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The pricing of earnings and cash flows and an affirmation of accrual accounting

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Abstract Under accrual accounting, earnings add to shareholders' equity. Cash flow generated by a business has no effect on the book value of shareholders' equity but reduces the book value of net assets employed in business operations. In short, accrual accounting rules prescribe that earnings add to shareholder value, but cash flow is irrelevant to the valuation of equity. This paper documents that the stock market prices equity shares according to this prescription. Earnings are priced positively but, given earnings, a dollar more of free cash flow from a business—cash flow from operations minus cash investment—is, on average, associated with approximately a dollar less in the market value of the business and has no association with changes in the market value of the equity claim on the business. Furthermore, controlling for the cash investment component of free cash flow, cash flow from operations also reduces the market value of the business dollar-for-dollar and is unrelated to the changes in market value of the equity.

Keywords Accruals · Cash flow · Accrual accounting

JEL Classification G14 · M40 · M41

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This paper examines a core idea in accounting, drummed into every beginning accounting student: accrual accounting, rather than cash accounting, is appropriate for business reporting. Accounting goes beyond a mere cash book, to report (accrual) earnings rather than cash flow as the measure of valued added. The paper investigates whether common shares are priced in the stock market according to accounting prescriptions on how earnings and cash flows affect shareholders' equity.

To develop an empirical specification that incorporates the prescriptions, the paper first formally lays out how earnings and cash flows relate to shareholders' equity in the accounting system. With a focus on the shareholder, it makes the standard distinction in both valuation theory and accounting between the business and the equity claim on the business. Under accrual accounting, earnings from the business add to both the book value of assets and the book value of the equity claim on those assets. This, of course, is well appreciated. Less appreciated, however, are prescriptions about cash flow that are imbedded in accrual accounting: net cash flow from a business—commonly referred to as free cash flow—has no effect of the book value of the equity (we show) but reduces the book value of business assets, dollar-for-dollar. Accrual accounting treats cash flow not as an addition to business value but as a payout from the business. That payout reduces the value of business without affecting the cum-dividend value of the equity.

The empirical analysis shows that the stock market prices business firms and equity claims on firms according to this prescription. We find that, on average, annual changes in both the market value of the firm and the market value of equity shares are positively related to annual earnings. However, given earnings, changes in the market value of the firm are negatively related to cash flows from the firm. Indeed, a dollar of free cash flow is, on average, associated with approximately a dollar less in market value of the firm, while changes in the market value of equity are unrelated to the free cash flow that business generates. Furthermore, separating out the investment portion of flow free cash flow, we find that the remaining "cash flow from operations" is also associated with lower market value for the firm, dollar-for-dollar, and is unrelated to changes in equity value.

The result with respect to earnings is, of course, not new; the finding of a positive correlation between earnings changes and stock returns in the Ball and Brown (1968) paper is an affirmation of accrual accounting, replicated many times. Dechow (1994) and Dechow et al. (1998), among others, affirm the importance of accruals over cash flows under a variety of conditions. Our analysis explores an additional feature of accounting: not only does accrual accounting promote earnings as the primary valuation attribute (rather than cash flows), but actually treats cash flows as irrelevant to equity valuation. Our empirical analysis affirms.

The result with respect to cash flows may be surprising, for one typically thinks of cash flow as a "good"—more cash flow means higher value—and analysts often recommend stocks of companies that have positive cash flow. However, our results are not surprising when one recognizes that economic theory also affirms the accounting: accrual accounting operates in a way that recognizes Miller and Modigilani (1961) notion of dividend displacement and the complementary notion of dividend irrelevance. Just as dividends, the distribution of cash to shareholders, reduce the equity claim but do not affect the cum-dividend value of equity, free cash flow, the corresponding distribution from the firm (to all claimants), is a dividend from the firm that reduces the value of the firm but does not affect the cum-dividend value of the firm. Because the equity claim is on both the value of the firm and the cash flow, it is unaffected by the cash flow but rather by the cum-dividend value of the firm. In short, accrual accounting honors the foundational principles of modern finance, and the stock market prices firms and equity claims according to these principles.

The results in the paper seemingly conflict with previous research. In Rayburn (1986), Wilson (1987), Dechow (1994), Bowen et al. (1987), Clubb (1995), and Francis et al. (2003), among others, cash flow variables in return regressions load with a positive coefficient, with and without earnings included. The difference revolves around the issue of specification. This paper develops a regression specification quite methodically (in Sect. 1) so the differences are well understood. Indeed, while the pricing of earnings and cash flows is our substantive concern, the issue of specification in capital market research is a subtext. In this respect, the paper responds to the Holthausen and Watts' (2001) criticism that capital markets research in accounting has had little to contribute to normative issues faced by standard setters. With attention to specification—which Holthausen and Watts argue is necessary—we are able to draw conclusions about a very basic normative issue, the use of cash accounting versus accrual accounting for business reporting. Our result in no way nullifies the results in other papers; indeed, we are able to reconcile what look like very different findings to the earlier results.

The ability of earnings to explain changes in market values depends, of course, on how the earnings are measured. Indeed, one expects cash flow to be informative if earnings are poorly measured, and the comparison of cash flow to earnings is a standard diagnostic in earnings quality analysis (see, for example, Sloan 1996; Dechow and Dichev 2002; Dechow et al. 2008). We build specifications that explicitly recognize that cash flows (and dividends) can have information content in response to poor earnings measurement. Nevertheless, using US GAAP earnings measures, we find that cash flows, *on average*, do not explain changes in stock prices. The emphasis that the findings apply on average is important, for GAAP is (presumably) designed for broad application in the cross-section. The average result in no way abrogates the findings that accrual accounting may be deficient and cash flows relevant in particular contexts.

1 Specification of return regressions involving earnings and cash flows

While documenting the relevant correlations, most prior research that relates stock prices and returns to earnings, cash flows, or both does not use pre-specified models. Some exceptions are Jennings (1990), who addresses some specification issues in earnings and cash flows regressions, and Barth et al. (1999), who refer to valuation models to develop regression equations involving earnings and cash flows. In this paper we develop a specification and then put it to the test. The specification is dictated by the accounting structure that produces earnings and cash flows numbers. We first lay out this structure (in Sect. 1.1), then specify pricing equations that incorporate the structure (in Sect. 1.2), which we then take to the data (in Sect. 2). A general discussion of specification of returns regressions containing accounting numbers is in the "Appendix".

1.1 Accounting relations that govern accrual accounting

Accrual accounting, at least nominally, tracks the evolution of shareholders' equity over discrete periods; in each period, accounting calculates a number, earnings, which updates shareholders' equity via the closing entry. We lay out a set of accounting operations that amount to prescriptions that govern the accounting. We start with cash flows.

1.1.1 Cash flow relations

The firm (the business operations) is distinguished from the claims on the firm, as in the typical balance sheet. Correspondingly, cash flows generated by a business (free cash flow) are distinguished from those paid to claimants. The standard cash conservation equation equates the two:

$$\text{Free Cash Flow} = d + F \tag{1}$$

As the analysis focuses on the pricing of common shares, the dividend to common shareholders, d, is distinguished from payments to all other claimants (such as bondholders and preferred stock holders), F. Distributions to debt issuers—by the purchase of financial assets with the cash—are also an application of free cash flow, so F refers to cash payments to net debt holders (debt holders and debt issuers). Dividends, d, are net cash distributions to shareholders (dividends plus stock repurchases less stock issues).[1]

It is common to distinguish the two components of free cash flow, cash from operations (C) and cash investment (I): Free Cash Flow = $C - I$. The distinction between C and I is an accrual accounting issue, however, involving an allocation to periodic income statements that does not bear on net cash generated.[2] To delineate clearly between cash and accrual accounting, our reference will be to the net cash from operations, that is, free cash flow. However, at the end of the paper we will distinguish between C and I to examine the pricing of cash from operations (C) with which previous papers have largely been concerned. So we will denote free cash flow as $C - I$ with the reminder that this refers to the net cash flow from operations.

[1] The statement of cash flows in the United States obeys the cash conservation equation, of course, but the classifications within the statement do not honor the distinction between cash from operations and the disposition of that cash to claimants. For example, cash interest is classified as cash from operations rather than cash paid to debt holders, investment of excess cash in financial assets is treated as investment in operations, and investment in cash is treated as a residual ("change in cash") rather than an investment in operating cash or financial assets (see Nurnberg 2006).

[2] For instance, investment in research and development is treated as cash flow for operations under GAAP while investment in property, plant, and equipment is treated as cash in investing activities only because the latter is capitalized on the balance sheet (and then depreciated), while the former is expensed immediately.

1.1.2 Accrual accounting for the firm

Accrual accounting adjusts free cash flows from operations on the left hand side of Eq. 1 to yield income from operations, as follows:

$$\text{OI} = (C - I) + I + \text{Operating accruals} \tag{2}$$

The adjustments are added to net operating assets on the balance sheet:

$$\Delta\text{NOA} = I + \text{Operating accruals} \tag{3}$$

While Eq. 3 distinguishes between cash investment (like purchases of equipment) and operating accrual components of ΔNOA (like receivables and payables), cash investment is really an accrual that allocates current cash flows to income in future periods. Accordingly, ΔNOA is total accruals, comprised of current cash flows booked to the balance sheet as investments plus other non-cash flows also recorded to the balance sheet.

1.1.3 Accrual accounting for shareholders' equity

As well as tracking net operating assets, accrual accounting tracks net financial obligations (NFO) to net debtholders such that the balance sheet reports the common shareholders' equity (B, for book value) as the residual claim on the net operating assets:[3]

$$B = \text{NOA} - \text{NFO} \tag{4}$$

Thus the updating of the shareholders' equity obeys the relation,

$$\Delta B = \Delta\text{NOA} - \Delta\text{NFO}. \tag{5}$$

The change in NOA can be stated in terms of accrual and cash flow components. As I + operating accruals = OI − (C − I), by Eq. 2, the change in net operating assets in Eq. 3 can be restated as

$$\Delta\text{NOA} = \text{OI} - (C - I). \tag{6}$$

Similarly, the change in net financial obligations is the difference between the net financial expenses (NFE) recorded in the income statement under accrual accounting and cash flow to net debtholders, F: ΔNFO = NFE − F. But $F = (C - I) - d$, by the cash conservation Eq. 1, so

$$\Delta\text{NFO} = \text{NFE} - (C - I) + d. \tag{7}$$

By taking the difference between Eqs. 6 and 7, the change in shareholders' equity is accounted for:

[3] The accounting for net financial obligations adjusts the cash flow, F, to report net financial expenses, NFE in the income statement. The difference between NFE and F is reported on the balance sheet: ΔNFO = NFE − F. In more detail, NFE = $F - D$ + Financing accruals, where D is payments of principal (amounts borrowed) net of receipts of principal. Accordingly, ΔNFO = $-D$ + Financing accruals. Combining the accounting for operations and financing activities, Earnings (available to common) = OI − NFE.

$$\begin{aligned}\Delta B &= \mathrm{OI} - (C - I) - \mathrm{NFE} + (C - I) - d \\ &= \mathrm{OI} - \mathrm{NFE} - d \\ &= \mathrm{Earnings} - d,\end{aligned} \tag{8}$$

where earnings are comprehensive earnings. Equation 8 is, of course, the clean-surplus equation for updating shareholders' equity, forced by the balance sheet Eq. 5 and the accounting for net operating assets and net financial obligations in Eqs. 6 and 7.[4]

1.1.4 The normative prescriptions and the economics of cash flows

As fixed relations, the accounting relations in Eqs. 1–8 are normative prescriptions that direct how one accounts for equity value. In particular, Eqs. 6 and 7 embed presumptions about the relevance of earnings and free cash flow for determining equity value. By Eq. 6, operating income increases net operating assets, but free cash flow reduces net operating assets; indeed free cash flow reduces net operating assets dollar for dollar. By Eq. 7, free cash flow also reduces net financial obligations; free cash flow, net of dividends, reduces net indebtedness dollar for dollar. But, as shown in Eq. 8, free cash flow drops out of the calculation of shareholders' equity: accrual accounting treats free cash flow as if it is irrelevant to the value of equity.

These prescriptions are at the heart of accrual accounting; they articulate the exception that accrual accounting takes to cash accounting. They are, therefore, worthy of validation against the actual equity pricing in the stock market, and our empirical analysis does so. Specifically, it asks whether, given operating income, the stock market prices free cash flow as a one-to-one reduction of the value of the firm, as in Eq. 6 and, given earnings, the market prices free cash flow as having no effect on the value of shareholders' equity, as in Eq. 8.

The structure described accords with the economics of valuation. A basic principle of financial economics states that, given that markets exist where claims can be traded efficiently, the timing of cash flows is irrelevant to value. The irrelevance of cash flows corresponds to the notion of dividend irrelevance but with reference to cash flows pertaining to the firm rather than the shareholder. Accounting Eq. 8 rules that earnings are not affected by dividends, but the book value of equity is reduced by dividends, dollar-for-dollar, with cum-dividend book value unaffected by dividends. Ohlson (1995) articulates how this accounting is in accordance with the dividend-irrelevance concept and complementary dividend displacement concept of Miller and Modigilani (1961), and Penman and Sougiannis

[4] The system characterized by the eight equations here corresponds to GAAP accounting but (with equity valuation in mind) with a strict proprietorship perspective and a clean distinction between accruals and cash flows that pertain to operating and financing activities. The differences between GAAP and the system here is one of classification of particular items. GAAP does not invoke a strict proprietorship view and makes only an approximate distinction between cash flows and earnings generated by operating activities and those involved in financing activities. GAAP financial statements can be reformulated on a comprehensive income basis with items classified as either operating or financial activities, so the lay out here adds no additional content to GAAP accounting; it is merely a repackaging. See Penman (2010), Chaps. 7 and 9. Our empirical analysis uses GAAP numbers but with this repackaging.

(1997) confirm empirically that the accounting for earnings and book values exhibits the dividend irrelevance and displacement properties. The presentation above depicts free cash flow as a "dividend" from the operating activities. Free cash flow reduces the book value of the operations, dollar-for-dollar, in Eq. 6, and this dividend is paid to the net debt and equity claimants, in Eqs. 7 and 8. Equations 7 and 8 also show that the share of each of these claimants in the cash flow reduces their claim, dollar-for-dollar. (For a pure equity firm with no net debt, free cash indeed equals dividends to shareholders.). And in the calculation of the change in shareholders' equity cum-dividend, in Eq. 8, free cash flow is irrelevant. Feltham and Ohlson (1995) build an accounting-based valuation model (again consistent with Miller and Modigliani principles) from these accounting relations.

We proceed now to build a regression specification to answer these questions. But first, recognize three points.

First, it is understood that total operating income and free cash flow converge as the period over which they are measured increases; accruals only affect timing. Dechow (1994) and Charitou and Clubb (1999) examine earnings and cash flows over long return windows. Our concern is with periodic (annual) reporting and the contemporaneous repricing of shares over annual periods: does the annual updating of shareholders' equity according to the rules of accrual accounting correspond to the way that the market updates shareholder value?

Second, as an empirical matter, free cash flows may be correlated with stock returns because they are correlated with other information. Indeed, the "information-content-of-dividends hypothesis" posits an informational role for dividends even though the timing of dividends, in the Miller and Modigliani sense, is irrelevant. The same point applies to free cash flows.

Third, the equations that govern the accounting pertain to structure; as purely a matter of algebra, they say nothing about how the accruals—and thus earnings and book values—are measured. That is a matter of principles of measurement (of historical cost accounting or fair value accounting as a broad measurement issue, for example, or the estimation of allowances for bad debts as a specific issue). Indeed, one can conjecture financial reports where the quality of the accrual measurement is so poor as to make earnings meaningless and cash flow the only quality information.

With respect to the third point, we now develop a regression model that connects the pricing of equity in the market to the contemporaneous accounting for equity value but in such a way that incorporates measurement. With respect to the second point, we show how the measurement of earnings not only determines the pricing of those earnings but also determines whether dividends or cash flows provide additional information content.

1.2 Specification of return regression models involving earnings and cash flows

1.2.1 Accounting relations and regression specifications

The "Appendix" to the paper makes that point that, in examining the value implications of an accounting number, regression specifications must reflect the accounting relations that govern the number, for those relations contain the normative statement as to how the number relates to shareholder value. We now develop regression specifications that incorporate the accounting relations above.

Book value of equity is the final calculation in the accounting system, by Eq. 8, so it is the natural starting point for the regression modeling. Indeed, if accounting measurement were such as to produce a book value number equal to market value, the analysis would stop there, and neither earnings nor cash flows would add information. We begin the development with the recognition that, due to accounting measurement, book value can differ from the (market) value of equity, thus admitting an informational role for earnings, cash flows, or both. Introducing the time and firm subscripts that were understood above, the idea that the balance sheet measures equity price, P_{it}, with error is stated as

$$P_{it} = B_{it} + (P_{it} - B_{it}),$$

and

$$P_{it} - P_{it-1} = \Delta B_{it} + (P_{it} - B_{it}) - (P_{it-1} - B_{it-1})$$

This expression describes the updating of book value, ΔB_{it}, as occurring contemporaneously with the change in the share price and thus incorporates the ultimate step in the periodic accounting updating in Eq. 8. By Eq. 8,

$$P_{it} - P_{it-1} = \text{Earnings}_{it} - d_{it} + (P_{it} - B_{it}) - (P_{it-1} - B_{it-1}). \tag{9}$$

This tautology states that the change in market value is always equal to earnings, net of dividends, plus the change in the market premium over book value, as recognized in Easton et al. (1992), for example. If there is no change in premium, then the change in market price plus dividend (that is, the stock return) must equal earnings.

Dividing through by equity price at the beginning of the period,

$$\frac{P_{it} - P_{it-1}}{P_{it-1}} = \frac{\text{Earnings}_{it}}{P_{it-1}} - \frac{d_{it}}{P_{it-1}} + \frac{B_{it-1}}{P_{it-1}} + \frac{P_{it} - B_{it}}{P_{it-1}} - 1. \tag{9a}$$

Accordingly, with an initialization on beginning-of-period book value, a complete accounting for periodic price changes involves an accounting for earnings, dividends, and an accounting for the premium (unrecorded goodwill) at the end of the period. Correspondingly, information that explains stock returns, other than the included accounting information, must inform about the end-of-period premium. For the moment, this "other information" is left unidentified in the disturbance of a regression equation with coefficients (multipliers on the accounting numbers) specified such that the disturbance is mean zero:

$$\frac{P_{it} - P_{it-1}}{P_{it-1}} = a + b_1 \frac{\text{Earnings}_{it}}{P_{it-1}} + b_2 \frac{d_{it}}{P_{it-1}} + b_3 \frac{B_{it-1}}{P_{it-1}} + \varepsilon_{it}. \tag{10}$$

(To this base-line regression, we later introduce cash flow variables.) The regression coefficients take on values based on the correlation of the included variables with the disturbance, that is, their ability to explain changes in premiums.[5] As a

[5] From Eq. 9a, the disturbance reflects the end-of-period premium, not the change in premium. However, as the beginning premium is in the regression (with the beginning-of-period book-to-price ratio), the disturbance is effectively the ending premium relative to the beginning premium.

benchmark, $b_1 = 1$, and $b_2 = -1$, but only if earnings and dividends are uncorrelated with changes in premiums. A $b_1 > 1$ implies an earnings multiplier, and that multiplier means that earnings (relative to beginning-of-period price) explain changes in premiums.

1.2.2 Features of the regression specification

This regression model has the following features that bear on the interpretation on the empirical results. They are numbered for later reference.

First, the division by P_{it-1} initializes all variables on the market price at the beginning of the period, so all time t variables pertain to the updating of that valuation and accordingly are evaluated relative to the expectation of those variables contained in the beginning-of-period price (see Ohlson and Shroff 1992).

Second, the specification recognizes earnings as the primary accounting variable that explains price changes, for earnings update equity, by Eq. 8. This point has been emphasized in the discussion of levels versus changes specifications, in Easton and Harris (1991) for example. Cash flow is excluded from the specification, for cash flow does not affect owners' equity under accrual accounting.

Third, the tautology 9 that is the starting point for the returns modeling is an alternative statement, in accounting terms, of the Campbell (1991) tautology: stock returns are composed of "cash flow news," expected returns, and changes in expected returns. The variable, $\frac{\text{Earnings}_{it}}{P_{it-1}}$, is the accrual accounting rendition of cash flow news. However, both included variables and the disturbance can incorporate expected returns as well as information about cash-flow payoffs and changes in expected returns. If particular, the earnings yield variable, $\frac{\text{Earnings}_{it}}{P_{it-1}}$, may reflect risk and thus the required return, as well as news about payoffs. While many papers in capital market research specify risk-adjusted returns, the specification here recognizes that risk can be built into accounting measurement and thus the specification calls for raw returns (unadjusted for risk).[6]

Fourth, the tautology in 9 conveys the idea that other information (besides earnings) explains price changes because of the way in which earnings are measured; earnings measurement creates other information. Other information is relevant if it explains the change in premium (see Shroff 1995) but, as earnings explain the change in book value, the change in price relative to the change in book value—the change in the premium—reflects the way that earnings are measured. If earnings are measured such as to add to price dollar-for-dollar ($b_1 = 1$), there can be no change in premium and no role for other information; such is the case with mark-to-market (or "fair value") accounting. If, alternatively, earnings are sufficient to forecast the future earnings stream ("permanent earnings"), there again can be no role for other information: earnings takes on a multiplier ($b_1 > 1$) and this multiplier fully explains the change in premium.

[6] Ball (1978) nominates the earnings yield as an indicator of expected returns, and standard formulations show that the *P*/*E* ratio (and *E*/*P* ratio) is, in part, determined by the expected return. Ohlson (1999) models conservative accounting as a measurement principle that incorporates risk in the accounting numbers.

Interpretation is further enhanced by recognizing what a change in premium is. By the residual income valuation model, premiums are expected earnings to be added to book value in the future. Thus a change in premium is growth in expected earnings to be added to book value. That growth can be explained by current earnings (with a multiplier) indicating higher future earnings or by other information. Accordingly, given $b_2 = -1$, a variable added to the regression—such as free cash flow—provides additional information only if it indicates earnings growth over that indicated by a multiplier, $b_1 > 1$, applied to earnings.

Dividends, the cash flow to shareholders included in the regression, serve to illustrate the point. Dividends reduce book value dollar-for-dollar. If they also reduce price dollar-for-dollar (as they do under the Miller and Modigliani dividend displacement property), they have no effect on premiums. Thus the benchmark, $b_2 = -1$. If the coefficient differs from -1, "dividend signaling" is implied, but dividends have information content only because of the imperfections of earnings measurement that induces a changes in premium.

Fifth, Eq. 9 holds irrespective of whether the market is efficient in incorporating the implications of information. If, for example, earnings explains the change in equity value perfectly but the market misprices the earnings (the market "deviates from fundamentals"), there must be a change in the premium. Accordingly, a change in the premium and the disturbance in Eq. 10 can be due to earnings being an imperfect summary of all factors that affect returns or to the market's mispricing of earnings.

Sixth, the beginning-of-period book-to-price ratio, $\frac{B_{it-1}}{P_{it-1}}$, has an initializing role in the regression, with alternative interpretations:

(a) $\frac{B_{it-1}}{P_{it-1}}$ initializes on net assets on the balance sheet that may forecast subsequent earnings. Thus $\frac{B_{it-1}}{P_{it-1}}$ may be correlated with $\frac{\text{Earnings}_{it}}{P_{it-1}}$ in the regression and so have explanatory power, even though unconditionally it is uncorrelated with returns (see Ohlson 2005). $\frac{B_{it-1}}{P_{it-1}}$ is determined by how both book values and earnings are measured, and this measurement can introduce a correlation between book values and earnings.[7] The initialization controls for this measurement.

(b) $\frac{B_{it-1}}{P_{it-1}}$ may indeed predict returns unconditionally. Following the third point above, the book-to-price ratio may proxy for risk and expected returns, as conjectured by Fama and French (1992). If so, the specification controls for these expected returns in the cross section.

(c) Pertinent to the fifth point above regarding market inefficiency, book-to-price at $t-1$ predicts abnormal returns during period t—the alternative conjecture to that of Fama and French—so $\frac{B_{it-1}}{P_{it-1}}$ initializes for the mispricing of book values at the beginning of the return period.

[7] For example, low book-to-price ratios indicate conservative accounting which, given growth in investment, depresses earnings (included in the regression), creates earnings growth, and increases premiums. Penman (1996) documents a positive correlation between book-to-price ratios and earnings-to-price ratios, consistent with conservative accounting (with investment growth) depressing both the earnings yield and book-to-price variables in the regression.

The specification does not include free cash flow, because accrual accounting so prescribes. Adding free cash flow to the regression facilitates a test of whether, given accrual earnings, free cash flow is indeed irrelevant to the pricing of equity:

$$\frac{P_{it} - P_{it-1}}{P_{it-1}} = a + b_1 \frac{\text{Earnings}}{P_{it-1}} + b_2 \frac{d_{it}}{P_{it-1}} + b_3 \frac{B_{it-1}}{P_{it-1}} + b_4 \frac{(C-I)_{it}}{P_{it-1}} + \varepsilon_{it} \tag{11}$$

If free cash flows are irrelevant for value, $b_4 = 0$. As an empirical matter, free cash flow can, of course, have information content but only because of imperfections in the measurement of accrual earnings. If free cash flow has information content it must explain changes in premiums (and the earnings growth implied) that is not indicated by earnings and its multiplier, b_1. We have no priors on this, but one might reasonably conjecture that a firm with more cash flow might have more expected growth.[8]

1.2.3 Return regressions for the firm

The regressions developed above pertain to the pricing of the equity. Corresponding regressions—that provide further insights about the pricing of cash flows—can be developed for the operations. We assume that market values of net financial obligations are equal to their book values. This is a standard working assumption and, indeed, many financial assets are now marked to market.[9] Accordingly, $P_{it}^{\text{NOA}} = P_{it} + \text{NFO}_{it}$ where P_{it}^{NOA} is the market value of the net operating assets (firm value or enterprise value).

Recognizing that the market value of operations can differ from their book value,

$$P_{it}^{\text{NOA}} = \text{NOA}_{it} + (P_{it}^{\text{NOA}} - \text{NOA}_{it})$$

and

$$\Delta P_{it}^{\text{NOA}} = \Delta\text{NOA}_{it} + \Delta(P_{it}^{\text{NOA}} - \text{NOA}_{it}).$$

But, by Eq. 6, $\Delta\text{NOA}_{it} = \text{OI}_{it} - (C - I)_{it}$. Deflating by the beginning market value of the operations,

$$\frac{P_{it}^{\text{NOA}} - P_{it-1}^{\text{NOA}}}{P_{it-1}^{\text{NOA}}} = \frac{\text{OI}_{it}}{P_{it-1}^{\text{NOA}}} - \frac{(C-I)_{it}}{P_{it-1}^{\text{NOA}}} + \frac{\text{NOA}_{it-1}}{P_{it-1}^{\text{NOA}}} + \frac{P_{it}^{\text{NOA}} - \text{NOA}_{it}}{P_{it-1}^{\text{NOA}}} - 1, \tag{12}$$

and the regression equation that explains the change in the market value of the operations takes the form,

$$\frac{P_{it}^{\text{NOA}} - P_{it-1}^{\text{NOA}}}{P_{it-1}^{\text{NOA}}} = \alpha + \beta_1 \frac{\text{OI}_{it}}{P_{it-1}^{\text{NOA}}} + \beta_2 \frac{(C-I)_{it}}{P_{it-1}^{\text{NOA}}} + \beta_3 \frac{\text{NOA}_{it-1}}{P_{it-1}^{\text{NOA}}} + \varepsilon_{it} \tag{13}$$

[8] Clubb (1996) shows that the Feltham and Ohlson (1995) model implies that free cash flow does not convey incremental information to operating income if the accounting is unbiased but does so under conservative accounting (that induces changes in premiums).

[9] The regressions use changes in prices, so an error common to both P_{it}^{NOA} and P_{it-1}^{NOA} will not affect the calculation.

This regression has the same structure as Eq. 10, with operating income instead of earnings and the dividend from operations (free cash flow) instead of the dividend to shareholders. The incoming price-to-book ratio is now that for operations, the enterprise (or unlevered) price-to-book ratio. If free cash flow has information content such that $\beta_2 \neq -1$, it must explain a change in premium (for operating activities), that is growth in operating income not explained by the multiplier, β_1, applied to current operating income.

2 Empirical analysis: contemporaneous associations

Regression Eqs. 10, 11, and 13, were estimated from the cross section for each year, 1963–2001. All NYSE and AMEX listed firms on the COMPUSTAT annual database with the requisite financial statement data were included, both survivors and nonsurvivors, with the exception of financial firms. Firms for which COMPUSTAT indicates an acquisition in any given year were also excluded, to avoid pooling accounting that violates clean-surplus accounting. Firms with negative book values and negative net operating assets were retained. The sample consists of 54,759 firm years, or 97.4% of the eligible nonfinancial firms listed on COMPUSTAT. In estimating regression equations, however, we rejected firms with the top and bottom one percent (in the data pooled over all years) of each variable included in the regressions. Accordingly, 51,673 firm years were involved in the estimations (with a slight variation over the alternative regression specifications), with the number of firms per year ranging from 338 in 1963 to 1,798 in 1974. Results were not particularly sensitive to alternative outlier treatments.

Annual accounting variables included in the specifications were calculated as in the "Appendix" to Nissim and Penman (2001). For the contemporaneous regression results reported below, annual changes in share prices were calculated over the fiscal year so as to align dividends (going ex) with the prices and book values they affect. As the final accounting report for a year is published with some delay, this does not precisely align the pricing period with the reporting period, though much of the accounting information is available through quarterly reports and analysts' forecasts prior to the end of the fiscal year. The analysis was repeated with price changes calculated over a year beginning 3 months after fiscal-year end, with annual earnings reported and dividends paid over that period as dependant variables. This procedure aligns price changes with earnings reported but does not align earnings, book values, and dividends in time. Results were similar to those reported here but with lower coefficients estimated on earnings and lower R^2 values.

Table 1 summarizes cross-sectional Pearson and Spearman rank correlations between the variables of interest. The reported numbers are means of cross-sectional correlations estimated for each year of the sample period. Price-deflated free cash flows and operating income are not highly correlated, indicating their information content (if any) is quite different. While price-deflated earnings and operating income are positively correlated with contemporaneous stock price changes and changes in the price of operations, respectively, free cash flows have near-zero or negative correlation with these price changes. The incoming book-to-price ratio

Table 1 Mean correlations between variables under investigation. Pearson correlations above and Spearman correlations below the main diagonal, 1963–2001

	$(P_t - P_{t-1})/P_{t-1}$	$(P_t^{NOA} - P_{t-1}^{NOA})/P_{t-1}^{NOA}$	$\text{Earnings}_t/P_{t-1}$	d_t/P_{t-1}	$\text{OI}_t/P_{t-1}^{NOA}$	$(C-I)_t/P_{t-1}^{NOA}$	B_{t-1}/P_{t-1}	$\text{NOA}_{t-1}/P_{t-1}^{NOA}$
$(P_t - P_{t-1})/P_{t-1}$		0.928	0.431	0.054	0.416	0.082	0.079	0.064
$(P_t^{NOA} - P_{t-1}^{NOA})/P_{t-1}^{NOA}$	0.574		0.410	0.097	0.437	0.091	0.082	0.072
$\text{Earnings}_t/P_{t-1}$	0.279	0.165		0.332	0.883	0.197	0.284	0.259
d_t/P_{t-1}	−0.026	0.004	0.249		0.256	0.164	0.235	0.222
$\text{OI}_t/P_{t-1}^{NOA}$	0.323	0.321	0.812	0.216		0.146	0.213	0.170
$(C-I)_t/P_{t-1}^{NOA}$	0.006	−0.014	0.119	0.126	0.082		0.156	0.153
B_{t-1}/P_{t-1}	0.081	0.037	0.043	0.164	0.082	0.093		0.934
$\text{NOA}_{t-1}/P_{t-1}^{NOA}$	0.059	0.043	0.062	0.220	0.104	0.092	0.892	

The table reports the mean of 39 estimates of cross-sectional correlations for each year of the sample period. Variables (denominated by beginning-of-period equity price per share, P_{t-1}, or the price of operations, P_{t-1}^{NOA}) are defined as follows

$(P_t - P_{t-1})/P_{t-1}$: Change in equity price per share for period t

$(P_t^{NOA} - P_{t-1}^{NOA})/P_{t-1}^{NOA}$: Change in the value of operations for period t

$\text{Earnings}_t/P_{t-1}$: Earnings per share for period t

d_t/P_{t-1}: Dividends per share for period t

$\text{OI}_t/P_{t-1}^{NOA}$: Operating income for period t

$(C-I)_t/P_{t-1}^{NOA}$: Free cash flow for period t

B_{t-1}/P_{t-1}: Book-to-price ratio for equity at $t-1$

$\text{NOA}_{t-1}/P_{t-1}^{NOA}$: Book-to-price ratio for operations at $t-1$

(levered and unlevered) has some positive correlation with subsequent price changes, consistent with the "book-to-market effect," but are also positively correlated with subsequent earnings, consistent with accounting measurement affecting both book-to-price ratios and earnings yields in the same direction. Dividends are positively correlated with earnings and with free cash flows, as one expects, but have little correlation with contemporaneous price changes.

Our interest, however, is not in these unconditional correlations but in how the variables are evaluated jointly in the specifications dictated by accounting relations.

2.1 Testing the specified regression models

Table 2 summarizes results from estimating regression models (10) and (11) for each of the 39 years, 1963–2001, with all variables on a per-share basis. The table gives the mean of the coefficients estimated for each year, along with *t*-statistics assessed relative to zero and calculated with standard errors estimated from the time series of coefficients.[10] (In the commentary that follows, the significance of *t*-statistics is assessed at the 95% confidence level.) Average adjusted R^2 values are also given in the table. Under each *t*-statistic is the percentage of the 39 estimated coefficients that are positive. Given the number of cross-sections, the proportion of positive coefficients is approximately normal with mean of 50% and standard deviation of 8%, under the null hypothesis that the median coefficient is zero. Thus, proportions above (below) 66% (34%) are significantly different from zero at the 5% level. The table also reports mean coefficients and mean R^2 for subperiods indicated, to assess the robustness of the estimates overtime.

The mean estimated intercept in Panel A is not significantly different from zero, indicating that other information outside the included variables have mean zero implications for price changes. The b_1 estimates indicate that earnings are positively priced. As with regressions estimated with earnings levels in prior research (in Easton and Harris 1991; Easton et al. 1992, for example), the mean coefficient of 1.67 is well over one; a *t*-statistic comparing the mean estimate with 1.0 rather than zero is 3.35. Estimates range from 1.03 to 3.47 over subperiods, with the lowest coefficients and R^2 in more recent periods. Thus earnings takes on a multiplier that partially explains changes in premiums.

While the unconditional correlations between dividends and price changes in Table 1 are positive (but low), the mean coefficient on dividends in Table 2 is negative, and significantly so, with consistent results for subperiods. This observation confirms that accounting according to the clean surplus calculation in Eq. 8—which treats earnings as an increase in equity value but dividends as a

[10] Variables in Table 2 are on a per-share basis. Accordingly, dividends are cash dividends per share, as in most studies that investigate the information content of dividends. Results were similar when regressions were run on a total dollar basis, with dividends equal to cash dividends plus stock repurchases net of share issues. The latter is strictly appropriate, for returns do not necessarily reconcile to earnings and the change in premium according to Eq. 9 on a per-share basis. Results were also similar when annual coefficient estimates are weighted, in the averaging over years, by the square root of the number of observations for that year. Changes in interest rates affect price changes differentially for firms in the same yearly regression but with different fiscal year ends. However, results were similar when only December 31 fiscal-year-end firms were included each year.

Table 2 Mean estimates of regressions relating annual equity price changes to contemporaneous earnings, dividends, and free cash flows, 1963–2001

Panel A: Regression without free cash flows

$\frac{P_{it}-P_{it-1}}{P_{it-1}} = a + b_1\frac{\text{Earnings}_{it}}{P_{it-1}} + b_2\frac{d_{it}}{P_{it-1}} + b_3\frac{B_{it-1}}{P_{it-1}} + \varepsilon_{it}$

	a	b_1	b_2	b_3	Adj. R^2
1963–2001	0.05	1.67	−2.98	0.08	0.13
t-Statistics	(1.46)	(8.35)	(−5.64)	(5.10)	
Percent +		97%	13%	85%	
1996–2001	0.06	1.03	−2.04	0.09	0.07
1991–1995	0.14	1.12	−3.64	0.14	0.08
1986–1990	0.00	1.17	−1.40	0.08	0.13
1981–1985	0.03	1.38	−2.39	0.15	0.14
1976–1980	0.18	1.32	−3.34	0.01	0.19
1971–1975	−0.09	1.26	−1.00	0.03	0.14
1963–1970	0.03	3.47	−5.62	0.06	0.18

Panel B: Adding free cash flows to the regression

$\frac{P_{it}-P_{it-1}}{P_{it-1}} = a + b_1\frac{\text{Earnings}_{it}}{P_{it-1}} + b_2\frac{d_{it}}{P_{it-1}} + b_3\frac{B_{it-1}}{P_{it-1}} + b_4\frac{(C-I)_{it}}{P_{it-1}} + \varepsilon_{it}$

	a	b_1	b_2	b_3	b_4	Adj. R^2
1963–2001	0.04	1.69	−2.88	0.08	−0.03	0.14
t-Statistics	(1.37)	(8.38)	(−5.62)	(4.96)	(−1.12)	
Percent +		97%	82%	13%	46%	
1996–2001	0.06	1.05	−2.00	0.08	−0.01	0.07
1991–1995	0.13	1.11	−3.41	0.15	−0.06	0.08
1986–1990	−0.01	1.18	−1.38	0.09	−0.05	0.13
1981–1985	0.03	1.40	−2.38	0.15	0.03	0.14
1976–1980	0.17	1.38	−3.26	0.00	−0.01	0.20
1971–1975	−0.08	1.27	−0.98	0.02	0.11	0.15
1963–1970	0.02	3.49	−5.42	0.06	−0.16	0.20

The table summarizes 39 cross-sectional regressions for the years 1963–2001. Reported coefficients are means of the 39 estimates. The *t*-statistics are the ratio of the mean cross-sectional coefficients relative their standard errors estimated from the time series of coefficients. "Percent +" is the percentage of the 39 cross-sectional coefficient estimates that are positive. The adjusted *R*-squares are the mean of the 39 estimates. Panel A involves 52,135 firm-year observations, Panel B 51,673 observations. Variables are defined in the notes to Table 1

reduction of value—is in accordance with the market's pricing. The predicted size of the coefficient is −1 if dividends do not provide information. The mean coefficient of −2.98 is inconsistent with a tax effect that implies prices drop by less than a dollar for each dollar of dividends. The coefficient can be attributed to dividend signaling, but the result suggests a negative rather than a positive signal suggested by most dividend signaling stories.[11] The informational interpretation from the fourth point above—dividends are negatively correlated with changes in premiums and so imply lower earnings growth—suggests that high payout (low retention) firms do not have investment opportunities that yield growth in earnings. These points aside, the results in Table 2 resolve rather unambiguously the issue of the relevance of accrual earnings versus cash flows to equity: the market prices earnings as additions to equity, in contrast to the cash flows to shareholders (dividends) that reduce equity. In short, pricing accords with accounting Eq. 8.

Panel B of Table 2 adds free cash flow—the net cash flow from operations rather than the cash flow to shareholders—to the regression, for a test of the hypothesis that $b_4 = 0$ in regression model (11). The results support the hypothesis: given earnings and dividends, price changes are not on average related to the amount of cash flow that firms generate from operations. The mean estimated coefficient on free cash flow is -0.03, not significantly different from zero and varies around zero for the subperiods. The presumption of the irrelevance of free cash flows underlying the accrual accounting models is consistent with how the market prices firms. Furthermore, following the fourth interpretative point in the last section, free cash flows do not inform about earnings growth, on average; more free cash flow does not imply an ability to grow earnings.

Table 3 gives the results from estimating regression model (13) involving the pricing of the operations. The numbers here are on a total dollar basis, not per-share, to ensure they are free of leverage effects. Just as total earnings explain changes in the market value of equity, so does the operating income component of earnings explain changes in the market value of operations, and with an average multiplier of 2.21. Free cash flow, however, reduces the market value of operations almost dollar-for-dollar. The mean estimated coefficient on free cash flow, β_2, is -1.10, significantly different from zero. Assessed relative to -1.0, the t-statistic is -2.17 (the reason will become apparent shortly). The mean coefficient is negative and close to -1.0 in all subperiods, including those where interest rates varied significantly (1976–1985) where our assumption that net debt on the balance sheet is at market value could be questioned. Although the mean coefficient is a little less than the -1.0 benchmark, we conclude that, on average, the market prices free cash flow as a distribution from the operations, not as an attribute that adds value to the operations. In short, pricing accords with the accounting in Eq. 6.

There is a complementary interpretation of the estimated coefficients. As, by accounting operations in Eqs. 2 and 3, $\mathrm{OI} = C - I + \Delta\mathrm{NOA}$, then

[11] Adding the change in dividends, $\Delta d_{it}/P_{it-1}$, to the regression suggests a positive signal. The mean coefficient on the dividend change was 4.60, with a t-statistic of 9.61, with little change in the other coefficient estimates, including that on the dividend. The dividend change variable effectively adds $d_{it\text{-}1}/P_{it-1}$ to the regression. Given that a time $t-1$ variable should not predict time t price changes in an efficient market, this result suggests that d_{it-1}/P_{it-1} adds to the regression as a predictor of d_{it}/P_{it-1}, so isolating the signal component of d_{it}. Note that the specification assumes that dividends are paid at the end of the year (at time t). So, with dividends paid throughout the year, the measured dividends understate their end-of-period value through compounding. This amount is small for most firms so, while one would expect the error to result in a coefficient less than -1.0, the measurement error cannot explain the size of the negative coefficient.

Table 3 Mean estimates of regressions relating changes in the market value of operations to contemporaneous operating income and free cash flow, 1963–2001

$\frac{P_{it}^{NOA}-P_{it-1}^{NOA}}{P_{it-1}^{NOA}} = \alpha + \beta_1 \frac{OI_{it}}{P_{it-1}^{NOA}} + \beta_2 \frac{(C-I)_{it}}{P_{it-1}^{NOA}} + \beta_3 \frac{NOA_{it-1}}{P_{it-1}^{NOA}} + \varepsilon_{it}$

	α	β_1	β_2	β_3	Adj. R^2
1963–2001	0.01	2.21	−1.10	−0.01	0.22
t-statistics	(0.37)	(12.63)	(−24.77)	(−0.62)	
Percent +		100%	0%	49%	
1996–2001	0.02	1.87	−1.12	0.03	0.12
1991–1995	0.10	1.91	−1.22	0.01	0.15
1986–1990	−0.03	1.59	−1.05	0.05	0.23
1981–1985	0.01	1.88	−0.99	0.04	0.19
1976–1980	0.11	1.80	−1.03	−0.10	0.33
1971–1975	−0.09	1.68	−0.83	0.01	0.25
1963–1970	−0.03	3.82	−1.31	−0.10	0.28

See notes to Table 2. Variables are defined in the notes to Table 1. The estimates are made from 52,419 firm-year observations

$$\beta_1 \mathrm{OI} + \beta_2 (C - I) = \beta_1 \Delta \mathrm{NOA} + (\beta_1 + \beta_2)(C - I)$$

(with subscripts and the price deflation understood). Accordingly, the coefficients can be interpreted as the pricing of the ΔNOA (total accruals) and free cash flow components of operating income. The mean estimate of $\beta_1 + \beta_2$ in Table 3 is 1.11, a little over a dollar. Thus the estimates in Table 3 can be interpreted as an additional dollar of net operating assets adding \$2.21 of value, on average, but net cash from operations adding \$1.11. The ΔNOA component of earnings amounts to growth in operations on the balance sheet that begets earnings in the future, so is priced at a multiplier greater than one.

In summary, Tables 2 and 3 show that, while earnings and accruals are priced with a multiplier, free cash flow is not, on average, relevant to the pricing of equity and reduces the price of operations (the firm) a little more than one dollar for each dollar of cash flow. Dividends displace equity value and free cash flow displaces the value of operations. These observations agree with the prescriptions of accrual accounting.

2.2 Partitioning on free cash flow

Presumably, accrual accounting is designed to have broad application. The results thus far document average or typical relationships between prices and accounting numbers, and so are appropriate for an affirmation of GAAP accrual accounting for general application. One might, however, conjecture cases where cash flow is weighted differently from the average, either as a diagnostic for the quality of the accrual earnings for indicating growth or an indication of the market's mispricing of accruals. The work on the differential persistence of cash flows and accruals in Ali (1994), Sloan (1996), Cheng et al. (1996), and Fairfield et al. (2003b) suggests the former; the ability of the cash flows and accrual composition of earnings to predict stock returns in Sloan (1996), Fairfield et al. (2003a), and Richardson et al. (2006) suggests the latter.

We investigate just one partitioning of the data that is generic to the issue at hand. A proponent of "cash in king" might insist that the ability to generate cash is particularly valued. It is not uncommon, for example, for analysts to recommend firms that can generate "good cash flow," with the argument that the cash flow implies more growth. Table 4 gives the opposite impression. This table presents results from estimating the Table 3 regression each year, but for ten groups formed by ranking firms on free cash flow generated, $(C - I)_{it}/P_{it-1}$. Group 1 consists of firms with the lowest $(C - I)_{it}/P_{it-1}$ and group 10 firms with the highest.

The means of the dependent and independent variables in the regression that are reported in the table are quite instructive. Mean free cash flow increases, by construction, from a (negative) −37.6 cents per dollar of price in portfolio 1 to 26.1 cents in portfolio 10. However, price deflated operating income varies little over the portfolios. As the difference between mean operating income and mean free cash flow is ΔNOA_{it} (the total accruals), the growth in net operating assets and free cash flow composition of income thus differs considerably across portfolios, and growth in net operating assets is negatively correlated with free cash flow. That is, firms with negative free cash flow tend to have high growth in net operating assets, and the converse is true for firms with high (positive) free cash flow. Mean price changes, however, are negatively correlated with free cash flow but positively correlated with growth in NOA. Considerable growth in net operating assets (in portfolios 1 through 3) is associated with relatively large price appreciation even though mean free cash flow is negative.

Despite the differing accrual and cash flow components of operating income, the coefficients on operating income are similar over all portfolios (though lower for portfolio 1) and similar to the mean of 2.21 for the pooled estimation in Table 3; over a wide range of free cash flow realizations, accrual income is priced similarly. The variance inflation factors (VIF), which take of a value of 1.0 if an independent variable is orthogonal to the other regressor variables, indicate that, within portfolios, operating income and free cash flows are not highly correlated, similar to the correlation in the pooled data in Table 1. Potentially, then, free cash flow adds additional explanatory information. However, the mean coefficients on free cash flow are typically negative. The exceptions are in portfolios 7 through 9 where the mean coefficients on free cash flow are not significantly different from zero. Portfolio 8 is a benchmark case where mean operating income is approximately equal to mean free cash flow (and the mean change in net operating assets is, consequentially, almost zero). In the portfolios where the accrual accounting induces differences between operating income and free cash flow, the coefficient on free cash flow is negative and, in most cases, reliably different from zero. Indeed, for portfolios 1 through 3 with relative low (and negative) free cash flow, the coefficients on free cash flow are lower (more negative) than those in portfolios 8 through 10 for high (and positive) free cash flow: lower free cash flow implies higher price changes. The next subsection illuminates.

Table 4 Results of regressions relating changes in the market value of operations to contemporaneous operating income and free cash flow for firms grouped on free cash flows, 1963–2001

$$\frac{P_{it}^{NOA}-P_{it-1}^{NOA}}{P_{it-1}^{NOA}} = \alpha + \beta_1\frac{OI_{it}}{P_{it-1}^{NOA}} + \beta_2\frac{(C-I)_{it}}{P_{it-1}^{NOA}} + \beta_3\frac{NOA_{it-1}}{P_{it-1}^{NOA}} + \varepsilon_{it}$$

Portfolio	Mean $\frac{\Delta P_{it}^{NOA}}{P_{it-1}^{NOA}}$	Mean $\frac{OI_{it}}{P_{it-1}^{NOA}}$	Mean $\frac{(C-I)_{it}}{P_{it-1}^{NOA}}$	Mean $\frac{\Delta NOA_{it}}{P_{it-1}^{NOA}}$	Mean $\frac{NOA_{it-1}}{P_{it-1}^{NOA}}$	α	β_1	β_2	β_3	Adj. R^2
1 (low)	0.646	0.074	−0.376	0.450	0.822	**0.126**	**1.571**	**−1.437**	**−0.148**	0.217
t-statistics						(2.26)	(7.55)	(−10.80)	(−3.02)	
Percent +						0.0%	84.6%	0.0%	28.2%	
VIF							1.13	1.10	1.08	
2	0.278	0.061	−0.127	0.188	0.752	**−0.021**	**2.185**	**−1.523**	**−0.034**	0.159
t-statistics						(−0.40)	(6.95)	(−6.34)	(−0.88)	
Percent +						0.0%	97.4%	12.8%	56.4%	
VIF							1.06	1.02	1.06	
3	0.162	0.061	−0.058	0.120	0.717	**−0.040**	**2.434**	**−1.250**	**−0.024**	0.167
t-statistics						(−1.00)	(13.59)	(−2.67)	(−0.62)	
Percent +						0.0%	97.4%	30.8%	59.0%	
VIF							1.09	1.02	1.09	
4	0.114	0.062	−0.021	0.083	0.686	**−0.023**	**2.231**	**−0.996**	**−0.010**	0.155
t-statistics						(−0.55)	(9.16)	(−1.59)	(−0.26)	
Percent +						0.0%	97.4%	33.3%	64.1%	
VIF							1.05	1.02	1.05	
5	0.089	0.065	0.006	0.059	0.683	**−0.044**	**2.344**	**−0.646**	**−0.017**	0.161
t-statistics						(−1.24)	(7.17)	(−0.80)	(−0.50)	
Percent +						0.0%	100.0%	46.2%	51.3%	
VIF							1.05	1.02	1.05	
6	0.097	0.068	0.029	0.039	0.689	**−0.007**	**2.567**	**−1.593**	**−0.053**	0.134
t-statistics						(−0.17)	(8.63)	(−1.71)	(−2.13)	

Table 4 continued

$\frac{P_{it}^{NOA} - P_{it-1}^{NOA}}{P_{it-1}^{NOA}} = \alpha + \beta_1 \frac{OI_{it}}{P_{it-1}^{NOA}} + \beta_2 \frac{(C-I)_{it}}{P_{it-1}^{NOA}} + \beta_3 \frac{NOA_{it-1}}{P_{it-1}^{NOA}} + \varepsilon_{it}$

Portfolio	Mean $\frac{\Delta P_{it}^{NOA}}{P_{it-1}^{NOA}}$	Mean $\frac{OI_{it}}{P_{it-1}^{NOA}}$	Mean $\frac{(C-I)_{it}}{P_{it-1}^{NOA}}$	Mean $\frac{\Delta NOA_{it}}{P_{it-1}^{NOA}}$	Mean $\frac{NOA_{it-1}}{P_{it-1}^{NOA}}$	α	β_1	β_2	β_3	Adj. R^2
Percent +						0.0%	100.0%	33.3%	30.8%	
VIF							1.06	1.02	1.06	
7	0.088	0.074	0.052	0.022	0.734	**0.009**	**1.845**	**0.594**	**−0.075**	0.129
t-statistics						(0.18)	(11.81)	(0.77)	(−3.11)	
Percent +						0.0%	97.4%	56.4%	28.2%	
VIF							1.05	1.02	1.05	
8	0.076	0.078	0.080	−0.002	0.803	**−0.037**	**2.490**	**0.246**	**−0.072**	0.168
t-statistics						(−0.61)	(11.00)	(0.26)	(−3.38)	
Percent +						0.0%	100.0%	43.6%	25.6%	
VIF							1.07	1.02	1.07	
9	0.065	0.087	0.124	−0.037	0.891	**−0.044**	**2.125**	**−0.136**	**−0.061**	0.170
t-statistics						(−1.02)	(11.53)	(−0.50)	(−2.64)	
Percent +						0.0%	100.0%	35.9%	30.8%	
VIF							1.04	1.02	1.05	
10 (high)	0.007	0.104	0.261	−0.156	1.027	**0.014**	**2.244**	**−0.879**	**−0.004**	0.236
t-statistics						(0.37)	(11.78)	(−8.63)	(−0.12)	
Percent +						0.0%	100.0%	7.7%	59.0%	
VIF							1.06	1.08	1.05	
Grand mean	**0.162**	**0.073**	**−0.003**	**0.077**	**0.780**					

Portfolios are formed by ranking firms on $(C-I)_{it}/P_{it-1}^{NOA}$ each year, 1963–2001. Reported coefficients are means of the 39 estimates from each year. The *t*-statistics are the ratio of the mean cross-sectional coefficients relative to their standard errors estimated from the time series of coefficients. "Percent +" is the percentage of the 39 cross-sectional coefficient estimates that are positive. The adjusted *R*-squares are the mean of the 39 estimates. Variance inflation factors (VIF) for each variable, *j*, are calculated as $VIF_j = \frac{1}{1-R_j^2}$ where R_j^2 is the R^2 from regressing variable, *j*, on the other regressor variables. The means of variables are averages of means for each year. Variables are defined in the notes to Table 1

2.3 Distinguishing cash from operations from cash investment

Free cash flow is the net cash generated by operations. We have represented this net cash flow as $C - I$, cash flow from operations minus cash investment, similar to the headings in the GAAP cash flow statement. Pure cash accounting makes no such a distinction; indeed, as explained in Sect. 1.1, the distinction is an accrual concept, involving interperiod allocation rules. Nevertheless, free cash flow is net of cash investment, and investment in nonzero net present projects creates a change in premium: investments are booked to book value at historical cost, but price adds value that is different from cost. One might, then, expect free cash flows to explain changes in premiums, and thus the coefficient on free cash flow in Table 3 to be different from −1.0. The mean estimated coefficient on free cash flow in Table 3 of −1.10 is indeed significantly less than −1.0, indicating free cash flows are negatively correlated with changes in premium; this would be the case with positive net present value investing, for investment reduces free cash flow.

Panel A of Table 5 estimates the Table 3 regressions but with the separation made as follows:

Table 5 Mean estimates of regressions relating changes in the market value of operations and the equity to contemporaneous operating income, cash flow from operations, and cash investment, 1987–2001

Panel A: Changes in the market value of the operations

$$\frac{P^{\mathrm{NOA}}_{it} - P^{\mathrm{NOA}}_{it-1}}{P^{\mathrm{NOA}}_{it-1}} = a + \beta_1 \frac{\mathrm{OI}_{it}}{P^{\mathrm{NOA}}_{it-1}} + \beta^C_2 \frac{C_{it}}{P^{\mathrm{NOA}}_{it-1}} + \beta^I_2 \frac{I_{it}}{P^{\mathrm{NOA}}_{it-1}} + \beta_3 \frac{\mathrm{NOA}_{it-1}}{P^{\mathrm{NOA}}_{it-1}} + \varepsilon_{it}$$

	α	β_1	β^C_2	β^I_2	β_3	Adj. R^2
1987–2001	0.02	1.68	−0.98	1.30	0.02	0.15
t-Statistics	(0.53)	(12.42)	(−15.53)	(12.88)	(0.60)	
Percent +		100%	0%	100%	50%	
1996–2001	0.01	1.70	−0.95	1.30	0.01	0.12
1991–1995	0.09	1.79	−1.04	1.38	−0.01	0.13
1987–1990	−0.08	1.48	−0.92	1.18	0.08	0.22

Panel B: Changes in the market value of equity

$$\frac{P_{it} - P_{it-1}}{P_{it-1}} = a + b_1 \frac{\mathrm{Earnings}}{P_{it-1}} + b_2 \frac{d_{it}}{P_{it-1}} + b_3 \frac{B_{it-1}}{P_{it-1}} + b_4 \frac{C_{it}}{P_{it-1}} + b_4 \frac{I_{it}}{P_{it-1}} + \varepsilon_{it}$$

	a	b_1	b_2	b_3	b^C_4	b^I_4	Adj. R^2
1987–2001	0.06	1.15	−2.65	0.08	0.05	0.14	0.09
t-Statistics	(1.63)	(10.78)	(−7.13)	(2.85)	(1.55)	(2.45)	
Percent +		93%	7%	73%	60%	73%	
1996–2001	0.06	1.13	−2.49	0.07	0.05	0.15	0.07
1991–1995	0.12	1.21	−3.64	0.12	0.03	0.19	0.09
1987–1990	−0.02	1.11	−1.66	0.05	0.07	0.08	0.12

See notes to Table 2. Cash investment (I) is calculated as cash in investing activities (as reported in the cash flow statement) plus net investment in short-term securities. Cash flow from operations (C) is calculated as free cash flow + cash investment. Other variables are defined in the notes to Table 1. Estimates are made from 19,435 firm-year observations

$$\frac{P_{it}^{\text{NOA}} - P_{it-1}^{\text{NOA}}}{P_{it-1}^{\text{NOA}}} = a + \beta_1 \frac{\text{OI}_{it}}{P_{it-1}^{\text{NOA}}} + \beta_2^C \frac{C_{it}}{P_{it-1}^{\text{NOA}}} + \beta_2^I \frac{I_{it}}{P_{it-1}^{\text{NOA}}} + \beta_3 \frac{\text{NOA}_{it-1}}{P_{it-1}^{\text{NOA}}} + \varepsilon_{it}$$

For cash investment (*I*), we use cash investment reported in the GAAP cash flow statement, but adjusted for net investment (presumably of excess cash) in short-term investments and marketable securities.[12] Cash from operations (*C*) is free cash flow plus this number. The regression is estimated each year from 1987 onwards, the year in which cash flow statements were first required in place of working capital statements.

By Eq. 6, cash from operations reduces the book value of operations dollar-for-dollar and cash investment increases book value dollar-for-dollar: $\Delta\text{NOA} = \text{OI} - C + I$. The mean coefficient estimated on cash from operations in Panel A of Table 5 is −0.98, not significantly different from −1.0, and the coefficients are close to −1.0 in the three subperiods. This cash flow reduces the value of operations dollar-for-dollar. The mean coefficient on cash investment is, however, 1.30. For zero-net-present value investing, one expects the coefficient to be 1.0 (a dollar in investment adds a dollar of value). A *t*-statistic assessed relative to 1.0 is 2.98, indicating that investment is, on average, priced as positive net present value investment (and explains changes in premiums). The more negative coefficients on the negative free cash flow portfolios 1 and 2 in Table 4 are also explained: investment reduces free cash flow, but positive net-present-value investment creates earnings growth and increases premiums.

A rearrangement of the regression equation for operations yields further insights. As OI = *C* + operating accruals, by Eq. 2, then

$$\beta_1 \text{OI} + \beta_2^C C + \beta_2^I I = \beta_1(\text{operating accruals}) + \left(\beta_1 + \beta_2^C\right) C + \beta_2^I I.$$

(with subscripts and the price deflation understood). The implied coefficient on the operating accruals component of operating income is 1.68 and that on the cash from operations component is 0.70. The higher coefficient on operating accruals makes sense since cash is often net receipts with respect to past periods sales and expenses, while accruals pertain to current sales and expenses that forecast future earnings growth.

The mean coefficient on cash flow from operations of −0.98 in Panel A of Table 5 contrasts strikingly with the positive coefficient observed on cash flow variables in previous research. One must be careful in making comparisons, for specifications differ (with different questions in mind); some previous papers, for example, deal with earnings changes and cash flow changes rather than levels. However, previous research has not investigated cash flow for operations while controlling for the investment with which it is necessarily related: as *C* = Free cash flow + *I*, cash flow from operations is the residual of free cash flow after determining cash investment, as a matter of accrual accounting. As all the previous research on cash flows has dealt with equity returns (rather than returns for the firm),

[12] Cash investment in the GAAP cash flow statement includes investment in these financial assets (which is not an investment in operating assets but rather a disposition of net cash from operations). The GAAP number also includes investments in long-term financial assets, but these cannot be isolated using COMPUSTAT data.

Panel B of Table 5 involves the equity return regression in Panel B of Table 2 but now with free cash flow broken down into C and I. The mean coefficient on I is 0.14, with a t-statistic of 2.45. The mean coefficient on C is positive but not significantly different from zero at a 95% confidence level, although the t-statistic of 1.55 corresponds to a p-value of approximately 0.06 for a one-tailed test; in 40% of the years, the estimated coefficient was negative. Given investment, any relationship between cash flow from operations and changes in equity value is weak at best.

3 Conclusion

The question of focusing on earnings or cash flows is a continuing issue in equity valuation. Accrual accounting principles are very explicit on the matter. Under accrual accounting, free cash flow—the net cash generated by operations—does not affect equity value but reduces the value of the firm's operations, dollar-for-dollar. Free cash flows are cash distributions, like dividends, and, just as dividends reduce the value of equity, free cash flows reduce the value of operations. Furthermore, just as dividends do not affect the cum-dividend value of equity, free cash flows do not affect the cum-dividend value of operations, nor the value of equity. Rather, (accrual) earnings add value to equity. This paper has developed regression specifications to assess whether the stock market prices earnings according to the prescription of the accrual accounting model.

In testing these specifications, we find that stock returns are positively related to earnings but with a multiplier greater than 1.0 (Table 2, Panel A). However, stock returns are not related to free cash flow (Table 2, Panel B): given GAAP earnings, the amount of free cash flow that firms deliver does not affect their stock price, on average. Furthermore, free cash flows reduce the value of firms' operations, at slightly more than a dollar for each dollar of free cash flow (Table 3). The results vary little for cases of positive and negative cash flows, nor over firms with different composition of cash flow and accruals in their reported earnings (Table 4). The result with regard to earnings is consistent with prior research. However, the result with regard to cash flow is new and is a specification dependent. Overall, the paper validates the accrual accounting model as implemented by GAAP.

In breaking free cash flow down into its cash flow from operating activities and cash investment components, we find that a dollar of cash flow from operating activities reduces the price of operations by a dollar, but a dollar of investment is associated with an average price increase of \$1.30, consistent with positive net present value investing (Table 5, Panel A). Accordingly, free cash flow has information content that is incremental to earnings, but that information arises from a distinction between cash investment and cash from operations, an exercise in accrual accounting. Given earnings and investment, equity returns are unrelated to cash flow from operating activities (Table 5, Panel B).

The results of the paper are averages for yearly cross-sections of firms over an extended period, 1963 through 2001 and thus affirm the general application of GAAP to the cross-section. However, they do not deal with cases where the measurement of accrual earnings differs from the average—where the imperfections in accrual accounting show up. This, surely, is an avenue for future research. In what circumstance would one apply a coefficient other -1.0 to cash flows when valuing shares? This question pertains to the quality of (accrual) earnings for particular companies. But our results indicate that the stock market, *on average*, prices GAAP earnings as adding to equity value but cash flows being as irrelevant for valuation. Indeed, the stock market effectively prices free cash flows as distributions of value rather than value added.

Our analysis examines how accounting numbers are contemporaneously priced in the stock market, as does much of capital markets research. However, stock prices provide a benchmark for evaluating accounting numbers only if those prices are "efficient." Considerable research indicates that a variety of accounting numbers are correlated with future stock returns as well as current prices. Indeed, Sloan (1996) shows that cash flows relative to accruals predict future stock returns. While the interpretation of these predictive correlations is open to debate, one conjecture is that stock markets do not price accounting information efficiently. If so, estimates of coefficients here are open to question; indeed, to be extreme, one could attribute the results here to the market being "fixated" on earnings rather than cash flows.

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Appendix: Note on return regression models involving accounting numbers

The point that specification must reflect the accounting structure that governs the numbers can be illustrated by asking how the cost of goods sold (CGS) number on income statements is priced in the market: is it a reduction of the value of shareholders' equity as the accounting prescribes? To answer this question, one might naively run the following cross-sectional regression using a levels specification:

$$P_{it} = a + b\mathrm{CGS}_{it} + e_{it},$$

where P_{it} is the market value of the shares of firm i at date t. Or, using a "changes" specification, with stocks returns as the regressand:

$$P_{it} + d_{it} - P_{it-1} = \alpha + \beta\Delta\mathrm{CGS}_{it} + \varepsilon_{it}.$$

The changes versus levels specification issue aside, an accountant might well object. Cost of goods sold is an expense (a reduction in shareholder value), yet the estimated slope coefficients from these equations are probably positive. Indeed, using data from 1963 to 2001 described in Sect. 2, the estimate of coefficient, b, is 1.12 (with a t-statistic of 13.52 calculated from mean estimates from annual cross-sectional regressions) and the estimate of β, after deflating each variable by beginning-of-period price, P_{it-1}, is 0.23 (with a t-statistic of 8.62). As a matter of statistical correlation, the estimates are appropriate, but they do not inform. Cost of goods sold is part of the calculation of earnings; by accounting principle, it is involved with the sales with which it is matched to determine gross margin, so cost of goods sold cannot be considered without the matching sales. Specifying regressions under this dictate,

$$P_{it} = a + b_1 \text{Sales}_{it} + b_2 \text{CGS}_{it} + e_{it}$$

$$P_{it} + d_{it} - P_{it-1} = \alpha + \beta_1 \Delta\text{Sales}_{it} + \beta_2 \Delta\text{CGS}_{it} + \varepsilon_{it}$$

Using our data, the estimate of b_2 is reliably negative (−3.94 with a t-statistic of −17.74), as is the estimate of β_2 (−0.74 with a t-statistic of −9.48); the estimates of b_1 and β_1 are reliably positive, at 3.66 and 0.82, respectively.

The corrected specifications follow the form of an accounting relation: revenues − cost of goods sold = gross margin. Lipe (1986) and Ohlson and Penman (1992), among others, invoke income statement relations of this form to examine the pricing of income statement components. Aboody et al. (2004) embed income statement relations in a regression model to examine whether the stock market prices grants of employee stock options as an expense. Landsman (1986) and Barth (1994), among others, employ the balance sheet equation in specifying regressions involving assets and liabilities. Income statement and balance sheet equations are only two of several accounting relations that govern accrual accounting, but the point is clear: a regression specification involving accounting numbers should be determined by the structure that delivers the numbers, for that structure prescribes how they are to be interpreted.

A further issue arises in interpreting estimated coefficients in regression equations like those above: coefficients on included variables are affected by correlation with omitted information (in the regression disturbance). The regressions developed in this paper not only mirror the accounting relations governing earnings and cash flow but also provide a characterization of omitted information and an interpretation of how earnings and cash flows correlate with the omitted information.

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