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Australian Evidence Concerning the Information Content of Economic Value-Added

by

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Abstract:

Pooled time-series, cross-sectional data on 110 Australian companies over the period 1992-1998 is employed to examine whether the trademarked variant of residual income known as economic value-added (EVA®) is more highly associated with stock returns than other commonly-used accounting-based measures. These other measures of internal and external performance include earnings, net cash flow and residual income. Three alternative formulations for pooling data are also employed in the analysis, namely, the common effects, fixed effects and random effects models, with the fixed effects approach found to be the most empirically appropriate. Relative information content tests reveal returns to be more closely associated with EVA® than residual income, earnings and net cash flow, respectively. An analysis of the components of EVA® confirms that the GAAP-related adjustments most closely associated with EVA® are significant at the margin in explaining stock returns.

Keywords:

VALUE-RELEVANCE; RELATIVE AND INCREMENTAL INFORMATION CONTENT; ECONOMIC-VALUE ADDED; RESIDUAL INCOME

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1. Introduction

In recent years, Economic Value-Added (EVA®) – a trademarked variant of residual income (net operating profits less a charge for the opportunity cost of invested capital) – has become increasingly popularised as a tool for financial decision-making. Its developer and principal advocate, US-based business consultants Stern Stewart, argue that "earnings, earnings per share, and earnings growth are misleading measures of corporate performance [and that] the best practical periodic performance measure is economic value-added" (Stewart 1991, p. 66). Similarly, Stewart (1991, p. 66) contends that EVA® "… is the financial performance measure that comes closer than any other to capturing the true economic profit of an enterprise [and] is the performance measure most directly linked to the creation of shareholder wealth over time". As a means of providing support for these claims, Stern Stewart has commissioned several in-house studies to link changes in EVA with changes in shareholder wealth. For instance, Stewart (1994, p. 75) provides evidence that:

> EVA stands well out from the crowd as the single best measure of wealth creation on a contemporaneous basis [and] is almost 50% better than its closest accounting-based competitor [including EPS, ROE and ROI] in explaining changes in shareholder wealth.

Support for EVA® has also been forthcoming from other sources. *Fortune* has called it "today's hottest financial idea", "The Real Key to Creating Wealth" (30 September 1993) and "A New Way to Find Bargains" (9 December 1996). And Peter Drucker in the *Harvard Business Review* suggested that EVA's® growing popularity reflected the demands of the information age for a measure of 'total factor productivity' (1 November 1991). McClenahen (1998) similarly observes that "traditional corporate performance measures are being relegated to second-class status as metrics such as EVA® become management's primary tools". Finally, there has been the widespread adoption of EVA® by security analysts since "instead of using a dividend discount approach, these models measure value from the point of view of the firms' capacity for ongoing wealth creation rather than *simply* wealth distribution" (Herzberg 1998, p. 45) (emphasis added).

In response to these claims, an emerging literature has addressed the empirical issue as to whether EVA® is more highly associated with stock returns and firm values than other accounting-based figures. For example, Biddle, Bowen and Wallace (1997) used relative and incremental information tests to examine whether stock returns were more highly associated with EVA®, residual income or cash flow from operations. Biddle et al. (1997, p. 333) concluded that while "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".

Chen and Dodd (1997) likewise examined different dimensions of the EVA® system and concluded: "… not a single EVA measure [annualised EVA return, average EVA per share, change in standardised EVA and average return on capital] was able to account for more than 26 percent of the variation in stock return". Lehn and Makhija (1997) Rogerson (1997) and Biddle, Bowen and Wallace (1997) reached similar conclusions. Clinton and Chen (1998) also compared share prices and returns to residual cash flow, economic value-added and other traditional measures, and recommended that companies using EVA consider residual cash flow as an alternative.

However, Bao and Bao (1998, p. 262) in an analysis of price levels and firm valuations concluded that the "results are not consistent for earnings and abnormal economic earnings, but are consistent for value added, i.e., value-added is significant in both levels and changes deflated by price analyses". Similarly, Uyemura, Kantor and Petit (1996) demonstrated that EVA® has a high correlation with market value added (the difference between the firm's value and cumulative investor capital) and thereby stock price, while O'Byrne (1996) estimated that changes in EVA® explain more variation in long-term stock returns than changes in earnings. Finally, and from a stock selection perspective, Herzberg (1998, p. 52) concluded that the residual income valuation model (including EVA) "appears to have been very effective in uncovering firms whose stock is underpriced when considered in conjunction with expectations for strong earnings and growth". Nevertheless, the bulk of empirical evidence indicates that the superiority of EVA® over earnings (as variously defined) has not been established.

However, when examining existing research in this area, two salient points emerge. First and foremost, and notwithstanding that EVA® figures are readily available and promoted in the UK, Australia, Canada, Brazil, Germany, Mexico, Turkey and France [see Stern Stewart (1999)], no empirical studies of this type (as far as the authors are aware) have been conducted outside the United States. This is despite several international companies adopting EVA® for performance measure and/or incentive compensation packages. There is an obvious requirement to examine the usefulness of EVA® vis-à-vis traditional financial statement measures in an alternative institutional milieu.

Second, there has been an emphasis in previous empirical work in this area on either a cross-section of companies or limited pooled time-series, cross-sectional data. For example, Bao and Bao (1998) only employ a cross-section of 166 firms over the period 1992/93. Examination of extended time-series data would certainly permit greater empirical certainty on the usefulness of economic value-added. However, while data sets that combine time series and cross sections are increasingly common in financial analysis, modelling in these settings calls for some quite complex stochastic specifications. For example, past empirical studies have often employed pooled time-series, cross-sectional data without giving specific *a priori* justification for the choice of model formulation. More particularly, the simplest assumption of common effects has usually been made. It is with these considerations in mind that the present study is undertaken.

The remainder of the paper is divided as follows. The second section briefly outlines the calculation of EVA® and discusses the empirical methodology employed. The results are dealt with in the third section. The paper ends with some brief concluding remarks.

2. Empirical Methodology

The calculation of EVA® consists of two separate but related steps. The primary adjustment is where a capital charge is subtracted from net operating profit after-tax. The capital charge is derived from multiplying the firm's overall financing cost, as reflected in the weighted average cost of capital by the amount of invested capital. Invested capital in turn is defined as total assets, net of non-interest bearing current liabilities. In this form, EVA® is essentially the same as residual income, though the latter measure is normally expressed as net income less a charge for the cost of equity capital (with the cost of debt already included in the calculation of net income). The second and more controversial step consists of a series of adjustments to GAAP-based numbers. These modifications to a company's conventional accounts may be meaningfully grouped as adjustments to research and development, deferred taxes, intangibles, depreciation, provisions for warranties and bad debts, restructuring changes, and macroeconomic conditions [see Stewart (1991 and 1994), O'Hanlon and Peasnell (1998; 2000), Young (1999), Stern Stewart (1999) and Worthington and West (2001) for a detailed discussion of these accounting adjustments].

The analysis contained in this paper consists of two closely related empirical questions. The first question relates to the purported dominance of EVA over both residual income and the conventional accounting performance measures of earnings before extraordinary items and net cash flow from operations in explaining contemporaneous stock returns. The second empirical question concerns those components unique to EVA that help explain these contemporaneous stock returns beyond that explained by residual income, earnings before extraordinary items and net cash flow from operations. Assuming that equity markets are (semi-strong form) efficient, stock returns may be used to compare the information content (or value-relevance) of these competing accounting-based performance measures (Bowen, Burgstahler and Daley 1987; Jennings 1990; Easton and Harris 1991; Ali and Pope 1995; Biddle, Seow and Siegel 1995). Both relative and incremental information content comparisons are made. In terms of specific studies, the approach selected in the current study is most consistent with that used by Biddle et al. (1997) and Bao and Bao (1998).

2.1 Linkages between EVA and EVA Components

The first methodological requirement is to describe the linkages that exist between the competing measures of firm performance; namely, earnings before extraordinary items (*ERN*), net cash flow from operations (*NCF*), residual income (*RI*) and economic value-added (*EVA*). Starting with *ERN* as the most basic indicator of firm value we have:

$$ERN_t = NCF_t + ACC_t \quad (1)$$

where *ERN* is the sum of net cash flow from operations (*NCF*) and accruals (*ACC*) with the t sub-script denoting the time-period. *ACC* is defined as total accruals relating to operating activities and is composed of depreciation, amortisation, changes in non-cash current assets, changes in current liabilities, and changes in the non-current portion of deferred taxes. Net operating profit after tax (*PRF*) is a closely related indicator of current and future firm performance and is calculated by adding after-tax interest expense (*ATI*) to *ERN*:

$$PRF_t = ERN_t + ATI_t = NCF_t + ACC_t + ATI_t \quad (2)$$

As indicated, the most significant difference between *ERN* and *PRF* is that the later separates operating activities from financing activities by including the after-tax effect of debt financing (interest expense). As a measure of operating profit, no allowance is therefore made in (2) for the financing activities (both debt and equity) of the firm. One measure that does is residual income (*RI*) where operating performance is reduced by a net charge for the cost of all debt and equity capital employed:

$$RI_t = PRF_t - (WACC_t \times CAP_{t-1}) = NCF_t + ACC_t + ATI_t - CC_t \quad (3)$$

where *WACC* is an estimate of the firm’s weighted average cost of capital, and capital (*CAP*) is defined as 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. The product of the firm's *WACC* and the amount of contributed capital thereby forms a capital charge (*CC*) against which *PRF* is reduced to reflect the return required by the providers of debt and equity capital. A positive (negative) *RI* indicates profits in surplus (deficit) of that required by the suppliers of debt and equity capital and is associated with an increase (decrease) in shareholder wealth.

The primary point of departure for *EVA* from *RI* is the adjusting of both *PRF* and *CAP* for purported 'distortions' in the accounting model of performance. EVA-type adjustments are made to both accounting measures of operating profits (*PRF*), and accounting measures of capital *(CAP)*. EVA thereby reflects adjustments to GAAP in terms of both operating and financing activities. Simplifying, *EVA* is thus determined by:

$$EVA_t = NCF_t + ACC_t + ATI_t - CC_t + ADJ_t \qquad (4)$$

where the total *EVA* accounting adjustment (*ADJ*) is the net figure of adjustments to *PRF* (*NCF* + *ACC* + *ATI*) less the adjustment to capital in determining *CC* (*WACC* × *CAP*).

2.2 Specification of 'Valuation' and 'Components' Models

The second methodological requirement is to specify the regression models used to: (i) calculate the relative and incremental content of the competing measures of firm performance, and (ii) calculate the relative and incremental content of the components of economic value-added (EVA®) itself. The first specification is referred to as the 'valuation model':

$$STK_{it} = b_0 + b_1 NCF_{it} + b_2 ERN_{it} + b_3 RI_{it} + b_4 EVA_{it} + e_{it} \qquad (5)$$

The dependent variable in (5) is the compounded annual stock return (*STK*) for firm *i* in period *t*. A 12-month non-overlapping period ending three months following the firm's fiscal year end is chosen to allow time for information contained in the annual report to be impounded in market prices. The explanatory variables in the firm valuation model are net cash flows from operations (*NCF*), earnings before extraordinary items (*ERN*), residual income (*RI*) and economic value-added (*EVA*). The first three accounting measures are specified since they represent both components of EVA and alternative measures of periodic performance. Selected descriptive statistics for these variables are given in Table 1. Following the value-relevance literature on financial statement information, the hypothesis suggests positive coefficients for *NCF*, *ERN*, *RI* and *EVA* when specified as explanatory variables for stock returns, and the relative information content of these measures will be higher the more closely they approximate these returns.

This model is similar to that used in Biddle's et al. (1997) EVA study save two respects. First, in the Biddle et al. (1997) the independent variables are normalised by the lagged market value of equity to provide consistency with the lagged accounting values specified in an autoregressive model. In this study the independent variables are normalised by the number of outstanding shares with no requirement to normalise in the same manner due to the absence of lags. While both approaches are commonly used to reduce heteroskedasticity in firm-level data, White's (1980) heteroskedastic-consistent estimator is also employed, along with an equivalent correction for time-wise autocorrelation in the pooled time-series, cross-sectional least squares regression. Second, in Biddle et al. (1997) the dependent variable is specified as market adjusted returns (each firm's 12-month compounded stock return less the 12-month compounded value-weighted market wide return) whereas in this analysis each firm's stock return remains unadjusted by the market return. This difference in specification maintains consistency with both the method of normalisation used for the independent variables and is largely nominal given that the regression sum of squares and the slope coefficients, which are the focus of this analysis, are unaffected.

The second specification examined is referred to as the 'components model':

$$EVA_{it} = b_0 + b_1 NCF_{it} + b_2 ACC_{it} + b_3 ATI_{it} + b_4 CC_{it} + b_5 ADJ_{it} + e_{it} \qquad (6)$$

This model is also estimated using a pooled time-series, cross-sectional least squares regression with corrections for heteroskedasticity and autocorrelation. The dependent variable is given as *EVA*. The independent variables are the five components of *EVA*: namely, net cash flows (*NCF*), operating accruals (*ACC*), after-tax interest (*ATI*), cost of capital (*CC*) and EVA accounting adjustments (*ADJ*). All variables are as previously defined and are equivalent to the left-hand side of equation (4). Descriptive statistics are provided in Table 1. This set of explanatory variables are also normalised by the number of shares on issue. The first variable, *NCF*, is as previously defined. *ACC* is defined as earnings less net cash flow from operations (*ERN* - *NCF*). Accruals can either be positive or negative, but are usually negative (reflecting non-cash expenses such as depreciation and amortisation). The *ex ante* sign on the coefficient for accruals is thought to be positive when specified as an explanatory variable for EVA and stock returns. *ATI* is calculated as one minus the firm's tax rate (assumed to be 36 per cent) multiplied by interest expense. A positive coefficient is hypothesised when EVA and stock returns are regressed against interest expense.

CC is defined as each firm's weighted-average cost of capital multiplied by the beginning of year capital (*WACC* × *CAP*). A negative coefficient is hypothesised. Finally *ADJ* reflects Stern Stewart's adjustments to earnings and capital, and is defined as economic value-added less residual income (*EVA* - *RI*). Given the fact that the direction of change for *ADJ* may vary across firms in the sample depending on both financing and operations (GAAP-related accounting adjustments can either be positive or negative), it is somewhat difficult to postulate the relationship between GAAP adjustments and EVA/stock returns. No *a priori* coefficient is hypothesised.

2.3 Data

The third methodological requirement is to specify the data sources for the financial statement numbers in (5) and (6) along with stock returns as the dependent variable. Three separate sources of data are used. Data for EVA® and its components is obtained directly from Stern Stewart's Australian *EVA® Performance Rankings*. These data contain EVA®, the weighted average cost of capital (*WACC*), return on capital, net operating profit after-tax (*PRF*), capital (*CAP*) and average shareholder returns for Australia's 110 largest listed (non-financial) companies. The sample of firms consists of both adopters and non-adopters of the *EVA™ Financial Management System* over the period of 1992–1998. Financial statement data for *ERN*, *ATI*, *RI*, *NCF*, *ACC* and *ADJ* are collected from the Australian Stock Exchange's (ASX) *Datadisk* database and the Connect-4 *Annual Report Collection* database. Finally, share price data are obtained from the Australian Graduate School of Management's (AGSM) *Share Price and Price Relative* database (incorporating capitalisation adjustments and dividends). Descriptive statistics for these variables are detailed in Table 1.

<TABLE 1 HERE>

2.4 Choice of Pooling Technique

The fourth methodological requirement is to examine the different methods of pooling panel data. In the basic regression model, a simple assumption is that the parameters do not vary across sample observations. One advantage of pooled time series models is that it "…allows parameters to vary in some systematic and/or random way across partitions of the sample data, or even from observation to observation" (Judge, Hill, Griffiths, Lütkepohl and H. Lee, 1988, p. 468). However, while pooling of data is used extensively in practice, most studies assume that financial relations, however defined, are homogeneous across firms (a common effects model).

The two additional pooling models considered are the fixed effects (or dummy variable) model and the random effects (or error components) model. To start with, the fixed effects model allows the differences in intercepts to be modeled using dummy variables, i.e., fixed coefficients. Assuming we have i = 1, 2, …, N cross-sectional observations, and t = 1, 2, …, T time-series observations, the (i, t)th observation on the dummy variable model with which we are concerned can be written as:

$$y_{it} = \sum_{j=1}^{N} \beta_{1j} D_{jt} + \sum_{k=2}^{K} \beta_k x_{kit} + e_{it} \tag{7}$$

where β_{1i} represents the intercept coefficient for the ith cross-sectional firm, D_{jt} are dummy variables that take a value of unity for observations on firm j but will be 0 for observations on other firms, β_k represent the slope coefficients that are common to all firms, y_{it} is the dependent variable, x_{kit} are the explanatory variables, and the e_{it} are independent and identically distributed random variables with $E[e_{it}] = 0$ and $E[e_{it}^2] = \sigma_e^2$. This specification is usually employed when specifying a different intercept coefficient for each cross-sectional unit can adequately capture differences in cross-sectional units. That is, cross-sectional identifiers explain changes from firm to firm (Judge et al. 1988).

An alternative to the fixed effects model is a random effects model that assumes that the coefficients are random variables drawn from some larger population:

$$y_{it} = \overline{\beta}_1 + \sum_{k=2}^{K} \beta_k x_{kit} + u_i + e_{it} \tag{8}$$

where $E[u_i] = 0$, $E[u_i^2] = \sigma_u^2$, $E[u_i u_j] = 0$ for $i \neq j$, $E[u_i e_{it}] = 0$ and all other variables are as previously defined. The structure of the model is such that, for a given firm, the correlation between any two disturbances in different time periods is the same, and unlike a first-order autoregressive model, does not decline as the disturbances become farther apart in time. Further, not only is the correlation constant over time, it is identical for all firms (Judge et al. 1988). The inference is that the results from this model may be generalised to the whole population from which the sample is taken.

In this manner, the distinction between the random and fixed effects can be viewed as the distinction between conditional and unconditional inference (Judge et al. 1988, p. 491). With the fixed effects model, inference is conditional on the firms in the sample, whereas the random effects model is more appropriate when we are interested in (unconditional) inferences about a larger population. Bearing in mind the fact that the sample is nearly exhaustive of the Australian companies for which Stern Stewart calculate EVA, a reasonable assumption in most circumstances might be a fixed effects formulation, however such assumptions should be tested empirically. This is especially important in studies of this type where the number of cross-sections (*N*) is relatively large and the number of time series (*T*) is relatively small. Under these conditions the results of the two models can differ significantly.

The procedures used to carry out tests between the models are as follows. Firstly, the model is estimated using common coefficients, and tested against the fixed and random effects specifications using an *F*-test. The *F* ratio used for the test is:

$$F(n-1, nT-n-K) = \frac{(R_u^2 - R_p^2)/(n-1)}{(1-R_u^2)/(nT-n-K)} \tag{9}$$

where u indicates the unrestricted model (common effects) and p indicates the pooled or restricted model with only a single overall constant term. Under the null hypothesis, the efficient estimator is pooled least squares (Greene 1993, p. 617). The second test is used to choose between a fixed or random effects specification. This is accomplished using a Hausman test. Under this hypothesis, there are two sets of estimates; one of which is consistent under both the null and alternative hypothesis, and another that is consistent only under the null. The null hypothesis is that both the fixed and random specifications are consistent, whereas under the alternative the fixed effect model is, but the random effects model is not. The test is based on a Wald criterion:

$$W = \chi^2[K] = \frac{(b-\hat{\beta})^2}{Var[b] - Var[\hat{\beta}]} \tag{10}$$

which is asymptotically distributed as chi-squared with *K* degrees of freedom (Greene 1993, p. 613). From this, the preferred model is identified and used in the incremental and relative information content tests.

2.5 Relative and Incremental Information Content Tests

The 'valuation model' is estimated using a pooled time-series, cross-sectional least squares regression assuming cross-sectional heteroskedasticity and timewise autoregression (Greene 1997, p. 613). The first set of tests is joint hypothesis tests of equation (5), that *NCF*, *ERN*, *EVA* and *RI* have equal relative information content. To accomplish this, each of these variables is specified as the explanatory variable in separate univariate regressions with stock returns as the dependent variable [i.e., *STK* and *NCF*, *STK* and *ERN*, etc.] (Biddle et al. 1997; Bao and Bao 1998). Comparisons of the R^2 of the regression results are made to determine which variable better explains variation in *STK*. Rejection of this hypothesis is viewed as evidence of a significant difference in the relative information content.

The second set of tests indicates whether one of these predictors of firm value provides value-relevance data beyond that provided by another measure. Rejection of this hypothesis is viewed as evidence of incremental information content. In these tests, each of the four explanatory variables in the valuation model is alternately paired with each other measure in a multivariate regression. As before, *STK* is specified as the dependent variable. For example, the incremental information content for *EVA*/*ERN* is obtained from a multivariate regression where both *EVA* and *ERN* are specified as explanatory variables. Taking the adjusted R^2 from this pairwise regression, and subtracting the individual R^2 for *ERN* obtained in the earlier univariate regression, yields the incremental information content of *EVA* over *ERN*.

Similar tests of relative and incremental information content are performed in the 'components model' (6), using the preferred pooling technique. The components in this instance are *NCF*, *ACC*, *ATI*, *CC* and *ADJ*. Additionally, in order to evaluate the sensitivity of these models to the specification of variables, two separate regressions are undertaken. These are identical in all respects except that in the first form all variables are expressed in levels (or undifferenced), while in the second the variables represent year-to-year changes in the variables (or differenced). Bao and Bao (1998) also evaluated the usefulness of value added measures using level and differenced variables. As an alternative, Biddle et al. (1997, p. 309) specified the independent variables in levels along with a lagged value: "it is in a more convenient form that allows the slope or 'response' coefficient to be observed directly (rather than being derived directly from separate coefficients on levels and changes)".

3. Empirical Results

The first step in the analysis is to select the most appropriate pooling technique for both the 'valuation' (5) and 'components' (6) models. In the first instance, the explanatory variables are net cash flow (*NCF*), earnings before extraordinary items (*ERN*), residual income (*RI*) and economic value-added (*EVA*). In the second instance, the explanatory variables are net cash flows from operations (*NCF*), accruals (*ACC*), after-tax interest (*ATI*), the cost of capital (*CC*) and accounting adjustments (*ADJ*). The dependent variable in the first instance is the compounded annual stock return and in the second, economic value-added. An assumption of a linear relationship between these variables is made.

Table 2 presents the estimated coefficients, standard errors and *t*-statistics for both models, in both differenced and levels form, across the three alternative pooling techniques; namely, common, fixed and random effects. In general, there is consistency in the signs on the estimated coefficients for both the valuation and components models across both the alternative panel data specifications and whether the regression employs levels or differenced variables. However, levels of significance do vary. For instance, the levels of significance are generally higher for the differenced regressions for the valuation model while the reverse holds for the levels regressions for the components model. Moreover, across the three alternative methods of pooling data R^2 is highest for the fixed effects models and lowest for the models assuming common effects. This reinforces the suggestion that at least some of the difference in information content found across past EVA studies may be attributable to differences in the chosen pooling technique.

<TABLE 2 HERE>

As discussed, the significance of group effects (fixed or random) over the common effects in the valuation model is tested using (9). The test for common effects in the undifferenced data [$F = 8.438 \sim F^{.05}_{109,656}$] rejects the null hypothesis that the efficient estimator is the unrestricted (common effects model). Likewise, the test for common effects in the differenced data [$F = 5.170 \sim F^{.05}_{109,656}$] also reflects the null hypothesis. Since both statistics are larger than the critical value we may reject the null hypothesis of no common effect (i.e., variation across cross-sections).

The next procedure (10) uses Hausman's test for fixed and random effects. The underlying idea of the Hausman test is to compare two sets of estimates, one of which is consistent under both the null and alternative hypothesis, and another that is consistent only under the null hypothesis. Under the null hypothesis both the fixed and random specifications are consistent, whereas under the alternative the fixed effect model is, but the random effects model is not. The Wald value calculated in the valuation model is 79.546 for the undifferenced data and 89.985 for the differenced data. Both of these are larger than the critical value of 9.48773 (chi-square at 5 percent level of significance), thus rejecting the null hypothesis. We may conclude that the fixed effects specification is appropriate whether using levels (undifferenced) or differenced data. As the fixed effects (or dummy variable) model is the preferred model it is used in the remainder of the analysis.

Table 3 presents the estimated coefficients, standard errors and *t*-statistics of the valuation model, for both differenced and levels, assuming a fixed effects specification. The dependent variable is specified as compounded annual stock returns (with a lagged period of three months following fiscal year end) and the explanatory variables are variously specified as net cash flow, earnings before extraordinary items, residual income and economic value-added. Variance inflation factors (VIF) are also calculated using the R^2 for each independent variable when regressed on the remaining independent variables. As a rule of thumb, if the VIF of an independent variable exceeds 10, multicollinearity may be a problem. In the case of the regressors in the valuation model, the highest VIF is only 5.71 (ERN) while the highest VIF in the components model is 6.76 (ACC). These suggest that multicollinearity, while present, is not significant.

<TABLE 3 HERE>

Table 3 indicates that all four accounting-based performance measures are positively associated with stock returns (except on four occasions net cash flow). These tables also show that only residual income (and on four occasions earnings and one occasion net cash flow) is significant in explaining stock returns over the period 1992–1998. Of the estimated 40 slope coefficients, only 14 are significant at the .10 level or lower and four are not in the predicted direction (*NCF*). This finding holds when a pairwise combination of performance measures is specified in the same regression. Table 3 shows that residual income is most significant by itself and when paired with net cash flow. Also earnings are significant by itself and when paired with net cash flow. The pairwise regression that most explains stock returns (*STK*) is *EVA/RI* (26.56%), *EVA/NCF* (25.99%), *EVA/ERN* (25.57%), *RI/NCF* (18.47%), *ERN/RI* (18.44%) and finally *ERN/NCF* (14.17%). As EVA is in the three pairwise regressions that best explain returns, there is already an indication that it is a highly significant explanatory factor.

The significance of these variables improves with the differenced variables as detailed in Table 3, indicating that changes from year to year are important. The most significant explanatory pairwise combinations are in order of decreasing power are *EVA/RI* (41.91%), *EVA/ERN* (38.72%), *EVA/NCF* (38.17%), *NCF/RI* (23.72%), *ERN/RI* (22.97%) and *ERN/NCF* (17.80%). Again EVA has the most explanatory power, although it lacks significance. NCF is also periodically in the wrong direction, meaning that firms in the sample for the period under consideration may have experienced predominately negative cash flows, thus skewing the results and causing insignificance. Thus the market may not recognise EVA and net cash flows (*NCF*) as legitimate or reliable firm valuation measures. These results show that earnings are highly valued by the market, as is the long-established residual income concept. The summary results of these regressions in the form of relative and incremental information content tests are presented in Tables 4 and 5.

Part A of Tables 4 and 5 indicates that there is a significant difference in relative information content between the accounting-based measures. The highest adjusted R^2 from the single coefficient regressions is shown on the left, with lower explanatory power in descending order to the right. The suggestion is that *EVA* better explains *STK* than *RI*, *ERN* and *NCF* alone, the explanatory power being slightly higher for differenced variables (Table 5). *EVA*, however, does lack significance, whereas *RI* is highly significant. In terms of international comparisons, Biddle et al. (1997) indicated that earnings *(ERN*) was more highly associated with stock returns than either *RI* or *EVA*, but that all three measures dominate net cash flow (*NCF*). Furthermore, the explanatory power of all four accounting-based measures is significantly higher than that found in a number of comparable studies. For example, Biddle et al. (1997) estimated the relative information content of *ERN*, *RI*, *EVA* and *NCF* at 9.04, 6.24, 5.07 and 2.38 percent respectively.

<TABLES 4 AND 5 HERE>

The results in Part B of Tables 4 and 5 provide incremental information content tests for the pairwise combinations of *EVA*, *ERN*, *RI* and *NCF*. For example, in Table 4 *EVA/ERN* (11.15 percent) is equal to the information content of the pairwise comparison of *EVA* and *ERN* (25.57 percent) minus the information content of *ERN* (14.42 per cent) from Table 3. The pairwise combinations of *EVA* and *ERN*, *NCF* and *RI* indicate that explanatory power has increased by

11.15, 12.48 and 8.03 per cent respectively over the *EVA* measure alone. A comparison with the incremental information tests contained in Bao and Bao (1998) for pooled data indicates that earnings have a zero impact on *EVA* alone, while residual income increases explanatory power by some 38 percent. Overall, the results indicate that *EVA* exhibits the largest relative information content among the measures, with *RI* (0.88 percent), *NCF* (0.31 percent) and *ERN* (-0.11 percent) providing only limited incremental information content beyond *EVA*. The most logical pairing of information variables in explaining stock returns is therefore composed of *EVA* and *RI*. These results persuasively support the claims made by Stern Stewart that EVA® outperforms other accounting-based performance measures in explaining stock returns.

The second phase of the study is to examine the components of *EVA*. These components are net cash flows from operations (*NCF*), accruals (*ACC*), after-tax interest (*ATI*), the cost of capital (*CC*) and accounting adjustments (*ADJ*). This part of the analysis addresses the empirical question of what component of EVA contributes most to variation in EVA, and hence explaining stock returns. Table 6 presents the results of the individual and pairwise regressions of the components of EVA, employing both levels and differenced data.

In Table 6, the individual regressions show that two of the five variables (*CC*, *ATI*) are significant at the 0.01 level. The cost of capital (*CC*) is highly significant for all regressions, and interestingly, accruals (*ACC*) is never significant until included in the final regression. *ADJ* are only significant when paired with *CC* and *ATI*, and *NCF* is only significant when paired with *CC*. *ATI* losses significance when paired with *CC*, and *CC* loses significance itself in this pairwise regression, when compared to the others. The pairwise combinations show that *CC*/*ADJ* most explains *EVA* (78.08%), followed by *ATI*/*ADJ* (64.46%), *CC*/*NCF* (61.15%), *CC*/*ATI* (56.92%), *ADJ*/*NCF* (56.92%), *CC*/*ACC* (56.01%), *ATI*/*NCF* (55.72%), *ACC*/*ADJ* (51.34%), and *ACC*/*NCF* (56.92%). The final regression shows almost complete explanation (98.40%) with all variables highly significant and in the predicted direction.

<TABLE 6 HERE>

Table 6 also shows that three out of the five variables are significant (*ACC*, *ADJ* and *NCF*) at the 0.01 level for the individual regressions. *ATI* is found never to be significant, even when included in the final regression with all of the variables included in the model. CC is significant when paired with *ADJ* and in the final regression. *NCF* loses significance when paired with ACC, compared to the other regressions. *ACC* loses significance when paired with *ATI* and *ADJ*, when paired with the other regressors. The pairwise regressions for the differenced variables show (in order of explanatory power) that *ADJ/NCF* (65.21%) better explains EVA than *CC/ADJ* (64.03%), *ACC/ADJ* (62.32%), *ATI/ADJ* (60.53%), *ATI/NCF* (50.44%), *CC/NCF* (50.13%), *ACC/NCF* (65.21%), *ATI/ACC* (49.74%), *CC/ATI* (48.86%), and *CC/ACC* (48.85%). A comparison of the two tables shows that differences in *ACC*, *ADJ* and *NCF* explain *EVA* better than these variables in levels analysis, and that the remaining two variables *CC* and *ATI* have more explanatory power in the levels analysis. In Table 6, only in two of five of the single coefficient or pairwise regressions does the estimated sign for *CC* correspond with the *ex ante* sign, and *ATI* coefficients never demonstrate the postulated sign (positive). Also, even in the final regression specification in Table 6 the *ex post* sign for *ATI* does not correspond with *a priori* reasoning.

Part A of Tables 7 and 8 give the results of relative information content tests of the components of *EVA*. In Table 7, when specified as a single slope coefficient *CC* (56.16 percent) has greater explanatory power than *ATI* (54.36 percent), *ADJ* (50.26 percent), *NCF* (48.04 percent) and *ACC* (47.46 percent). Table 8 describes different results, namely that when specified as a single slope coefficient *ADJ* (60.57 percent) has greater explanatory power than *NCF* (49.67 percent), *ATI* (48.64 percent), *ACC* (48.42 percent), and *CC* (47.29 percent). The results from Table 8 are consistent with the previous part of the analysis since *ADJ* is shared by *EVA* with *ERN*, *RI* and *NCF*, *ATI* and *CC* with *RI*, and *ADJ* by itself alone. Part B of Tables 7 and 8 present the incremental information content results. Starting with the base *CC*, *ADJ* adds 27.82 percent in explanatory power, *NCF* adds 13.11 percent, *ACC* 8.05 percent and *ATI* adds 2.56 percent. Overall, the component of *EVA* that explains most variation in stock returns is adjustments (*ADJ*), followed by net cash flow (*NCF*), accruals (*ACC*), after-tax interest (*ATI*), and capital charges (*CC*). In other words, the first part of the analysis is supported, because *ADJ*, which separates *EVA* from other accounting-based performance measures is the most significant factor.

<TABLES 7 AND 8 HERE>

The results indicate that EVA® does indeed explain more variation in stock returns than traditional accounting-based performance measures, namely earnings (*ERN*), residual income (*RI*), and net cash flows (*NCF*). All other things being equal, the relative information content of EVA is in the order of 25 to 38 percent (depending upon the specification), whereas it is 18 to 23 percent for residual income, 14 to 17 percent for earnings and 13 to 17 percent for net cash flow. The second part of the first phase of the study shows that for the differenced variables, Stern

Stewart's accounting adjustments (*ADJ*) more adequately explains STK than cash flows (*NCF*), after-tax interest (*ATI*), accruals (*ACC*) or the cost of capital (*CC*). The importance of these adjustments is also suggested by the fact that EVA has a relative information content of some 8.03 percent over the closely related measure of residual income.

4. Concluding Remarks

A number of points emerge from the present study. The first part of the analysis uses pooled time-series, cross-sectional data of 110 listed Australian companies to evaluate the usefulness of EVA® and other accounting-based performance measures. The measures of relative and incremental information content indicate that over the period 1992 to 1998 some 27 percent of the variation in the level of stock returns could be explained by these measures, and 44 percent of the variation in returns defined as year-to-year changes. Notwithstanding the obvious importance of earnings figures in value-relevance studies, EVA® is significant at the margin in explaining variation in stock returns. This would support the potential usefulness of EVA-type measures for internal and external performance measurement.

In the second part of the analysis, the components of EVA® are specified as explanatory variables in regressions with EVA. When examining the components of EVA® (most of which are shared with closely-related performance measures) the capital charge and after-tax interest payments were found to be the most significant components explaining EVA differences, and, accordingly, the level of stock returns. However, the accounting adjustments entailed in EVA calculations were found to be more significant in explaining changes in EVA and hence stock returns. Net cash flow, after-tax interest, accruals and the capital charge followed this. Overall, the results are broadly comparable to other studies supporting the usefulness of economic value-added, including Uyemura et al. (1996), O'Byrne (1996) and Bao and Bao (1998), amongst others. However, the divergence between the results of this paper and that of Biddle et al. (1997) and some other US studies requires explanation, of which two possibilities are thought likely.

One possibility is that GAAP differences between Australia and the US may account for at least some difference in incremental information content between these two institutional settings. Barth and Clinch (1996, p. 164), for example, concluded that "…in addition to domestic net income and shareholder equity, differences in accounting for goodwill, asset revaluations, deferred income taxes, and pensions (or, equivalently, the US GAAP for these items) provide incremental power in explaining share returns or prices for either, or both UK and Australian firms". Though Barth and Clinch (1996) found that the direction and magnitude of differences in Australian and US GAAP varies by the type of accounting change, one might expect that the relatively less conservative nature of Australian GAAP would result in earnings numbers that are more reflective of 'economic income'. Since O'Hanlon and Peasnell (1998) point out that one of Stern-Stewarts main objectives in calculating EVA is undoing (US) accounting conservatism to more closely reflect the economic substance of transactions, the significant marginal contribution of EVA in explaining Australian stock returns is a surprise. Unfortunately, it is not possible to decompose the specific GAAP adjustments in the publicly available dataset in order to throw light on this issue. Nonetheless, it would be useful to more fully examine the institutional differences between the US and Australia in order to understand disparities in future empirical work.

The second possibility is that differences in research design are responsible for the differences in results between this analysis and that of, say, Biddle et al. (1997). Without doubt, while there are differences in the specification of both the dependent and independent variables in these analyses, the singularly most important finding in this study is that differences in the explanatory power of accounting-based measures across firms could be captured by differences in the constant term (a fixed effects formulation). The implication is that the results from similar studies that rely upon the simpler common effects formulation of panel data could be questioned on a number of grounds. For instance, in Biddle et al. (1997), a simple common effects specification is employed. That is, no allowance is made for the cross-sectional specific variation in the valuation relationship likely to arise when a sample is drawn from different industries and at different stages in the firm's life cycle. One particular outcome is that regressions incorporating this sort of assumption would tend to understate the significance of accounting-based performance measures when specified as common explanatory factors for stock returns. By itself, this may account for the differences in information content between this study and earlier work by Biddle et al. (1997), amongst others.

There are at least three ways in which this research may be extended. First, a limitation in this study is that a comparison could not be made of firms who use the *EVA® Financial Management System* (incorporating redesigned executive compensation plans) against firms that use traditional accounting earnings-based incentives. While the results in the present study are suggestive of the benefits of EVA as a tool for internal performance measurement and compensation design, it is conceivable that the association between EVA® and returns is even stronger for EVA® adopters (Biddle et al. 1997; Ferguson and Leistikow 1998; Garvey and Milbourn 2000).

Second, there is abundant empirical evidence to suggest that models relating accounting and stock returns have more explanatory power when the accounting returns are expressed by relative changes and the relation is a non-linear, convex-concave function [see, for example, Freeman and Tse (1992), Riahi-Belakoui (1996) and Frankel and Lee (1998)]. A further avenue of research would therefore consist of alternative specifications of accounting and stock returns, along with the use of non-linear regression techniques.

Finally, there is scope for the investigation of the usefulness of EVA® as an internal and external performance measure in other settings. Stern Stewart also provide performance rankings for listed companies in the UK, Canada, Brazil, Germany, Mexico, Turkey, and France, amongst others (Stern Stewart, 1999), and empirical evidence from these institutional milieus would provide additional evidence regarding the contextual and/or substantive usefulness of accounting-based value-added measures.

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Table 1
Descriptive Statistics of Variables Employed in the Valuation and Components Models

This table provides descriptive statistics for compounded annual stock returns (*STK*), net cash flows from operations (*NCF*), earnings before extraordinary items (*ERN*), residual income (*RI*) and economic value-added (*EVA*), accruals (*ACC*), after-tax interest expense, cost of capital (*CC*) and accounting adjustments (*ADJ*) as specified in the valuation and components models over the period 1992 to 1998. All variables except *STK* are scaled by the number of outstanding shares.

Variable	Mean	Std. Dev.	Skewness	Kurtosis
STK	0.1496	0.4015	1.8345	13.5283
NCF	0.4205	0.6693	5.2401	45.5583
ERN	0.3869	0.5061	3.8748	23.7392
RI	-0.1445	0.4773	-2.7882	17.6090
EVA	-0.0640	0.2997	-5.2973	55.5217
ACC	-0.0330	0.4710	-7.7296	113.6291
ATI	-0.0579	0.1111	-6.9512	68.6646
CC	0.4760	0.4808	3.2759	16.9221
ADJ	0.0873	0.3581	2.0636	16.7207

Table 2
Association with Market Returns and Economic Value-Added

This table presents the estimated coefficients, standard errors, t-statistics and R^2 for the valuation (equation 5) and components (equation 6) models. The upper panel provides the results for the valuation model assuming common, fixed (equation 7) and random (equation 8) effects in the pooled data for undifferenced and differenced variables. The dependent variable in these models is compounded annual stock returns (*STK*) and the independent variables are net cash flows from operations (*NCF*), earnings before extraordinary items (*ERN*), residual income (*RI*) and economic value-added (*EVA*). The lower panel provides the results for the components model assuming common, fixed (equation 7) and random (equation 8) effects in the pooled data for undifferenced and differenced variables. The dependent variable in these models is economic value-added (*EVA*) and the independent variables are net cash flow (*NCF*), accruals (*ACC*), after-tax interest expense (*ATI*), cost of capital (*CC*) and accounting adjustments (*ADJ*).

			Undifferenced variables				Differenced variables			
		Variable	Estimated. coefficient	Standard error	*t*-stat	R^2	Estimated. coefficient	Standard error	*t*-stat	R^2
Valuation model	Common effects	CONS.	0.1176	0.0263	4.47	2.86	0.1457	0.0169	8.62	11.01
		NCF	0.0275	0.0431	0.64		-0.0089	0.0364	-0.24	
		ERN	0.0714	0.0615	1.16		0.2320	0.1049	2.21	
		RI	-0.0090	0.0481	-0.19		0.3293	0.1454	2.26	
		EVA	0.1476	0.1011	1.46		0.0952	0.0864	1.10	
	Fixed effects	NCF	-0.0228	0.1050	-0.22	27.59	-0.0066	0.0313	-0.21	44.06
		ERN	0.1354	0.1337	1.01		0.2098	0.0991	2.12	
		RI	0.1977	0.1117	1.77		0.3097	0.1240	2.50	
		EVA	0.0610	0.1101	0.55		0.0806	0.0797	1.01	
	Random effects	CONS.	0.1304	0.0305	4.28	18.96	0.1462	0.0293	4.99	41.41
		NCF	0.0083	0.0423	0.20		-0.0074	0.0321	-0.23	
		ERN	0.0763	0.0639	1.19		0.2168	0.0819	2.65	
		RI	0.0402	0.0603	0.67		0.3168	0.0593	5.34	
		EVA	0.1237	0.0841	1.47		0.0849	0.0562	1.51	
Components model	Common effects	CONS.	0.0045	0.0031	1.45	97.59	-0.0423	0.0101	-4.18	31.09
		NCF	0.9490	0.0249	38.11		0.2386	0.1797	1.32	
		ACC	0.9479	0.0252	37.61		0.1929	0.1859	1.03	
		ATI	0.9919	0.0300	33.06		-0.4203	0.6163	-0.68	
		CC	-0.9679	0.0187	-51.75		-0.2973	0.1170	-2.54	
		ADJ	0.9550	0.0264	36.17		0.5029	0.2499	2.01	
	Fixed effects	NCF	0.9031	-0.9614	0.93	98.42	0.4166	0.0992	4.19	72.60
		ACC	0.9045	0.0299	30.25		0.3690	0.0994	3.71	
		ATI	0.9848	0.0361	27.27		-0.0256	0.3405	-0.07	
		CC	-0.9614	0.0160	-60.08		-0.3889	0.0806	-4.82	
		ADJ	0.9707	0.0181	53.62		0.4988	0.1358	3.67	
	Random effects	CONS.	0.0055	0.0040	1.37	98.22	-0.0465	0.1736	-0.26	61.65
		NCF	0.9431	0.0086	109.66		0.3645	0.0526	6.92	
		ACC	0.9427	0.0098	96.19		0.3171	0.0540	5.87	
		ATI	0.9917	0.0277	35.80		-0.1536	0.1557	-0.98	
		CC	-0.9657	0.0093	-103.83		-0.3623	0.0478	-7.57	
		ADJ	0.9588	0.0097	98.84		0.4999	0.0322	15.52	

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Table 3
Association with Market Returns for the Valuation Model with Fixed Effects

This table provides the estimated coefficients, standard errors, t-statistics, F-statistic and adjusted R^2 for the valuation models in equation (5) assuming fixed effects (equation 7) in the pooled data. The variables are specified in undifferenced form in the upper panel and differenced form in the lower panel. The dependent variable is compounded annual stock returns (*STK*) and the independent variables are net cash flows from operations (*NCF*), earnings before extraordinary items (*ERN*), residual income (*RI*) and economic value-added (*EVA*). The 11 models in each panel are comprised of four models where each independent variable is specified univariately followed by six models where the independent variables are specified in pairwise combinations and finally jointly.

	NCF			ERN			RI			EVA			F	Adj. R^2
	Estimated coefficient	Standard error	*t*-stat	Estimated coefficient	Standard error	*t*-stat	Estimated coefficient	Standard error	*t*-stat	Estimated coefficient	Standard error	*t*-stat		
Undifferenced variables	0.4118	0.0367	11.22										1.26	13.51
				0.1867	0.0579	3.22							10.41	14.42
							0.2510	0.0878	2.86				8.44	18.53
										0.2326	0.1484	1.57	2.60	25.68
	-0.0288	0.0879	-0.33							0.2205	0.1488	1.48	138.01	25.99
				0.0992	0.086	1.15				0.2260	0.1459	1.55	137.40	25.57
							0.1971	0.1123	1.76	0.0835	0.1135	0.74	142.78	26.56
	0.0043	0.0403	0.11	0.1810	0.0648	2.79							92.43	14.17
				0.0504	0.0900	0.56	0.2350	0.0981	2.40				111.19	18.44
	0.0412	0.0424	0.97				0.2539	0.0884	2.87				110.54	18.47
	-0.0228	0.1050	-0.22	0.1354	0.1337	1.01	0.1977	0.1117	1.77	0.0610	0.1101	0.55	48.65	27.15
Differenced variables	0.0823	0.0629	1.31										1.71	17.09
				0.1673	0.0893	1.87							3.51	17.31
							0.2731	0.0841	3.25				10.47	23.06
										0.1647	0.1022	1.61	2.60	37.69
	-0.0015	0.0311	-0.05							0.1656	0.1023	1.62	175.79	38.17
				0.2043	0.1288	1.59				0.1504	0.1042	1.44	182.43	38.72
							0.3124	0.1204	2.59	0.0935	0.0767	1.22	206.66	41.91
	0.0790	0.0801	0.99	0.0960	0.1158	0.83							99.65	17.80
				0.0382	0.0897	0.43	0.2568	0.0838	3.06				117.11	22.97
	0.0789	0.0634	1.24				0.2554	0.0855	2.99				120.83	23.72
	-0.0066	0.0313	-0.21	0.2098	0.0991	2.12	0.3097	0.1240	2.50	0.0806	0.0797	1.01	72.73	43.63

Table 4

Relative and Incremental Information Content for Valuation Model, Undifferenced Variables

This table provides the hypothesis tests of equation (5) that *EVA*, *RI*, *ERN* and *NCF* have equal relative (Panel A) and incremental (Panel B) information content in undifferenced form. The adjusted R^2 for the fixed effects specification in Table 3 where each independent variable is specified univariately provides the tests of relative information content. Taking the adjusted R^2 from each pairwise regression in Table 3, and subtracting the R^2 obtained in the earlier univariate regression obtain the tests for relative information content.

A. Relative Information Content											
EVA	>	RI	>	ERN	>	NCF					
25.68%		18.53%		14.42%		13.51%					
B. Incremental Information Content											
EVA/ERN	ERN/EVA	EVA/NCF	NCF/EVA	EVA/RI	RI/EVA	ERN/NCF	NCF/ERN	ERN/RI	RI/ERN	NCF/RI	RI / NCF
11.15%	-0.11%	12.48%	0.31%	8.03%	0.88%	0.66%	-0.25%	-0.09%	4.02%	-0.06%	4.96%

Table 5

Relative and Incremental Information Content for Valuation Model, Differenced Variables

This table provides the hypothesis tests of equation (5) that *EVA*, *RI*, *ERN* and *NCF* have equal relative (Panel A) and incremental (Panel B) information content in differenced form. The adjusted R^2 for the fixed effects specification in Table 3 where each independent variable is specified univariately provides the tests of relative information content. Taking the adjusted R^2 from each pairwise regression in Table 3, and subtracting the R^2 obtained in the earlier univariate regression obtain the tests for relative information content.

A. Relative Information Content											
EVA	>	RI	>	ERN	>	NCF					
37.69%		23.06%		17.31%		17.09%					
B. Incremental Information Content											
EVA/ERN	ERN/EVA	EVA/NCF	NCF/EVA	EVA/RI	RI/EVA	ERN/NCF	NCF/ERN	ERN/RI	RI/ERN	NCF/RI	RI / NCF
21.41%	1.03%	21.08%	0.48%	18.85%	4.22%	0.71%	0.49%	-0.09%	5.66%	0.66%	6.63%

-

Table 6
Association with EVA for the Components Model, Fixed Effects Specification

This table provides the estimated coefficients, standard errors, t-statistics, F-statistic and adjusted R^2 for the components models in equation (6) assuming fixed effects (equation 7) in the pooled data. The variables are specified in undifferenced form in the upper panel and in differenced form in the lower panel. The dependent variable is economic value-added (*EVA*) and the independent variables are net cash flow (*NCF*), accruals (*ACC*), after-tax interest expense (*ATI*), cost of capital (*CC*) and accounting adjustments (*ADJ*). The 16 models in each panel are comprised of five models where each independent variable is specified univariately followed by 11 models where the independent variables are specified in pairwise combinations and finally jointly.

	NCF			ACC			ATI			CC			ADJ			F	Adj. R^2
	Estimated coefficient	Standard error	*t*-stat	Estimated coefficient	Standard error	*t*-stat	Estimated coefficient	Standard error	*t*-stat	Estimated coefficient	Standard error	t-stat	Estimated coefficient	Standard error	*t*-stat		
Undifferenced variables	-0.0227	0.0428	0.53													0.28	48.04
				0.0532	0.0536	0.99										0.97	47.96
							0.9548	0.3518	2.71							7.37	54.36
										-0.3072	0.0795	3.86				14.88	56.16
													0.1861	0.1401	1.33	2.30	50.26
							0.4413	0.4504	0.98	-0.2251	0.1082	2.08				509.72	56.92
				-0.0019	0.0427	0.04				-0.3077	0.0839	3.67				500.21	56.01
										-0.7312	0.0948	7.71	0.6996	0.1242	5.63	1396.67	78.08
	0.1065	0.0396	2.69							-0.4608	0.0729	6.32				613.25	61.15
				-0.0263	0.0514	0.51	0.9947	0.3754	2.65							458.28	54.29
							1.5673	0.3742	4.19				0.407	0.1543	2.64	699.05	64.46
	0.0908	0.0596	1.52				1.1695	0.4337	2.70							481.76	55.72
				0.0948	0.0668	1.42							0.2184	0.1441	1.52	415.77	51.34
	0.1019	0.1374	0.74	0.1565	0.1533	1.02										368.74	48.52
	-0.0616	0.0561	1.10										0.2358	0.1869	1.26	404.35	56.92
	0.9231	0.0307	30.07	0.9045	0.0299	30.25	0.9848	0.0361	27.28	-0.9614	0.016	60.09	0.9707	0.0181	53.63	5826.20	98.40
Differenced variables	0.0817	0.0262	3.12													9.72	49.67
				-0.0696	0.0262	2.66										7.07	48.42
							-0.5757	0.4009	1.44							2.06	48.64
										0.0546	0.0686	0.80				0.63	47.29
													0.3102	0.1172	2.65	7.81	60.57
							-0.6302	0.4377	1.44	-0.029	0.0809	0.36				314.36	48.86
				-0.0685	0.0261	2.62				0.0497	0.0683	0.73				322.89	48.85
										-0.2258	0.0756	2.99	0.4134	0.1183	3.49	600.51	64.03
	0.0792	0.0254	3.12							0.0453	0.0826	0.55				336.76	50.13
				-0.0595	0.0253	2.35	-0.4983	0.3972	1.25							327.56	49.74
							-0.0718	0.3142	0.23				0.3051	0.1226	2.49	506.89	60.53
	0.0674	0.0247	2.73				-0.4056	0.4086	0.99							333.76	50.44
				-0.0513	0.0205	2.50							0.3021	0.1157	2.61	543.03	62.32
	0.1696	0.0689	2.46	0.0992	0.0651	1.52										336.72	49.90
	0.0621	0.0237	2.62										0.3528	0.1181	2.99	630.27	65.21
	0.4166	0.0992	4.20	0.369	0.0994	3.71	-0.0256	0.3405	0.08	-0.3889	0.0806	4.83	0.4988	0.1358	3.67	210.66	72.28

Table 7
Relative and Incremental Information Content for the Components Model, Undifferenced Variables

This table provides the hypothesis tests of equation (6) that *NCF*, *ACC*, *ATI*, *CC* and *ADJ* have equal relative (Panel A) and incremental (Panel B) information content in undifferenced form. The adjusted R^2 for the fixed effects specification in Table 6 where each independent variable is specified univariately provides the tests of relative information content. Taking the adjusted R^2 from each pairwise regression in Table 3, and subtracting the R^2 obtained in the earlier univariate regression obtain the tests for relative information content.

A. Relative Information Content

CC	>	ATI	>	ADJ	>	NCF	>	ACC
56.16%		54.36%		50.26%		48.04%		47.96%

B. Incremental Information Content

CC/ATI	ATI/CC	CC/ACC	ACC/CC	CC/ADJ	ADJ/CC	CC/NCF	NCF/CC	ATI/ACC	ACC/ATI
2.56%	0.76%	8.05%	-0.15%	27.82%	21.92%	13.11%	4.99%	6.33%	-0.07%
ATI/ADJ	ADJ/ATI	ATI/NCF	NCF/ATI	ACC/ADJ	ADJ/ACC	ACC/NCF	NCF/ACC	ADJ/NCF	NCF/ADJ
14.20%	10.10%	7.68%	1.36%	1.08%	3.38%	0.48%	0.56%	8.88%	6.66%

Table 8
Relative and Incremental Information Content for the Components Model, Differenced Variables

This table provides the hypothesis tests of equation (6) that *NCF*, *ACC*, *ATI*, *CC* and *ADJ* have equal relative (Panel A) and incremental (Panel B) information content in differenced form. The adjusted R^2 for the fixed effects specification in Table 6 where each independent variable is specified univariately provides the tests of relative information content. Taking the adjusted R^2 from each pairwise regression in Table 3, and subtracting the R^2 obtained in the earlier univariate regression obtain the tests for relative information content.

A. Relative Information Content

ADJ	>	NCF	>	ATI	>	ACC	>	CC
60.57%		49.67%		48.64%		48.42%		47.29%

B. Incremental Information Content

CC/ATI	ATI/CC	CC/ACC	ACC/CC	CC/ADJ	ADJ/CC	CC/NCF	NCF/CC	ATI/ACC	ACC/ATI
0.22%	1.57%	0.43%	1.56%	3.46%	16.74%	0.46%	2.84%	1.32%	1.10%
ATI/ADJ	ADJ/ATI	ATI/NCF	NCF/ATI	ACC/ADJ	ADJ/ACC	ACC/NCF	NCF/ACC	ADJ/NCF	NCF/ADJ
-0.04%	11.89%	0.77%	1.80%	1.75%	13.90%	0.23%	1.48%	15.54%	4.64%

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