Does EVA® beat earnings? Evidence on associations with stock returns and firm values

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Abstract

This study tests assertions that Economic Value Added (EVA®) is more highly associated with stock returns and firm values than accrual earnings, and evaluates which components of EVA, if any, contribute to these associations. Relative information content tests reveal earnings to be more highly associated with returns and firm values than EVA, residual income, or cash flow from operations. Incremental tests suggest that EVA components add only marginally to information content beyond earnings. Considered together, these results do not support claims that EVA dominates earnings in relative information content, and suggest rather that earnings generally outperforms EVA.

Key words: Value-relevance, relative information content, incremental information content, firm market value, economic value added, EVA, residual income, economic profits, earnings, cash from operations, charge for capital.

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1. Introduction and motivation

For centuries, economists have reasoned that for a firm to create wealth it must earn more than its cost of debt and equity capital (Hamilton, 1777; Marshall, 1890). In the twentieth century, this concept has been operationalized under various labels including residual income.[1] Residual income has been recommended as an internal measure of business-unit performance (Solomons, 1965) and as an external performance measure for financial reporting (Anthony, 1973, 1982a, 1982b). General Motors applied this concept in the 1920s and General Electric coined the term "residual income" in the 1950s and used it to assess the performance of its decentralized divisions (Stern Stewart EVA Roundtable, 1994).

More recently, Stern Stewart & Company has advocated that a trademarked variant of residual income, Economic Value Added (EVA®), be used instead of earnings or cash from operations as a measure of both internal and external performance.[2] They argue: "Abandon earnings per share" (Stewart, 1991, p. 2). "Earnings, earnings per share, and earnings growth are misleading measures of corporate performance" (Stewart, 1991, p. 66). "The best practical periodic performance measure is economic value added (EVA)" (Stewart, 1991, p. 66). "Forget EPS, ROE and ROI. EVA is what drives stock prices" (Stern Stewart advertisement in *Harvard Business Review*, November-December, 1995, p. 20). Stewart (1994) cites in-house research indicating that "EVA stands well out from the crowd as the single best measure of wealth

[1] Residual income is generally defined as after-tax operating profits less a charge for invested capital. Operating profits are profits before deducting the after-tax cost of interest expense. The firm's weighted average cost of debt and equity capital is deducted in the capital charge. Other labels include: abnormal earnings, Feltham and Ohlson (1995); excess earnings, Canning (1929) and Preinreich (1936, 1937, 1938); excess income, Kay (1976), Peasnell (1981, 1982); excess realizable profit, Edwards and Bell (1961); and super-profits, Edey (1957).

[2] Stern Stewart & Company is a New York-based consulting firm that markets the "EVA Financial Management System" for internal and external performance measurement and incentive compensation. Performance measures marketed by competing firms include cash-flow return on investment (CFROI) by Boston Consulting Group's HOLT Value Associates, discounted cash-flow analysis (DCA) by Alcar, discounted economic profits (EP) by Marakon Associates, and economic value management (EVM) by KPMG Peat Marwick.

creation on a contemporaneous basis" and "EVA is almost 50% better than its closest accounting-based competitor in explaining changes in shareholder wealth" (p. 75).

This study provides independent empirical evidence on the information content of EVA, residual income, and two mandated performance measures, earnings and cash flow from operations. Our inquiry is motivated by: the claims cited above, interest in EVA in the business press, increasing use of EVA by firms, increasing interest in EVA among academics, and potential interest in EVA among accounting policy makers. Citations of EVA in the business press have grown exponentially, rising from 1 in 1989 to 294 in 1996 (Lexis/Nexis 'allnews' library). *Fortune* has touted EVA as "The Real Key to Creating Wealth" (September 30, 1993), "A New Way to Find Bargains" (December 9, 1996), and has begun augmenting its well-known "500" ranking with an annual "Performance 1000" based on data from Stern Stewart (Tully, 1993, 1994; Fisher, 1995; Lieber, 1996; Teitelbaum, 1997).

Companies that have adopted EVA for performance measurement and/or incentive compensation include AT&T, Coca Cola, Eli Lilly, Georgia Pacific, Polaroid, Quaker Oats, Sprint, Teledyne and Tenneco. The "EVA Financial Management System" is alleged to encourage managers to act more like owners by helping managers make improved operating, financing and investment decisions.[3] Evidence provided in Wallace (1998) suggests that managers compensated on the basis of EVA (instead of earnings) take actions consistent with EVA-based incentives.

[3] CFO Basil Anderson of Scott Paper states: "We used to have different financial measures for different purposes -- discounted cash flow for capital decisions, another measure for rewarding performance and the like. ... Now EVA is one measure that integrates all that. ... it offers an excellent link to the creation of shareholder value" (Walbert, 1994, p. 111-112). Jim Meenan, CFO of AT&T's communications services group expresses a similar view: "Every decision is now based on EVA. The motivation of our business units is no longer just to make a profit. The drive is to earn the cost of capital. ... when you drive your business units toward EVA, you're really driving the correlation with market value" (Walbert, 1994, p. 112). Eugene Vesell, managing director of Oppenheimer Capital states: "The first thing we look at when we pick companies is, are they motivated by EVA? We prefer it to measures like EPS or return on equity." (Tully, 1994, p. 143)

Recently, academics have shown interest in models of equity valuation that express firm value in terms of book value and the expected stream of residual income or "abnormal earnings" (Ohlson, 1995; Feltham and Ohlson, 1995). Our study provides empirical evidence on whether current period realizations of residual income (RI) and EVA are more closely associated with stock returns than are traditional accounting measures such as earnings and cash from operations (CFO).

Finally, data on the information content of EVA and RI provide potentially useful input to the normative policy debate on what performance measure(s) should be reported in financial statements.[4] Financial reporting has been criticized for low-quality and lack of relevance in today's information-rich environment. The AICPA Special Committee on Financial Reporting (1994), the Jenkins Committee, makes suggestions for improving financial reporting that are consistent with firms using EVA for internal decision making and external reporting. A prediction from an April 1995 AICPA workshop on the future of financial management is that EVA will replace EPS in *The Wall Street Journal's* regular stock and earnings reports (Zarowin, 1995, p. 48). Widespread interest in revisiting the quality of financial reporting suggests that alternatives to currently mandated performance measures should be evaluated for value-relevance. This study provides evidence that we hope will be useful to policy-makers who may be interested in EVA or RI as replacements (or complements) to earnings and CFO as key measures of firm performance.

The first (of two) empirical questions we address is:

Q1: Do EVA and/or RI dominate currently mandated performance measures, earnings and operating cash flow, in explaining contemporaneous annual stock returns?

[4] We emphasize that our results are only an input to the policy making process. Each of the measures we consider may have value in other decision contexts, e.g., cash from operations may provide valuable information to lenders and suppliers about liquidity. Questions regarding cost and best source(s) of data are beyond the scope of this research.

This *relative* information content question examines which variables (EVA, RI, CFO or earnings) have a greater association with contemporaneous stock returns and provides a direct test of one of Stern Stewart's claims about the superiority of EVA. (In section 5.5 we examine separately another Stern Stewart claim that EVA outperforms earnings in explaining firm values.) Using a sample of 6,174 firm-years representing both adopters and non-adopters of EVA over the period 1984-1993, tests of question 1 indicate that earnings (R^2 = 12.8%) is significantly more highly associated with market-adjusted annual returns than are RI (R^2 = 7.3%) or EVA (R^2 = 6.5%) and that all three of these measures dominate CFO (R^2 = 2.8%). This finding is supported across a number of alternative specifications.

Second, we examine whether EVA and/or RI *complement* currently mandated performance measures, earnings and CFO:

> Q2: Do components unique to EVA and/or RI help explain contemporaneous stock returns beyond that explained by CFO and earnings?

This is equivalent to asking: Does the market appear to value a given EVA component beyond the information contained in the other components? To address this *incremental* information content question, we decompose EVA into components (e.g., cash from operations, operating accruals, capital charge, and accounting "adjustments") and evaluate the contribution of each component toward explaining contemporaneous stock returns. For the full sample, while each component is significantly associated with market-adjusted returns, the EVA components do not appear to be economically significant. Further, tests across alternative specifications indicate that, while cash flow and accrual components are consistently significant, components unique to EVA (capital charge and accounting adjustments) are typically not significant. Considering the relative and incremental information content results together, neither EVA nor RI appears to dominate earnings in its association with stock market returns.

The remainder of the paper is organized as follows. Section 2 provides a description of EVA and its components, presents hypotheses, and describes statistical tests for relative and incremental information content. Section 3 reports sample selection criteria, variable definitions, and descriptive statistics. Section 4 provides empirical results on the relative and incremental information content of EVA and its components. Section 5 reports various extensions and sensitivity analyses. We close with a summary and a discussion of potential factors contributing to the failure of EVA and/or RI to dominate earnings.

2. Components of EVA, hypotheses and statistical tests

2.1 Linkages between operating cash flow, earnings, residual income and EVA

This section describes linkages between operating cash flows (CFO), earnings before extraordinary items (EBEI), residual income (RI) and economic value added (EVA). We begin by partitioning earnings into operating cash flows and accruals:

EBEI = CFO + Accrual, where:

CFO = net cash provided by operating activities.

Accrual = total accruals related to operating (as opposed to investing or financing) activities, e.g., depreciation, amortization, Δnon-cash current assets, Δcurrent liabilities (other than notes payable and current portion of long-term debt), and Δnon-current portion of deferred taxes.

Next, we define net operating profits after tax (NOPAT) as EBEI plus the after-tax cost of interest expense:

NOPAT = EBEI + ATInt, where:

ATInt = the after-tax equivalent of book interest expense.

NOPAT separates operating activities from financing activities by adding back the after-tax effect of debt financing charges (interest expense) included in EBEI.

Residual income differs from EBEI in that it measures operating performance (NOPAT) net of a charge for the cost of all debt and equity capital employed:

RI = NOPAT - (k * Capital), where:

k = Stern Stewart's estimate of the firm's weighted average cost of capital.

Capital = Stern Stewart's definition of assets (net of depreciation) invested in going-concern operating activities, or equivalently, contributed and retained debt and equity capital, at the beginning of the period.

Positive RI reflects profits in excess of that required by debt and equity capital suppliers and, thus, is consistent with the firm creating wealth for the residual claimants, the shareholders. Negative RI is consistent with decreasing shareholder wealth.

EVA is Stern Stewart's proprietary version of RI. Stern Stewart attempts to improve on RI by adjusting NOPAT and Capital for what they view to be "distortions" in the accounting model of performance measurement (Stewart, 1991, Chapter 2):

$EVA = NOPAT + AcctAdj_{op} - k * [Capital + AcctAdj_{c}]$, where:

$AcctAdj_{op}$ = Stern Stewart adjustments to accounting measures of operating profits.

$AcctAdj_{c}$ = Stern Stewart adjustments to accounting measures of capital.

As an example of a common accounting adjustment, Stewart (1991, pp. 28-30) argues that research and development costs should be capitalized (if material) and amortized. This requires adjustments to both NOPAT (via $AcctAdj_{op}$) and to Capital (via $AcctAdj_{c}$). NOPAT is adjusted by adding back the period's R&D expense and deducting amortization of the R&D asset.[5] In any given year, the net effect is an increase (decrease) in NOPAT if R&D expense is greater (less) than R&D amortization. $AcctAdj_{c}$ reflect the cumulative effect on Capital of the

[5] Other adjustments to NOPAT include: adding the change in bad debt allowances; adding the change in the LIFO reserve; adding goodwill amortization; adding other operating income; and subtracting an estimate of taxes owed for the period (Stewart 1991, pp. 742-743). Stern Stewart do not disclose complete details about their accounting adjustments, e.g., asset lives and amortization patterns.

capitalization and amortization of current and past R&D expenditures. At any point in time, Capital is higher by the amount of the net capitalized R&D asset.[6]

Relying on the above definitions, EVA can be decomposed into its component parts:

EVA = CFO + Accrual + ATInt - CapChg + AcctAdj, where:

$$\text{CapChg} = k * \text{Capital}$$

$$\text{AcctAdj} = \text{AcctAdj}_{op} - (k * \text{AcctAdj}_{c}).$$

Figure 1 summarizes these relations by showing how EVA components combine into other performance measures, i.e., CFO, EBEI, and RI. We use this decomposition to examine the incremental information content of EVA components.

[insert figure 1 about here]

2.2 Hypotheses

By assuming that equity markets are (semi-strong) efficient, forward-looking and can form estimates of performance measures, we use stock market returns to compare the information content, or value-relevance, of CFO, EBEI, RI and EVA. Following Biddle, Seow and Siegel (1995), we draw a distinction between relative and incremental information content. Relative information content comparisons are appropriate when one desires a ranking of performance measures by information content or when making mutually exclusive choices among performance measures, i.e., when only one measure can be chosen. In contrast, incremental information content comparisons assess whether one measure provides value-relevant inferences beyond those provided by another measure and apply when assessing the information content of a supplemental

[6] Other adjustments to capital include: capitalization and amortization of certain marketing costs; subtracting marketable securities and construction in progress (because neither contributes to current operating activities); adding the present value of non-capitalized long term leases; adding allowances for bad debts, inventory obsolescence, warranties, etc.; adding the LIFO reserve; adding net capitalized intangibles (including R&D); adding cumulative goodwill amortization; adding unrecorded goodwill; and adding (subtracting) cumulative unusual losses (gains), net of taxes (Stewart, 1991, pp. 112-117). AcctAdj_{op} and AcctAdj_{c} are not examined individually in subsequent empirical tests because Stern Stewart does not disclose them separately.

disclosure or the information of a component measure (e.g., Bowen, Burgstahler and Daley, 1987).

Despite claims by Stern Stewart and others that EVA and RI are more value-relevant to market participants than EBEI and CFO, we take a neutral position and conduct two-tail tests of the null hypotheses that CFO, EBEI, RI and EVA have equal relative information content:

H_R: The information content of measure X_1 is equal to that of X_2

where X_1 and X_2 represent pairwise combinations from the set of performance measures: CFO, EBEI, RI and EVA. Rejection of H_R is viewed as evidence of a significant difference in relative information content.

We examine the incremental value relevance of EVA components summarized in figure 1 by testing the null hypotheses that individual components of EVA do not provide incremental information content beyond other components that also comprise CFO and EBEI:

H_I: Component X_1 does not provide information content beyond that provided by the remaining components X_2 through X_5

where X_1 through X_5 are components of EVA (i.e., CFO, Accrual, ATInt, CapChg and AcctAdj). Rejection of H_I is viewed as evidence of incremental information content.

2.3 Statistical tests

A standard approach for assessing information content is to examine the statistical significance of the slope coefficient, b_1, in the following ordinary-least-squares regression (that omits firm subscripts):

$$D_t = b_0 + b_1 FE_{Xt}/MVE_{t-1} + e_t \tag{1}$$

where:

D_t is the dependent variable, a measure of (abnormal or unexpected) returns for time period t,

FE_{Xt}/MVE_{t-1} is the unexpected realization (or forecast error) for a given accounting measure, X (e.g., CFO, EBEI, RI or EVA), scaled by the beginning-of-period market value of the firm's equity, MVE_{t-1},[7] and

e_t is a random disturbance term.

Because little is known about suitable proxies for market expectations for performance measures other than earnings, we use an approach from Biddle and Seow (1991) and Biddle, Seow and Siegel (1995) that estimates market expectations "jointly" with slope coefficients. This is accomplished by first expressing the forecast error as the difference between the realized value of a performance measure and the market's expectation: $FE_t = X_t - E(X_t)$. It is then assumed that market expectations are formed according to a discrete linear stochastic process (in autoregressive form):

$$E(X_t) = \delta + \phi_1 X_{t-1} + \phi_2 X_{t-2} + \phi_3 X_{t-3} + \ldots \qquad (2)$$

where the δ is a constant and ϕ's are autoregressive parameters. Substituting equation (2) into equation (1) yields:

$$D_t = b_0 + b_1 (X_t - (\delta + \phi_1 X_{t-1} + \phi_2 X_{t-2} + \phi_3 X_{t-3} + \ldots)) / MVE_{t-1} + e_t.$$

$$= b'_0 + b'_1 X_t/MVE_{t-1} + b'_2 X_{t-1}/MVE_{t-1} + b'_3 X_{t-2}/MVE_{t-1} + b'_4 X_{t-3}/MVE_{t-1} + \ldots + e_t. \quad (3)$$

Equation (3) relates abnormal returns and (scaled) lagged measures of accounting performance, where $E(b'_0) = b_0 - b_1\delta$, $E(b'_1) = b_1$, and $E(b'_i) = - b_i \phi_{i-1}$ for $i > 1$. In equation (3), the proxy for market expectations is estimated jointly with the slope coefficient (b'_i) using the same data and optimization criterion (minimum mean squared errors).

Equation (3) encompasses a range of alternative specifications for market expectations, including random-walk, ARIMA, constant stock price multiple, and combined "levels and changes" specifications. Although equation (3) is flexible in terms of allowing any number of

[7] The MVE deflator is measured 3 months after the prior year end to be consistent with the start of the returns period measured by the dependent variable.

lagged observations to be included as explanatory variables, in the presence of possible structural change across time, we limit equation (3) to one lag:[8]

$$D_t = b_0 + b_1 X_t/MVE_{t-1} + b_2 X_{t-1}/MVE_{t-1} + e_t. \quad (4)$$

This “one-lag” version is equivalent to the “levels and changes” specification proposed by Easton and Harris (1991), but it is motivated differently. It also is in a more convenient form that allows the slope or “response” coefficient (b_1) to be observed directly (rather than being derived from separate coefficients on levels and changes).[9]

2.3.1 Tests for relative information content

To assess relative information content, we employ a statistical test from Biddle, Seow and Siegel (1995) that allows a test of the null hypothesis of no difference in the ability of two competing sets of independent variables to explain variation in the dependent variable. Using this test, we make six pairwise comparisons of regressions among the accounting performance measures CFO, EBEI, RI and EVA, as specified in equation (4). The test is constructed as a comparison of R^2s. Under usual regularity conditions (uncorrelated homoskedastic errors), it is finite sample exact, generalizes to any number of predictor variables, and can be used in conjunction with White’s (1980) correction for heteroskedastic errors. As a result, it is well

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[8] We also consider a specification that allows each information variable to be predicted by lagged observations of all of the information variables. Thus each information variable, say EVA, is predicted by lagged values of each of the other variables -- CFO, EBEI, RI and EVA. This is one way of addressing the potential concern that (say) EVA is less well predicted by past observations of EVA than (say) EBEI is predicted by past values of EBEI. Results based on these specifications are qualitatively similar to those reported and are available from the authors.

[9] The relation between the two specifications can be illustrated by starting with the levels-changes specification (in 4a) and deriving the one-lag specification (in 4c):

$$D_t = a_0 + a_1 X_t/MVE_{t-1} + a_2 (X_t - X_{t-1})/MVE_{t-1} + e_t \quad (4a)$$

$$= a_0 + a_1 X_t/MVE_{t-1} + a_2 X_t/MVE_{t-1} - a_2 X_{t-1}/MVE_{t-1} + e_t \quad (4b)$$

$$= a_0 + (a_1 + a_2) X_t/MVE_{t-1} - a_2 X_{t-1}/MVE_{t-1} + e_t \quad (4c)$$

Equation (4c) corresponds to equation (4) where $b_1 = a_1 + a_2$ and $b_2 = - a_2$. Since a_1 and a_2 are both expected to be positive, b_1 (b_2) is predicted to be positive (negative). The coefficient(s) on the non-lag term(s) can be interpreted directly as “response” coefficient(s), e.g., in (4c) the response coefficient is ($a_1 + a_2$).

suited to evaluate the significance of relative information content comparisons in accounting contexts.[10]

2.3.2 Tests for incremental information content

Following standard methodology (e.g., Bowen, Burgstahler, and Daley, 1987), incremental information content is assessed by examining the statistical significance of regression slope coefficients. Specifically, for the one-lag specification in equation (4) generalized to two accounting performance measures X and Y, incremental information content is assessed using t-tests on individual coefficients and F-tests of the joint null hypotheses:

H_{0X}: $b_1 = b_2 = 0$
H_{0Y}: $b_3 = b_4 = 0$

where b_1, b_2, b_3, and b_4 are from equation (5) below:

$$D_t = b_0 + b_1 X_t/MVE_{t-1} + b_2 X_{t-1}/MVE_{t-1} + b_3 Y_t/MVE_{t-1} + b_4 Y_{t-1}/MVE_{t-1} + e_t. \quad (5)$$

To control for the potential effects of heteroskedastic errors, White's (1980) correction is employed in both the relative and incremental information content tests.

[10] The Biddle, Seow and Siegel (1995) test derives from Hotelling (1940). By using a lack-of-fit measure defined as the average of the sum of squared residuals and the sum of squared prediction errors, a nonlinear null hypothesis is obtained that involves quadratic forms of regression coefficients. It is tested using a Wald test (Kennedy 1985) of estimated coefficients and their heteroskedasticity-adjusted variance-covariance matrix. As discussed in Biddle, Seow and Siegel (1995), this method for assessing relative information content compares favorably with alternative tests provided in Davidson and MacKinnon (1981) and Vuong (1989). Davidson and MacKinnon's non-nested "J-test" and Vuong's likelihood ratio test are "pairwise tests for model selection" designed to assess which of two competing models is closer (in terms of Kullback-Liebler distance) to the "truth." Both are valid only asymptotically and may have poor finite sample properties. The J-test also can yield ambiguous results, which is problematic in applications assessing relative information content. Dechow, Lys and Sabino (1996) provide evidence that Vuong's test outperforms the J-test. Biddle and Siegel (1996) provide evidence that the Biddle, Seow and Siegel (1995) test performs as well as or better than Vuong's test in calibration and power. As confirming evidence, we replicated our relative information content tests using Vuong's test with qualitatively similar results as discussed briefly in section 4 below.

3. Sample selection, variable definitions and descriptive statistics

3.1 Sample selection

Data used in this study were purchased directly from Stern Stewart & Co.[11] These data include up to eleven annual observations for economic value added (EVA), capital, and cost of capital for firms with fiscal years ending June 1983 through May 1994 (see variable definitions below). The initial sample of 1000 firms (8,524 firm-year observations) is reduced by 219 firms (2271 observations) due to either missing Compustat or CRSP (Center for Research in Securities Prices) data or to provide a lagged observation for each variable. We also delete 79 extreme outlier observations defined as more than 8 standard deviations from the median. Next, both the dependent and independent variables are winsorized to ±4 standard deviations from the median.[12] The resulting sample has 6,174 firm-year observations for 773 firms.

These data are compiled by Stern Stewart & Company from *Business Week*'s listing of the 1,000 largest firms in market capitalization. Stern Stewart modifies this list by first removing utilities and financial institutions, and then adding firms from prior *Business Week* 1000 listings to bring the sample back to 1,000 firms. Stern Stewart introduced its first 1000 ranking for the calendar year ended 1988. The listing has been published annually since.

3.2 Dependent variable

Our dependent variable, market adjusted returns, is commonly used in information content studies to measure unexpected returns (e.g., Biddle, Seow and Siegel, 1995; Bowen, Johnson, Shevlin and Shores, 1989).

MktAdjRet Market adjusted return computed from CRSP data as a firm's 12 month compounded stock return less the 12 month compounded value-weighted market-wide return. A 12 month non-overlapping period ending 3 months following the

[11] For their publicly available database used in this study, Stern Stewart make "a handful" of standard adjustments. For their corporate clients, Stern Stewart make additional custom adjustments (not available to the public).

[12] In other words, data greater (less) than 4 standard deviations from the median of the firm-year observations are assigned a value equal to the median plus (minus) 4 standard deviations. The total number of observations reset for any variable range from 51 to 97, or 0.83% to 1.57% of the 6,174 sample firm years.

firm's fiscal year-end is chosen to allow time for information contained in the firm's annual report to be impounded in stock market prices.

3.3 Independent variables and descriptive data -- relative information content tests

The four measures of accounting performance in the relative information content tests, CFO, EBEI, RI, and EVA, are defined below:

CFO	Cash flow from operations obtained from the statement of cash flows or the statement of changes in financial position, depending upon the year of the observation. For years after 1987 Compustat data item D308, operating activities - net cash flow, is used. For years prior to 1988, data item D110, funds from operations - total, is used if the firm used the cash definition of funds for the statement of changes in financial position. If the firm used the working capital definition of funds in any year prior to 1988, cash flow from operations is estimated similar to Bowen, Burgstahler, and Daley (1986, 1987) as funds from operations (D110) plus the change in current liabilities (D5) less the change in debt in current liabilities (D34) less the change in current assets (D4) plus the change in cash and cash equivalents (D1).[13]
EBEI	Earnings defined as Compustat data item D18, net income before extraordinary items.
RI	Residual income equals earnings plus after-tax interest expense less a charge on all capital (RI = EBEI + ATInt - CapChg). See section 3.4 below for definitions of ATInt and CapChg.
EVA	Economic value added obtained from the Stern Stewart 1000 database.

In order to reduce heteroscedasticity in the data, we deflate all independent variables by the market value of equity three months after the beginning of the fiscal year (MVE_{t-1}). Descriptive data on these deflated, winsorized variables pooled across time are provided in panel A of table 1. EBEI has the lowest standard deviation among the four performance measures consistent with the smoothing effects of accruals. CFO has the largest firm-year mean and median followed by EBEI, EVA and RI. Undeflated median values of each performance measure are plotted across time in figure 2. Despite a survivorship bias in the data, median RI is negative in every year and median EVA is negative in 7 of 10 years. Near zero EVA and RI is consistent with a competitive economy where even the typical large firm has difficulty earning

[13] Consistent with the possibility that pre-1988 measures of CFO are noisy, R^2s in two-year sub-periods from

more than its cost of capital. Low values of EVA and RI are also consistent with a potential upward bias in Stern Stewart's cost of capital estimates.

[insert figure 2 about here]

Correlations among these measures are provided in panel A of table 1. Correlations between the independent variables are all positive and significant except that EVA and RI are negatively correlated with CFO. EBEI has the highest correlation with market adjusted returns.

[insert table 1 about here]

3.4 Independent variables and descriptive data -- incremental information content tests

The independent variables in the incremental information content tests are the five components of EVA described in section 2.1 and summarized in figure 1: CFO (defined above), operating accruals, after-tax interest expense, capital charge and accounting adjustments:

Accrual	Operating accruals defined as earnings less cash flow from operations (Accruals = EBEI - CFO). Accruals can be positive or negative but are more likely to be negative (reflecting non-cash expenses such as depreciation and amortization).
ATInt	After tax interest expense computed as 1 minus the firm's tax rate multiplied by interest expense (D15). The firm's tax rate is assumed to be zero if net operating losses are present. Otherwise the maximum statutory corporate tax rate is used for the given year. ATInt is non-negative.
CapChg	Capital charge defined as the firm's weighted average cost of debt and equity capital times its beginning of year capital.[14] Both of these items are obtained from Stern Stewart. CapChg is positive since both the cost of capital and capital are positive.
AcctAdj	Accounting adjustments reflect Stern Stewart's net annual adjustments to earnings and capital, and are defined as economic value added less residual income (AcctAdj = EVA - RI).[15] AcctAdj can be positive or negative.

1988 onward are slightly higher than for the two, two-year sub-periods before 1988.

[14] According to Stewart (1994), Stern Stewart estimate the cost of capital by weighting the cost of equity (applying the capital asset pricing model) and the after-tax cost of debt. Capital is a proxy for all cash invested in the business since a company's inception. See Stewart (1991), especially pp. 741-745.

[15] Our definition of RI incorporates Stern Stewart adjustments to Capital. Data were not available from Stern Stewart to calculate capital before accounting adjustments.

Descriptive data on these deflated, winsorized EVA components are provided in panel B of table 1. CFO has by far the largest correlation with market-adjusted returns. Both mean and median Accrual and AcctAdj are negative, consistent with some smoothing of the underlying operating cash flows. Correlations between CFO, ATInt and CapChg are positive and significant, consistent with firms with higher operating cash flows also having higher debt and equity costs. The negative correlation between CFO and Accrual is again consistent with the accrual process smoothing earnings relative to the underlying operating cash flows. The correlation between CFO and AcctAdj is insignificant.

4. Empirical results

4.1 Relative information content tests

Relative information content is assessed by comparing adjusted R^2s from four separate regressions, one for each performance measure, CFO, EBEI, RI, and EVA.[16] Adjusted R^2s from these regressions are provided in table 2. The highest R^2 is shown on the left (which in both panels is from the EBEI regression) and the lowest is shown on the far right (which in both panels is from the CFO regression). P-values from two-tailed statistical tests of relative information content are shown centered in parentheses for each of the six possible pairwise comparisons.

Results in panel A of table 2 are based on equation (4) and each of the six pairwise differences in R^2 are significant at conventional levels, with EBEI having a significantly larger adjusted R^2 (9%) than each of the other three performance measures. The RI regression has a significantly larger adjusted R^2 (6.2%) than does the EVA regression (5.1%), and both have a

[16] On average, we predict a positive (negative) slope coefficient on contemporaneous (lagged) observations of each performance measure. The negative coefficient on the lagged term follows from the prediction that *changes* in the performance measures also are positively associated with stock returns (see section 2.3, especially footnote 9). In results available from the authors, coefficient b_1 (b_2) is positive (negative) and

significantly larger adjusted R^2s than CFO (2.4%). These results suggest that, in terms of relative information content, earnings significantly outperforms RI, RI significantly outperforms EVA (although the gap here is smaller), and all three outperform CFO.[17]

[insert table 2 about here]

The underlying regressions in panel A constrain the coefficients to be equal across all firm-year observations. Hayn (1995), Burgstahler and Dichev (1997) and Collins, et al (1997) provide evidence that loss firms have smaller earnings response coefficients than do profitable firms. Because the value-relevance of the other performance measures (CFO, RI and EVA) could also vary with their sign (O'Byrne, 1996), we repeat our tests for relative information content after partitioning each performance measure into positive and negative values:

$$MktAdjRet_t = b_0 + b_1 X_{t,pos}/MVE_{t-1} + b_2 X_{t,neg}/MVE_{t-1} + b_3 X_{t-1,pos}/MVE_{t-1} + b_4 X_{t-1,neg}/MVE_{t-1} + e_t. \quad (6)$$

Panel B of table 2 presents results for regression (6) for the complete sample of 6,174 firm-year observations. Consistent with prior research, coefficients (available from the authors) are generally larger (in absolute value) and more significant for positive values of X_t than for the negative values. Compared to results reported above in panel A, adjusted R^2s increase for each performance measure when allowing for separate coefficients on positive and negative values. This increase is largest for the EBEI regression with adjusted R^2 increasing from 9% to 12.8%. However, the ranking of performance measures remains identical and statistical comparisons between regressions are nearly unchanged -- earnings dominates each of the other three performance measures and all three (EBEI, RI and EVA)

significant (at <.00001) for each performance measure based on the full sample of 6,174 firm-years.

[17] Nearly identical inferences are obtained using the Vuong (1989) test. For example, for the relative comparisons in panel A of table 2 and table 4, identical inferences are obtained at conventional significance levels for all pairwise comparisons. In general, the Vuong test provides greater statistical significance, consistent with its asymptotic nature and tendency to reject the null observed in simulation tests (Biddle and Siegel, 1996).

dominate CFO. The only difference is that RI and EVA are no longer statistically different from each other.

Taken as a whole, the relative information content results show no evidence of EVA (RI or CFO) dominating EBEI. Thus, we cannot support the Stern Stewart claim that EVA has greater information content than earnings. In contrast, this evidence points to earnings having higher relative information content than EVA. In section 5, we examine the sensitivity of these results to alternative specifications. In section 6, we discuss possible reasons why we fail to detect stronger value-relevance for EVA and RI.

4.2 Incremental information content tests

Table 3 presents results on the incremental information content of EVA components from regression (7):

$$\begin{aligned} MktAdjRet_t = {} & b_0 + b_1 CFO_t + b_2 CFO_{t-1} + b_3 Accrual_t + b_4 Accrual_{t-1} + \\ & b_5 ATInt_t + b_6 ATInt_{t-1} + b_7 CapChg_t + b_8 CapChg_{t-1} + \\ & b_9 AcctAdj_t + b_{10} AcctAdj_{t-1} + e_t. \end{aligned} \tag{7}$$

Predicted signs on each coefficient are provided below the variable labels. We expect a positive association between market-adjusted returns and the three components CFO, Accrual and AcctAdj. We expect a negative association between returns and the two components representing non-negative capital costs, ATInt and CapChg. Similar to the relative information content regressions in (4), the lagged terms are predicted to have the opposite sign (footnote 9).

[insert table 3 about here]

In panel A for the full sample, 9 of 10 coefficients are in the predicted direction and significant in one-tail t-tests at the 0.05 level or better. The exception is the lagged term for AcctAdj, which is in the wrong direction. All of the two-tail F-tests are significant at the 0.05 level or better. The relative sizes of the F-statistics suggest that CFO and Accrual make by far the largest incremental contributions to explaining market-adjusted returns, while ATInt, CapChg and AcctAdj exhibit much smaller incremental contributions. When combined with the relative information content findings above, these results suggest that, while EVA components offer some incremental information content beyond earnings components, their contributions to the information content of EVA are not sufficient for EVA to provide greater relative information content than earnings.

Figure 3 uses a Venn diagram to summarize our findings on relative and incremental information content for the four information variables CFO, EBEI, RI and EVA. The size of each circle represents relative information content and the non-overlapping areas represent incremental information content. EBEI exhibits the largest relative information content among the measures. CFO, RI and EVA protrude slightly from behind EBEI reflecting some limited incremental information content beyond earnings. However, the overall minuscule increase in adjusted R^2 between the regression of returns on EBEI (9.04% in panel A of table 2) and returns on EVA components (9.07% in table 3) suggests that the *economic* significance of the incremental information content of the EVA components is slight.

[insert figure 3 about here]

5. Sensitivity analyses and extensions

In this section, we examine the sensitivity of the basic results reported above to alternative specifications. We repeat selected information content tests by: 1) partitioning annual observations into five, non-overlapping, 2-year test periods (instead of one ten-year period); 2) evaluating subsets of firms that claim to use EVA for internal business decisions; 3) changing the return interval from one-year to five-years; and 4) changing the return interval from one-year (contemporaneous) returns to two-year (combined contemporaneous and one-year ahead) returns. Finally, we discuss a replication and extension of O'Byrne (1996), where the dependent variable is the level of market value of the firm (rather than returns). We conclude with an overall assessment of the results of the sensitivity tests.

5.1 Partitioning the sample into sub-periods

Results reported in tables 2 and 3 pool observations over the ten years 1984-1993. In this section, we report relative and incremental information content tests on annual data grouped into five, non-overlapping, two-year periods. Because of survivorship bias in the Stern Stewart data, firm-year observations increase from 1,015 in the 1984-85 period to 1,481 in 1992-93.

In pairwise comparisons of relative information content, adjusted R^2s are largest for EBEI in every two-year period. However, in 1984-85 differences between EBEI, EVA and RI are not statistically significant at conventional levels. Using a 5% cutoff, in 1986-87, EBEI does not outperform RI ($p = 0.072$) but does outperform EVA ($p = 0.045$). In 1988-89 and 1990-91, EBEI outperforms each of the other performance measures at the 0.01 level or better. In 1992-93, EBEI does not outperform RI ($p = 0.083$) but does outperform EVA ($p = 0.006$). Taken together, there is no evidence of EVA (RI or CFO) dominating EBEI. Thus we again cannot support the Stern Stewart claim that EVA has greater information content than earnings. In contrast, the evidence points to earnings having higher relative information content in many sub-periods.

We also consider the 606 observations following the September 1993 Fortune article that touted EVA as "The Real Key to Creating Wealth" (Tully, 1993). The earnings regression again has the highest R^2 (11.2%), and the evidence is suggestive of EBEI dominating EVA ($p = 0.049$) and CFO ($p = 0.061$) but not RI. EVA apparently did not catch on with market participants in the period immediately following the Fortune article.

In incremental information content tests, CFO and Accrual are significant in every two-year period. Among the remaining EVA components (ATInt, CapChg and AcctAdj), only 1 of

15 F-statistics is significant at the 5% level – AcctAdj in the 1984-85 sample period. Results for the period after release of the 1993 Fortune article again show strong support for the incremental information content of CFO and Accrual, but little evidence for the incremental significance of the remaining EVA components.

5.2 Adopters of 'EVA-like' performance measures

It is possible that firms adopt EVA at least in part because their past experience indicates a relatively strong relation between EVA and stock returns. Further, investors may become more attuned to the measure for firms that adopt EVA. Thus, it is conceivable that the association between EVA and returns is stronger for EVA adopters. To examine this possibility, we consider separately four sub-samples of firms that make some "use" of EVA-like measures. Firms in the "Any" sample have disclosed that they use EVA (or some similar concept) sometime during the period studied – even if that use appears to be minimal. Firms in the "Performance" sample provide more detail about their use of an EVA-like measure for performance measurement and/or decision making. Firms in the "Comp" sample state that they use an EVA-like measure in senior management incentive compensation plans and thus, presumably, also use it for performance measurement and/or decision making. We include all available data including years *before* the plan was implemented. The "Comp Year" sample restricts observations in the "Comp" sample to only those years in which an EVA-based compensation plan is in effect. Thus, the "Comp Year" sample is a subset of the "Comp" sample, which is a subset of the "Performance" sample, which, in turn, is a subset of the "Any" sample.

Table 4 reports the results of relative information content tests for firms using an EVA-like performance measure. EBEI exhibits the largest R^2s for the "Any," "Performance" and "Comp" groups, but EVA has the largest R^2 for the "Comp Year" sample. However, none of the performance measures differ significantly in relative information content at the 5% level, and only 3 of 18 comparisons at the 10% level (EBEI > CFO for the “Any” sub-sample (p = 0.073); EBEI > RI for the “Any” and "Performance" sub-samples (p = 0.094 and 0.059, respectively)). While earnings is not as dominant in these smaller sub-samples of EVA users, neither do the findings show EVA dominating earnings in its association with stock returns. The lower significance levels may be attributable in part to the smaller sample sizes used in these tests.

[insert table 4 about here]

Table 5 reports tests of incremental information content for users of EVA-like performance measures. In one-tail t-tests of individual slope coefficients using a 5% cutoff (t = 1.65), 13 of 16 are significant for the CFO and Accrual components while only 1 of 24 are individually significant for the remaining EVA components. With the exception of the “Comp Year” group, none of the two-tail F-tests are significant for components unique to EVA. In the small “Comp Year” sample (n = 35), both CapChg and AcctAdj have significant F-statistics suggesting they make an incremental contribution to explaining contemporaneous security returns in years where firms have EVA-based compensation plans in effect. However, caution is warranted in drawing any inferences from this result due to: the small size of the “Comp Year” sample, the surprising insignificant F-statistics on CFO and Accrual, and the unexpected signs on coefficients on CapChg. Again, other than weakly suggestive results for the “Comp Year” sample, it does not appear users of EVA are adopting the concept because of its stronger association with stock returns.

[insert table 5 about here]

5.3 Five-year returns as the dependent variable

In this section we extend the return interval from one year to five years. Stern Stewart reports its strongest results for EVA on five-year data (Stewart, 1991, 1994). In addition, because five-year data are less sensitive to the choice of expectations models, these tests help address the possibility that the weaker performance of EVA is due to a poorer expectations model. Regression (8) below is used to evaluate relative information content comparisons. It includes non-lagged and lagged terms similar to the annual return regression (4) and are analogous to the "level and changes" specification discussed in section 2.3 and footnote 9. Independent variables reflect "five-year sums" in that each performance measure, X_t, is summed over the most recent five year period 1989-93 (for the non-lagged term) and summed over the prior five years, 1984-88 (for the lagged term).

$$\text{"5-year sums:" } MktAdjRet_t = b_0 + b_1 \sum X_t/MVE_{t-5} + b_2 \sum X_{t-5}/MVE_{t-5} + e_t. \quad (8)$$

Since all 10 years of data are used to examine the association between five-year returns and each performance measure, only one test period is reported in table 6. Results again show the earnings regression with the highest R^2 (31.2%) followed by CFO (18.9%), EVA (14.5%) and RI (10.9%). The differences in explanatory power between EBEI and each of the other three performance measures are highly significant.

[insert table 6 about here]

In table 7 we report incremental information content of EVA components after extending the return interval from one year to five years. CFO and Accrual are again highly significant but the results on components unique to EVA (CapChg and AcctAdj) are insignificant.[18]

[insert table 7 about here]

5.4 Two-year (contemporaneous and one-year ahead) returns as the dependent variable

To consider the possibility that equity market participants take longer to learn about and impound EVA, we extend the return interval from the one-year contemporaneous period used

[18] We also evaluated the relative and incremental information content using changes in (rather than sums of) each performance measure over the five-year period. In relative information content tests, once again EBEI outperformed EVA. In incremental information content tests, only AcctAdj for the 1988-93 sub-period was significant at the 5% level while none of the other components unique to EVA were significant in the predicted direction.

above to a two-year period that includes both the contemporaneous and subsequent year. Consistent with results in table 2, and inconsistent with the conjecture that the market subsequently learns about the importance of EVA, EBEI has significantly higher association with two-year returns (adjusted R^2 = 4.4%) than does any of the other three information variables (whose R^2s range from 2% to 2.3%).

5.5 Market value of the firm as the dependent variable

Another claim made by Stern Stewart is EVA's higher association with the market value of the firm.[19] To test this claim, we replicate and extend a study authored by Stern Stewart vice-president Stephen O'Byrne (1996). There are three main differences between O'Byrne's research and our tests reported above. First, O'Byrne uses market value of the firm (debt plus equity) as the dependent variable while we use market-adjusted returns. Second, he draws inferences by comparing the magnitudes of R^2s, while we draw inferences by relying on formal statistical tests of relative information content. Third, and in our view most important, O'Byrne makes a series of 'adjustments' *only* to the EVA regressions and uses R^2s from these adjusted regressions to infer superiority of EVA over competing information variables**.**

The initial relations tested in O'Byrne (before 'adjustments') are:[20]

$$MV_t/capital_{t-1} = \beta_0 + \beta_1 (EVA_t/k)/capital_{t-1} + e_t \quad (9)$$

$$MV_t/capital_{t-1} = \beta_0 + \beta_1 (NOPAT_t)/capital_{t-1} + e_t \quad (10)$$

where:

$MV_t/capital_{t-1}$	the market value of debt plus equity deflated by beginning of period capital.
EVA_t	economic value added for year t, i.e., $NOPAT_t - k(capital_{t-1})$
$NOPAT_t$	net operating profits after tax for year t.
k	Stern Stewart's estimate of the firm's weighted average cost of capital.

[19] We also examined the change in "market value added" (defined by Stern Stewart as firm market value less invested capital) as a dependent variable with qualitatively similar findings.
[20] O'Byrne scales EVA by k and capital and NOPAT only by capital. We cannot replicate results for free cash flow because O'Byrne (1996) does not provide a precise definition.

$capital_{t-1}$	Stern Stewart's definition of assets (net of depreciation) invested in going-concern operating activities, or equivalently, contributed and retained debt and equity capital, at the beginning of period t.
e_t	unexplained residual error.

O'Byrne compares R^2s from the initial two models and reports 31% for the EVA model (9) and 33% for the NOPAT model (10). Next, he makes a series of adjustments to the EVA regressions by: 1) allowing separate coefficients for positive and negative values of EVA, 2) including the natural log of capital in an attempt to capture differences in the way the market values firms of different sizes, and 3) including 57 industry dummy variables in order to capture potential industry effects. None of these adjustments are made for the NOPAT regression, and O'Byrne further argues that a pure NOPAT model should be forced through the origin (p. 120).[21] After these adjustments, he reports a much higher R^2 for the final model containing EVA (56%) than for the final model containing NOPAT (which, because of the intercept restriction, falls to 17%).[22] O'Byrne (1996, p. 125) concludes:

> "EVA, unlike NOPAT or other earnings measures like net income or earnings per share, is systematically linked to market value. It should provide a better predictor of market value than other measures of operating performance. And, as we have shown, it does provide a better predictor once we understand and adjust for two critical relationships between EVA and market value."

Given the success of earnings in our returns tests discussed above, we add EBEI to the consideration set and replicate O'Byrne's final model using 5,843 firm-year observations obtained from Stern Stewart as described earlier. In table 8, we treat EVA, NOPAT and EBEI as competing performance measures and apply O'Byrne's three adjustments to each variable (as described in regression equation (11) in a note to the table). With this 'level playing field,' EVA's superiority disappears. With all of O'Byrne's adjustments (including industry dummies), the EBEI regression has a significantly higher association with firm value (adjusted R^2 = 53%) than the EVA regression (50%).[23] After making the same adjustments to the NOPAT regression,

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[21] O'Byrne argues that a non-zero intercept makes predicted MV a function of capital and therefore an EVA model in disguise. If so, it would follow from our findings that current realizations of EBEI are a better proxy for future EVA than are current realizations of EVA.

[22] O'Byrne reports adjusted R^2 of 42% for the EVA model omitting industry intercept dummies.

[23] Omitting scaling by the cost of capital (k) from regression equation (11) yields R^2s of 53% for EBEI, 51% for

the R^2 of 49% is not significantly different from the EVA regression. Thus, similar to results reported for our returns tests above, results in table 8 provide no evidence of the EVA regression outperforming earnings in explaining deflated firm values.[24]

[insert table 8 about here]

5.6 Overall assessment of the sensitivity tests

Considering jointly the sensitivity analyses of relative information content discussed in sections 5.1 through 5.5, we still find no evidence to support the Stern Stewart claim that EVA (or RI) outperform EBEI. In only one case (the "Comp Year" group in table 4) does EVA and/or RI have a higher R^2 than EBEI and this difference is not statistically significant. In contrast, adjusted R^2 is highest for EBEI in the remaining comparisons and EBEI significantly outperforms EVA in several sensitivity tests at the 5% level.

In terms of incremental information content, the analyses in section 5 provide only limited evidence that components unique to EVA (i.e., CapChg and AcctAdj) add to the information set that includes earnings (i.e., CFO and accruals), e.g., only 2 of the F-statistics and none of the t-statistics on CapChg and AcctAdj are significant at the 5% level. Thus, from the sensitivity tests in section 5, we find no evidence that EVA dominates earnings in its association with stock returns or firm values.

EVA and 51% for NOPAT. Omitting industry dummies from equation (11) (while retaining scaling by k) yields R^2s of 47% for EBEI, 43% for EVA and 41% for NOPAT.

[24] These results are not directly comparable with the returns results above since they employ different functional forms and additional variables due to O'Byrne (1996).

6. Summary and potential limitations

Motivated by increased use in practice and increased interest in the media and among academics, we examine the value-relevance of EVA and residual income compared to currently-mandated performance measures – earnings and cash flow from operations. There is little evidence to support the Stern Stewart claim that EVA is superior to earnings in its association with stock returns or firm values. In no case does EVA significantly outperform EBEI in tests of relative information content. On the contrary, in most cases the evidence suggests that earnings outperforms EVA. Further, while the charge for capital and Stern Stewart's adjustments for accounting "distortions" show some marginal evidence of being incrementally important, this difference does not appear to be economically significant. Possible reasons why we do not detect stronger value-relevance for EVA include:

- Our research design uses current realizations, not future flows, of each performance measure. Equity valuation is ultimately the discounted present value of future equity cash flows (or dividends or RI or EVA). Even if EVA is a good proxy for economic profits, realized EVA may not outperform the current realizations of other performance measures such as earnings in proxying for future equity cash flows. This is similar to the rationale we often hear for why EBEI generally outperforms CFO (arguably the more primitive measure) in relative information content.

- Stern Stewart's estimates of the charge for capital and accounting adjustments may contain measurement error relative to what the market is using to value firms. Further, we use Stern Stewart's publicly available database which does not include many custom adjustments they use for their clients.

- There exists little or no "surprise value" in components unique to EVA including the capital charge and Stern Stewart's accounting adjustments. For example, if the cost of capital and the amount of capital are slow to change (or the changes are predictable months or years in advance), the market should long ago have impounded these data. However, over five-year return intervals, the opportunity for surprise should be larger, and results reported in section 5.3 do not lend support for the superiority of EVA over this longer return interval.

- Data needed to compute EVA are not easily estimated and the market does not have these data during our test period. Recall that we assume that the market has access to sufficient data within 3 months of a firm's fiscal year end such that EVA (and its components) can be reliably estimated by that time. This potential issue is mitigated in tests that use alternative dependent variables (i.e., five-year return intervals in section 5.3, two-year return intervals that include both contemporaneous and one-year ahead returns in section 5.4, and firm values in section 5.5). Again the evidence does not support the superiority of EVA.

- In attempting to approximate economic profits, adjustments made by Stern Stewart may remove accruals that market participants use to infer firms' future prospects. These could be discretionary accruals that managers use to "signal" future prospects or nondiscretionary accruals that are by-products of the accounting process.[25] Thus, in constructing EVA, it is possible that Stern Stewart obtains a measure that is closer in level to economic profits (than say EBEI), but at the same time reduces its association with stock returns.

- In violation of our maintained hypothesis of semi-strong market efficiency, the market may have failed to recognize the reporting benefits of EVA through the period we study, consistent with the notion of 'earnings myopia.'[26] As more data become available, future studies will be able to assess whether market participants have come to appreciate EVA. It also is possible to imagine a new equilibrium in which firms would disclose EVA rather than earnings. However, this would subject EVA to many of the same legal and regulatory influences, and as a consequence, the resulting metric might closely resemble earnings (or what earnings might become). For this reason, and despite its alleged advantages for internal decision making, we do not anticipate that EVA will displace earnings for financial reporting purposes.

[25] Collins and DeAngelo (1990), Subramanyam (1996), and Hunt, Moyer and Shevlin (1997) report evidence consistent with discretionary accruals increasing the informativeness of earnings. Wu (1997) presents an agency model in which firms will optimally choose accounting adjustments for internal performance metrics that serve to reduce their correlation with stock returns.
[26] Wallace (1996, 1997) reports that some adopters of EVA feel they must still base their external performance on earnings because this is the measure on which financial analysts continue to focus.

Until further research can be conducted, our conclusion is that, although for some firms EVA may be an effective tool for internal decision making, performance measurement and incentive compensation, it does not dominate earnings in its association with stock market returns for the sample firms and period studied. To the contrary, and in contrast to claims by Stern Stewart, our evidence suggests that earnings generally dominates EVA in value-relevance to market participants.

An avenue for future research suggested by the findings of this study is to examine more closely which components of EVA and earnings contribute to, or subtract from, information content. For example, ex ante, capitalizing R&D and marketing costs should only add to EVA's information content given both are generally expensed in the determination of earnings. In contrast, by estimating taxes paid in cash (rather than tax expense), EVA may lose information content by removing value-relevant deferred tax accruals. Research at this level of detail requires data that are currently unavailable from Stern Stewart on individual adjustments used in the calculation of EVA.

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Figure 1
Components of Economic Value Added (EVA)

$$EVA = \underbrace{\underbrace{\underbrace{\underbrace{CFO + Accrual}_{\text{earnings (EBEI)}} + ATInt}_{\text{operating profits (NOPAT)}} - CapChg}_{\text{residual income (RI)}} + AcctAdj}_{\text{economic value added (EVA)}}$$

Figure 2
Median values of performance measures, 1984-93

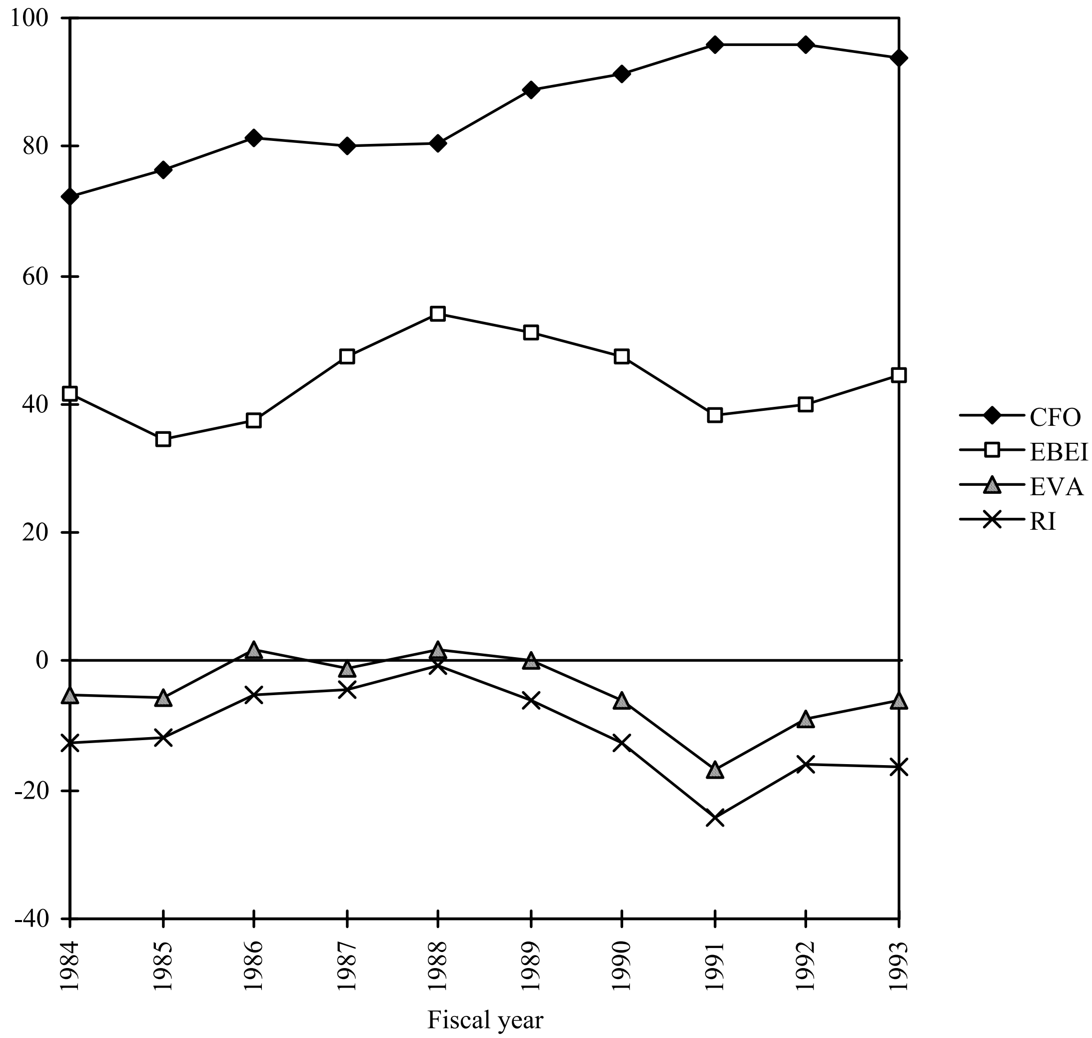
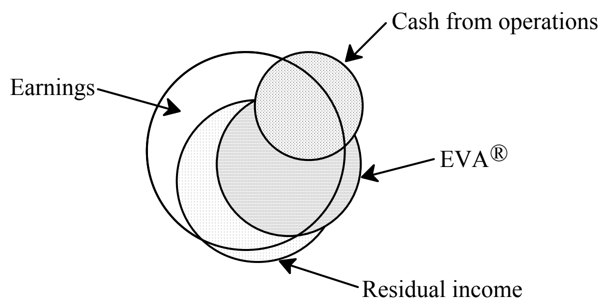


Figure 3

Relative and incremental information content of EVA®, residual income, earnings and operating cash flow



This figure depicts a combination of relative information content comparisons (R^2s) shown as circle sizes and incremental information content comparisons (F-statistics) shown as relative positioning or lack of overlap (with *less* overlap indicating more incremental information content). Adjusted R^2s for relative comparisons (from panel A of table 2) are: EBEI = 9% > RI = 6.2% > EVA = 5.1% > CFO = 2.4%.

The incremental comparisons shown in the figure are based on a regression of MktAdjRet on CFO, EBEI, EVA and RI rather than on their components as in table 2. Incremental F-statistics indicating areas not overlapping with *any* of the other circles are: EBEI = 24.66, CFO = 11.55, EVA = 9.81 and RI = 2.31.

Table 1

Descriptive statistics for pooled data

Panel A: Descriptive statistics on the dependent and independent variables in *relative* information content tests[a]

Descriptive statistics:

	Dependent Variable	Independent Variables			
	$MktAdjRet_t$	$EBEI_t$	EVA_t	RI_t	CFO_t
Mean	.059	.057	-.049	-.056	.142
Median	.011	.065	-.007	-.017	.118
Std. Dev.	.362	.082	.134	.127	.133

Correlations[b]

	$MktAdjRet_t$	$EBEI_t$	EVA_t	RI_t	CFO_t
$MktAdjRet_t$	1.00				
$EBEI_t$	.247	1.00			
EVA_t	.153	.592	1.00		
RI_t	.155	.652	.900	1.00	
CFO_t	.138	.307	-.125	-.122	1.00

Panel B: Descriptive statistics on the dependent and independent variables in *incremental* information content tests[a]

Descriptive statistics:

	Dependent Variable	Independent Variables				
	$MktAdjRet_t$	CFO_t	$Accrual_t$	$ATInt_t$	$CapChg_t$	$AcctAdj_t$
Mean	.059	.142	-.086	.034	.149	-.007
Median	.011	.118	-.055	.016	.111	-.007
Std. Dev.	.362	.133	.137	.054	.129	.055

Correlations[b]

	$MktAdjRet_t$	CFO_t	$Accrual_t$	$ATInt_t$	$CapChg_t$	$AcctAdj_t$
$MktAdjRet_t$	1.00					
CFO_t	.138	1.00				
$Accrual_t$	.021	-.782	1.00			
$ATInt_t$	-.026	.363	-.501	1.00		
$CapChg_t$	-.018	.469	-.580	.751	1.00	
$AcctAdj_t$	-.011	.004	.039	.210	.057	1.00

---

[a] The sample has 6,174 firm-year observations. All variables are winsorized ±4 standard deviations from the median. All independent variables are deflated by the market value of equity three months after the beginning of the fiscal year.

[b] Pearson correlation coefficients > .0204 are significant at < .10
> .0319 are significant at < .01
> .0407 are significant at < .001

Table 2

Tests of the relative information content of

EVA®, residual income, earnings and operating cash flow (H_R)

Panel A: coefficient on positive and negative values of each performance measure constrained to be equal[a]

	Observations	Relative Information Content						
Rank order of R^2		(1)		(2)		(3)		(4)
All Firms	6,174	EBEI	>	RI	>	EVA	>	CFO
Adj. R^2		.0904		.0624		.0507		.0238
p-value[b]			(.000)		(.041)		(.001)	
				(.000)		(.000)		
					(.000)			

Panel B: coefficient on positive and negative values of each performance measure allowed to differ[c]

	Observations	Relative Information Content						
Rank order of R^2		(1)		(2)		(3)		(4)
All Firms	6,174	EBEI	>	RI	>	EVA	>	CFO
Adj. R^2		.1278		.0732		.0649		.0280
p-value[b]			(.000)		(.266)		(.000)	
				(.000)		(.000)		
					(.000)			

[a] Underlying regressions are from equation (4): $D_t = b_0 + b_1 X_t/MVE_{t-1} + b_2 X_{t-1}/MVE_{t-1} + e_t$ where D_t = market-adjusted returns; X = a given performance measure (CFO, EBEI, RI and EVA); and MVE = the market value of equity three months after the beginning of the fiscal year. Performance metrics are listed in order of R-squares from highest (on the left) to lowest (on the right). Statistical tests of differences in explanatory power across performance measures are presented centered in parentheses below the adjusted R-squares. See description of *p*-values below.

[b] Two-tailed *p*-values in parentheses represent tests of the null hypothesis of no difference between pairwise comparisons of adjusted R-squares (Biddle, Seow and Siegel 1995). First row presents *p*-values for comparison between first and second ranked measures, second and third ranked measures and third and fourth ranked measures. On the next row, comparisons are between first and third ranked, and second and fourth ranked measures. The last row compares first and fourth ranked measures.

[c] Underlying regressions are from equation (4) modified to allow different coefficients on positive versus negative values of the independent variables:

$$D_t = b_0 + b_1 X_{t,pos}/MVE_{t-1} + b_2 X_{t,neg}/MVE_{t-1} + b_3 X_{t-1,pos}/MVE_{t-1} + b_4 X_{t-1,neg}/MVE_{t-1} + e_t \quad (6)$$

where D_t = market-adjusted returns; X = a given performance measure (CFO, EBEI, RI or EVA); and MVE = market value of equity three months after the beginning of the fiscal year.

Table 3

Tests of incremental information content of EVA® components: CFO, operating accruals, after-tax interest, capital charge, accounting adjustments (H_I)[a]

	Obs.	Constant	CFO_t	CFO_{t-1}	$Accrual_t$	$Accrual_{t-1}$	$ATInt_t$	$ATInt_{t-1}$	$CapChg_t$	$CapChg_{t-1}$	$AcctAdj_t$	$AcctAdj_{t-1}$	Adj. R^2
Predicted signs:			+	-	+	-	-	+	-	+	+	-	
All Firms	6,174	.013	1.473	-.824	1.192	-.751	-.594	.772	-.391	.270	.357	.055	.0907
t-stat		1.42	16.02	-8.53	13.09	-7.73	-2.21	2.63	-2.43	1.72	3.12	0.48	
F-stat			128.42		87.83		3.45		3.61		6.55		
p-value[b]			(.000)		(.000)		(.032)		(.027)		(.001)		

[a] Dependent variable = market-adjusted returns; independent variables are components of EVA (CFO, operating accruals, after-tax interest expense, capital charge, accounting adjustments) and are shown in non-lagged and lagged forms as column headings. Each independent variable is deflated by market value of equity 3 months after the beginning of the fiscal year.

[b] P-values in parentheses represent non-directional F-tests of the null hypothesis of no incremental information content (hypothesis H_I).

Table 4

Tests of relative information content (H_R): Sample partitioned by relative "use" of EVA®[a]

Rank order of R[c]	Observations	Relative Information Content[b] (1)		(2)		(3)		(4)
"Any"	626	EBEI	>	RI	>	EVA	>	CFO
Adj. R^2		.0799		.0523		.0484		.0317
p-value[c]			(.094)		(.867)		(.550)	
				(.278)		(.486)		
					(.073)			
"Performance"	445	EBEI	>	EVA	>	CFO	>	RI
Adj. R^2		.0461		.0386		.0262		.0239
p-value			(.765)		(.699)		(.938)	
				(.481)		(.491)		
					(.059)			
"Comp"	344	EBEI	>	CFO	>	EVA	>	RI
Adj. R^2		.0306		.0292		.0220		.0181
p-value			(.962)		(.834)		(.855)	
				(.735)		(.737)		
					(.412)			
"Comp Year"	35	EVA	>	RI	>	EBEI	>	CFO
Adj. R^2		.3072		.2644		.2366		.1152
p-value			(.352)		(.667)		(.393)	
				(.481)		(.330)		
					(.211)			

[a] Firms are categorized in their use of EVA as follows:

- "Any" represents all firms that have mentioned that they use EVA for performance evaluation and/or explicit incentive compensation – even if that use appears minimal.
- "Performance" represents those firms that have mentioned that they use EVA for performance measurement but do not disclose any use of EVA in their explicit incentive compensation plans.
- "Comp" represents those firms that use EVA in their explicit incentive compensation plans and, presumably therefore, for performance measurement. Given the existence of a plan in any year, all available firm-years are included.
- "Comp Year" represents a subset of observations from "Comp" only including years where firms have an EVA-based compensation plan in place.

"Comp Year" is a subset of "Comp"; "Comp" is a subset of "Performance"; and "Performance" is a subset of "Any."

[b] Underlying regressions are from equation (4): $D_t = b_0 + b_1 X_t/MVE_{t-1} + b_2 X_{t-1}/MVE_{t-1} + e_t$ where D_t = market-adjusted returns; X = a given performance measure (EVA, RI, EBEI, CFO); and MVE = the market value of equity three months after the beginning of the fiscal year. Performance metrics are listed in order of R-squares from underlying regression equation (4), from highest (on the left) to lowest (on the right). Statistical tests of differences in explanatory power across performance measures are presented centered in parentheses below the adjusted R-squares. See description of *p*-values below.

[c] Two-tailed *p*-values in parentheses represent tests of the null hypothesis of no difference between pairwise comparisons of adjusted R-squares (Biddle, Seow and Siegel 1995). First row presents *p*-values for comparison between first and second ranked measures, second and third ranked measures and third and fourth ranked measures. On the next row, comparisons are between first and third ranked, and second and fourth ranked measures. The last row compares first and fourth ranked measures.

Table 5

Tests of incremental information content of EVA® components (H_I): Sample partitioned by relative "use" of EVA[a,b]

	Obs.	Constant	CFO_t	CFO_{t-1}	$Accrual_t$	$Accrual_{t-1}$	$ATInt_t$	$ATInt_{t-1}$	$CapChg_t$	$CapChg_{t-1}$	$AcctAdj_t$	$AcctAdj_{t-1}$	Adj. R^2
Predicted signs:			+	-	+	-	-	+	-	+	+	-	
"Any"	626	-.012	1.138	-.624	.843	-.896	-1.105	1.434	-.123	-.215	.324	-.126	.1054
t-stat		-0.45	5.30	-2.61	4.04	-3.41	-1.35	1.69	-0.58	-1.05	0.95	-0.43	
F-stat			14.09		10.40		1.45		2.01		0.46		
p-value[c]			(.000)		(.000)		(.235)		(.136)		(.634)		
"Performance"	445	-.044	1.047	-.396	.835	-.919	-1.036	.791	-.129	-.087	.488	-.494	.0780
t-stat		-1.52	4.08	-1.55	3.53	-3.07	-1.08	0.76	-0.60	-0.41	1.35	-1.54	
F-stat			8.64		7.17		0.59		0.62		1.54		
p-value			(.000)		(.001)		(.557)		(.539)		(.216)		
"Comp"	344	-.055	.868	-.365	.709	-.958	-1.023	.376	.344	-.368	.425	-.562	.0625
t-stat		-1.70	3.05	-1.23	2.60	-2.61	-1.00	0.37	0.62	-0.71	1.09	-1.51	
F-stat			4.72		4.70		0.61		0.25		1.34		
p-value			(.009)		(.010)		(.544)		(.779)		(.265)		
"Comp Year"	35	-.015	.308	-1.769	.759	-2.178	-1.687	-1.240	3.130	-.841	-2.122	-4.167	.3344
t-stat		-1.70	3.05	-1.23	2.60	-2.61	-1.00	0.37	0.62	-0.71	1.09	-1.51	
F-stat			0.87		2.02		1.26		4.04		3.66		
p-value			(.430)		(.154)		(.303)		(.031)		(.041)		

[a] Firms are categorized in their use of EVA as follows:

"Any" represents all firms that have made any mention of using EVA for performance evaluation and/or explicit incentive compensation – even if that use appears minimal.

"Performance" represents those firms that have mentioned that they use EVA for performance measurement but do not disclose any use of EVA in their explicit incentive compensation plans.

"Comp" includes all firm-year observations for those firms that use EVA in their explicit incentive compensation plans in any year.

"Comp Year" includes a subset of observations from "Comp" for only those years where the EVA-based compensation plan is in effect.

"Comp Year" is a subset of "Comp"; "Comp" is a subset of "Performance"; and "Performance" is a subset of "Any."

[b] Dependent variable = market-adjusted returns; independent variables are components of EVA (CFO, operating accruals, after-tax interest expense, capital charge, accounting adjustments) and are shown in non-lagged and lagged forms as column headings.

[c] P-values in parentheses represent non-directional F-tests of the null hypothesis of no incremental information content (hypothesis H_I).

Table 6

Tests of relative information content (H_R): Returns measured over 5-year periods[a]

	Observations	Relative Information Content						
Rank order of R^2		(1)		(2)		(3)		(4)
"5-Year Sums"	509	EBEI	>	CFO	>	EVA	>	RI
Adj. R^2		.3118		.1888		.1446		.1090
p-value[b]			(.005)		(.264)		(.030)	
				(.000)		(.051)		
					(.000)			

[a] Underlying regression is from equation (8):

"5-year sums:" $D_t = b_0 + b_1 \sum X_t/MVE_{t-5} + b_2 \sum X_{t-5}/MVE_{t-5} + e_t$,

where $\sum$ is defined over the 5-year intervals, 1989-93 (non-lag) and 1984-88 (lagged) terms, respectively; D_t = market-adjusted returns measured over 5 years; X = a given performance measure (CFO, EBEI, RI, or EVA); and MVE = market value of equity three months after the beginning of the fiscal year.

[b] P-values in parentheses represent two-tail tests of the null hypothesis of no difference between pairwise comparisons of adjusted R-squares (Biddle, Seow and Siegel 1995). First row presents *p*-values for comparison between first and second ranked measures, second and third ranked measures and third and fourth ranked measures. On the next row, comparisons are between first and third ranked, and second and fourth ranked measures. The last row compares first and fourth ranked measures.

Table 7
Tests of incremental information content of EVA® components (H_I): Returns measured over 5-year periods[a,b]

	Obs.	Constant	CFO_t	CFO_{t-1}	$Accrual_t$	$Accrual_{t-1}$	$ATInt_t$	$ATInt_{t-1}$	$CapChg_t$	$CapChg_{t-1}$	$AcctAdj_t$	$AcctAdj_{t-1}$	Adj. R^2
Predicted signs:			+	-	+	-	-	+	-	+	+	-	
"5-Year Sums"	509	-.373	2.128	-.731	1.659	-.072	-.509	.089	-.088	.275	.549	.487	.3241
t-stat		-2.54	7.93	-2.56	5.99	-0.25	-0.11	0.17	-0.42	1.21	1.39	1.64	
F-stat			33.16		18.01		0.01		0.81		2.75		
p-value[c]			(.000)		(.000)		(.986)		(.447)		(.065)		

[a] Dependent variable = market-adjusted returns; independent variables (EVA components) are shown as column headings.

[b] Underlying regression is as follows:
"5-year sums:" $D_t = b_0 + b_1 \sum X_t/MVE_{t-5} + b_2 \sum X_{t-5}/MVE_{t-5} + b_3 \sum X_t/MVE_{t-5} + b_4 \sum X_{t-5}/MVE_{t-5} + \ldots + b_9 \sum X_t/MVE_{t-5} + b_{10} \sum X_{t-5}/MVE_{t-5} + e_t$

where $\sum$ is defined over the 5-year intervals, 1989-93 (non-lag) and 1984-88 (lagged) terms, respectively; D_t = market-adjusted returns; X_t = a given EVA component, i.e., CFO, Accrual, ATInt, CapChg, and AcctAdj; and MVE = market value of equity three months following the beginning of the fiscal year.

[c] P-values in parentheses represent non-directional F-tests of the null hypothesis of no incremental information content (hypothesis H_I).

Table 8

Replication and extension of O'Byrne (1996):

Tests of relative information content (H_R) for EVA®, NOPAT and EBEI where the dependent variable is the market value of the firm[a]

	Observations	Relative Information Content				
Rank order of R^2		(1)		(2)		(3)
Sample Size	5,843	EBEI	>	EVA	>	NOPAT
Adj. R^2		0.5321		0.4965		0.4886
p-value[b]			(0.000)		(0.413)	
				(0.000)		

[a] Underlying regression is from O'Byrne (1996):

$$MV_t/capital_{t-1} = b_0 + b_1 Y+_t/capital_{t-1} + b_2 Y-_t/capital_{t-1} + b_3 \ln(capital_{t-1}) + b_j \Sigma I_j + e_t \quad (11)$$

where MV = market value of debt and equity; Y = a given performance measure (EVA, NOPAT, NI) deflated by the firm's cost of capital (as estimated by Stern Stewart), where + and - refer to positive and negative values of the performance measure, respectively; $capital_{t-1}$ = the firm's beginning of period contributed capital; and I is a dummy variable representing industry membership.

Performance metrics are listed in order of R-squares from highest (on the left) to lowest (on the right). Statistical tests of differences in explanatory power across performance measures are presented in parentheses below the adjusted R-squares. See description of *p*-values below.

[b] Two-tailed *p*-values in parentheses represent tests of the null hypothesis of no difference between pairwise comparisons of adjusted R-squares (Biddle, Seow and Siegel 1995). First row presents *p*-values for comparison between first and second ranked measures and second and third ranked measures. On the next row, comparisons are between first and third ranked. Tests based on Vuong (1989) are qualitatively identical.