A Re-examination of the Inferences Drawn from Earnings' Relative Inability to Predict Future Cash Flows

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Abstract: We re-examine inferences drawn in research that examines whether earnings achieve objectives laid out in the Conceptual Framework by facilitating improved cash flow prediction. Counterintuitively, the test statistics used in prior research become *less* supportive of earnings achieving this objective when accruals covary *more* strongly with future cash flows, all else equal. Understanding this counterintuitive relation changes key inferences on multiple fronts. First, we challenge the inference that earnings fail to achieve central tenets of the Conceptual Framework (Nallareddy et al. [2020]). When interpreted considering this counterintuitive relation, tests employing different proxies of cash flow expectations (i.e., contemporaneous returns and realized cash flows) can be reconciled, all supporting the opposite inference (i.e., earnings achieve the objectives of the framework). Second, this counterintuitive relation draws into question the inference that the adjusted measures in Ball and Nikolaev [2022] outperform bottom line earnings in achieving the objectives of the framework. Third, we extend the inferences of Barth et al. [2001] by showing that this counterintuitive relation plays an important role in the information masking that occurs when earnings components are aggregated. Future research examining the predictive ability of aggregate earnings should consider the components of the relevant test statistics when drawing inferences.

Keywords: earnings, cash flows, accruals, R-squared

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1. Introduction

FASB Statement of Financial Accounting Concepts No. 1 (SFAC 1) asserts that "earnings based on accrual accounting generally provides a better indication of an enterprise's …ability to generate favorable cash flows than information limited to…cash receipts and payments" (hereafter we refer to this as *the intent of SFAC 1*). SFAC No. 8 makes similar statements. However, aggregate earnings underperform in explaining future cash flows, relative to current cash flows (Nallareddy et al. [2020]). This has caused some studies to conclude that earnings do not achieve the objective of accrual accounting as stated in SFAC 1 above. These findings and conclusions are surprising considering evidence demonstrating that accruals are incrementally informative (Barth et al. [2001]). Understanding how information generated by accruals-based accounting systems relates to future cash flows is fundamental. However, findings from tests of aggregate earnings' *relative* ability to explain future cash flows and tests of the *incremental* information conveyed by accruals present unresolved discrepancies. In this study, we examine whether the metrics used to test earnings' relative predictive ability lead to reliable inferences regarding the intent of SFAC 1.

In our investigation of this question, we examine the implications of using (1) R^2 values, (2) coefficient values, and (3) out-of-sample predictions to test whether earnings achieve the intent of SFAC 1. As prior research uses R^2 values as the primary metric and coefficient values and out-of-sample prediction accuracy as secondary metrics (Barth et al. [2001]; Nallareddy et al. [2020]; Ball and Nikolaev [2022]), we focus most of our discussion on R^2 values, while also demonstrating that our findings apply to all three metrics.

We begin with an analytical decomposition of the R^2 statistic for models predicting future cash flows. This analysis reveals that two factors explain the *entire* difference between the R^2 with current cash flows versus current earnings as the predictor: (1) a difference in the volatilities of current cash flows and earnings and (2) the covariance between future cash flows and current accruals. We consider whether the relations between each of these factors and R^2 values suggest that the R^2 serves as a valid measure of whether earnings achieve the intent of SFAC 1. The first factor behaves as intuition would suggest: as the volatility of earnings decreases, the R^2 value increases, all else equal. The second factor, however, exhibits counterintuitive behavior. One might expect R^2 values in earnings-based regressions to increase as the *absolute* covariance between current accruals and future cash flows increases, all else equal. This is true if the covariance is positive, but if it is negative, then tests using aggregate earnings to explain future cash flows exhibit *higher* R^2 values when accruals covary *less* with future cash flows, all else equal. This occurs because (1) cash flows and total accruals covary unconditionally with future cash flows in opposite directions and (2) these covariances are summed and offset in the numerator of the R^2 calculation, which reduces R^2 values (we call this the 'opposing covariances effect').[1] This issue biases R^2-based inferences towards concluding that earnings do not achieve the intent of SFAC 1. We note that tests examining coefficient values or out-of-sample predictions are subject to the same problem described here (see Appendix A).

Seeing that the opposing covariances problem raises questions about the ability of R^2 values to speak to earnings achieving the intent of SFAC 1, we turn to examining the degree to which this problem influences inferences drawn by prior studies. To begin, we replicate prior results using a constant sample. We start our sample in 1990 to avoid the measurement error that occurs when using the balance sheet to measure operating cash flows. We confirm that current cash flows

[1] In Section 2, we highlight the conditions necessary for the opposing covariances effect to occur.

explain more variation in future cash flows than do earnings, while the components of earnings explain more variation in future cash flows than do current cash flows alone.

Next, we employ comparative statics to reconcile the R^2 from regressions that include current cash flows as the independent variable to those that use earnings. In this way, we examine the extent to which the lower R^2 values in regressions of future cash flows on current earnings are driven by the opposing covariances effect. In our sample, we document that earnings are less volatile than current cash flows. This lower volatility exerts *upward* pressure on the R^2 of regressions using earnings relative to those using cash flows. Thus, the lower R^2 value in regressions of future cash flows on current earnings documented by prior literature is caused entirely by the fact that accruals and future cash flows do covary, albeit negatively. To be clear, we do not suggest that aggregate earnings outperform cash flows in explaining variation in future cash flows. Rather, we argue that, when regressing future cash flows on aggregate earnings, reliance on the R^2 value can lead to incorrect inferences regarding whether earnings achieve the intent of SFAC 1. In the literature, lower R^2 statistics have been interpreted as suggesting that earnings may not achieve the intent of SFAC 1 and that standard setters should consider how to improve accrual measurement (Nallareddy et al. [2020]). Our evidence does not support this conclusion. We document counterintuitively that R^2 values are reduced when accruals relate *more strongly* to future cash flows. When interpreted carefully, the evidence suggests the opposite conclusion: that accrual accounting conveys information relevant to cash flow prediction. This inference aligns with those of other studies (e.g., Dechow [1994]) that find that earnings outperform cash flows in explaining contemporaneous returns (an alternative to future realized cash flows as a proxy for expected future cash flows). We replicate these findings from Dechow [1994] and demonstrate that they are not plagued by the opposing covariances problem. By examining the components of R^2 values before drawing inferences, we reconcile a long-standing discrepancy and draw similar inferences when examining earnings' ability to explain two proxies for future cash flows (i.e., contemporaneous returns and realized cash flows).

Based in part on the conclusions in Nallareddy et al. [2020], Ball and Nikolaev [2022] examine whether certain adjusted earnings measures that “achieve a closer mapping into operating cash flows” (p. 2) are better able to achieve the intent of SFAC 1. In R^2-based tests, they observe that their adjusted measures “dominate operating cash flows in predicting operating cash flows.” They interpret these results as evidence of “the information added by accrual accounting” (Ball and Nikolaev [2022]; p.19). We document, however, that the magnitude of the covariance between future cash flows and the accrual components of each of their adjusted measures is significantly smaller than the covariance between future cash flows and total accruals. The *increase* in R^2 values exhibited by the Ball and Nikolaev [2022] measures is driven almost entirely by the *decreased* magnitude of the covariance between their adjusted accruals and future cash flows. We conclude that the increased R^2 values related to the adjusted measures in Ball and Nikolaev [2022] cannot be interpreted as providing clear evidence that these adjusted earnings measures achieve the intent of SFAC 1 any better than bottom line earnings.

Next, we use comparative statics to reconcile the R^2 from regressions using aggregate earnings to regressions using earnings decomposed into cash flows and accruals. We consider whether the information masking that occurs when earnings components are aggregated is driven mainly by the forced equal weighting of components (as suggested by Barth et al. [2001]) or the opposing covariances effect. Our findings suggest that addressing the opposing covariances problem is a primary driver of higher R^2 values in cash flow prediction models using disaggregated earnings. We concur with Barth et al. [2001] that aggregating earnings components masks information and contribute to their findings by demonstrating that this masking occurs not only because of the forced equal weighting of earnings components but also because of opposing covariances in R^2 calculations.

Finally, we answer the call of Kim and Kross [2005] (p. 779) "to reconcile the increasing ability of current earnings to predict future cashflows with the decreasing ability of current earnings and cash flow to explain prices" and to "provide a consistent thread of interpretation for [these] remarkable results." Considering the opposing covariances effect, we reconcile these findings by demonstrating that both are driven by the decreasing absolute magnitude of the covariances between accruals and each respective dependent variable (i.e., returns and future cash flows).

This study contributes by demonstrating a major flaw in how inferences have been drawn regarding how information generated by accruals-based accounting systems relates to future cash flows. That is, prior studies have inferred that earnings do not achieve the intent of SFAC 1 based on the fact that accruals do covary, albeit negatively, with future cash flows. Our finding changes inferences for many studies extending back several decades (e.g., Bowen et al. [1986]; Finger [1994]; Lorek and Willinger [2009]; Nallareddy et al. [2020]; Ball and Nikolaev [2022]). We suggest that researchers in this area take care to ensure that the inferences drawn from the components of the metrics analyzed (R^2 values, coefficient magnitudes, out of sample predictions, etc.) match the inferences drawn from the summary metrics themselves. Our comparative static analysis provides an easily implementable means of doing so.

2. Background and Hypothesis Development

2.1 Background

In 1978, the FASB introduced SFAC 1 and stated that "information about enterprise earnings based on accrual accounting generally provides a better indication of an enterprise's present and continuing ability to generate favorable cash flows than information limited to the financial effects of cash receipts and payments." This and other statements in SFAC 1 were widely interpreted as claims by the FASB that current earnings should be superior to current cash flows in predicting future cash flows (e.g., Greenberg et al. [1986]; Bowen et al. [1986]; Finger, [1994]).[2] Motivated by SFAC 1 and the use of earnings as a summary measure of performance by investors and creditors in compensation plans, debt contracts, etc., numerous studies have considered which summary measure, earnings or cash flows, better predicts future cash flows (e.g., Finger, [1994]; Barth et al. [2001]; Nallareddy et al. [2020]).

Tests of the relative predictive abilities of earnings and cash flows as summary measures of performance are important, because these tests are often used to infer whether earnings achieve the intent of SFAC 1. Early studies of this sort typically use small samples and document mixed results (e.g., Greenberg et al. [1986]; Bowen et al. [1986]; Finger, [1994]; Dechow et al. [1998]). However, recent studies using larger samples and reported operating cash flows from the statement of cash flows (as opposed to deriving it from changes in balance sheet accounts) consistently find that current cash flows outperform current earnings in predicting future cash flows (e.g., Nallareddy et al. [2020]). Accordingly, Nallareddy et al. [2020] conclude that earnings' underperformance in explaining next period cash flows "challenges an important tenet of financial reporting" (p. 3) and that standard setters should consider what they "can do to improve measurement of accruals and earnings to enhance its predictive ability" (p. 21). This conclusion is

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[2] The discussion in SFAC No. 8 is similar to that found in SFAC No 1. For example, SFAC No. 8 states that, "Accrual accounting depicts the effects of transactions, and other events and circumstances on a reporting entity's economic resources and claims 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 information about a reporting entity's economic resources and claims and changes in its economic resources and claims during a period provides a better basis for assessing the entity's past and future performance than information solely about cash receipts and payments during that period."

perplexing because prior research provides convincing evidence that the components of earnings and accruals are incrementally informative about future cash flows (Barth et al. [2001]).

Notwithstanding such conclusions, many studies adopt the premise that earnings outperform cash flows in predicting future cash flows, based on evidence from studies that examine the abilities of earnings and cash flows to explain stock returns. The rationale for using stock returns in place of realized future cash flows is that market values are commonly modeled as the present value of expected future cash flows. These studies find that earnings do a better job than cash flows at explaining returns and equity values (e.g., Ball and Brown, [1968]; Beaver and Dukes, [1972]; Dechow, [1994]; Barth et al. [2001]; Subramanyam and Venkatachalam, [2007]). Healy and Whalen [1999] (p. 367 and p. 373) summarize the findings of these studies, stating that current earnings "have been widely found to be value-relevant and are typically better predictors of future cash flow performance than are current cash flows," and "this interpretation is confirmed by Dechow's [1994] findings that current earnings are better predictors of future cash flows than are current cash flows."

In summary, the differing findings and conclusions in studies examining earnings' ability to predict future cash flows and explain contemporaneous returns present another unresolved discrepancy. In the next section, we analyze test metrics to develop hypotheses that help provide a consistent thread of interpretation related to earnings' ability to achieve the intent of SFAC 1.

2.2 Hypothesis development

Prior studies have examined the relative abilities of earnings and cash flows to explain future cash flows and returns using the R^2 statistics of the following regression models:

$$CF_{i,t+1} = \beta_0 + \beta_1 CF_{i,t} + \varepsilon_{i,t+1} \qquad \text{(Model 1)}$$
$$CF_{i,t+1} = \beta_0 + \beta_1 EARN_{i,t} + \varepsilon_{i,t+1} \qquad \text{(Model 2)}$$
$$RET_{i,t} = \beta_0 + \beta_1 CF_{i,t} + \varepsilon_{i,t} \qquad \text{(Model 3)}$$
$$RET_{i,t} = \beta_0 + \beta_1 EARN_{i,t} + \varepsilon_{i,t} \qquad \text{(Model 4)}$$

Following Hribar and Collins [2002], we decompose earnings ($EARN_t$) into cash flows (CF_t) and accruals (AC_t). The R^2 statistics for Model (1) and Model (2) can be expressed as shown in Eqs. (1) and (2), respectively: [3]

$$R^2_{CF_{t+1}.CF} = R^2_{CF_{t+1}.(CF)} = \left[r_{CF_{t+1}.(CF)}\right]^2 = \frac{[Cov(CF_{t+1},CF)]^2}{Var_{(CF)}Var_{CF_{t+1}}} \tag{1}$$

$$R^2_{CF_{t+1}.EARN} = R^2_{CF_{t+1}.(CF+AC)} = \left[r_{CF_{t+1}.(CF+AC)}\right]^2 = \frac{[Cov(CF_{t+1},CF)\boldsymbol{+Cov(CF_{t+1},AC)}]^2}{Var_{(CF\boldsymbol{+AC})}Var_{CF_{t+1}}} \tag{2}$$

To facilitate comparison of these equations, the components of Eq. (2) that are different than those of Eq. (1) are shown in red font. The R^2 statistics for Model (3) and Model (4) can be expressed identically to Eqs. (1) and (2), respectively, except that each reference to future cash flows is replaced by $RET_{i,t}$. In Eq. (1), the numerator is simply the square of the unconditional covariance between current and future cash flows. By comparison, the numerator in Eq. (2) is the square of the sum of the unconditional covariances of current and future cash flows (i.e., $Cov(CF_{t+1}, CF_t)$) and of accruals and future cash flows (i.e., $Cov(CF_{t+1}, AC_t)$). Depending on the sign and magnitude of $Cov(CF_{t+1}, AC_t)$ relative to $Cov(CF_{t+1},CF_t)$, the covariance between future cash flows and accruals can either increase or decrease the R^2 as calculated in Eq. (2). To isolate the numerator effect, we assume that the summation of accruals and cash flows results in an earnings measure with the same volatility as that of cash flows.

> **Assumption 1.** The summation of accruals and cash flows results in an earnings measure with the same volatility as that of cash flows. Formally, $Var_{CF} = Var_{(CF+AC)}$.

Empirically, this assumption is almost never strictly true. Thus, we relax it in all empirical tests and no inferences drawn in this paper depend on it.[4] However, holding the denominator constant

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[3] For parsimony hereafter, subscripts *t* and *i* are omitted from equations while *t*+1 remains.

[4] In empirical tests, we hold constant the difference in volatilities (i.e., the denominators of Eqs. (1) and (2)) by controlling for this difference or by using comparative static adjustments. Additionally, we confirm that given the

allows a simpler pedagogical presentation of our hypotheses in this section. Based on this assumption, cash flows will be observed to explain more variation in future cash flows relative to earnings when the following inequality holds:

$$[\mathrm{Cov}(CF_{t+1}, CF)]^2 > [(\mathrm{Cov}(CF_{t+1}, CF) + \mathrm{Cov}(CF_{t+1}, AC)]^2. \tag{3a}$$

Let $Cov(CF_{t+1}, AC_t)$ be equal to some multiple k of $Cov(CF_{t+1}, CF_t)$ such that

$$\mathrm{Cov}(CF_{t+1}, AC) = k \times \mathrm{Cov}(CF_{t+1}, CF). \tag{3b}$$

Substituting Eq. (3b) into Eq. (3a) yields

$$[\mathrm{Cov}(CF_{t+1}, CF)]^2 > [(\mathrm{Cov}(CF_{t+1}, CF) + k \times \mathrm{Cov}(CF_{t+1}, CF)]^2, \tag{3c}$$

which can be rearranged as

$$[\mathrm{Cov}(CF_{t+1}, CF)]^2 > [(1 + k) \times \mathrm{Cov}(CF_{t+1}, CF)]^2. \tag{3d}$$

Simplifying equation (3d) yields

$$1^2 > (1 + k)^2. \tag{3e}$$

Figure 1 graphically presents each side of Eq. (3e) in Euclidean space. The y-axis represents the value of each function, and the x-axis represents the value of k. The dashed line plots the function $y = 1^2$ while the solid parabola plots the function $y = (1 + k)^2$. We divide the x-axis into four ranges. Ranges A, B, C, and D span negative infinity to negative two, negative two to negative one, negative one to zero and zero to infinity, respectively. Graphically, cash flows explain more variation than earnings when the straight dashed line is above the solid parabolic line. This corresponds to Range B and Range C (i.e., $-2 < k < 0$). The relative advantage of cash flows is greatest when $k = -1$. As k moves from -1 to -2 in Range B (i.e., $Cov(CF_{t+1}, AC_t)$ becomes

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observed variance of earnings, $\delta R^2/\delta|Cov(CFt+1, ACt)|$ (i.e., the first derivative of the R^2 with respect to the absolute covariance between accruals and future cash flows) is negative.

increasingly *negative*), the relative advantage of cash flows decreases. By contrast, as k moves from -1 to 0 in Range C (i.e., $Cov(CF_{t+1}, AC_t)$ diminishes towards zero), the relative advantage of cash flows also decreases. That is, beginning at k = -1, the relative advantage of cash flows will decrease whether $Cov(CF_{t+1}, AC_t)$ becomes increasingly negative or whether it diminishes towards zero. For Ranges A and D, aggregate earnings explain more variation in future cash flows relative to cash flows. We formally summarize these results in Theorem 1 below assuming Assumption 1 holds.

Theorem 1.

1. *For $-2 < k < 0$, cash flows explain more variation in future cash flows than do earnings.*
2. *For $-2 < k \leq -1$, the superiority of cash flows relative to aggregate earnings in explaining variation in future cash flows is decreasing in the absolute magnitude of $Cov(CF_{t+1},AC_t)$.*
3. *For $-1 \leq k < 0$, the superiority of cash flows relative to aggregate earnings in explaining variation in future cash flows is increasing in the absolute magnitude of $Cov(CF_{t+1},AC_t)$.*[5]

To formulate our first hypothesis, we supplement Theorem 1 with a discussion of the following empirical regularities documented within our sample and by prior research. First, as expected, the covariance between current cash flows and future cash flows is positive (e.g., Dechow and Dichev [2002]). Second, the covariance between current accruals and future cash flows is negative (e.g., Dechow and Dichev [2002]), possibly due to reversals inherent to accrual accounting.[6] Third, the magnitude of $Cov(CF_{t+1}, AC_t)$ in our sample and in prior research (e.g., Dechow and Dichev [2002]) falls between zero and negative one multiplied by $Cov(CF_{t+1}, CF_t)$, or as expressed in

[5] To be clear, in $Cov(CF_{t+1},AC_t)$, AC_t is the accruals component *as aggregated* with cash flows in computing summary earnings. If the accruals component is added to cash flows, then the raw covariance should be used to determine the range in which the covariance falls relative to k. If the accruals component is subtracted from cash flows, as with depreciation for example, then the covariance should be multiplied by negative one.

[6] We note that the *conditional* covariance between accruals and cash flows (i.e., when controlling for current cash flows) is positive in our sample. This is consistent with prior research (e.g., Barth et al. [2001]).

terms of the inequality above, falls within the range ($-1 < k < 0$).[7] These empirical facts suggest that Range C of Figure 1 is the relevant range for regressions of future cash flows on earnings. Consequently, the signs and magnitudes of the covariances between earnings components and future cash flows raise significant concerns about the appropriateness of using R^2 statistics to evaluate whether aggregated earnings achieve the intent of SFAC 1. Counterintuitively, when considering the signs and magnitudes of the relevant covariances, we expect a *larger* negative covariance between future cash flows and accruals to *reduce* R^2 values in regressions of future cash flows on earnings and thereby enhance the relative superiority of current cash flows in explaining variation in future cash flows when assessed using the R^2.[8] Accordingly, we state the following hypothesis.

H1: *The superiority of cash flows relative to earnings in explaining future cash flows is driven in part by the opposing covariances effect.*

This first hypothesis is developed using the R^2 formula; however, the opposing covariances problem also plagues coefficient values, the out-of-sample R^2 (R^2_{oos}) employed by Ball and Nikolaev [2022], and the Diebold and Mariano [1995] Mean Squared Prediction Error (MSPE employed by Nallareddy et al. [2020]). First, as the numerator of coefficient values is equal to $Cov(CF_{t+1}, CF_t) + Cov(CF_{t+1}, AC_t)$, the opposing covariances problem will reduce the coefficient value towards zero in range C. Second, as the in-sample coefficients are employed in out-of-sample prediction, these coefficients will, as just stated, be reduced towards zero. Within range C this causes both the R^2_{oos} and the MSPE to be more indicative of earnings achieving the intent of SFAC

[7] In 100 randomly selected subsamples, $Cov(CF_{t+1},AC_t)$ is always less than zero and is never less than negative one multiplied by $Cov(CF_{t+1}, CF_t)$.

[8] We note that it is not clear ex ante whether the counterintuitive relation in Theorem 1 drives the entire difference in the R^2 values or even a meaningful portion of the difference. For example, differences in the variance of earnings and cash flows could be the main driver (i.e., the denominators of Eqs. 1 and 2).

1 when accruals covary less with future cash flows, all else equal. We more formally demonstrate that the opposing covariance problem plagues these measures in Appendix A.

Next, we consider the implications of Theorem 1 for the recent finding that certain adjusted earnings measures explain more variation in future cash flows than do ‘bottom line’ earnings. Ball and Nikolaev [2022] examine multiple adjusted earnings measures based on the notion that some accruals included in ‘bottom line’ earnings do not map into operating cash flows, depreciation being their prominent example. Accordingly, they create “accruals-based earnings variables that achieve a closer mapping into operating cash flows” by excluding certain accruals (Ball and Nikolaev [2022], p. 2). Using R^2 values as their metric, they find that these adjusted earnings measures outperform cash flows in predicting future cash flows. These adjustments and results have intuitive appeal; however, prior literature documents that at least some of the accruals they exclude “have significant predictive ability for future cash flows” (Barth et al. [2001], p. 28). Because these accruals have predictive ability, excluding them may reduce the negative covariance between accruals and future cash flows. If this is the case, a potential implication of Theorem 1 is that the *higher* R^2 values observed by Ball and Nikolaev [2022] for their adjusted earnings measures could occur in part because of the opposing covariances effect—because the measures they consider include accrual components that covary *less* with future cash flows. We state our second hypothesis as follows:

> **H2:** *The increased explanatory power of earnings measures that are adjusted to map more closely to operating cash flows is driven in part by the exclusion of accruals that would, if included, cause total accruals to covary more strongly with future cash flows.*

Having analytically demonstrated that a smaller covariance between accruals and future cash flows can increase the measured explanatory power of aggregate earnings, we next turn to examining how this opposing covariances effect relates to regression models that disaggregate earnings into accruals and cash flows. To facilitate this discussion, we expand Eq. (2) as follows:

$$R^2_{CF_{t+1}.EARN} = \frac{[Cov(CF_{t+1},CF)+Cov(CF_{t+1},AC)]^2}{Var_{(CF+AC)}Var_{CF_{t+1}}} = \frac{Cov(CF_{t+1},CF)^2+Cov(CF_{t+1},AC)^2+2Cov(CF_{t+1},CF)Cov(CF_{t+1},AC)}{Var_{(CF+AC)}Var_{CF_{t+1}}} \quad (4a)$$

We reconcile this equation, which represents the R^2 of regressions using aggregate earnings, to the R^2 of regressions using disaggregated earnings (i.e., both cash flows and accruals). We do so in three steps. We complete the first step as follows, with changes highlighted in blue:

$$R^2_{Step1} = \frac{Cov(CF_{t+1},CF)^2+Cov(CF_{t+1},AC)^2-2Cov(CF_{t+1},CF)Cov(CF_{t+1},AC)Cov(CF,AC)}{Var_{(CF+AC)}Var_{CF_{t+1}}} \quad (4b)$$

The numerator here is very similar to Equation (4a), but the addition sign is changed for a subtraction sign and the covariance between accruals and current cash flows is considered. At first glance, it seems that the subtraction sign should eliminate any issues related to opposing covariances. However, $Cov(CF_t, AC_t)$ is also negative, causing this term to reduce the numerator of Eq. (4b) more as the absolute value of $Cov(CF_{t+1}, AC_t)$ increases. Since the absolute value of $Cov(CF_t, AC_t)$ is less than one, these changes attenuate the opposing covariances effect.

We complete the second step, independent of the first step, by including $Var(CF_t)$, $Var(AC_t)$, and $Cov(CF_t, AC_t)$ as they appear in the denominator of the third term of the disaggregated R^2 formula. The inclusion of these factors, highlighted in red, yields the following:

$$R^2_{Step2} = \frac{Cov(CF_{t+1},CF)^2}{Var_{CF_{t+1}}Var_{(CF+AC)}} + \frac{Cov(CF_{t+1},AC)^2}{Var_{CF_{t+1}}Var_{(CF+AC)}} + \frac{2Cov(CF_{t+1},CF)Cov(CF_{t+1},AC)}{Var_{CF_{t+1}}Var_{CF}Var_{AC}-Var_{CF_{t+1}}Cov(CF,AC)^2} \quad (4c)$$

Considering the third fraction in Eq. (4c), within our sample $Var_{CF}Var_{AC}$ is less than one-hundredth of a percent of $Var_{(CF+AC)}$. This will reduce the denominator of this third fraction. Further, subtracting the positive term $Var_{CF_{t+1}}Cov(CF,AC)^2$ from the positive term $Var_{CF_{t+1}}Var_{CF}Var_{AC}$ will further reduce the denominator but not below zero.[9] A smaller positive

[9] Because a squared covariance is always less than or equal to the product of the variances, we can unambiguously sign the denominator as positive (DeGroot and Schervish [2012]).

denominator will unambiguously increase the absolute value of the third fraction in Eq. (4c). While the changes in Eq. (4b) reduce the numerator and thus attenuate the opposing covariances effect, the changes in Eq. (4c) reduce the denominator and exacerbate it. Accordingly, it is an empirical question whether disaggregation will increase or decrease the R^2 value due to these changes related to the opposing covariances effect.

In the third step, we turn to examining all other differences in the R^2 formula that do not relate to the opposing covariances effect. These differences allocate unique and unequal weights to the cash flow and accrual components of earnings (Barth et al. [2001]). These unique weights are included in the disaggregated R^2 formula, highlighted in purple, as follows.

$$R^2_{Step3} = \frac{Cov(CF_{t+1},CF)^2}{Var_{CF_{t+1}}Var_{CF} - \frac{Var_{CF_{t+1}}Cov(CF,AC)^2}{Var_{AC}}} + \frac{Cov(CF_{t+1},AC)^2}{Var_{CF_{t+1}}Var_{AC} - \frac{Var_{CF_{t+1}}Cov(CF,AC)^2}{Var_{CF}}} + \frac{2Cov(CF_{t+1},CF)Cov(CF_{t+1},AC)}{Var_{CF_{t+1}}Var_{(CF+AC)}} \quad (4d)$$

In the first term in each denominator, Var_{CF} or Var_{AC} is used instead of the $Var_{(CF+AC)}$. Because cash flows and accruals are each more volatile than earnings, this change will reduce the R^2 value. However, because $\frac{Var(CF_{t+1})Cov(CF,AC)^2}{Var(AC)}$ and $\frac{Var(CF_{t+1})Cov(CF,AC)^2}{Var(CF)}$ can unambiguously be signed as positive, subtracting these terms in the denominator will increase the R^2 value. Given that these factors influence the R^2 in opposite directions, whether these factors ultimately yield an increase or decrease in the R^2 depends on the magnitudes of the various factors and, thus, is an empirical question. Performing all three steps together yields the following:

$$R^2_{Disag} = \frac{Cov(CF_{t+1},CF)^2}{Var_{CF_{t+1}}Var_{CF} - \frac{Var(CF_{t+1})Cov(CF,AC)^2}{Var(AC)}} + \frac{Cov(CF_{t+1},AC)^2}{Var_{CF_{t+1}}Var_{AC} - \frac{Var(CF_{t+1})Cov(CF,AC)^2}{Var(CF)}} - \frac{2Cov(CF_{t+1},CF)Cov(CF_{t+1},AC)Cov(CF,AC)}{Var_{CF_{t+1}}Var_{CF}Var_{AC} - Var_{CF_{t+1}}Cov(CF,AC)^2} \quad (4e)$$

The R^2 from Eq. (4e) is equal to the R^2 from regressions of future cash flows on current earnings disaggregated into cash flows and accruals. In summary, the changes in blue attenuate the opposing covariances effect and unambiguously exert upward pressure on the R^2. The change in red exacerbates the opposing covariances effect and exerts downward pressure on the R^2. The changes in purple exert ambiguously signed pressure on the R^2. The degree to which each of these factors contributes to the increase in R^2 observed in disaggregated models (Barth et al. [2001]) is an empirical question. We state our third hypothesis as follows.

H3: *That disaggregated earnings explain more variation in future cash flows, relative to aggregated earnings, is due in part to the attenuation of the opposing covariances effect.*

Last, we focus on how the opposing covariances effect applies to Kim and Kross [2005] (p. 779), who document an "increasing ability of current earnings to predict future cashflows [and a] decreasing ability of current earnings […] to explain prices" over time. Ball and Nikolaev [2022] (p. 14) also find this result, saying that "the source of this trend is unclear [… and that] the explanation most likely lies in some type of secular change or changes in firm characteristics generally, or in the characteristics of firms that choose to be listed." Bushman et al. [2016] (p. 41) document that the negative "correlation between accruals and cash flows has dramatically declined in magnitude [over time]…and has largely disappeared in more recent years." If the correlation between current cash flows and accruals has diminished, then the correlation between future cash flows and current accruals may also have diminished over time. Based on this expectation and the analytical decomposition supporting Theorem 1, we expect that the *increasing* ability of current earnings to predict future cash flows is paradoxically driven by a *diminishing* covariance (i.e., a negative covariance approaching zero) between accruals and future cash flows. Because regressions of returns on aggregate earnings are not plagued by covariances of opposing signs (i.e., the relevant covariances are both positive) and based on evidence that the relation between earnings and market prices is decreasing over time (Kim and Kross [2005]), we conjecture that the decrease in the ability of earnings to explain returns could similarly be driven by a diminishing covariance between accruals and returns (i.e., a positive covariance approaching zero). In summary, we conjecture that the findings of Kim and Kross [2005] could be explained by the covariances of accruals and the respective dependent variables (future cash flows and returns) approaching zero over time, albeit from opposite sides of zero. We state our final hypotheses as follows:

> **H4a:** *Aggregate earnings' increasing ability to explain variation in future cash flows over time is driven in part by a decrease in the magnitude of the negative covariance between future cash flows and accruals.*
>
> **H4b:** *Aggregate earnings' decreasing ability to explain variation in returns over time is driven in part by a decrease in the magnitude of the positive covariance between returns and accruals.*

3. Methodology and Results

3.1 Sample

To test our hypotheses, we construct a constant sample of firms over the period spanning from 1990 to 2019. Our final sample consists of 47,934 firm-year observations with the data required to calculate the necessary variables.[10] We obtain returns data from CRSP and firm fundamentals from COMPUSTAT. Descriptive statistics are presented in Table 1. Covariances are presented in Table 2. We provide additional digits where necessary to allow the reader to manually recalculate various R^2 values throughout the paper.

3.2 Replication of prior results

We begin our analyses by replicating results documented in prior literature. We do so by regressing operating cash flows in year t+1, (CF_{t+1}), on cash flows in year t, (CF_t), as shown in Model (1). We then regress CF_{t+1} on annual earnings ($EARN_t$) following Model 2. *CF* is measured as operating cash flows from the statement of cash flows less extraordinary items scaled by total assets (Hribar and Collins, 2002). *EARN* is measured as income before extraordinary items scaled

[10] We also require observations to have the data necessary to calculate the theoretical components of market returns (i.e., cost of equity and long-term growth). These measures are used in additional analyses.

by total assets. Following prior studies, we examine the relative magnitudes of the R^2 values from these regressions. As can be seen in columns 1 and 2 of Table 3, earnings only explain 43 percent of the variation in future cash flows that cash flows explain (i.e., the R^2 in column 2 of 0.159 divided by the R^2 in column 1 of 0.366). We next regress *RET* on *CF* as shown in Model (3) and on *EARN* as shown in Model (4). *RET* is the buy and hold abnormal return over year *t*. As documented in columns 3 and 4 of Table 3, Model (4) yields a higher R^2 value than does Model (3). Aggregate earnings explain 63 percent more variation in contemporaneous returns than do cash flows (i.e., the R^2 in column 4 of 0.026 divided by the R^2 in column 3 of 0.016). These results have been employed to draw opposite inferences about the information conveyed by accruals (Dechow et al. [1998]; Konchitchki and Patatoukas, [2014]; Lev et al. [2010]; Nallareddy et al. [2020]). In columns 5 and 6, we include both components of disaggregated earnings in the regressions. In both instances, we find that accruals provide incremental information relative to cash flows. As in Barth et al. [2001], the association between accruals and future cash flows is positive when conditioned on current cash flows (column 5).

Nallareddy et al. [2020] employ an incremental-R^2 approach and conclude that accruals contribute roughly 5 percent of the total explanatory power of disaggregated earnings when future cash flows is the dependent variable. We employ a Shapley-Owen (Lipovetsky and Conklin [2001]) decomposition that apportions explanatory power between variables and find that accruals contribute 10 percent of the explanatory power of disaggregated earnings (column 5). These decompositions also suggest that accruals contribute 24 percent of the explanatory power of disaggregated earnings when returns is the dependent variable (column 6).

3.3 Empirical demonstrations of Theorem 1

Before testing our hypotheses, we perform two analyses to empirically demonstrate Theorem 1. First, we consider a simplified scenario in which firms' aggregate earnings consist only of cash flows minus depreciation expense (*CF_LESS_DEP)*, essentially assuming that depreciation is the only accruals-based component of earnings. The unconditional covariance between depreciation and future cash flows is positive (e.g., Barth et al. [2001]; Feltham and Ohlson [1996]), but *subtracting* depreciation from cash flows, as is done to compute aggregate earnings, effectively switches the sign of this covariance from positive to negative. Since current cash flows covary positively with future cash flows, this aggregation in earnings yields an R^2-reducing opposing covariances effect, because the covariances of opposing signs offset each other in the numerator of R^2 calculations. To illustrate the impact of this, we again present the results of regressing CF_{t+1} on CF_t in Column 1 of Table 4 and present results of regressing CF_{t+1} on $CF\_LESS\_DEP_t$ in Column 2. In comparing the R^2 values in Columns 1 and 2, we see that the subtraction of depreciation from cash flows reduces the R^2 by 25 percent relative to the R^2 of cash flows alone. In contrast, if earnings are instead aggregated by *adding* depreciation to cash flows (*CF_PLUS_DEP)* the R^2 is larger than that of cash flows alone (compare Columns 1 and 3 of Table 4). In fact, notwithstanding *CF_PLUS_DEP* exhibiting greater volatility than *CF_LESS_DEP* (which applies downward pressure on the R^2), the increase in the R^2 that is observed when moving from *CF_LESS_DEP* to *CF_PLUS_DEP* (i.e., moving from Column 2 to Column 3 of Table 4) accounts for over 96 percent of the increase in the R^2 that is observed when moving from *CF_LESS_DEP* to disaggregated *CF* and *DEPRECIATION* (i.e., moving from Column 2 to Column 5 of Table 4). This simple example demonstrates that the opposing covariances effect can drive a substantial portion of the increase in the R^2 value related to disaggregation.

Our next empirical validation of Theorem 1 requires a sample with variation in the components of and overall values of Eqs. (1) and (2). This is not possible with a single sample. Accordingly, we create 100 random subsamples of our main sample. Each subsample contains 25 percent of our main sample. We then calculate the components and overall values of Eqs. (1) and (2) for each sample. In each of these random samples, the value of *k* falls below zero but not below negative one (i.e., located in Range C of Figure 1). We demonstrate Theorem 1 empirically using the following regression specifications.

$$R^2_{EARN} = \beta_0 + \beta_1 COV\_ACCR\_CF + \beta_2 VOL\_RATIO \qquad \text{(Model 5)}$$

$$R^2_{CF} - R^2_{EARN} = \beta_0 + \beta_1 COV\_ACCR\_CF + \beta_2 VOL\_RATIO \qquad \text{(Model 6)}$$

In these regressions, R^2_{EARN} is the sample-specific R^2 value from Eq. (2) and R^2_{CF} - R^2_{EARN} is the sample-specific difference between the R^2 values from Eq. (1) and Eq. (2). *COV_ACCR_CF* is the absolute value of the sample-specific covariance between accruals and future cash flows. *VOL_RATIO* is the sample-specific ratio of the volatility of earnings to the volatility of cash flows (capturing the difference in the denominators of Eqs. [1] and [2]). Table 5 presents the results from this analysis. Column 1 of Table 5 confirms that as the relation between accruals and future cash flows strengthens, earnings explain less variation in future cash flows (i.e., the coefficient on *COV_ACCR_CF* in column 1 is negative and significant). Column 2 empirically demonstrates Theorem 1. As expected, cash flows' superior ability to predict future cash flows, relative to that of earnings', increases as the magnitude of the covariance between accruals and future cash flows increases (i.e., the coefficient on *COV_ACCR_CF* in column 2 is positive and significant). Importantly, this result holds while controlling for *VOL_RATIO,* relaxing the need for Assumption 1.

3.4 Test of H1

We next turn to quantifying the degree to which the opposing covariances effect drives the superiority of cash flows over earnings in explaining future cash flows (H1). Again, we highlight that the covariance between current and future cash flows is positive and the covariance between accruals and future cash flows is negative (see Table 2). Importantly, the magnitudes of these covariances suggest that *k* falls between negative one and zero (within Range C of Figure 1).

We investigate H1 by employing a simple comparative static approach. This approach allows us to examine how much each difference between Eq. (1) and Eq. (2) contributes to cash flows' relative superiority in explaining future cash flows. In Row 1 of Table 6, we present the relevant formula and the R^2 value from Model 1 without any adjustments. The R^2 value in row 1 is equal to the corresponding value in column 1 of Table 3. The rightmost column of Table 6 presents the percentage of the difference between Eq. (1) (i.e., row 1) and Eq. (2) (i.e., row 4) that is reconciled by that row's adjustment. In row 2, we add the covariance between future cash flows and current accruals to the numerator of Eq. (1). This adjustment *reduces* the R^2 value by 111 percent of the total change between Eqs. (1) and (2). This suggests that a non-zero covariance between accruals and future cash flows reduces the explanatory power of earnings, all else equal. We do not believe this is a desirable attribute of any metric used to infer whether accruals achieve the intent of SFAC 1. In row 3, we adjust the denominator of Eq. (1) by replacing $Var_{(CF_t)}$ with $Var_{(CF_t+AC_t)}$. This adjustment increases the R^2 value by 30 percent of the total change between Eqs. (1) and (2). This suggests that even if accruals had no association with future cash flows, earnings would better achieve the intent of SFAC 1 via reduced volatility. In row 4, we make both adjustments simultaneously. Row 4 is also equivalent to Eq. (2) and to column 2 of Table 3. While a cursory examination of R^2 values might lead one to infer that accruals do not meet central tenets of financial reporting or achieve the intent of SFAC 1, an analysis of the components of the R^2 challenges this inference. We argue that even regressions of future cash flows on *aggregate* earnings provide evidence consistent with accruals achieving the intent of SFAC 1, if interpreted carefully.

3.5 Test of H2

As previously discussed, Ball and Nikolaev [2022] find that the ability of cash flows to predict future cash flows is exceeded by that of certain adjusted accrual-based earnings measures. The adjusted earnings measures they examine are *IBC_A*, bottom-line earnings adjusted by removing various non-operating items; *OE*, operating earnings calculated following Dechow and Dichev [2002], and *OP*; operating income before depreciation and amortization. Our hypothesis predicts that the superior predictive ability of these adjusted earnings measures arises in part because of the opposing covariances effect—because each measure's accrual component exhibits diminished covariances with future cash flows. To investigate this, we first replicate the finding that *IBC_A*, *OE*, and *OP* explain more variation in future cash flows across the various specifications employed by Ball and Nikolaev [2022]. Specifically, we compare the R^2 values from regressions of future cash flows on *EARN* to R^2 values where *IBC_A*, *OE*, or *OP* is the independent variable, estimated over our whole sample in pooled tests.[11] These results are presented for *IBC_A*, *OE*, and *OP* in Table 7.[12] Within our sample, we replicate the finding that these adjusted measures exhibit much higher R^2 values relative to that of 'bottom line' earnings (see columns 1 and 2 of Table 7). We then proceed to examine whether this overall finding can be explained by the opposing covariances

[11] We focus on presenting and discussing the results of pooled regressions. All inferences in this section are also robust to using cross-sectional, time-series and industry-specific tests, following the methodology of Ball and Nikolaev [2022].

[12] Ball and Nikolaev [2022] measures cash flows slightly differently than Nallareddy et al. [2020]. To be consistent across our tests, we hold our measurement of cash flows constant (i.e., by using the Nallareddy et al. [2020] measure of cash flows). To ensure that this difference doesn't influence our inferences, we ensure that the inferences drawn from tests following Ball and Nikolaev [2022] are similar when using the Ball and Nikolaev [2022] measure of cash flows.

effect. In column 3 through 5 of Table 7, we present the covariances between future cash flows and accruals (total accruals, accruals included in each adjusted earnings measure, and accruals excluded in each measure). We make two observations from these columns. First, the covariance between total accruals and future cash flows (in column 3) falls within Range C of Figure 1 in each specification. This is a necessary condition for the opposing covariances effect to influence these results. Second, in all cases the absolute covariances of the accruals included in the adjusted measures (column 4) are smaller than that of total accruals. In terms of percentages, the absolute covariance diminishes by 49, 74, and 85 percent for the accruals that Ball and Nikolaev [2022] expect to map more closely into future cash flows. In column 5, note that the accruals excluded from *IBC_A*, *OE*, and *OP* covary with future cash flows at similar or larger magnitudes, relative to the accruals included in the measures. Together, columns 3 through 5 suggest that the increase in R^2 values observed (in column 2) when employing the adjusted earnings measures *IBC_A*, *OE*, and *OP* is not driven by strengthened associations between future cash flows and the accrual components of the adjusted measures. The approach utilized by Ball and Nikolaev [2022] that sorts accruals to inclusion in or exclusion from the adjusted earnings measures, though intuitively appealing, does not effectively identify accruals that are more strongly associated with future cash flows.

Another possible explanation for the Ball and Nikolaev [2022] results is that the adjusted earnings measures exhibit less volatility than ‘bottom line’ earnings. We provide the standard deviation of *EARN* and each adjusted earnings measure in columns 6 and 7. As can be seen, the standard deviations of *OE* and *OP* are higher than that of *EARN*. This suggests that the increased R^2 values in column (2) related to *OE* and *OP* are entirely explained by the diminished covariance between future cash flows and the accruals included in *OE* and *OP*. We cannot infer that these adjusted earnings measures achieve the intent of SFAC 1 any better than 'bottom line' earnings. However, *IBC_A* is less volatile than *EARN*, and perhaps improves the predictive ability of earnings by providing less noisy information about future cash flows. To examine how much of the increase in the R^2 values is driven by the opposing covariances effect and how much is driven by reduced volatility, we provide comparative static adjustments in columns 8 and 9 of Table 7 to reconcile the R^2 values from regressions using *EARN* to those of regressions using the adjusted earnings measures. These comparative statics employ Eq. (2) when *EARN* is the independent variable as the benchmark (i.e., column 1). The first adjustment (in column 8) replaces $Cov(CF_{t+1}, AC_t)$ with the covariance between future cash flows and the accruals included in the relevant Ball and Nikolaev [2022] measure (i.e., column 4). This adjustment represents the degree to which the opposing covariances effect influences the results of Ball and Nikolaev [2022]. The second adjustment (in column 9) replaces the standard deviation of *EARN* with the standard deviation of the relevant Ball and Nikolaev [2022] measure (i.e., column 7). In each case, the amount of the difference accounted for by the opposing covariances effect dwarfs the amount accounted for by differences in volatility. We conclude that this evidence contradicts the assertion that the adjusted earnings measures of Ball and Nikolaev [2022] achieve the intent of SFAC 1 any better than do 'bottom line' earnings.[13, 14]

3.5 Test of H3

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[13] This conclusion is also supported by disaggregated tests. In untabulated analyses, we perform Shapley-Owen (Lipovetsky and Conklin [2001]) decompositions and find that in two of three instances the excluded accruals contribute more (in one case, almost three times more) to the explanatory power of disaggregated earnings than do the included accruals.

[14] Ball and Nikolaev [2022] also examine how firm, industry, and annual specifications influence the predictive ability of earnings relative to their adjusted measures. Consistent with their results, we find that firm and industry specifications partially alleviate the opposing covariances problem because 32 percent and 8 percent of firms and industries, respectively, have covariances that fall outside of Range C in Figure 1.

We next turn to examining how the opposing covariances effect influences the increase in R^2 values observed in regressions of future cash flows on current earnings disaggregated into cash flows and accruals. To do so, we employ a comparative static adjustment following the mathematical reconciliation provided in Eqs. (4a) through (4e). Table 8 demonstrates how the steps of this reconciliation influence the R^2 from disaggregated models. Eq. (4a), which represents the R^2 calculation for aggregated earnings ($R^2_{CF_{t+1}.EARN}$) is presented in row 1, along with the corresponding R^2 value from column 2 of Table 3. In row 2 we present a formula and R^2 value which reflect the numerator and denominator adjustments (from Eqs (4b) and (4c)) related to the opposing covariances effect.[15] By addressing the opposing covariances effect, the R^2 increases from 0.159 in row 1 to 0.256 in row 2—this increase accounts for 46 percent of the difference between the R^2 values from aggregated (0.159) and disaggregated (0.373) models. Consistent with the assertion of Barth et al. [2001], the remaining 54 percent of the increase in the R^2 value gained from disaggregating comes from allowing unique weights for each component of earnings (row 3). These unequal weights yield individual increases of 0.091 (*CF*) and 0.026 (*AC*) in the R^2 which respectively account for 42 and 12 percent of the difference between the R^2 from aggregated models and disaggregated models. The formula and R^2 value in row 4 include all adjustments, fully reconciling aggregated and disaggregated models. We interpret these results as suggesting that the increase in R^2 values observed in disaggregated models cannot be solely attributed to the equal weighting issue highlighted by Barth et al. [2001], but rather that multiple factors are at play—

[15] If performed independently, the adjustment in Eq. (4b) attenuates the opposing covariances effect and yields an increase in the R^2 relative to row 1 of Table 8, while the adjustment in Eq. (4c) exacerbates the opposing covariances effect and yields a decrease in the R^2 relative to row 1. To examine the net effect of these two adjustments, we present the combined effect of these two adjustments in row 2.

addressing the opposing covariances effect also significantly increases the measured explanatory power.

3.6 Test of H4a and H4b

Hypothesis 4a predicts that the *increasing* ability of earnings to explain variation in future cash flows occurs because the negative covariance between future cash flows and contemporaneous accruals approaches zero. Hypothesis 4b predicts that the *decreasing* ability of earnings to explain variation in market returns occurs because the positive covariance between market returns and contemporaneous accruals approaches zero. To test these hypotheses, we calculate the R^2 values from Model 2 (as described in Eq. 2) and Model 4 (as in the equivalent of Eq. 2 with returns as the dependent variable) along with all relevant components for each year from 1990 to 2019. These values and relevant components are presented in Panel A of Table 9. The row labeled "Trend" presents the coefficient estimate calculated by separate regressions of the variable indicated at the head of each column on the year variable in column 1. Columns 2 and 3 replicate the findings of Kim and Kross [2005], confirming that the explanatory power of earnings increases over time with respect to future cash flows and decreases over time with respect to market returns. Other than the standard deviation of *EARN* in column 7, all components of Eq. (2) exhibit significant time trends. The effect of each time trend on the R^2 values in columns 2 and 3 is determined by the sign of the trend and the location of the component in the relevant equation (i.e., in the numerator or denominator of Eq. 2). We highlight that the trends for the covariances between accruals and the dependent variables (in columns 5 and 9) impact the R^2 in opposite directions. In column 5, a positive trend in the negative covariance between accruals and future cash flows (i.e., toward zero) increases the R^2 in column 2—this is the diminishing impact over time of the opposing covariances effect. Relatedly, in column 9, a negative trend in the positive covariance between accruals and returns (i.e., toward zero) decreases the R^2 in column 3—this is straightforward and is not influenced by the opposing covariances effect. Both of these trends are consistent with accruals conveying less information over time, which reconciles the results Kim and Kross [2005] call incongruous and remarkable.

While only the covariances between accruals and each dependent variable exhibit trends that impact the R^2 in opposite directions, differences in the magnitudes of the various trends in other components could explain the majority of the Kim and Kross [2005] results as well. That is, although it is clear the opposing covariances effect drives a portion of the incongruous results of Kim and Kross [2005], it is unclear how material the opposing covariances effect is in driving these results. To examine the degree to which the Kim and Kross [2005] findings are driven by the opposing covariances effect, we calculate $R^2_{CFt+1,EARN}$ and each relevant component (see Eq. 2) for an early period of our overall sample (years 1990 through 1995) and separately for a late period (2014 through 2019). These statistics are presented at the top of Panel B of Table 9. The R^2 value is 12 percent in the early period and 25 percent in the latter period. We employ comparative static adjustments that alter the early-period value by replacing one early-period component with one late-period component. We do this for each component and examine the magnitude of the change in the value for each separate component. We begin by replacing $Cov(CF_{t+1}, AC_t)$ for the early period with that of the late period (adjustment 1 in Table 9, Panel B). All else equal, this difference accounts for 102 percent of the overall change between the early and late periods. This component accounts for the largest portion of the change by far. Adjustment 2, accounting for the change in the second accruals-based component, $Var(CF_t+AC_t)$, has a negligible impact (3 percent). The changes in cash flow attributes, $Cov(CF_{t+1}, CF_t)$ in adjustment 3 and $Var(CF_{t+1})$ in adjustment 4, account for -42 and 40 percent of the observed change in Eq. (2) over time, respectively.[16] These changes offset and are dwarfed by the impact of changes in accruals attributes. Accordingly, we conclude that earnings' increasing ability to explain cash flows is driven by changes in accruals characteristics, not cash flow characteristics. This conclusion stands in contrast with the conclusions of Nallareddy et al. [2020] (p. 3), who state that the "trend in explanatory power is attributable to the cash flows component, not accruals."

5. Conclusion

In Statement of Financial Accounting Concepts No. 1 (SFAC 1), the FASB asserts that accrual-based information should outperform cash flows in predicting future cash flows. We re-examine why empirical research concludes the opposite—that cash flows outperform earnings in this regard. Our examination highlights a significant limitation of using R^2 values, coefficient estimates, and out-of-sample predictions from regressions of future cash flows on aggregate earnings to assess whether accrual accounting serves the purposes outlined in the conceptual framework. Since the covariance between current accruals and future cash flows has the opposite sign of the covariance between current cash flows and future cash flows, tests using aggregate earnings to predict future cash flows paradoxically are *more* supportive of earnings achieving the intent of SFAC 1 when accruals covary *less* in absolute with future cash flows, all else equal (an opposing covariances effect). We demonstrate that this main finding changes key inferences. When taking the opposing covariances effect into account, we conclude that (1) accruals do help earnings to meet central tenets of financial reporting and achieve the intent of SFAC 1 (Nallareddy et al. [2020]); (2) the conflicting trends observed by Kim and Kross [2005] are both driven by

[16] The negative percentage is meant to convey that the change in $Cov(CF_{t+1}, CF_t)$ over time exerted pressure on the R^2 in the opposite direction of the overall change.

accruals covarying less with future cash flows and returns over time; (3) paradoxically, the adjusted earnings measures of Ball and Nikolaev [2022] yield higher R^2 values because the measures include accruals less related to future cash flows; and (4) the information masking that occurs by aggregating earnings components is driven not only by the forced equal weighting of earnings components (Barth et al. [2001]), but also by addressing the opposing covariances effect. Importantly, we provide a simple comparative static approach that reconciles (1) the R^2 from regressions including current cash flows to those including earnings as the independent variable and (2) the R^2 from regressions using aggregate earnings to regressions using earnings decomposed into cash flows and accruals. In doing so, we provide a clearer understanding of the relation between tests employing aggregated and disaggregated earnings as well as tools to analyze the drivers of differences in R^2 values. We suggest that future research examining aggregate earnings' ability to explain future cash flows should ensure that the inferences drawn from the components of the relevant metric match the inferences drawn from the summary metric itself. Our comparative static analysis provides an easily implementable means of doing so.

Appendix A

Section 2 of the paper describes how regressions of future cash flows on earnings exhibit lower R^2 values as accruals covary more with future cash flows. This causes R^2 values to be questionable metrics of whether earnings achieve the intent of SFAC 1. Prior studies have also used slope coefficients and out-of-sample analyses as robustness tests to bolster inferences gleaned from R^2 values. In this appendix, we analytically decompose these additional measures to demonstrate that they do not resolve the opposing covariances effect documented in the main body of the paper.

Slope Coefficients

We begin by demonstrating that the slope coefficient diminishes as the absolute covariance between future cash flows and accruals grows. This can be clearly seen in Equation (A1) where $\widehat{\beta}_{Earn}$ is the slope coefficient from a regression of future cash flows on earnings.

$$\widehat{\beta}_{Earn} = \frac{Cov(CF_t + ACC_t, CF_{t+1})}{Var_{Earn}} = \frac{Cov(CF_t, CF_{t+1}) + Cov(ACC_t, CF_{t+1})}{Var_{Earn}} \tag{A1}$$

If the covariance between accruals and future cash flows falls within Range C of Figure 1 in the main body of the manuscript, then the opposing covariances problem will monotonically reduce the slope coefficient as accruals covary more with future cash flows. This monotonic reduction will continue until $Cov(CF_t, CF_{t+1}) = -1 * Cov(AC_t, CF_{t+1})$ at which point the coefficient will equal zero and the R^2 will equal zero.

Out-of-sample R^2

Next, we turn to discussing the out-of-sample R^2 statistics used in Ball and Nikolaev [2022]. Per Ball and Nikolaev [2022], these statistics are calculated as follows:

$$R^2_{oos} = 1 - \frac{\sum_j (y_{j,T} - \hat{y}_{j,T|T-1})^2}{\sum_j (y_{j,T} - \bar{y}_T)^2} \tag{A2}$$

Ball and Nikolaev [2022] state that "j indexes firms and T indexes years, $y_{j,T}$ denotes actual future operating cashflows, $\hat{y}_{j,T|T-1}$ denotes predicted operating cash flows conditional on data up to time T−1, and $\bar{y}_T$ denotes the unconditional mean across firms based on the information up to time T−1" (p.4 of Online Appendix B in Ball and Nikolaev [2022]). Accordingly, we substitute in either $\hat{\alpha}_{CF} + \hat{\beta}_{CF} * CF_{j,T}$ or $\hat{\alpha}_{Earn} + \hat{\beta}_{Earn} * Earn_{j,T}$ for $\hat{y}_{j,T|T-1}$ and present Eq. (A2) after these substitutions as Eq. (A3) and Eq. (A4). The subscripts on these coefficients index the predictor variable used to estimate the coefficients based on information up to T-1.

$$R_{CF}^2 = 1 - \frac{\sum_j (y_{j,T} - \hat{\alpha}_{CF} + \hat{\beta}_{CF} * CF_{j,T}\ )^2}{\sum_j (y_{j,T} - \bar{y}_T)^2} \qquad \text{(A3)}$$

$$R_{Earn}^2 = 1 - \frac{\sum_j (y_{j,T} - \hat{\alpha}_{Earn} + \hat{\beta}_{Earn} * Earn_t)^2}{\sum_j (y_{j,T} - \bar{y}_T)^2} \qquad \text{(A4)}$$

While it is not immediately obvious which of these R^2 values will be greater, recall the above discussion demonstrating that $\hat{\beta}_{Earn}$ will monotonically reduce as accruals covary more with future cash flows. This will occur as long as the covariances fall within Range C of Figure 1 of the manuscript (our descriptive statistics show that these values fall within Range C). As an increase in the absolute magnitude of the covariance between current accruals and future cash flows causes $\hat{\beta}_{Earn}$ to approach zero, $\hat{\alpha}_{Earn}$ will monotonically approach $\bar{y}_T$. Thus, the term $y_{j,T} - \hat{\alpha}_{Earn} + \hat{\beta}_{Earn} * Earn_{j,T}$ monotonically approaches $y_{j,T} - \bar{y}_T$ up to the point where $Cov(CF_t, CF_{t+1}) = -1 * Cov(AC_t, CF_{t+1})$, at which point $\hat{\beta}_{Earn}$ will equal zero, $\hat{\alpha}_{Earn}$ will equal $\bar{y}_T$ and the out-of-sample R^2 will equal zero. At any point in range C, as accruals covary *more* strongly with future cash flows, these out-of-sample R^2 statistics will be less indicative of earnings achieving the intent of SFAC 1 (all else equal).

Out-of-Sample: Mean Squared Prediction Error

Next, we turn to discussing the out of sample mean squared prediction error statistic (i.e., an implementation of the Diebold-Mariano [1995] MSPE statistic) used in Nallareddy et al. [2020]. Per Nallareddy et al. [2020], these statistics are calculated as follows:[17]

$$MSPE_{t+1} = \frac{\sum(CF_{j,t+1} - Pred\_CF_{j,t+1,CF})^2 - (CF_{j,t+1} - Pred\_CF_{j,t+1,Earn})^2}{n} \tag{A5}$$

Where $Pred\_CF_{t+1,CF}$ is the predicted value of future cash flows using cash flows from year *t* as the predictor and $Pred\_CF_{t+1,Earn}$ is predicted value of future cash flows using earnings from year *t* as the predictor. Again, we substitute in $\hat{\alpha}_{CF} + \hat{\beta}_{CF} * CF_{j,t}$ for $Pred\_CF_{j,t+1,CF}$ and $\hat{\alpha}_{Earn} + \hat{\beta}_{Earn} * Earn_{j,t}$ for $Pred\_CF_{j,t+1,Earn}$ as follows:

$$MSPE_{t+1} = \sum \frac{(CF_{j,t+1} - \hat{\alpha}_{CF} + \hat{\beta}_{CF} * CF_{j,t})^2}{n} - \sum \frac{(CF_{j,t+1} - \hat{\alpha}_{Earn} + \hat{\beta}_{Earn} * Earn_{j,t})^2}{n} \tag{A6}$$

The first and second terms of this equation are essentially the mean squared error for cash flows and earnings respectively when predicting future cash flows. As has been demonstrated above, $\hat{\beta}_{Earn}$ will monotonically reduce as accruals covary more with future cash flows. As an increase in the absolute magnitude of the covariance between current accruals and future cash flows causes $\hat{\beta}_{Earn}$ to approach zero $\hat{\alpha}_{Earn}$ will monotonically approach the average of CF at *t+1* for the training sample. Assuming that the average CF is constant between periods, this second term will converge to the total sum of squares (TSS) at the point where $Cov(CF_t, CF_{t+1}) = -1 * Cov(AC_t, CF_{t+1})$. At any point in range C, as accruals covary *more* strongly with future cash flows, the MSPE statistic will be less indicative of earnings achieving the intent of SFAC 1 (all else equal).

[17] Nallareddy et al. [2020] omit the summation operator and division by *n* but their manuscript is clear enough that these can be assumed.

Appendix B
Variable Definitions

CRSP/Compustat variables are indicated in quotations.

$RET_{i,t}$	Buy-and-hold abnormal return for firm i in year t, calculated as $e^{\sum_{m=1}^{12}\ln(1+\text{"ret"})} - e^{\sum_{m=1}^{12}\ln(1+\text{"vwretd"})}$ where m is the month in year t.
$CF_{i,t}$	Cash flows from operations less cash flows from extraordinary items and discontinued operations for firm i in year t ("oancf" – "xidoc") scaled by average total assets ("at").
$CF_{i,t+1}$	Cash flows from operations less cash flows from extraordinary items and discontinued operations for firm i in year t+1 ("oancf" – "xidoc") scaled by average total assets ("at").
$AC_{i,t}$	Total accruals measured as ("ibc" - ("oancf" – "xidoc")) scaled by average total assets ("at").
$EARN_{i,t}$	The sum of $CF_{i,t}$ and $AC_{i,t}$ as defined above.
$CF\_LESS\_DEP_{i,t}$	$CF_{i,t}$ as defined above, less depreciation (dpc).
$CF\_PLUS\_DEP_{i,t}$	$CF_{i,t}$ as defined above, plus depreciation (dpc).
$OE_{i,t}$	$CF_{i,t}$ – [("recch" + "invch" + "apalch" + "txach" + "aoloch") scaled by average total assets ("at")].
$OP_{i,t}$	"oibdp" scaled by average total assets ("at").
$IBC\_A_{i,t}$	("ibc" + "xidoc" + "dpc" + "sppiv" + "esubc" + "fopo") scaled by average total assets ("at").
$COV\_ACCR\_CF_s$	The absolute covariance between $AC_{i,t}$ and $CF_{i,t+1}$ in sample s.
VOL_RATIO_s	The ratio of the volatility of $EARN_{i,t}$ to the volatility of $CF_{i,t}$ in sample s.

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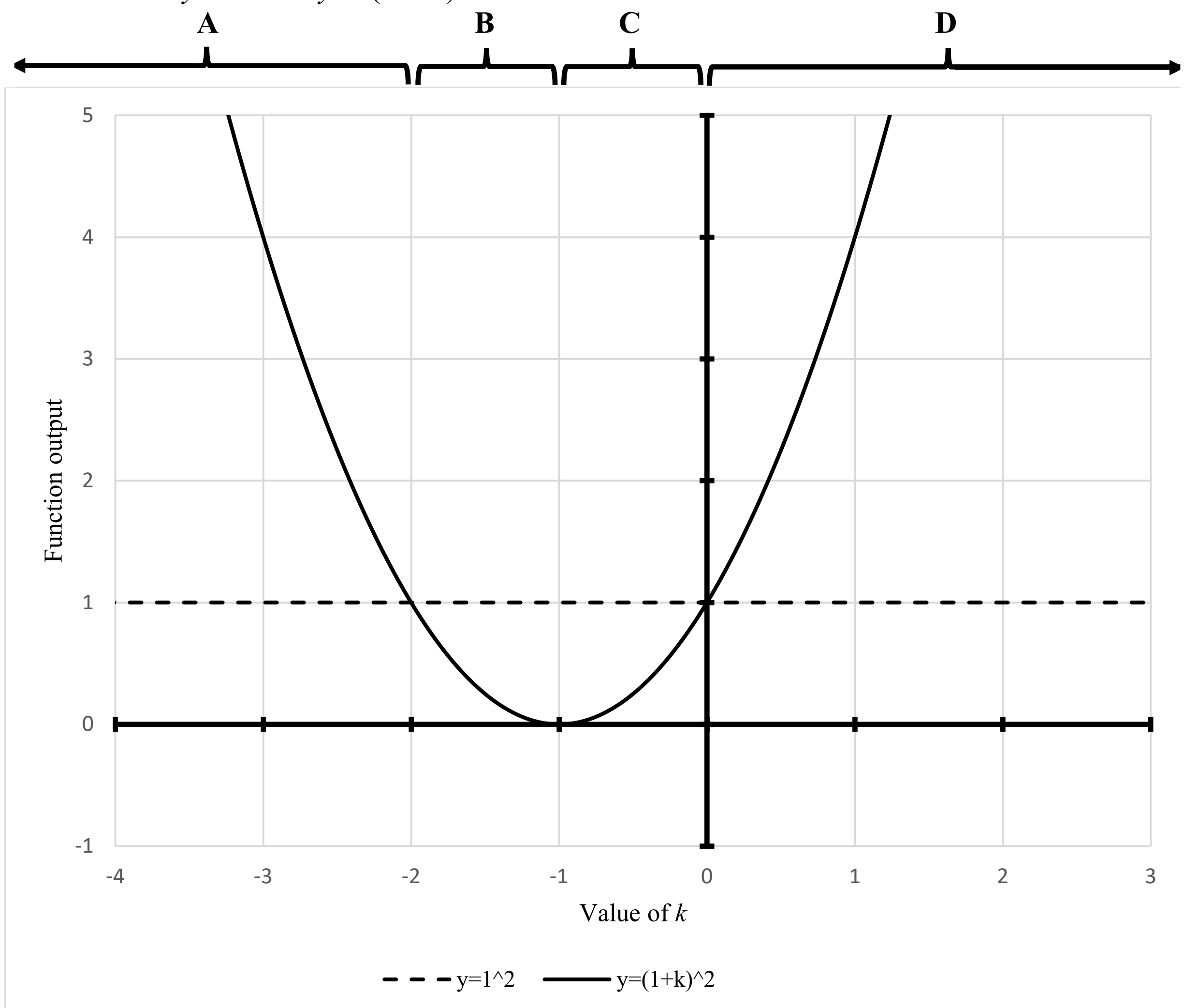
Figure 1

The functions $y = 1^2$ and $y = (1 + k)^2$



In ranges A, B, and D, Eq. (2) is increasing in the absolute value of $Cov(CF_{t+1},AC_t)$

In range C, Eq. (2) is decreasing in the absolute value of $Cov(CF_{t+1},AC_t)$

In ranges B and C, Eq. (2) is less than Eq. (1), holding the denominators constant

In ranges A and D, Eq. (1) is less than Eq. (2), holding the denominators constant

Table 1
Summary Statistics

Variable	N	Mean	Std. Dev.	Q1	Median	Q3
$RET_{i,t}$	47,934	0.089	0.529819	-0.214	0.002	0.257
$EARN_{i,t}$	47,934	0.055	0.074963	0.024	0.053	0.090
$CF\_Less\_Dep_{i,t}$	47,934	0.055	0.077503	0.016	0.051	0.095
$CF\_Plus\_Dep_{i,t}$	47,934	0.153	0.093599	0.970	0.144	0.204
$CF_{i,t+1}$	47,934	0.103	0.078172	0.059	0.098	0.145
$CF_{i,t}$	47,934	0.104	0.081014	0.059	0.098	0.147
$AC_{i,t}$	47,934	-0.049	0.075214	-0.083	-0.047	-0.015

This table provides descriptive statistics for select variables used in our tests. All firm-specific variables have been winsorized at the 1st and 99th percentiles. See Appendix B for variable definitions and measurements.

Table 2
Covariances

	RET_t	$EARN_{t+1}$	$EARN_t$	CF_{t+1}	CF_t	AC_t
RET_t	0.280708					
$EARN_{t+1}$	0.008322	0.006227				
$EARN_t$	0.006444	0.003066	0.005619			
CF_{t+1}	0.003488	0.003328	0.002334	0.006111		
CF_t	0.005385	0.002721	0.003263	0.003831	0.006563	
AC_t	0.001059	0.000345	0.002357	-0.001497	-0.003301	0.005657

This table provides covariances among select variables used in our tests. All firm-specific variables have been winsorized at the 1st and 99th percentiles. See Appendix B for variable definitions and measurements.

Table 3
In-Sample Replication of Prior Findings

	Relative Predictive Ability								Incremental Predictive Ability			
	(1)		(2)		(3)		(4)		(5)		(6)	
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Earnings Components**		**Earnings Components**	
Dep. Var:	CF_{t+1}		CF_{t+1}		RET_t		RET_t		CF_{t+1}		RET_t	
	Coef.	*p-val.*	*Coef.*	*p-val.*	*Coef.*	*p-val.*	*Coef.*	*p-val.*	*Coef.*	*p-val.*	*Coef.*	*p-val.*
Intercept	0.042	[0.00]***	0.080	[0.00]***	0.004	[0.41]	0.026	[0.00]***	0.042	[0.00]***	0.001	[0.00]
CF_t	0.584	[0.00]***			0.821	[0.00]***			0.638	[0.00]***	1.294	[0.00]***
$EARN_t$			0.415	[0.00]***			1.147	[0.00]***				
AC_t									0.107	[0.00]***	0.943	[0.00]***
Observations	47,934		47,934		47,934		47,934		47,934		47,934	
R^2	0.366		0.159		0.016		0.026		0.373		0.028	
Adj. R^2	0.366		0.159		0.016		0.026		0.373		0.028	
Shapley-Owen: CF_t									90.31%		76.48%	
Shapley-Owen: AC_t									9.69%		23.52%	

This table presents estimates from regressions of returns on earnings or its components and regressions of future cash flows on earnings or its components. All variables are defined in Appendix B. *** denotes two-tailed significance at the 1 percent level.

Table 4
Describing the Opposing Covariances Effect Using a Depreciation Example

	(1)		(2)		(3)		(4)		(5)	
Dep. Var:	CF_{t+1}		CF_{t+1}		CF_{t+1}		CF_{t+1}		CF_{t+1}	
	Coef.	*p-val.*	*Coef.*	*p-val.*	*Coef.*	*p-val.*	*Coef.*	*p-val.*	*Coef.*	*p-val.*
Intercept	0.042	[0.00]***	0.074	[0.00]***	0.025	[0.00]***	0.064	[0.00]***	0.029	[0.00]***
CF_t	0.584	[0.00]***							0.547	[0.00]***
$CF\_LESS\_DEP_t$			0.527	[0.00]***						
$CF\_PLUS\_DEP_t$					0.513	[0.00]***				
$DEPRECIATION_t$							0.808	[0.00]***	0.349	[0.00]***
Observations	47,934		47,934		47,934		47,934		47,934	
R^2	0.366		0.273		0.377		0.088		0.381	

This table presents estimates from regressions of future cash flows on current cash flows and depreciation. All variables are defined in Appendix B.
*** denotes two-tailed significance at the 1 percent level.

Table 5
Empirical Validation of Theorem 1

	(1) Model 5			(2) Model 6		
Dep. Var:	R^2_{EARN}			R^2_{CF} - R^2_{EARN}		
	Coef.	*p-val.*		*Coef.*	*p-val.*	
Intercept	0.47	[0.00]	***	-0.39	[0.00]	***
COV_ACCR_CF	-52.49	[0.00]	***	149.54	[0.00]	***
VOL_RATIO	-0.25	[0.00]	***	0.40	[0.00]	***
Observations	100			100		
R^2	0.1197			0.8446		

This table presents regressions of R^2 value-based variables on the absolute covariance between accruals and future cash flows (*COV_ACCR_CF*) and the ratio of the volatility of earnings to the volatility of cash flows (*VOL_RATIO*). The R^2 values used for the dependent variables were calculated based on 100 unique randomly selected portions of our main sample. Each randomly selected portion contains one quarter of our main sample. R^2_{EARN} is the sample-specific R^2 value from Eq. (2) and R^2_{CF} - R^2_{EARN} is the sample-specific difference between the R^2 values from Eq. (1) and Eq. (2). All variables are defined in Appendix B. *** denotes two-tailed significance at the 1 percent level.

Table 6
Test of H1: Comparative Statics

Row	Item	Formula	Value	% Change Reconciled Between Eq. 1 (Row 1) and Eq. 2 (Row 4)
1	Eq. (1) or $R^2_{CFO_{t+1}.CFO_t}$	$\frac{[Cov(CF_{t+1}, CF)]^2}{Var_{(CF)}Var_{CF_{t+1}}}$	0.366	0%
2	Eq. (1) with a numerator adjustment (shown in red font)	$\frac{[Cov(CF_{t+1}, CF) + Cov(\mathrm{CF}_{t+1}, AC)]^2}{Var_{(CF)}Var_{CF_{t+1}}}$	0.136	-111%
3	Eq. (1) with a denominator adjustment (shown in red font)	$\frac{[Cov(CF_{t+1}, CF)]^2}{Var_{(CF+AC)}Var_{CF_{t+1}}}$	0.427	30%
4	Eq. (1) with a denominator and numerator adjustment (shown in red font), or Eq. (2), or $R^2_{CFO_{t+1}.EARN_t}$	$\frac{[Cov(CF_{t+1}, CF) + Cov(\mathrm{CF}_{t+1}, AC)]^2}{Var_{(CF+AC)}Var_{CF_{t+1}}}$	0.159	-100%

This table presents the manual calculation of R^2 statistics and comparative static adjustments to these R^2 statistics. The "% Change Reconciled" column is calculated as the change in "Value" column between the given row and row 1 divided by the change between row 1 and row 4.

Table 7
Test of H2: Revisiting Ball and Nikolaev [2022]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	R^2 from the Model: $CF_{t+1} = \alpha + \beta Predictor_{i,t} + \varepsilon_{t+1}$								
	Predictor =		Cov(AC, CF_{t+1})			St. Dev. of Earnings Measure		Driver of Difference (Column 1 vs. Column 2)	
B&N Earnings Measure:	**EARN**	**B&N Earnings Measure**	**Total Accruals (Included + Excluded)**	**Accruals Included by B&N**	**Accruals Excluded by B&N**	**EARN**	**B&N**	**Opposing Covariances Effect**	**Volatility Effect**
IBC_A (N = 47,934)	0.159	0.308	-0.001497	-0.00077	-0.00073	0.07496	0.07057	77%	14%
OE (N = 47,934)	0.159	0.244	-0.001497	-0.00039	-0.00111	0.07496	0.08918	219%	-55%
OP (N = 47,934)	0.159	0.297	-0.001497	-0.00022	-0.00128	0.07496	0.08465	159%	-25%

This table presents R^2 values and selected components for 'bottom line' earnings (*EARN*) and three adjusted earnings measures. "B&N" refers to the three adjusted earnings measures examined (*IBC_A*, *OE*, and *OP*) following the methodology of Ball and Nikolaev [2022]. The number of observations included in each specification (N) varies with the data requirements of the B&N variables. Column (1) presents R^2 values from pooled regressions of future cash flows on *EARN*. Column (2) presents R^2 values from pooled regressions of future cash flows on each of the three adjusted earnings measures in turn. Columns (3), (4), and (5) present the covariance between future cash flows and the accrual component of *EARN*, the accruals included from the adjusted earnings measure, and the accruals excluded from the adjusted earnings measure, respectively. Columns (6) and (7) present the standard deviation of *EARN* and the adjusted earnings measure, respectively. The final two columns quantify how much of the difference in R^2 values between columns (1) and (2) is driven by opposing covariances (i.e., numerator effect) (Column 8) and differences in volatility (i.e., denominator effect) (Column 9).

Table 8
Test of H3: Comparative Statics

Row	Item	Formula	Value	% Change Reconciled between Eq. 4a (Row 1) and Eq. 4e (Row 4)
1	Eq. (4a) or $R^2_{CF_{t+1}.EARN}$	$\frac{Cov(CF_{t+1},CF)^2 + Cov(CF_{t+1},AC)^2 + 2Cov(CF_{t+1},CF)Cov(CF_{t+1},AC)}{Var_{(CF+AC)}Var_{CF_{t+1}}}$	0.159	0%
2	Numerator (Eq. 4b) and denominator (Eq. 4c) adjustments related to the opposing covariances effect.	$\frac{Cov(CF_{t+1},CF)^2}{Var_{CF_{t+1}}Var_{(CF+AC)}} + \frac{Cov(CF_{t+1},AC)^2}{Var_{CF_{t+1}}Var_{(CF+AC)}} - \frac{2Cov(CF_{t+1},CF)Cov(CF_{t+1},AC)Cov(CF,AC)}{Var_{CF_{t+1}}Var_{CF}Var_{AC}-Var_{CF_{t+1}}Cov(CF,AC)^2}$	0.256	46%
3	Eq. (4d), adjustments unrelated to the opposing covariances effect	$\frac{Cov(CF_{t+1},CF)^2}{Var_{CF_{t+1}}Var_{CF} - \frac{Var(CF_{t+1})Cov(CF,AC)^2}{Var(AC)}} + \frac{Cov(CF_{t+1},AC)^2}{Var_{CF_{t+1}}Var_{AC} - \frac{Var(CF_{t+1})Cov(CF,AC)^2}{Var(CF)}} + \frac{2Cov(CF_{t+1},CF)Cov(CF_{t+1},AC)}{Var_{CF_{t+1}}Var_{(CF+AC)}}$	0.276	54% (CF: 42%, AC: 12%)
4	Eq. (4e) or R^2_{Disag}	$\frac{Cov(CF_{t+1},CF)^2}{Var_{CF_{t+1}}Var_{CF} - \frac{Var(CF_{t+1})Cov(CF,AC)^2}{Var(AC)}} + \frac{Cov(CF_{t+1},AC)^2}{Var_{CF_{t+1}}Var_{AC} - \frac{Var(CF_{t+1})Cov(CF,AC)^2}{Var(CF)}} - \frac{2Cov(CF_{t+1},CF)Cov(CF_{t+1},AC)Cov(CF,AC)}{Var_{CF_{t+1}}Var_{CF}Var_{AC} - Var_{CF_{t+1}}Cov(CF,AC)^2}$	0.373	100%

This table presents the manual calculation of R^2 statistics and comparative static adjustments to these R^2 statistics. The "% Change Reconciled" column is calculated as the change in the "Value" column between the given row and row 1 divided by the change between row 1 and row 4. For presentation in this table, *s*ubscript *t* is omitted while *t+1* remains.

Table 9
Test of H4: Revisiting Kim and Kross [2005]

Panel A: Trend Analyses

(1) Year	(2) $R^2_{CFt+1.EARNt}$	(3) $R^2_{RETt.EARNt}$	(4) Cov(CF, CF_{t+1})	(5) Cov(AC_t, CF_{t+1})	(6) σ(CF_{t+1})	(7) σ ($EARN_t$)	(8) Cov(CF_t, RET_t)	(9) Cov(AC_t, RET_t)	(10) σ (RET_t)
1990	0.148	0.160	0.003	-0.001	0.077	0.066	0.006	0.005	0.426
1991	0.130	0.094	0.004	-0.002	0.077	0.068	0.001	0.012	0.641
1992	0.113	0.074	0.004	-0.002	0.079	0.069	0.007	0.001	0.458
1993	0.117	0.055	0.004	-0.002	0.084	0.072	0.004	0.005	0.547
1994	0.099	0.059	0.004	-0.002	0.085	0.073	0.007	0.000	0.401
1995	0.110	0.080	0.004	-0.002	0.088	0.078	0.007	0.007	0.612
1996	0.119	0.057	0.005	-0.002	0.089	0.077	0.009	0.001	0.561
1997	0.100	0.054	0.005	-0.003	0.089	0.077	0.007	0.002	0.538
1998	0.107	0.062	0.004	-0.002	0.086	0.077	0.010	0.001	0.539
1999	0.162	0.027	0.004	-0.002	0.090	0.075	0.011	0.000	0.840
2000	0.094	0.032	0.003	-0.001	0.081	0.082	0.006	0.004	0.679
2001	0.166	0.017	0.004	-0.001	0.077	0.083	0.004	0.003	0.642
2002	0.210	0.054	0.004	-0.001	0.076	0.079	0.007	0.002	0.475
2003	0.192	0.000	0.004	-0.002	0.080	0.076	-0.002	0.001	0.710
2004	0.236	0.028	0.004	-0.002	0.079	0.072	0.005	0.000	0.443
2005	0.234	0.062	0.004	-0.001	0.077	0.076	0.009	-0.001	0.448
2006	0.250	0.026	0.004	-0.001	0.074	0.070	0.003	0.001	0.375
2007	0.201	0.096	0.003	-0.001	0.075	0.073	0.005	0.005	0.446
2008	0.123	0.080	0.003	-0.001	0.072	0.093	0.003	0.005	0.301
2009	0.116	0.000	0.003	-0.001	0.075	0.085	0.004	-0.003	0.737
2010	0.202	0.015	0.004	-0.001	0.075	0.072	0.005	-0.001	0.426
2011	0.270	0.059	0.004	-0.001	0.071	0.069	0.005	0.000	0.339
2012	0.262	0.011	0.003	-0.001	0.068	0.071	0.000	0.003	0.369
2013	0.272	0.004	0.003	-0.001	0.068	0.067	0.001	0.002	0.487
2014	0.226	0.024	0.003	-0.001	0.066	0.065	0.004	-0.001	0.329
2015	0.216	0.072	0.003	-0.001	0.065	0.071	0.003	0.003	0.330
2016	0.212	0.001	0.003	-0.001	0.067	0.074	0.001	-0.002	0.432
2017	0.255	0.035	0.003	-0.001	0.069	0.068	0.006	0.000	0.403
2018	0.333	0.002	0.004	-0.001	0.067	0.073	0.003	-0.002	0.361
2019	0.400	0.035	0.004	0.000	0.068	0.074	0.004	0.001	0.318
Trend	0.007***	-0.002***	-0.00003**	0.00005***	-0.0007***	-0.0001	-0.0002**	-0.0002***	-0.008***

This panel presents annual R^2 values and their components between 1990 and 2019. The "Trend" row presents the coefficient from regressions of each respective column on the "Year" column. ** and *** denote two-tailed significance at the 5 and 1 percent levels.

Table 9
Test of H4: Revisiting Kim and Kross [2005], Continued

Panel B: What Drives the Differences in R^2 Values between Early and Late Sample Periods

Sample Period	Cov(CF_t, CF_{t+1})	Cov(AC_t, CF_{t+1})	$\sigma(EARN_t)$	$\sigma(CF_{t+1})$	$R^2_{CFt+1.EARN}$
1990-1995	0.003886	-0.001879	0.071775	0.082208	0.12
2014-2019	0.003273	-0.000863	0.070555	0.067102	0.25

Adjustment (shown in red)	Formula (Eq. 2)	Value	% Change Reconciled Between 1990-1995 Sample and 2014-2019 Sample
1 Accruals-based (numerator)	$\frac{[Cov(CF_{t+1},CF)_{1990-1995} + Cov(CF_{t+1},AC)_{2014-2019}]^2}{Var_{(CF+AC)_{1990-1995}} Var_{(CF_{t+1})_{1990-1995}}}$	0.26	102%
2 Accruals-based (denominator)	$\frac{[Cov(CF_{t+1},CF)_{1990-1995} + Cov(CF_{t+1},AC)_{1990-1995}]^2}{Var_{(CF+AC)_{2014-2019}} Var_{(CF_{t+1})_{1990-1995}}}$	0.12	3%
3 Cash flow-based (numerator)	$\frac{[Cov(CF_{t+1},CF)_{2014-2019} + Cov(CF_{t+1},AC)_{1990-1995}]^2}{Var_{(CF+AC)_{1990-1995}} Var_{(CF_{t+1})_{1990-1995}}}$	0.05	-42%
4 Cash flow-based (denominator)	$\frac{[Cov(CF_{t+1},CF)_{1990-1995} + Cov(CF_{t+1},AC)_{1990-1995}]^2}{Var_{(CF+AC)_{1990-1995}} Var_{(CF_{t+1})_{2014-2019}}}$	0.17	40%
All adjustments	$\frac{[Cov(CF_{t+1},CF)_{2014-2019} + Cov(CF_{t+1},AC)_{2014-2019}]^2}{Var_{(CF+AC)_{2014-2019}} Var_{(CF_{t+1})_{2014-2019}}}$	0.25	100%

Note: The upper portion of this table presents R^2 values estimated from regressions of future cash flows on earnings and each relevant component of the R^2 for the years 1990-1995 and 2014-2019. The bottom portion of this table demonstrates how the change in each component between the earlier and later periods impacted the R^2 over time. The "% Change Reconciled" column is calculated as the change in the "Value" column between the given row and the 1990-1995 R^2 presented at the top of the table, divided by the total change between the R^2 for the 1990-1995 sample and the 2014-2019 sample. To clearly demonstrate how each reconciling adjustment is made, the "Formula" column presents the relevant calculation that can be replicated using the data in the upper portion of this table. Red text indicates the factor in the formula that is adjusted