \alpha_3 \Delta SFP_t^A + \alpha_4 \Delta SFP_t^B + \alpha_5 OACC_t + \alpha_6 BVE_t + \varepsilon_t \quad \text{(c)}$$
$$MVE_t = \alpha_1 + \alpha_2 CFO_t + \alpha_3 SFP_t^A + \alpha_4 SFP_{t-1}^A + \alpha_5 SFP_t^B + \alpha_6 SFP_{t-1}^B + \alpha_7 OACC_t + \alpha_8 BVE_t + \varepsilon_t \quad \text{(d)}$$

	Mean adjusted R^2 from equation				Paired t test for adjusted R^2 from equations							
Industry	(a)	(b)	(c)	(d)	(b–a)	t	(c–b)	t	(d–c)	t	(d–b)	t
Chemicals	0.330	0.372	0.379	0.438	0.042	3.35	0.007	1.46	0.059	3.16	0.066	3.55
Computers	0.234	0.281	0.284	0.341	0.047	6.34	0.003	1.64	0.057	8.85	0.060	8.87
Electrical Equip.	0.267	0.279	0.293	0.320	0.012	2.50	0.014	2.46	0.027	2.79	0.041	4.19
Extractive	0.326	0.355	0.367	0.379	0.029	3.84	0.012	2.08	0.012	2.94	0.024	3.18
Food	0.494	0.529	0.533	0.548	0.035	3.15	0.004	1.25	0.015	2.75	0.019	3.05
Instruments	0.199	0.199	0.202	0.245	–0.000	–0.06	0.003	1.10	0.043	4.29	0.046	4.50
Machinery	0.374	0.379	0.377	0.410	0.005	1.50	–0.002	–0.43	0.033	3.45	0.031	3.05
Metal	0.373	0.398	0.401	0.422	0.025	3.36	0.003	0.84	0.021	3.17	0.024	3.37
Misc. Retail	0.402	0.428	0.433	0.459	0.026	3.82	0.005	1.45	0.026	3.14	0.031	3.68
Pharmaceuticals	0.066	0.075	0.095	0.205	0.009	1.18	0.020	1.51	0.110	7.03	0.130	8.32
Rubber/Plastic	0.566	0.584	0.587	0.594	0.018	3.12	0.003	1.05	0.007	1.57	0.010	1.91
Services	0.311	0.380	0.385	0.436	0.069	5.00	0.005	1.77	0.051	5.17	0.056	5.86
Transport Equip.	0.494	0.506	0.516	0.535	0.012	3.01	0.010	1.49	0.019	2.97	0.029	3.19
Textiles, Print, Pub.	0.493	0.531	0.533	0.555	0.038	4.23	0.002	1.33	0.022	4.35	0.024	4.55
Wholesale	0.456	0.468	0.469	0.494	0.012	1.88	0.001	0.54	0.025	3.39	0.026	3.53
Pooled	0.226	0.240	0.243	0.327	0.014	7.60	0.003	4.05	0.084	9.55	0.087	9.53

Table 4 continued

Panel B: Adjusted R^2 from cash flow forecasting equations

$$CFO_{t+1} = \alpha_1 + \alpha_2 CFO_t + \varepsilon_t \quad \text{(a)}$$

$$CFO_{t+1} = \alpha_1 + \alpha_2 CFO_t + \alpha_3 ACC_t + \varepsilon_t \quad \text{(b)}$$

$$CFO_{t+1} = \alpha_1 + \alpha_2 CFO_t + \alpha_3 \Delta SFP_t^A + \alpha_4 \Delta SFP_t^B + \alpha_5 OACC_t + \varepsilon_t \quad \text{(c)}$$

$$CFO_{t+1} = \alpha_1 + \alpha_2 CFO_t + \alpha_3 SFP_t^A + \alpha_4 SFP_{t-1}^A + \alpha_5 SFP_t^B + \alpha_6 SFP_{t-1}^B + \alpha_7 OACC_t + \varepsilon_t \quad \text{(d)}$$

	Mean adjusted R^2 from equation				Paired t test for adjusted R^2 from equations							
Industry	(a)	(b)	(c)	(d)	(b–a)	t	(c–b)	t	(d–c)	t	(d–b)	t
Chemicals	0.281	0.339	0.368	0.373	0.058	3.95	0.029	2.64	0.005	1.31	0.034	2.61
Computers	0.386	0.400	0.413	0.420	0.014	4.72	0.013	4.91	0.007	2.85	0.020	7.08
Electrical Equip.	0.297	0.334	0.375	0.378	0.037	3.21	0.041	5.17	0.003	0.83	0.044	4.31
Extractive	0.412	0.418	0.458	0.470	0.006	1.26	0.040	4.91	0.012	2.75	0.052	6.45
Food	0.327	0.392	0.411	0.416	0.065	3.03	0.019	2.39	0.005	0.89	0.024	2.26
Instruments	0.400	0.435	0.466	0.476	0.035	6.30	0.031	4.11	0.010	3.36	0.041	5.37
Machinery	0.268	0.310	0.338	0.360	0.042	4.45	0.028	3.83	0.022	2.96	0.050	5.34
Metal	0.163	0.230	0.236	0.240	0.067	4.60	0.006	0.82	0.004	0.80	0.010	1.22
Misc. Retail	0.323	0.349	0.372	0.377	0.026	4.08	0.023	2.87	0.005	2.87	0.028	3.02
Pharmaceuticals	0.544	0.578	0.587	0.602	0.034	4.33	0.009	1.95	0.015	2.91	0.024	3.65
Rubber/Plastic	0.281	0.343	0.376	0.391	0.062	3.58	0.033	2.02	0.015	1.54	0.048	2.73
Services	0.488	0.497	0.528	0.537	0.009	3.08	0.031	4.42	0.009	3.46	0.040	5.00
Transport Equip.	0.266	0.309	0.330	0.339	0.043	4.26	0.021	4.48	0.009	1.85	0.030	4.82
Textiles, Print, Pub.	0.218	0.273	0.306	0.315	0.055	4.09	0.033	2.97	0.009	1.19	0.042	2.80
Wholesale	0.138	0.186	0.242	0.251	0.048	4.08	0.056	3.30	0.009	0.98	0.065	3.77
Pooled	0.394	0.411	0.433	0.439	0.017	7.82	0.022	8.99	0.006	4.56	0.028	11.47

Table 4 continued

Panel C: Adjusted R^2 from operating earnings forecasting equations

$$OPEARN_{t+1} = \alpha_1 + \alpha_2 OPEARN_t + \varepsilon_t \quad \text{(a)}$$

$$OPEARN_{t+1} = \alpha_1 + \alpha_2 OPEARN_t + \alpha_3 ACC_t + \varepsilon_t \quad \text{(b)}$$

$$OPEARN_{t+1} = \alpha_1 + \alpha_2 OPEARN_t + \alpha_3 \Delta SFP_t^A + \alpha_4 \Delta SFP_t^B + \alpha_5 OACC_t + \varepsilon_t \quad \text{(c)}$$

$$OPEARN_{t+1} = \alpha_1 + \alpha_2 OPEARN_t + \alpha_3 SFP_t^A + \alpha_4 SFP_{t-1}^A + \alpha_5 SFP_t^B + \alpha_6 SFP_{t-1}^B + \alpha_7 OACC_t + \varepsilon_t \quad \text{(d)}$$

	Mean adjusted R^2 from equation				Paired t test for adjusted R^2 from equations							
Industry	(a)	(b)	(c)	(d)	(b–a)	t	(c–b)	t	(d–c)	t	(d–b)	t
Chemicals	0.401	0.433	0.443	0.456	0.032	4.01	0.010	1.86	0.013	2.50	0.023	2.95
Computers	0.271	0.322	0.329	0.337	0.051	6.48	0.007	1.71	0.008	3.48	0.015	3.65
Electrical Equip.	0.328	0.373	0.386	0.385	0.045	6.02	0.013	2.62	−0.001	−0.04	0.012	2.27
Extractive	0.206	0.244	0.261	0.276	0.038	3.24	0.017	4.17	0.015	3.16	0.032	6.22
Food	0.450	0.501	0.514	0.519	0.051	4.29	0.013	2.06	0.005	1.10	0.018	2.27
Instruments	0.394	0.446	0.456	0.457	0.052	5.56	0.010	2.15	0.001	0.98	0.011	2.19
Machinery	0.377	0.401	0.401	0.409	0.024	2.35	0.000	0.18	0.008	1.95	0.008	1.52
Metal	0.327	0.341	0.346	0.363	0.014	3.19	0.005	1.02	0.017	2.36	0.022	2.58
Misc. Retail	0.489	0.520	0.535	0.542	0.031	4.59	0.015	2.69	0.007	1.56	0.022	3.12
Pharmaceuticals	0.485	0.538	0.540	0.545	0.053	3.79	0.002	0.77	0.005	1.50	0.007	1.71
Rubber/Plastic	0.446	0.487	0.504	0.512	0.041	3.09	0.017	1.99	0.008	1.53	0.025	2.75
Services	0.408	0.449	0.454	0.455	0.041	4.63	0.005	2.11	0.001	0.84	0.006	2.25
Transport Equip.	0.393	0.433	0.442	0.450	0.040	4.61	0.009	2.13	0.008	2.54	0.017	2.96
Textiles, Print, Pub.	0.403	0.434	0.441	0.448	0.031	3.78	0.007	1.15	0.007	1.22	0.014	1.55
Wholesale	0.462	0.476	0.476	0.485	0.014	2.19	0.000	−0.27	0.009	2.20	0.009	1.81
Pooled	0.362	0.397	0.400	0.402	0.035	9.69	0.003	2.64	0.002	2.41	0.005	2.64

We estimate each of the (a) through (d) equations in panels A, B, and C by year by industry for 15 industries and 23 years, 1990–2012, and by year pooled across industries. Mean adjusted R^2s are the across-year means. See Appendix 2 for variable definitions

More importantly, as the model predicts, panel A reveals that partitioning accruals based on their role in cash-flow alignment results in even greater explanatory power. Equation (13d) has greater explanatory power than the other equations. In particular, the adjusted R^2 for Eq. (13d) is greater than that for Eq. (13c) for 14 industries and the pooled estimation (t-stats. > 1.70 range from 2.75 to 9.55). The only exception is the rubber/plastic industry (t-stat. = 1.57). A comparison of Eqs. (13d) and (13b) also is pertinent to assessing the empirical validity of the model's insights because Eq. (13c) partially considers the role of the accruals in cash flow-alignment. Equation (13d) has greater explanatory power than Eq. (13b) for all 15 industries and the pooled estimation (t-stats. > 1.70 range from 1.91 to 9.53).

Regarding forecasting future cash flows, panel B reveals inferences similar to those revealed by panel A. In particular, panel B reveals that partitioning *NI* into *CFO* and *ACC* results in Eq. (14b) having greater explanatory power than Eq. (14a) for 14 of the 15 industries and the pooled estimation (t-stats. > 1.70 range from 3.03 to 7.82). Panel B also reveals that partitioning *ACC* into ΔSFP^A, ΔSFP^B, and *OACC* results in Eq. (14c) having greater explanatory power than Eq. (14b) for 14 industries and the pooled estimation (t-stats. > 1.70 range from 1.95 to 8.99). More importantly, as in panel A and as the model predicts, panel B reveals that partitioning accruals based on their role in cash-flow alignment results in even greater explanatory power. In particular, the adjusted R^2 for Eq. (14d) is greater than that for Eq. (14c) for eight industries and the pooled estimation (t-stats. > 1.70 range from 1.85 to 4.56), and Eq. (14d) has greater explanatory power than Eq. (14b) for 14 of the 15 industries and the pooled estimation (t-stats. > 1.70 range from 2.26 to 11.47). The only exception is the metal industry (t-stat. = 1.22).[21]

Relating to forecasting future operating earnings, panel C again reveals similar inferences. In particular, although Eq. (15b) has greater explanatory power than Eq. (15a) for every industry and the pooled estimation (t-stats. range from 2.19 to 9.69), Eq. (15c) has greater explanatory power than Eq. (15b) for 10 industries and the pooled estimation (t-stats. range from 1.71 to 2.69). More importantly for our study, Eq. (15d) has greater explanatory power than Eq. (15c) for seven industries and the pooled estimation (t-stats. range from 1.95 to 3.48) and greater explanatory power than Eq. (15b) for 13 industries and the pooled estimation (t-stats. range from 1.71 to 6.22).[22]

[21] As defined, *CFO* includes some, but not all, investing cash flows. For example, *CFO* does not include cash outflows related to purchases of property, plant, and equipment but does include cash inflows related to sales of products manufactured using those assets. This seems to create a mismatch when using CFO_{t-1} to predict CFO_t that might affect our inferences. However, because $OACC \equiv ACC - \Delta SFP^A - \Delta SFP^B$, *OACC* is a control for such a mismatch. For example, ΔSFP^B reflects changes in property, plant, and equipment relating to both depreciation and capital expenditures, whereas *ACC* reflects only depreciation. Thus, by construction, *OACC* reflects capital expenditures. Nonetheless, we re-estimate Eqs. (14a) through (14d) but defining *CFO* as free cash flow, i.e., *CFO* + cash from investing activities. Untabulated findings reveal that, although the adjusted R^2s are smaller than those in Table 4, panel B, the findings reveal the same inferences. In particular, the pooled estimation adjusted R^2s increase across the four equations, and that of Eq. (13d) is the largest.

[22] Findings from untabulated analyses reveal the same inferences as Table 4. First, as explained in Sect. 5.1, we exclude *BVE* from Eqs. (14a) through (15d) but do not expect this exclusion to affect our

Taken together, the evidence in Table 4 supports the model's main insight that partitioning accruals based on their role in cash-flow alignment increases their ability to forecast cash flows and operating earnings and explain firm value.[23]

5.4 Additional analyses

5.4.1 Comparison to Barth et al. (2001)

Barth et al. (2001) develop a model based on the model of Dechow et al. (1998) and, consistent with the model's predictions, find that disaggregating income accruals into major components, namely change in accounts receivable, change in accounts payable, change in inventory, depreciation, amortization, and other accruals, enhances the predictive ability of accruals for future operating cash flow, incremental to current period operating cash flow. Because accounts receivable and accounts payable are SFP^{A} accruals and inventory, property, plant, and equipment, and intangible assets are SFP^{B} accruals, the Barth et al. (2001) accrual components are components of our ΔSFP^{B} and ΔSFP^{A} accruals. However, Barth et al.'s (2001) other accruals, *OTHER*, is a broader group of accruals than our *OACC* and thus likely aggregates *A*-type and *B*-type accruals. Although we model only one SFP^{A} and one SFP^{B} accrual, one would expect an expanded version of our model to reveal that different accruals within these types have different relations with equity value and future cash flow and earnings. More importantly, the Barth et al. (2001) model does not permit the beginning and ending balances of the accrual components to have different relations with future cash flow or equity value.[24]

Footnote 22 continued
inferences. To test this expectation, we estimate these equations including *BVE* as an additional explanatory variable. Second, Eqs. (6), (10), and (11) include θ_t and $E_t(\theta_{t+1})$ as explanatory variables. Thus we estimate Eqs. (13a) through (15d) including REV_t and REV_{t+1}, as proxies for θ_t and $E_t(\theta_{t+1})$, as additional explanatory variables. Third, negative and positive earnings have different relations with equity value and likely future cash flows and earnings (Hayn 1995). Thus we estimate Eqs. (13a) through (15d) after eliminating from the sample observations with negative *OPEARN*. Fourth, we re-estimated the pooled specifications in Table 4 using a jackknife procedure, whereby we omit each observation sequentially, obtain a predicted value for that observation, and construct mean absolute and squared prediction errors (MAE and MSE). For all three sets of equations, the MAEs and MSEs from equations (d) are significantly smaller than those from equations (b).

[23] Comparing the pooled adjusted R^2s from equations (b), (c), and (d) provides some evidence that partitioning accruals both on whether they are *A*-type or *B*-type and whether they relate to beginning or ending accruals contribute to the greater explanatory power. Our model reveals that both are important. Regarding the *MVE* equations, panel A reveals that the difference between the (d) and (b) equations, which reflect both aspects of our model's predictions, is 0.087 (0.327–0.240), of which 0.003 is obtained by separating *A*-type and *B*-type accruals (0.243–0.240) and an additional 0.084 is obtained by also separating the beginning and ending balances (0.327–0.243). Regarding the *CFO* equations, panel B reveals that the difference between the (d) and (b) equations adjusted R^2s is 0.028 (0.439–0.411), of which 0.022 is obtained by separating *A*-type and *B*-type accruals (0.433–0.411) and an additional 0.006 is obtained by also separating the beginning and ending balances (0.439–0.433). Regarding the *OPEARN* equations, panel C reveals that the difference between the (d) and (b) equations adjusted R^2s is 0.005 (0.402–0.397), of which 0.003 is obtained by separating *A*-type and *B*-type accruals (0.400–0.397) and an additional 0.002 is obtained by also separating the beginning and ending balances (0.402–0.400).

[24] Barth et al. (2001) do not test the relation between the accrual components and future earnings.

To compare our model's insights with the results of Barth et al. (2001), we estimate four versions of their Eq. (12) with *MVE*, CFO_{t+1}, and $OPEARN_{t+1}$ as dependent variables as alternatives to our (c) and (d) equations. First, we estimate their Eq. (12) with all three dependent variables. Second, we partition their *OTHER* variable into change in other SFP^A and SFP^B accruals, $\Delta SFP^A OTHER$ and $\Delta SFP^B OTHER$, and the remaining unclassified portion of *OTHER*, *OOTHER*. This more closely aligns their specification with our (c) equation. Third, we permit the beginning and ending balances of accounts receivable, accounts payable, and inventory to have different coefficients. Fourth, we also permit the beginning and ending balances of $\Delta SFP^A OTHER$ and $\Delta SFP^B OTHER$ to have different coefficients. Based on our model, we expect the fourth version to have the most explanatory power. Table 5 presents the findings. For the sake of parsimony, Table 5 presents aggregate statistics from the by-industry estimations and results from the pooled estimation.

Table 5 reveals that the adjusted R^2s from the pooled estimation of the Barth et al. (2001) specification, which we label (c^1) in Table 5, are larger than those from our (c) equations for CFO_{t+1} and $OPEARN_{t+1}$ in Table 4, panels B and C; the pooled adjusted R^2s in Table 4 from the (c) equations are 0.433 and 0.400, whereas they are 0.453 and 0.412 for the Barth et al. (2001) specification in Table 5. Untabulated statistics reveal that these differences are significant, which suggests that the Barth et al. (2001) disaggregation of SFP^A and SFP^B accruals is helpful in forecasting future cash flows and earnings. Although the pooled adjusted R^2 from the Barth et al. (2001) specification in Table 5 for *MVE* is smaller than that from our (c) equations for *MVE* in Table 4, panel A—0.131 versus 0.243—the two equations are not nested versions of one another, and thus the adjusted R^2s are not comparable. In particular, our (c) equation includes *BVE*, whereas the Barth et al. (2001) specification includes only elements of *BVE* associated with income accruals.

More importantly, consistent with the insights from our model, Table 5 reveals that permitting $\Delta SFP^A OTHER$ and $\Delta SFP^B OTHER$ and the beginning and ending balances of the Barth et al. (2001) accrual components as well as $\Delta SFP^A OTHER$ and $\Delta SFP^B OTHER$ to differ results in significantly greater explanatory power for all three dependent variables. For example, the t-statistics for the adjusted R^2 differences between the Barth et al. (2001) equation and the specification that permits the beginning and ending balances of $\Delta SFP^A OTHER$, $\Delta SFP^B OTHER$, and the other Barth et al. (2001) SFP^A and SFP^B accrual components to have different coefficients are 11.89, 7.03, and 7.47 for the *MVE*, CFO_{t+1}, and $OPEARN_{t+1}$ equations. In addition, the differences in adjusted R^2s from the industry regressions are positive in all 15 industries for all three dependent variables and significantly so in 15, 15, and 12 industries for the *MVE*, CFO_{t+1}, and $OPEARN_{t+1}$ equations.

5.4.2 Long-term accruals

Our simple model considers only accruals that align the prior, current, and next periods' cash flows with the current period economic factor. However, most firms have long-term accruals. Extending our model to include a link between economic fundamentals and cash flows across multiple periods, and thus long-term accruals,

Table 5 Comparisons of incremental explanatory power in Barth et al. (2001)

$$Y = \alpha_1 + \alpha_2 X_t + \alpha_3 \Delta AR_t + \alpha_4 \Delta INV_t + \alpha_5 \Delta AP_t + \alpha_6 DEPR_t + \alpha_7 AMORT_t + \alpha_8 OTHER_t + \varepsilon_t \quad (c^1)$$

$$Y = \alpha_1 + \alpha_2 X_t + \alpha_3 \Delta AR_t + \alpha_4 \Delta INV_t + \alpha_5 \Delta AP_t + \alpha_6 DEPR_t + \alpha_7 AMORT_t + \alpha_8 \Delta SFP^A OTHER_t + \alpha_9 \Delta SFP^B OTHER_t + \alpha_{10} OTHER_t + \varepsilon_t \quad (c^2)$$

$$Y = \alpha_1 + \alpha_2 X_t + \alpha_3 AR_t + \alpha_4 AR_{t-1} + \alpha_5 INV_t + \alpha_6 INV_{t-1} + \alpha_7 AP_t + \alpha_8 AP_{t-1} + \alpha_9 DEPR_t + \alpha_{10} AMORT_t + \alpha_{11} OTHER_t + \varepsilon_t \quad (d^1)$$

$$Y = \alpha_1 + \alpha_2 X_t + \alpha_3 AR_t + \alpha_4 AR_{t-1} + \alpha_5 INV_t + \alpha_6 INV_{t-1} + \alpha_7 AP_t + \alpha_8 AP_{t-1} + \alpha_9 DEPR_t + \alpha_{10} AMORT_t + \alpha_{11} SFP^A OTHER_t + \alpha_{12} SFP^A OTHER_{t-1} + \alpha_{13} SFP^B OTHER_t + \alpha_{14} SFP^B OTHER_{t-1} + \alpha_{15} OOTHER_t + \varepsilon_t \quad (d^2)$$

	Adjusted R^2 from equation				Tests of significance of adjusted R^2 differences from equations							
	(c^1)	(c^2)	(d^1)	(d^2)	(c^2–c^1)	*sig*	(d^1–c^1)	*sig*	(d^2–c^1)	*sig*	(d^2–c^2)	*sig*
Y and *X* and estimation												
$Y = MVE_t, X = CFO$												
By industry	0.326	0.332	0.347	0.389	1/14	1/4	3/12	1/10	0/15	0/15	0/15	0/15
Pooled	0.131	0.133	0.151	0.263	0.002	3.75	0.020	9.32	0.112	11.89	0.130	11.78
$Y = CFO_{t+1}$ $X = CFO$												
By industry	0.415	0.421	0.433	0.446	2/13	0/8	0/15	0/12	0/15	0/15	0/15	0/14
Pooled	0.453	0.456	0.458	0.466	0.003	6.18	0.005	4.12	0.013	7.03	0.010	5.26
$Y = OPEARN_{t+1}$ $X = OPEARN$												
By industry	0.451	0.459	0.459	0.475	2/13	0/7	4/11	0/7	0/15	0/12	0/15	0/10
Pooled	0.412	0.416	0.418	0.424	0.004	5.47	0.006	8.50	0.012	7.47	0.008	6.67

We estimate equations (a) through (d) by industry by year for 15 industries and 23 years, 1990–2012, and pooled across industries by year. For the by industry (pooled) estimations, the first four columns present mean adjusted R^2 across years and industries (years). For the by-industry estimations, the tests of significance columns—columns labeled with equation letters, e.g., (c^2–c^1), *sig*—present the number of negative/positive (significant, using a 10 % significance level from a well-specified test) across-industry differences in mean adjusted R^2 across years. For the pooled estimation, the tests of significance columns present the differences in mean adjusted R^2 across years (t-statistic associated with the paired *t* test of the differences) in columns labeled with equation letters (*sig*). *AR*, *INV*, *AP*, *DEPR*, *AMORT*, and *OTHER* denote accounts receivable, inventories, accounts payable, depreciation expense, amortization expense, and the aggregate of other accruals, as measured by Barth et al. (2001). ΔSFP^A-*OTHER* and $\Delta SFP^B OTHER$ denote SFP^A and SFP^B components of *OTHER*; $SFP^A OTHER$ and $SFP^B OTHER$ refer to their statement of financial position amounts. *OOTHER* is the remainder of *OTHER*. All variables are scaled by average total assets. See Appendix 2 for other variable definitions would result in lagged B-type accruals, i.e., SFP^{B}_{t-1}, SFP^{B}_{t-2}, and so on, conveying useful information to investors in valuation and forecasting. Although this, in turn, would mean that long-term accruals would have valuation and forecasting coefficients different from short-term accruals, the main insights from our model remain—namely, that partitioning accruals based on their role in cash-flow alignment increases the ability of accruals to forecast cash flows and operating earnings and explain firm value. Nonetheless, we conduct additional analyses to provide evidence on the extent to which the differences between long-term and short-term accrual coefficients affect the inferences we obtain from Tables 3 and 4. The untabulated findings from these analyses support our inferences.

Regarding Table 3, recall that Eq. (12) includes one lead and one lag of revenue, *REV*, because of the short-term focus of our model. In the presence of long-term accruals, omitting additional leads and lags of *REV* could affect our inferences that λ^{A}, λ^{B}, and λ^{C} exhibit across-industry and across-year variation. Untabulated λ^{A}, λ^{B}, and λ^{C} estimates obtained from estimating Eq. (12) including two leads and two lags of *REV* differ somewhat in magnitude from those in Table 3. However, the estimates reveal similar across-industry and across-year variation. For example, the untabulated λ^{A} ranges from −0.050 to 0.044 across industries and is positive (negative) in 12 (10) industries. The across-year pooled means (standard deviations) of λ^{A}, λ^{B}, and λ^{C} are 0.007, 0.071, and −0.017 (0.03, 0.03, and 0.04), whereas they are 0.000, 0.080, and −0.070 (0.03, 0.03, and 0.34) in Table 3.

Regarding Table 4, we estimate versions of the (c) equations partitioning ΔSFP^{A}_{t} and ΔSFP^{B}_{t} into their short-term and long-term components, i.e., $\Delta SFP^{A\text{–}ST}_{t}$, $\Delta SFP^{A\text{–}LT}_{t}$, $\Delta SFP^{B\text{–}ST}_{t}$, and $\Delta SFP^{B\text{–}LT}_{t}$, where the superscripts *ST* and *LT* denote that the accruals are short term and long term. Untabulated findings reveal that when *MVE*, *CFO*, and *OPEARN* are the dependent variables, the pooled adjusted R^2s for the expanded version of the (c) equations are 0.245, 0.446, and 0.404, which exceed those for the versions of the equations in Table 4 of 0.243, 0.433, and 0.400 (t-stats. = 3.67, 5.88, and 4.69). We also estimate versions of the (d) equations partitioning SFP^{A}_{t}, SFP^{A}_{t-1}, SFP^{B}_{t}, and SFP^{B}_{t-1} into their short-term and long-term components. Untabulated findings reveal that when *MVE*, *CFO*, and *OPEARN* are the dependent variables, the pooled adjusted R^2s for the expanded version of the (d) equations are 0.336, 0.457, and 0.412, which are greater than those for the versions of the equations in Table 4 of 0.327, 0.439, and 0.402 (t-stats. = 7.07, 7.59, and 7.61). These findings reveal that expanding the insights of the model to long-term accruals increases the ability of accruals to explain equity market value and forecast cash flows and operating earnings.

As additional evidence, we also estimate versions of the (c) and (d) equations, partitioning accruals only into their short-term and long-term components, without also partitioning them depending on their role in cash-flow alignment. Untabulated findings relating to these versions of the (c) equations reveal that when *MVE*, *CFO*, and *OPEARN* are the dependent variables, the pooled adjusted R^2s are 0.234, 0.396, and 0.375, which are smaller than those for the tabulated versions of the equations of 0.243, 0.433, and 0.400 (t-stats. = −2.10, −9.92, and −4.91). Untabulated findings relating to the (d) equations reveal that when *MVE*, *CFO*, and *OPEARN* are the dependent variables, the pooled adjusted R^2s are 0.274, 0.426, and 0.410, which are smaller, smaller, and larger than those for the tabulated versions of the equations of 0.327, 0.439, and 0.402 (t-stats. = −8.73, −5.33, and 3.59). More importantly for our inferences, these untabulated adjusted R^2s—0.274, 0.426, and 0.400—are all smaller than untabulated pooled adjusted R^2s from the (d) equations that also partition on the role of the accruals in cash-flow alignment of 0.336, 0.457, and 0.412 (t-stats. = −9.81, −10.12, and −2.59).[25]

5.4.3 Up and down markets

Many assets are written down when future cash flows are not expected to be sufficient to recover the asset but not written up when future cash flows are expected to exceed original expectations. Thus accruals may provide greater explanatory power for equity value and for forecasting cash flows and earnings during down markets than during up markets. We provide evidence on whether this is the case and the extent to which differences in the role of accruals in up and down markets affect the inferences we draw from Table 4. In particular, we re-estimated the Table 4 specifications separately for years in which the return on the S&P 500 Index was greater (less) than 12 %, a commonly assumed equity cost of capital (Dechow et al. 1999). This partition resulted in 11 (12) up (down) market years.

The untabulated findings reveal, as expected, that the pooled adjusted R^2s are larger in down market years in all specifications. More importantly for our research question, for all three dependent variables, the pooled adjusted R^2s increase across the four equations and that of equation (d) is the largest. For up (down) market years, the pooled adjusted R^2s for equations (a) through (d) when *MVE* is the dependent variable are 0.212, 0.224, 0.228, and 0.321 (0.239, 0.255, 0.257, and 0.332). When *CFO* is the dependent variable, they are 0.393, 0.409, 0.432, and 0.437 (0.394, 0.414, 0.433, and 0.441). When *OPEARN* is the dependent variable, they are 0.353, 0.393, 0.395, and 0.396 (0.369, 0.400, 0.404, and 0.407).

6 Conclusion

The question we address is what accruals tell us about the firm's future cash flows and thus how they help in forecasting the firm's cash flows and earnings and valuing its equity. A key role of accrual accounting is to align a firm's cash flows and the economics generating the cash flows, which can occur in periods before or after the cash flow occurs. Accruals recognized as assets and liabilities reflect this alignment and, as a result, reflect information about the firm's past and future cash flows. We develop a model adapted from those of Feltham and Ohlson (1995) and Ohlson

[25] The two alternative untabulated statistics described in footnote 19 reveal the same inferences as the t-statistics reported in the text, except that when *MVE* is the dependent variable, the untabulated t-statistics for the intercept from the AR(1) estimation is less than 1.70 for the comparison of Eq. (13c) when the change in accruals is partitioned into short-term and long-term accruals and when it is partitioned into short-term and long-term accruals in addition to the role the accruals play in cash-flow alignment (t-stat. = 1.39).

(1995) to characterize the information about future cash flows reflected in accruals. As do Dechow and Dichev (2002), we model a firm's cash flow in a particular period as comprising three components that relate to the economic factor from the prior, current, and next periods. We extend the Dechow and Dichev (2002) model by partitioning accruals based on their roles in cash-flow alignment. Our model shows that the information about future cash flows reflected in accruals depends on whether the accrual's role is to align future or past cash flow and current period economics and whether the accrual relates to the current or prior period. These fundamental features of accrual accounting largely have been overlooked in prior research.

Analysis of the model reveals that each accounting amount—cash flow and accruals associated with the prior and next periods' cash flows—has a different coefficient in valuation, forecasting future cash flows, and forecasting earnings. Each of these coefficients combines a weight that reflects the information role the accounting amount plays in valuation and forecasting multiples that reflect differences in how that information is used in valuation and cash flow and earnings forecasting. Because the information in each accounting amount does not vary across the tasks, its information weight is the same in the valuation and both forecasting tasks. However, the information weight differs across the accounting amounts because each amount provides different information relevant for valuation and forecasting.

The model reveals the information investors can extract from accruals information about future cash flows. Although current period cash flow contains information about next period's economic factor, the information is noisy. However, investors can use prior period accruals that align current period cash flow and the prior period's economic factor to reduce that noise. Accruals that align current period cash flow and next period's economic factor—such as inventory and deferred revenue—provide investors additional, noisy information about next period's economic factor. In addition, current period accruals that align next period's cash flow and the current period's economic factor—such as accounts receivable and warranty accruals—provide information about the transitory part of one component of next period's cash flow. These insights are apparent only because we distinguish accruals by the role they play in cash-flow alignment. They are not apparent by distinguishing accruals according to their classification on the statement of financial position, such as inventory and warranty accruals.

We also provide empirical evidence that supports our model's main insights. In particular, we show that partitioning accruals based on their role in cash-flow alignment—that is, whether the accrual aligns future or past cash flow and current period economics and whether it relates to the beginning or end of the period—increases the ability of accruals to forecast cash flows and earnings and explain firm value.

Acknowledgments We thank Robert Czernkowski, Kurt Gee, Richard Sloan, Dan Taylor, Patty Dechow (the editor), two anonymous reviewers, and workshop participants at the *Review of Accounting Studies* Conference, especially discussant Joseph Gerakos, and the University of California, Berkeley; University of California, Los Angeles, Spring 2015 Accounting Mini-Conference; University of Melbourne; University of Michigan, Accounting Kapnick Spring Conference; University of Technology, Sydney

Summer Accounting Symposium; and Stanford Graduate School of Business informal seminar for helpful comments and suggestions.

Appendix 1: Proofs

Proposition 1 (Sect. 3.3) *Because investors are risk neutral, the value of the firm at time t equals the expected present value of future dividends given information available to investors at t. Because* $Cash_t$*, i.e., the firm's cash at t, satisfies clean surplus, i.e.,* $Cash_t = RCash_{t-1} + CFO_t - Div_t$*, dividends can be replaced in the dividend valuation expression using the clean surplus expression to yield:*

$$P_t = Cash_t + \mathrm{E}_t\left[\sum_{\tau=1}^{\infty}\frac{CFO_{t+\tau}}{R^{\tau}}\right].$$

That is, the value of the firm at time t equals current cash plus the expected present value of future operating cash flows. Using Eq. (4) from Sect. 3.2, it is straightforward to determine that

$$\mathrm{E}_t(CFO_{t+1}) = \lambda^A\theta_t + (\lambda^C + \gamma\lambda^B)\mathrm{E}_t(\theta_{t+1}) + \mathrm{E}_t(e^A_{t+1}), \quad \text{and}$$
$$\mathrm{E}_t(CFO_{t+\tau}) = \gamma^{\tau-1}(\gamma^{-1}\lambda^A + \lambda^C + \gamma\lambda^B)\mathrm{E}_t(\theta_{t+1}), \text{ for } \tau > 1.$$

Using these in the expression for P_t *above, together with standard expressions for the sum of an infinite series, yields Proposition 1.*

Lemma (Sect. 4.1) *Given the definitions in Eq. (7) from Sect. 4.1 and assuming* θ_t *is known, it is straightforward to calculate the following:*

$$Var(z1_t) = \sigma^2_\theta + \frac{1}{(\lambda^B)^2}\left(\sigma^2_{e^A} + \sigma^2_{e^C} + \sigma^2_{e^B}\right)$$
$$Var(z2_t) = \sigma^2_\theta + \frac{1}{(\lambda^B)^2}\left(\sigma^2_{e^B} + \sigma^2_{\nu^B}\right)$$
$$Var(z3_t) = \frac{1}{(\lambda^B)^2}\left(\sigma^2_{e^A} + \sigma^2_{\nu^A}\right)$$
$$Var(z4_t) = \left(\sigma^2_{e^A} + \sigma^2_{\nu^A}\right)$$
$$Cov(\theta_{t+1}, z1_t) = Cov(\theta_{t+1}, z2_t) = \sigma^2_\theta$$
$$Cov(\theta_{t+1}, z3_t) = 0$$
$$Cov(e^A_{t+1}, z4_t) = \sigma^2_{e^A}$$
$$Cov(z1_t, z2_t) = \sigma^2_\theta + \frac{\sigma^2_{e^B}}{(\lambda^B)^2}$$
$$Cov(z1_t, z3_t) = \frac{\sigma^2_{e^B}}{(\lambda^B)^2}$$
$$Cov(z2_t, z3_t) = 0.$$

Using these expressions and the standard expression for conditional expectations in a multivariate normal distribution yields the following:

$$\mathrm{E}_t(\theta_{t+1}) = (1 - \beta_1 - \beta_2)\gamma\theta_t + \beta_1 z1_t + \beta_2 z2_t + \beta_3 z3_t,$$

where $\beta_1 = \frac{1}{D}(\sigma_\varepsilon^2 \sigma_{\nu^B}^2(\sigma_{e^A}^2 + \sigma_{\nu^A}^2)), \beta_2 = \frac{1}{D}\sigma_\varepsilon^2(\sigma_{e^A}^2\sigma_{e^C}^2 + (\sigma_{e^A}^2 + \sigma_{e^C}^2)\sigma_{\nu^A}^2),\ \beta_3 = -\frac{1}{D}(\sigma_\varepsilon^2 \sigma_{e^A}^2\sigma_{\nu^B}^2), D = \left(\sigma_\varepsilon^2 + \frac{\sigma_{e^B}^2 + \sigma_{\nu^B}^2}{(\lambda^B)^2}\right)(\sigma_{e^A}^2\sigma_{e^C}^2 + (\sigma_{e^A}^2 + \sigma_{e^C}^2)\sigma_{\nu^A}^2) + \left(\sigma_\varepsilon^2 + \frac{\sigma_{e^B}^2}{(\lambda^B)^2}\right)\sigma_{\nu^B}^2(\sigma_{e^A}^2 + \sigma_{\nu^A}^2),$ *and*

$$\mathrm{E}_t(e_{t+1}^A) = \beta_4 z4_t, \quad \text{where} \quad \beta_4 = \frac{\sigma_{e^A}^2}{\sigma_{e^A}^2 + \sigma_{\nu^A}^2}.$$

Appendix 2: Variable definitions

MVE	market value of equity
CFO	cash flow from operations from the statement of cash flows plus after tax net interest paid
OPEARN	net income before extraordinary items plus after tax net interest expense
REV	total revenue
BVE	book value of equity
NI	net income before extraordinary items and discontinued operations
ACC	*NI* minus *CFO*
SFP^A	total receivables plus deferred tax assets minus the sum of accounts payable, accrued expenses, pension liability, income taxes payable, and deferred tax liability
SFP^B	the sum of inventories, prepaid expenses, income tax refund, property, plant, and equipment, intangible assets, deferred charges, investments and advances-equity, and long-term pension assets minus deferred revenues
OACC	*ACC* minus the sum of ΔSFP^A and ΔSFP^B

All variables are measured as of the firm's fiscal year-end and deflated by average total assets. Δ denotes annual change

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