Title	A Comparison of Error Rates for EVA, Residual Income, GAAP-earnings, and Other Metrics Using a Long-window Valuation Approach
Authors(s)	Forker, John; Powell, Ronan
Publication date	2008
Publication information	European Accounting Review, 17 (3): 471-502
Publisher	Taylor and Francis
Item record/more information	http://hdl.handle.net/10197/7490
Publisher's statement	This is an electronic version of an article published in European Accounting Review. European Accounting Review is available online at: www.tandfonline.com/doi/abs/10.1080/09638180802172420 .
Publisher's version (DOI)	10.1080/09638180802172420

A Comparison of Error Rates for EVA, Residual Income, GAAP-earnings, and Other Metrics Using a Long-Window Valuation Approach

JOHN FORKER

Queen's University Belfast, Northern Ireland

RONAN POWELL

University of New South Wales, Sydney, Australia

The authors are grateful to Stern Stewart & Co., for providing the data for the US and UK on which this study is based, to Michael Kollo for research assistance and for financial support from the Centre for Business Performance, ICAEW, in funding this research. The paper has benefited from comments received from two anonymous reviewers, seminar participants at Queen's University Belfast, and the annual conferences of the British Accounting Association and European Accounting Association in 2003 and 2004, respectively.

Address for correspondence: Ronan Powell, School of Banking and Finance, the University of New South Wales, Sydney, NSW 2052, Australia. Tel: +61 2 93854925; Fax: +61 2 93856347; Email: r.powell@unsw.edu.au.

A Comparison of Error Rates for EVA, Residual Income, GAAP-earnings, and Other Metrics Using a Long-Window Valuation Approach

ABSTRACT Predictability and variability are two measures commonly used in the empirical literature to gauge the quality of earnings and hence, decision usefulness to investors. We adopt both measures to investigate empirically the relative quality of Stern Stewart's measure of economic value added (EVA) compared to GAAP earnings, residual income, cash flows and other mandated metrics in the US and UK. We proxy for accounting quality by applying a long-window methodology to obtain hindsight valuation errors based on the difference between *ex ante* market value and discounted *ex post* metrics. Decision usefulness, in terms of ease of forecasting, is proxied by differences in valuation errors between the benchmark and alternative accounting methods. Contrary to the Biddle, Bowen and Wallace (1997) finding that mandated earnings were superior to EVA and residual income, we find that EVA and other residual income metrics consistently give rise to lower average valuation errors and thus have higher predictability across a variety of windows and terminal dates. Further, on the basis of our second measure of accounting quality, the variability of valuation errors, EVA performs best in the US and third in the UK. The results strongly indicate that differences between residual income constructs, including EVA, are generally small but that earnings quality will be improved by recognition of a cost of equity capital in measuring reported income.

Keywords: valuation errors, residual income, EVA, MVA, GAAP, IASB

A Comparison of Error Rates for EVA, Residual Income, GAAP-earnings, and Other Metrics Using a Long-Window Valuation Approach

1. Introduction

The measurement and presentation of financial performance is central to the process by which investors' set and revise expected cash flows and serves as the basis for setting share prices and the efficient allocation of resources in market-based economies. The quality of mandated financial accounting information for this purpose is, however, increasingly under scrutiny. Alternative proprietary financial performance metrics, one of which is the measure of economic value added (EVA),[1] devised by Stern Stewart have been proposed. The quest to improve the quality of financial statements is also high on the agenda of accounting regulators. The International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) are engaged in a joint project to improve the content and presentation of financial statements for the purpose of assisting users of financial statements to predict cash flows. The aim of the current project on *Financial Statement Presentation* (IASB, 2007a) is to 'establish a high-quality standard of information in the financial statements, including the classification and display of items and the aggregation of line items into subtotals and totals.' The objective of this study is to investigate the relative decision usefulness of differences between GAAP-based accounting and alternative methods, such as Stern Stewart's measure of EVA to the prediction of cash flows. We focus in particular on the value relevance of the recognition of a cost of equity capital in measuring reported income which has long been advocated by Anthony (1975; 1983) and which is noticeably absent from the issues under consideration by the IASB in its quest to improve financial reporting quality.

Prior research demonstrates the theoretical equivalence of equity valuation models based on either discounted dividends, cash flows or GAAP-based earnings (Penman and Sougiannis, 1997). However, the Edwards, Bell and Ohlson residual income valuation model has been empirically identified as providing the best explanation for share prices (Penman and Sougiannis, 1998; Lee, Myers and Swaminathan, 1999; and Francis, Olsson and Oswald, 2000). A likely explanation is that the difficulty of forecasting dividends or cash flows is greater than taking book value of equity as a starting point and then estimating the residual of future earnings less a charge for the cost of equity (Lee, 1996). However, in a related study of the association between market returns and alternative performance metrics, Biddle *et al.*, (1997) find that mandated earnings have a higher association with equity returns compared to, in descending order, residual income, EVA and cash flow. In particular, Biddle *et al.*, (1997: 332) conclude '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.' The finding that the capital charge has minimal value relevance is puzzling given its central role in the residual income valuation model.

To investigate this issue further, we adopt a long-window design to test for the significance of the cost of capital charge in measuring equity valuation errors for a sample of UK and US firms. Many of the other Stern Stewart adjustments to GAAP earnings relate to accounting treatment and timing differences and we expect, based on the prior literature, that the effect of these to be less evident in our long-window research design. For example, O'Hanlon and Pope (1999) find little evidence that dirty-surplus flows (e.g., goodwill, prior-year adjustments) are value relevant in explaining valuation errors using long-window tests similar to Easton, Harris and Ohlson (1992). Further, in a cross-country comparison, Isidro, O'Hanlon and Young (2006) report similar findings for the UK, but also report some weak 'predictable' evidence between dirty-surplus flows and valuation errors for the US. To contribute to this literature, we investigate the relative value relevance of different line items in the income statement, before and after financing charges, exceptional items and, in the UK, for all recognised gains reported in the Statement of Recognised Gains and Losses (FRS 3, Accounting Standards Board, 1992).

We follow Schipper and Vincent (2003) by identifying predictability and variability as earnings quality constructs and in-line with previous empirical studies measure these as the mean and dispersion of valuation errors, respectively. To implement our research design we employ a methodology, adapted from Shiller (1981) and Penman and Sougiannis (1998), to obtain valuation errors, defined as the difference between the hindsight value for each performance metric and the *ex ante* market value. We report the mean and variability of valuation errors for alternative windows and performance metrics to gauge the relative quality and, hence, the decision usefulness of each metric. We also contribute to prior empirical work (Penman and Sougiannis, 1998; Lee *et al.,* 1999; and Francis *et al.,* 2000) by adopting the entity perspective, in which Stern Stewart's EVA and market value added (MVA) are grounded. Valuation equations identify the impact of different accounting methods and Stern Stewart data on EVA, MVA and the cost of capital are used to construct a benchmark against which to compare and rank hindsight valuation errors for different accounting methods. This allow us to assess the contribution to earnings quality of a charge for the cost of equity capital and to assess the decision usefulness, in terms of ease of forecasting, of mandated requirements for the display of specific earnings line items relative to Stern Stewart specific accounting practices.

The study utilises the Stern Stewart data sets for the UK and US covering 11 and 16 years, respectively. These data permit the calculation of valuation errors for 'windows' of up to 10 years. Selective substitution of alternative measures for capital and earnings provides insights into a range of measurement and presentational issues. Permanent differences between Stern Stewart's EVA and mandated earnings exist where GAAP applies dirty surplus accounting compared to the application of clean surplus accounting in EVA. For example, Stern Stewart and Penman (2003) advocate expense recognition of non-cash costs incurred by shareholders arising from the exercise of employee share options, which GAAP ignored prior to IFRS 2 (IASB, 2004). Like Anthony (1975; 1983) Stern Stewart also strongly advocate recognition of an expense for shareholders' cost of equity capital, which is also ignored under GAAP. Timing or transitory differences also exist between GAAP and EVA in the form of capitalisation and amortisation of value creating expenditure, such as research and development costs, which are typically written off immediately as an expense under GAAP. Other timing differences arise when Stern Stewart reverse managerial discretion in accounting for provisions and reserves in accounting for EVA.

The key results reported here are different to those found by Biddle *et al.* (1997). First, EVA and other residual income measures outperform mandated earnings by generating smaller valuation errors. This result provides strong support for Edwards and Bell (1961), Anthony (1975; 1983) and Stewart (1991) who advocate the recognition of a cost of equity capital in measuring financial performance. The result also confirms previous US findings (Penman and Sougiannis, 1998, Lee *et al.,* 1999; and Francis *et al.,* 2000) who also use long-window methodologies to compare a residual income metric based on mandated earnings with dividends and cash flow metrics. Second, for the set of residual income measures investigated, the differences in rankings are generally small. Focussing on the mean and variability of the distributions of errors, the best performing metric in the UK is residual income calculated using mandated earnings and Stern Stewart's measure of capital. In the US, the best performing metric is also residual income, calculated using mandated earnings and accounting book value of assets. However, and most importantly, EVA has the smallest variability across all metrics for the US which is consistent with the latter being easier to forecast compared to mandated practices. The currently mandated reporting of total recognised gains and losses in the UK is the best performing conventional metric. The relative rankings of metrics are fairly consistent across different windows, indicating a high degree of robustness in the results.

The paper proceeds as follows. Section 2 provides an overview of the theoretical background and related research and Section 3 describes the research design and the hypotheses to be tested. The data and results are reported in Section 4 and Section 5 concludes.

2. Theoretical background and related research

Earnings measurement and the valuation of equity are theoretically linked when two conditions are satisfied. The first requires application of the clean surplus relation when measuring income to take into account all factors impacting on shareholder wealth. The second is recognition of an expense for the cost of equity capital to report residual income. This gives the result that the current value of equity is equal to the book value of equity plus the discounted present value of the future stream of residual equity income. This relationship, first identified by Preinreich (1938), provided the theoretical core for Edwards and Bell's classic treatise, 'The Theory and Measurement of Business Income' (1961). Edwards and Bell's measure of 'business income' is based on valuing assets at replacement cost, and is equivalent to the concept of comprehensive income now advocated by the IASB as the basis for reporting financial performance. An integral part of the Edwards and Bell contribution to the theory for measuring business income was the deduction of a cost of equity capital based on the start of period value of assets. The resulting measure of residual income was termed 'excess current income'. Prior to this, the concept of residual income attained prominence in management accounting for the purpose of exercising control in diversified companies based on its application in General Motors and General Electric (Solomons, 1965).

Stern Stewart's measure of EVA meets the two requirements for a measure of residual income by adhering to the practice of clean surplus accounting and by the recognition of a cost of equity capital. For these reasons it is theoretically superior to mandated earnings. However, its role as a tool of management accounting in controlling and rewarding managerial performance is at least as prominent as its claimed contribution to investors seeking a relevant basis for equity valuation (Bromwich and Walker, 1998; O'Hanlon and Peasnell, 1998; Stark and Thomas, 1998). A main finding in the literature on residual income is that a single-period residual income figure is not a reliable indicator of the periodic change in shareholder wealth (see, e.g., Bromwich and Walker, 1998; and O'Hanlon and Peasnell, 1998); hence a long window research design is more appropriate than a one period window.

Biddle *et al.* (1997) focus on claims that EVA is more highly associated with shareholder returns than conventional accrual-based earnings. Residual income-type measures might be expected to have a higher association with firm value or security returns than mandated earnings as residual income features in the valuation equation, while mandated earnings does not. However, Biddle *et al*. (1997) note that investors only observe past and current data as the basis for predicting residual income and, suggest it may be the case that other metrics, such as mandated earnings, provide a better basis for predicting residual income than do residual income metrics, including EVA. Their study thus addresses the empirical issue of identifying the metric that provides more information about future residual income.

Biddle *et al,* (1997) regress contemporaneous shareholder returns on cash flow from operations, mandated earnings, residual income and EVA for the period 1984-1993. Their findings based on measures of relative information content were contrary to Stern Stewart's claims for EVA, that earnings have a higher association with security returns than EVA. In order of relative information content, the ranking was first, mandated earnings, then residual income followed by EVA and cash flow from operations. Further, an investigation of the Stern Stewart capital charge and the accounting adjustments added little in explaining contemporaneous returns. The Biddle *et al.* (1997) research design is, however, subject to the limitation that shareholders' return (an equity metric) is regressed on contemporaneous measures of performance that are measured at the entity (operating) level of the firm. Restricting the analysis to a single period contemporaneous association with firm values and returns does not address the problem that one period measures of residual income are not necessarily associated with the shareholder changes in wealth reflected in security returns. Also, an association between one period returns and a charge for the cost of capital is potentially mitigated by the charge having little variation across a sample of large firms.

Subsequent to the Biddle *et al.* (1997) study are three studies based on US data (Penman and Sougiannis, 1998; Lee *et al.,* 1999; and Francis *et al.,* 2000) that use long window methodologies to compare the relative accuracy of earnings, dividends and cash flows in explaining share prices. Penman and Sougiannis (1998) use a hindsight approach similar to that applied in this paper and Francis *et al.* (2000) discount forecasted variables to explain the cross sectional variation in prices. Lee *et al*. (1999) set out to explain the time-series relation between intrinsic value and share prices. Each study finds that residual income metrics provide the best explanation of market prices. This study extends this research by examining both US and UK data and by extending the metric set to include Stern Stewart's EVA and other conventional metrics, including (1) those that include/exclude extraordinary/exceptional items; (2) metrics that are based on equity accounting profits; (3) metrics based on operating cash flows; and (4) metrics which report separately recognised gains/losses and operating profit from continuing activity. A comparison of different metrics addresses issues under consideration in the IASB/FASB project on Financial Statement Presentation.[2]

3. Research Design and Testable Hypotheses

We investigate the accounting quality of different performance metrics using an entity-based residual income valuation model. EVA is an example of entity-based residual income that applies clean surplus accounting (Lee, 1996; O'Hanlon and Peasnell, 1998). A long window methodology in the manner of Shiller (1981) is employed. Based on fundamentals as reflected in *ex post* performance metrics, a range of 'hindsight' intrinsic values are calculated by discounting different measures of performance, together with a horizon term for the value of discounted future residual earnings. Valuation errors are the differences between *ex post* hindsight values and *ex ante* actual values. These provide the basis for investigating the earnings quality of different metrics.

We begin by expressing the value of the firm (V_0) in terms of future cash flows (CF_t in period *t*) up to a horizon date *h* plus a terminal value for the expected value of cash flows (V_h) from the horizon to infinity, all discounted at k the weighted average cost of capital:[3]

$$V_0 = \sum_{t=0}^{h} \frac{CF_t}{(1+k_t)^t} + \frac{V_h}{(1+k_h)^h} \tag{1}$$

Application of clean surplus accounting provides a link to the residual income valuation model for different clean surplus accounting methods *i* where cash flow is defined as net distributions to shareholders and debt-holders and earnings before interest is defined as:

$$EBI_t^i = TA_t^i + CF_t - TA_{t-1}^i \tag{2}$$

where EBI_t^i is earnings before interest charges but after tax and TA_t^i is book value of total assets at the end of the period. Residual income (RI) is then defined in the usual way as:

$$RI_t^i = EBI_t^i - k_t TA_{t-1}^i \tag{3}$$

It follows from (3) that we can rewrite (1) as:

$$V_0 - TA_0^i = \sum_{t=0}^{h} \frac{RI_t}{(1+k_t)^t} + \frac{V_h - TA_h^i}{(1+k_h)^h} \tag{4}$$

Next we expand the set of accounting methods to include dirty surplus alternatives *j*. Then,

$$EBI_t^j = TA_t^j + CF_t - TA_{t-1}^j + DIRTY_t^j \tag{5}$$

and $DIRTY_t^j$ is dirty-surplus flows that have bypassed earnings. Including dirty flows allows us to define income which is consistent with the clean surplus requirements of the residual income model. Relaxing the clean surplus requirement in equation (5) and rewriting equation (3) gives us:

$$DIRTY\_RI_t^j = EBI_t^j - DIRTY_t^j - (k_t * TA_{t-1}^j) \tag{6}$$

Where $DIRTY\_RI_t^j$ represents residual income calculated using dirty flows (e.g., earnings before extraordinary items or foreign currency translation differences). Now we have:

$$V_0 - TA_0^j = \sum_{t=1}^{h} \frac{DIRTY\_RI_t^j}{(1+k_t)^t} + \frac{V_h - TA_h^j}{(1+k_h)^h} + \sum_{t=1}^{h} \frac{DIRTY_t^j}{(1+k_t)^t} \tag{7}$$

If we include the final term in (7), we get the same result as in (4).

Next, valuation differences are measured relative to the opening and closing MVA for a benchmark accounting method *b* and for this purpose we choose Stern Stewart's clean surplus measure of MVA. To identify the source of valuation differences between the baseline method and clean surplus methods *i* we rewrite (4) as:

$$V_0 - TA_0^b = \sum_{t=1}^{h} \frac{RI_t^i}{(1+k_t)^t} + \frac{V_h - TA_h^b}{(1+k_h)^h} + TADIFF^i \tag{8a}$$

and for dirty surplus methods *j* we rewrite (7) as:

$$V_0 - TA_0^b = \sum_{t=1}^{h} \frac{DIRTY\_RI_t^j}{(1+k_t)^t} + \frac{V_h - TA_h^b}{(1+k_h)^h} + \sum_{t=1}^{h} \frac{DIRTY_t^j}{(1+k_t)^t} + TADIFF^j \tag{8b}$$

where $TADIFF^a = (TA_0^a - TA_0^b) - \frac{TA_h^b - TA_h^a}{(1+k_h)^h}$ and a = *i* or *j* for clean and dirty surplus models, respectively. Note that it follows from (4), (8a), and (8b) that excess value, or $V_0 - TA_0$ is the same for the benchmark (*b*), other clean surplus (*i*) and dirty surplus (*j*) accounting methods.

If we choose Stern Stewart's MVA as the benchmark model *b,* then $V_0 - TA_0^b = MVA_0^b$. Using Stern Stewart's MVA as a benchmark model allows the source of value differences in *RI* and *TA* for clean (*i*), or dirty surplus (*j*) accounting methods to be identified and measured against the Stern Stewart benchmark *b.*

We operationalise the insights obtained from equations (1) to (8b) by calculating, with hindsight, the *ex post* excess values for different metrics using actual realisations for income flows and interest rates and the actual horizon value (MVA) for the benchmark model. Under uncertainty, actual (*ex post*) income flows and discount rates will differ from expected (*ex ante*) values up to and including the horizon *h*. We denote the actual (hindsight) values by ^. Thus, the hindsight value for Stern Stewart's MVA, EVA, terminal value and discount rates over any given horizon is:

$$M\hat{V}A_0^b = \sum_{t=1}^{h} \frac{E\hat{V}A_t}{(1+\hat{k}_t)^t} + \frac{M\hat{V}A_h}{(1+\hat{k}_h)^h} \tag{9}$$

and the hindsight valuation error, given by the difference between actual (hindsight) and expected values for flows and discount rates for Stern Stewart's MVA is:

$$\text{Valuation error}_b = M\hat{V}A_0^b - MVA_0^b \tag{10}$$

Equations (8a) and (8b) suggest that valuation estimates could differ because of: (1) differences in the frequency or magnitude of dirty surplus flows; (2) differences in the measurement of assets; or (3) a combination of both. To highlight the impact of incorrect expectations for flows and interest rates we rewrite the valuation error for Stern Stewart's MVA as:

$$M\hat{V}A_0^b - MVA_0^b = \sum_{t=1}^{h} \frac{(E\hat{V}A_t^b)}{(1+\hat{k}_t)^t} - \sum_{t=1}^{h} \frac{(EVA_t^b)}{(1+k_t)^t} + \frac{(M\hat{V}A_h^b)}{(1+\hat{k}_h)^h} - \frac{(MVA_h^b)}{(1+k_h)^h} \qquad (11)$$

and for other clean surplus methods *i* as:

$$M\hat{V}A_0^i - MVA_0^b = \sum_{t=1}^{h} \frac{(R\hat{I}_t^i)}{(1+\hat{k}_t)^t} - \sum_{t=1}^{h} \frac{(EVA_t^b)}{(1+k_t)^t} + \frac{(M\hat{V}A_h^b)}{(1+\hat{k}_h)^h} - \frac{(MVA_h^b)}{(1+k_h)^h} + TADIFF_h^i \qquad (12)$$

Finally, the difference in valuation errors between the benchmark method and dirty surplus methods *j* is:

$$M\hat{V}A_0^j - MVA_0^b = \sum_{t=1}^{h} \frac{(DIRTY\_R\hat{I}_t^j)}{(1+\hat{k}_t)^t} - \sum_{t=1}^{h} \frac{(EVA_t)}{(1+k_t)^t} + \frac{(M\hat{V}A_h^b)}{(1+\hat{k}_h)^h} - \frac{(MVA_h^b)}{(1+k_h)^h} + \sum_{t=1}^{h} \frac{DIRTY_t^j}{(1+\hat{k}_t)^t} + TADIFF_h^j \qquad (13)$$

As is the case for the *ex ante* equations (4), (8a) and (8b), the valuation errors in equations (11), (12) and (13) are equal. However, our primary focus in this paper is on how well the forecasting needs of investors are served by different accounting measures of performance. The use of MVA as a benchmark allows us to compare different errors thus:

$$(M\hat{V}A_0^b - MVA_0^b) - (M\hat{V}A_0^a - MVA_0^b) \qquad (14)$$

and the difference in valuation errors between MVA and a challenger metric *a* is given by:

$$M\hat{V}A_0^b \text{ - } M\hat{V}A_0^a \qquad (15)$$

where *a* is either a clean or dirty surplus method.

We follow equation (9) and measure ex post $M\hat{V}A_0^a$ as:

$$M\hat{V}A_0^a = \sum_{t=1}^{h} \frac{\hat{I}_t^a}{(1+\hat{k}_t)^t} + \frac{M\hat{V}A^b{}_h}{(1+\hat{k}_h)^h} \tag{16}$$

where $\hat{I}_t^a$ is actual clean or dirty surplus income for the challenger methods. To estimate the contribution of income flows to valuation errors, we assume that the difference between expected and actual terminal asset values for the benchmark method is the same for the challenger methods.[4] Negative values for equation (15) indicate the benchmark method is of higher quality and more decision useful, consistent with a greater ease of forecasting compared to the alternative model.

Rather than focussing primarily on metric-specific errors, we focus on error rankings across metrics. We interpret these rankings as indicating decision usefulness measured by the relative extent to which metric-specific realisations reflect the accounting data on which investors confirm and revise their expectations for the purpose of setting security prices. Some accounting metrics may be easier to forecast than others and thus will be more appealing to investors, and we expect this to be reflected in lower valuation errors.

Our ranking of accounting quality and the decision usefulness of different performance metrics is based on the mean and variability of the respective valuation errors and pair-wise comparisons between errors using 'windows' of 3, 5 and 10 years. The longer the 'window', the greater is the influence of the characteristics of the respective performance metrics. To control for bias relating to the choice of any particular start or terminal date, errors are calculated for all available terminal dates in the period for which data was available. For example, in the UK (US) for the period 1990-2001 (1986-2001) there are 9 (13) different errors for the 3-year 'windows' that begin with 1990-1993 (1986-1989) and end with 1998-2001. For the 5-year 'windows' in the UK (US) 7 (11) different errors are calculated and for the 10-year 'window' 2 (6) different errors. The errors for each metric across the number of sub-periods are then averaged and these are reported for the 3, 5 and 10-year 'windows' as the basis for ranking the respective metric. The extent to which rankings are similar across different 'windows' and terminal dates is a feature of the research design that provides an informal method for assessing the reliability of the findings. Further, by examining the absolute differences between errors for different performance measures, we directly address the hypotheses outlined in Section 4.

Insert Table 1 about here

A full list of the different measures investigated in this paper is provided in Table 1. In accordance with the differences in *ex post* valuation errors between the Stern Stewart benchmark method and other clean and dirty surplus methods identified in equations (8a) and (8b) these are grouped into clean and dirty surplus measures of residual income-based methods that use Stern Stewart's estimates of capital to estimate the capital charge (Panel A) and those where the capital charge is estimated on GAAP-based book values reported in financial statements (Panel B) and, to reflect conventional practice, methods where no capital charge for equity is recognised (Panel C).

Arguments in favour of recognising a charge for the cost of equity capital in financial accounting performance metrics have been made by Edwards and Bell (1961), Anthony (1975; 1983), Edwards (1977; 1980) and Stewart (1991). For entity-based metrics, a direct test of whether investors' factor a cost of equity capital into their security pricing decisions is provided in this paper by comparing, *ceteris paribus*, the valuation errors using EVA (Table 1, Panel A) and other residual income metrics (Table 1, Panel B) to those based on other earnings and cash flow entity-based and mandated equity-based metrics (Table 1, Panel C). The former include a charge for the cost of equity capital while those in Panel C do not. Consistent with efficient pricing, the prediction is that compared to those for EVA and other residual income metrics, the errors (means and standard deviations) for the conventional before interest alternatives will be larger. A further prediction is that as the length of the hindsight 'window' increases, so too will the difference between the EVA and non-residual method valuation errors. The differences in valuation errors for EVA and NOPAT, for example, will be solely attributable to the omission of the capital charge, while those between EVA and dirty surplus methods will combine the net effect of differences attributable to dirty accounting flows and book values for assets (DIRTY and TADIFF) plus the omission of the capital charge. The hypotheses are presented in the null form.

Hypothesis 1

Ceteris Paribus, there will be no difference in valuation errors for residual income-based performance metrics that include a charge for the cost of equity capital compared to the conventional metrics that do not include a capital charge for equity capital. The size of the error will be unrelated to the 'window' used to calculate hindsight excess value.

Holding constant Stern Stewart's clean surplus-based measurement of income, further insight into the significance of the different measures of capital (average or ending operating capital) in calculating the capital charge is obtained by comparing the respective errors for Stern Stewart-based measures of residual income EVA and RI(SS) (Table 1, Panel A) that differ only by using Stern Stewart's measures of average or end of period operating capital.

Hypothesis 2

There is no difference in valuation errors based on different Stern Stewart measures of capital.

Considerable emphasis is placed by Stern Stewart on the adjustments they make to items in the conventional profit statements and balance sheets. Compared to mandated data these adjustments give rise to permanent and transitory differences in the recognition and measurement of assets and liabilities with consequent impact on the performance metric (DIRTY) and asset values (TADIFF). The effect of these differences will be reflected in the respective valuation errors for EVA compared to other metrics. Examples of permanent differences are the non-recognition in GAAP of non-cash costs incurred by shareholders for the costs of employee share options and equity share capital. If investors treat these items as costs then GAAP-based performance metrics will be over-stated relative to investors' expectations and positive valuation errors will arise. These errors will be positively related to the length of the window and will be greater than the valuation errors for EVA. The significance of transitory differences will be more evident for shorter windows.

To test the accounting quality of these adjustments compared to mandated accounting measures, valuation errors are calculated first using GAAP-based accounting performance data, but retaining the Stern Stewart measure of capital. These are the metrics for entity earnings (before interest) before exceptional and extraordinary items [RI(1), Table 1, Panel A], and for entity earnings after exceptional items [RI(2), Table 1, Panel A]. We then investigate the significance of Stern Stewart's adjustments by substituting GAAP-based accounting measures of total assets employed (TAE) [RI(1-TAE), Table 1, Panel B and RI(2-TAE)], Table 1, Panel B) for estimating the capital charge. A major focus of the Stern Stewart accounting adjustments is the correction of what are regarded as errors in the GAAP-based measurement of capital employed. Significant amongst these adjustments is the capitalisation of research expenditure, marketing and other value creating expenditures, the amortisation of goodwill and the deduction of marketable securities and construction in progress. If these differences are significant they will result in lower valuation errors for the Stern Stewart metric.

Hypothesis 3

Ceteris paribus, for the set of residual income metrics, there is no difference in the valuation errors for EVA and those for conventional entity earnings before or after exceptional items and irrespective of the definition of capital employed.

A major focus of the claims of Stern Stewart for EVA and of the challenge posed by the findings of Biddle *et al.,* (1997) is the relevance to investors of conventional equity earnings compared to EVA. Comparing valuation errors for EVA and the equity-based flow metric of earnings for ordinary provides a basis for assessing the relevance to investors of these metrics for the purpose of setting and revising investors' expectations of MVA. A feature of the Biddle *et al.* (1997) research design is the regression of an equity-based measure of shareholder returns on entity flows. In this study, the use of the entity-based MVA metric as the *ex ante* market value benchmark for measuring the respective error metrics provides a test that is consistent for entity metrics. Mandated equity-based metrics are subject to the same permanent and transitory differences as GAAP-based entity metrics, but the former are reported after the impact of financing decisions. Inspection of the differences between the valuation errors for EVA and mandated equity earnings provide a basis for assessing relative decision usefulness in terms of ease of forecasting for valuation purposes.

Hypothesis 4

Ceteris paribus, there is no difference in the valuation errors between EVA and conventional equity-based accounting profit.

A significant challenger to earnings-based performance measures is cash flow reporting. To compare the relevance of earnings and cash flow, two errors are calculated using a smoothed measure of cash flow from operations after tax, RI(OCF-SS) and RI(OCF-TAE), (Table 1, Panel B) based on Stern Stewart and conventional measures of capital, respectively.

Hypothesis 5

Ceteris paribus, there is no difference between Stern Stewart or conventional earnings-based metrics and a cash flow from operations metric.

Finally, to cast light on issues relating to conventional accounting measurement (Table 1, Panel C), insights into the debate on the provision of information on separate components of income are provided by calculating valuation errors for smoothed [PBIT(1), before extraordinary items] and unsmoothed [PBIT(2), after extraordinary items] accounting profit before interest and tax, operating profit for continuing activity [OPCO(1)], continuing and acquired activities [OPCO(2)] and finally for two equity-based metrics, clean surplus income (CSUR) and total recognised gains and losses (SRGL).

Hypothesis 6

There is no difference in the accounting quality of EVA, NOPAT and accounting–based entity and equity metrics that feature (a) all recognised gains (b) operating profit from continuing activity (c) shareholder earnings before and after exceptional items.

4. Data and Results

The starting point in our sample construction is the Stern Stewart 2002 UK and US datasets, which were provided by Stern Stewart & Co. The USA dataset contains 1,000 firms for a period of 16 years (1986 to 2001). The UK dataset contains 500 firms for a period of 12 years (1990 to 2001). Firms are allocated to both datasets if they rank in the top *N* firms (*N*=1,000 for the US and 500 for the UK) according to MVA, measured at 2001. Not all firms, however, are ranked, since Stern Stewart & Co. limit their rankings to only the largest listed firms in each country.

Each dataset contains up to 11 variables, including: (1) MVA; (2) EVA; (3) NOPAT; (4) WACC (*k*); and (4) ending operating capital (EOC). To supplement the datasets with conventional accounting metrics, we extract other variables for both the US and UK Stern Stewart list of firms from Compustat (US) and Datastream (UK). Definitions of all metrics are given in Table 1. Naturally, not all Stern Stewart firms have data for all years. Table 2 below shows the distribution of firm-years across the different performance metrics. Descriptive statistics are also reported for the different performance measures. They suggest that in terms of EVA and alternative definitions of RI, the median firm in the UK over the period 1990 to 2001 has generated profits in excess of a charge for capital in the region of £2 to £3 million. The equivalent results for the US, however, tend to be sensitive to the definition of RI, but also suggest value added. As expected, the results indicate that US firms are substantially larger than their UK counterparts in terms of market value (MV) and total assets employed (GAAP-based TAE).[5] Differences in Stern Stewart's measure of ending operating capital (EOC) compared to GAAP-based total assets employed (TAE) as reported by Datastream also tend to be much more pronounced in the US with a mean value of $4.1 billion for the former compared to $7.8 billion for the latter. Median values, however, are much closer at $1.3 billion for EOC compared to $1.4 billion for TAE. Also noteworthy, is the median WACC over the sample period, which is about 1% higher in the US at 10%.

Insert Table 2 about here

The results from Table 2 suggest that we need a treatment for outliers in calculating error rates. Several options are available, from simply deleting observations identified as outliers to winzorising. We chose the latter approach since we take the view that while outliers could distort results, reducing their influence through winzorising is preferred. We identify outliers as those observations that lie ±3 standard deviations from the cross-sectional mean. Values identified as outliers are simply reverted to ±3 standard deviations from the mean. This procedure is applied to all error metrics employed in the paper.

We first report the cross-sectional mean valuation errors (i.e., predictability) and the differences between mean paired valuation errors for 3, 5 and 10-year 'windows' (Table 3 and Table 4). Second, we report the variability of the individual valuation errors for all performance metrics (Tables 5). Third, Appendix B provides an overview of the actual cross sectional errors and differences in errors across all 'windows' and terminal dates. The smaller are the mean and variability statistics for valuation errors the higher is accounting quality and decision usefulness in forecasting future values. By calculating means across all firms in the sample we rely on a portfolio effect to control for the extent to which expectations differ from realisations at the level of the individual company. The valuation errors reported in the tables are a combination of systematic market errors arising from market optimism (negative errors) or pessimism (positive errors) and valuation errors that are metric specific. For any given 'window' the starting (*ex ante*) and terminal MVA for each firm are held constant across metrics which controls for systematic market errors. Thus, for a given 'window', the cross-sectional variation in valuation errors, as identified in equation (15), is attributable to valuation differences between metrics arising from the use of dirty surplus flows, different asset values and the recognition of the cost of capital.

Insert Table 3 about here

Inspection of the rankings reported in Table 3 indicates notable differences from the results reported by Biddle *et al.,* (1997). First, for Hypothesis 1, holding the 'window' constant to control for systemic market valuation errors, there is no US or UK evidence to support the null of no difference between errors for residual income-based metrics compared to those for conventional metrics. All residual-based metrics reported in the top half of Panels A (US) and B (UK) have lower valuation errors. The consistency of this finding across 3, 5 and 10-year 'windows' confirms its robustness. A measure of the size of the error attributable to permanent differences between Stern Stewart and GAAP-based metrics, for example, the omission of the cost of equity capital, the magnitude or frequency of dirty accounting flows or a combination of both for each of the three windows is reported in Table 4. The most precise estimate of the effect on estimating intrinsic value is given by the difference between the valuation errors for EVA and Stern Stewart's measure of operating profit [NOPAT (SS)], where the difference is, otherwise, only attributable to the capital base for measuring the charge for the cost of capital. The valuation error for EVA is always lower than for the first five performance measures, including mandated equity earnings, which omit a charge for the cost of equity capital. These differences, across all 'windows', are significantly different from zero using a standard *t*-test (similar results are obtained using a Wilcoxon signed ranked pairs test). We thus reject Hypothesis 1 that ignoring a capital charge in GAAP-based metrics has no impact on estimates of intrinsic value.

Insert Table 4 about here

To test hypothesis 2 we use three different measures of capital employed in calculating the capital charge to investigate the significance for intrinsic valuation of the permanent and transitory differences in accounting recognition and measurement between Stern Stewart and GAAP. These are average capital (EVA), ending operating capital [RI (SS), RI(1) and RI(2)], (the latter two use an accounting equivalent for NOPAT entity income, before interest and after tax) and GAAP-based total assets employed (TAE). The negative difference between EVA and RI(SS) across all ‘windows’ reported in Table 4 indicate that average Stern Stewart capital gives lower valuation errors to end of period Stern Stewart operating capital in the US, and in the UK for the 10-year ‘window’. The overall ranking across different ‘windows’ is different. In Table 3 in the US, EVA based on average capital is ranked 5th and based on end of period operating capital (RI SS) it is ranked 7th. In the UK, EVA ranks 7th for average capital and 4th for operating capital. However, these differences are not statistically significant and we cannot reject Hypothesis 2 that error metrics are not sensitive the use of Stern Stewart's average or ending operating capital.

Comparing valuation errors for the set of residual income metrics (hypothesis 3) identifies metric specific accounting quality. In general, these differences are small and generally insignificant. In the US, (Table 3, Panel A), for a ranking of the summed ranks across 3, 5 and 10-year windows, the best performing metric is GAAP-based RI(1-TAE), residual income before exceptional and extraordinary items with GAAP-based capital employed, and RI(2-TAE) residual income after exceptional and extraordinary items with GAAP-based capital employed. Compared to the UK, it is the before exceptional and extraordinary alternative that is consistently the best performing metric. In the UK, the best performing metrics over all windows are RI(1), residual income before exceptional and extraordinary items with Stern Stewart end of period capital employed and RI(2), residual income after exceptional and extraordinary items with Stern Stewart end of period capital employed. It is also the case that RI(1), measured before exceptional and extraordinary items, dominates RI(2) in the overall ranking, which is measured after these items. However, as indicated in Table 4, differences between the set of residual income-based metrics are not significant in the UK, indicating that differences in dirty flows (exceptional and extraordinary items) and asset values do not significantly impair valuation estimates. In the US, RI(1) is only significantly different for longer windows. We cannot reject Hypothesis 3 for the UK of no difference between EVA and other residual income-based metrics. For the US, however, there is evidence that RI(TAE), based on GAAP capital employed, is superior to EVA for longer windows.

In contrast to the Biddle *et al.,* (1997) finding that GAAP-based earnings are more value relevant than residual-based metrics, including EVA, we reject Hypothesis 4 of no difference between EVA and GAAP-based earnings. It is clear that the omission of a cost of capital from conventional earnings is a major source of error in estimating intrinsic value. In Tables 3, 4 and 5, for both the UK and US, we report significant differences between EVA and EBEI (GAAP earnings before exceptional and extraordinary items) and EVA and EFO (GAAP earned for ordinary before a charge for cost of capital). In Table 3, EVA is consistently ranked higher than EBEI (UK) and EFO (US). In Table 4, differences in errors between EVA and EBEI (UK) and EFO (US) are significant at the 1% level. The negative sign indicates that in each case, EVA gives lower valuation errors. Finally, and importantly, in Table 5, EVA has lower variability in errors than EBEI (UK) and EFO (US).

Insert Table 5 about here

In common with GAAP earnings, operating cash flow performs poorly compared to any residual-based measure and it is clearly inferior to EVA in the UK and US in its residual-based form. Thus, the null of no difference between EVA and operating cash flow in Hypothesis 5 is rejected. This finding is consistent with the view that cash flows, like dividends, are relatively more difficult to predict, hence the higher valuation errors.

The difference between GAAP-based earnings before and after exceptional items for NOPAT and PBIT reported in Table 3 are not statistically significant (Table 4). However, Stern Stewart NOPAT(SS) and GAAP-based NOPAT(1) and NOPAT(2) is superior to operating profit from continuing operations (OPCO) for 3 and 5-year windows. Finally, total recognised gains and losses reported in the UK (before a charge for the cost of equity capital) under FRS 3 is superior to NOPAT for a 5-year window. Thus we reject the null for Hypothesis 6 of no difference between EVA/NOPAT and GAAP metrics, although the results are mixed regarding the superiority of Stern Stewart compared to GAAP metrics.

A clearer picture emerges when we consider the relative size of the measures of variation of the valuation errors, which arguably are a better test of the performance of different metrics in reflecting the basis on which inventors' set expectations. Standard deviations of the absolute average valuation errors across performance metrics and the three windows are reported in Table 5. In the US (Panel A), EVA consistently has the lowest variation for each of the three windows and is ranked best. Next best are those residual-based metrics that include Stern Stewart measures of capital employed. These findings are consistent with relatively greater ease of forecasting using Stern Stewart accounting practices. It is noticeable that the metrics comprising mandated accounting earnings and capital values, RI(1-TAE), perform poorly, as do the accounting metrics that are measured before recognition of a cost of equity capital. The UK results are reported in Table 5, Panel B. Here metrics that combine accounting-based residual income with Stern Stewart capital employed have the lowest variation across the three windows. EVA is ranked 3rd. The UK results provide evidence that Stern Stewart capital measures contribute to forecasting accuracy. It is also noticeable that the accounting-based NOPAT(1) metric performs well for short windows. The accounting-based residual metrics are in the middle of the rankings and the poorest performing metrics are the GAAP-based metrics that ignore a charge for the cost of equity capital.

5. Conclusions

In this paper we contribute to the existing empirical literature on the quality of earnings measurement and presentation by using Stern Stewart data on EVA, MVA and the cost of capital in the context of a long window methodology. The quality of earnings and decision usefulness in terms of forecasting accuracy is assessed by the mean and variability of valuation errors for different measures of earnings. Compared to the residual income valuation model, conventional accounting practice is limited by the non-recognition of the cost of equity capital.

A feature of Stern Stewart's measure of EVA is that it satisfies two conditions for the residual income valuation model. First, by recognising a charge for the cost of equity capital and second, by the application of clean surplus accounting. In an earlier study, Biddle *et al.,* (1997) investigate whether EVA is more highly associated with share returns and firm value than mandated earnings. Contrary to the claims of Stern Stewart, mandated earnings had the higher association and, further, the inclusion of a capital charge had little incremental explanatory power. However, the Biddle *et al.* (1997) study was subject to the limitations of considering only the contemporaneous one-period relation between returns and earnings.

The present study applies a methodology adapted from Schiller (1981) and Penman and Sougiannis (1998) that measures valuation errors for long windows based on the difference between the *ex post* or hindsight values for different metrics and the *ex ante* equivalent observed value. These differences are described as valuation errors and provide the basis for assessing the ease of forecasting different accounting practices.

The results of the study are different to those reported by Biddle *et al.* (1997), but consistent with US findings in Penman and Sougiannis (1998), Lee *et al.* (1999) and Francis *et al.* (1999) regarding the superiority of the residual income valuation model. First, consistent with theory the set of residual-based metrics, including EVA, are superior to GAAP-based metrics that do not include a charge for the non-cash cost of equity capital. Second, residual-based metrics, including EVA, are superior for forecasting purposes to operating cash flow-based metrics. Third, differences between EVA and residual-based measures are small. There is no significant difference between using Stern Stewart's measure of average or ending operating capital for the capital charge. An all, GAAP-based residual-based metrics gives the smallest valuation errors in the US, but have relatively high variation. Overall, EVA emerges from these tests in a favourable light. Recognition of a charge for the cost of equity capital clearly improves the accuracy of estimates of intrinsic value. Although its valuation errors are not significantly lower than other residual income-based metrics, EVA does have the lowest variation of valuation errors in the US indicating relative forecasting accuracy.

Our findings have two main policy implications for improving the quality of earnings measurement reported in financial statements. First, the evidence reported in this paper warrants active consideration by accounting regulators of mandating the recognition of a cost of equity capital when reporting equity income in financial statements. Consideration should also be given to whether this can be accomplished on a pro forma basis, as part of a managerial analysis of performance or, as an integrated component of the financial accounting double entry system (Anthony, 1976). Secondly, the finding of a lower variability, and hence greater reliability for forecasting purposes, of the valuation error for EVA in the US warrants consideration of the elements of the Stern Stewart agenda for the reform of GAAP which have not yet been adopted.

Appendix A. US and UK errors using a 3 year window

PANEL A: US errors

Window	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Measure	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EVA	187	-1	389	40	446	-341	234	609	1810	1873	2013	24	-2500
RI(SS)	228	39	419	67	470	-318	264	641	1859	1936	2098	115	-2398
RI(1)	169	-4	350	-36	367	-435	119	588	1802	1938	2197	122	-2591
RI(2)	218	43	411	-50	355	-456	176	652	1902	2067	2354	264	-2375
OCF	547	817	1287	995	1271	531	1144	1542	2808	3045	3670	1570	-781
NOPAT(SS)	754	643	1086	745	1070	301	912	1303	2612	2723	2979	1043	-1270
NOPAT(1)	709	566	1021	626	966	186	785	1232	2548	2725	3062	1034	-1477
NOPAT(2)	739	630	1071	631	954	184	832	1297	2653	2855	3221	1185	-1272
PBIT(1)	946	828	1244	843	1188	420	1086	1559	2926	3139	3544	1512	-996
PBIT(2)	940	865	1303	995	1351	547	1185	1629	3017	3215	3629	1605	-809
RI(OCF-SS)	214	228	660	350	670	-110	502	864	2055	2249	2803	687	-1871
RI(OCF-TAE)	221	193	633	305	649	-301	274	520	1655	1738	2131	125	-2634
RI(TAE)	188	28	442	65	118	-888	-294	-20	1022	1012	1139	-803	-3710
RI(1-TAE)	144	-63	328	-85	-18	-1024	-457	-149	912	951	1112	-921	-3957
RI(2-TAE)	192	-8	380	-69	-24	-1042	-400	-81	1018	1074	1256	-776	-3723
EBEI(#18)	521	354	772	468	875	130	725	1083	2364	2485	2851	841	-1687

PANEL B: UK errors

	1990	1991	1992	1993	1994	1995	1996	1997	1998
	1993	1994	1995	1996	1997	1998	1999	2000	2001
EVA	35	2	-3	25	43	413	296	261	-409
RI(SS)	11	-24	-29	-5	13	384	270	248	-423
RI(1)	11	-34	-54	-10	29	360	166	212	-478
RI(2)	9	-47	-67	-16	16	353	151	206	-481
OCF	1414	344	260	299	364	662	504	555	-35
NOPAT(SS)	209	180	166	195	261	616	503	467	-184
NOPAT(1)	179	148	132	190	265	591	384	412	-236
NOPAT(2)	175	136	121	183	256	583	369	405	-237
PBIT(1)	261	221	222	294	377	699	495	512	-122
PBIT(2)	245	199	198	271	359	689	480	500	-135
OPCO(1)	n/a	328	505	431	496	761	677	678	51
OPCO(2)	n/a	327	225	210	234	510	388	417	-203
CSUR	n/a	172	59	81	154	453	273	366	-249
STRGL	4	54	11	155	227	549	323	372	-275
RI(OCF-SS)	345	187	120	154	190	497	338	404	-210
RI(OCF-TAE)	163	153	99	135	172	482	317	391	-254
RI(TAE)	14	-12	-33	21	84	433	218	286	-411
RI(1-TAE)	5	-22	-43	2	59	405	200	268	-454
RI(2-TAE)	0	-36	-57	-6	46	399	190	260	-462
EFO(#625)	151	127	119	138	233	562	489	493	-241

Appendix A (Continued). US and UK errors using a 5 year window

PANEL C: US	1986 1991	1987 1992	1988 1993	1989 1994	1990 1995	1991 1996	1992 1997	1993 1998	1994 1999	1995 2000	1996 2001
EVA	279	469	436	-186	774	545	1339	2079	2953	1624	-229
RI(SS)	335	524	479	-147	814	587	1397	2155	3051	1738	-105
RI(1)	244	386	333	-358	631	382	1199	2082	3050	1678	-273
RI(2)	327	427	349	-340	640	400	1322	2234	3256	1901	-25
OCF	1069	1783	1761	1286	2190	2022	2922	3885	5063	3658	1887
NOPAT(SS)	1291	1482	1458	905	1815	1640	2509	3348	4332	3066	1339
NOPAT(1)	1183	1342	1296	687	1639	1391	2312	3259	4312	2981	1154
NOPAT(2)	1255	1385	1311	697	1657	1466	2427	3416	4520	3208	1434
PBIT(1)	1548	1688	1636	1054	2044	1855	2847	3845	4984	3687	1845
PBIT(2)	1605	1842	1811	1273	2255	2092	3007	3983	5114	3830	2049
RI(OCF-SS)	480	869	828	222	1130	940	1782	2670	3795	2369	493
RI(OCF-TAE)	491	801	764	199	1083	664	1367	2059	3003	1612	-114
RI(TAE)	324	487	466	-161	292	-216	433	970	1688	388	-1425
RI(1-TAE)	178	296	257	-402	50	-508	190	766	1552	179	-1721
RI(2-TAE)	258	356	306	-364	105	-445	308	919	1753	398	-1454
EBEI(#18)	867	1063	1049	491	1463	1292	2151	2982	4019	2690	861

PANEL D: UK errors

	1990 1995	1991 1996	1992 1997	1993 1998	1994 1999	1995 2000	1996 2001
EVA	-33	19	132	332	283	347	29
RI(SS)	-78	-27	88	281	235	313	-7
RI(1)	-66	-27	74	256	226	343	-70
RI(2)	-82	-45	51	246	208	338	-85
OCF	1361	551	580	751	763	868	470
NOPAT(SS)	254	303	439	657	610	674	367
NOPAT(1)	210	276	406	615	588	689	258
NOPAT(2)	200	265	388	605	571	684	243
PBIT(1)	351	422	569	774	760	863	430
PBIT(2)	318	387	531	754	736	851	413
OPCO(1)	n/a	502	956	906	908	998	677
OPCO(2)	n/a	499	478	540	504	615	261
CSUR	n/a	239	179	435	421	554	158
STRGL	59	87	156	545	519	624	172
RI(OCF-SS)	-228	282	342	498	501	618	211
RI(OCF-TAE)	-482	230	316	473	485	587	180
RI(TAE)	-53	15	124	366	349	463	-4
RI(1-TAE)	-71	-9	91	325	307	416	-18
RI(2-TAE)	-88	-27	69	318	290	411	-33
EFO(#625)	161	222	423	585	552	654	285

Appendix A (Continued). US and UK errors using a 10 year window

PANEL E: US errors	1986 1996	1987 1997	1988 1998	1989 1999	1990 2000	1991 2001
EVA	735	1409	1911	1857	1882	664
RI(SS)	819	1501	1997	1958	1997	791
RI(1)	593	1202	1634	1452	1621	310
RI(2)	656	1314	1767	1662	1804	567
OCF	2015	4020	4734	4825	5023	3808
NOPAT(SS)	2572	3432	4044	4118	4157	2919
NOPAT(1)	2254	3011	3600	3603	3724	2434
NOPAT(2)	2347	3179	3779	3821	3953	2706
PBIT(1)	2959	3782	4408	4498	4698	3461
PBIT(2)	3194	4086	4752	4859	5064	3835
RI(OCF-SS)	838	2144	2766	2808	2845	1605
RI(OCF-TAE)	906	2057	2661	2754	2791	1160
RI(TAE)	832	1514	2019	1977	1114	-597
RI(1-TAE)	516	1142	1573	1425	567	-1187
RI(2-TAE)	620	1273	1725	1647	796	-910
EBEI(#18)	1822	2603	3201	3300	3381	2184

PANEL F: UK errors	1990 2000	1991 2001
EVA	172	-33
RI(SS)	99	-128
RI(1)	83	-111
RI(2)	64	-124
OCF	4647	874
NOPAT(SS)	703	513
NOPAT(1)	633	457
NOPAT(2)	607	444
PBIT(1)	895	700
PBIT(2)	840	668
OPCO(1)	n/a	627
OPCO(2)	n/a	585
CSUR	n/a	326
STRGL	55	73
RI(OCF-SS)	1723	394
RI(OCF-TAE)	1382	306
RI(TAE)	136	-9
RI(1-TAE)	101	-44
RI(2-TAE)	83	-58
EFO(#625)	650	387

The Appendix reports the errors (*ex-post* – *ex-ante*) for each performance measure for windows of 3, 5 and 10-years.

Notes

1. EVA and MVA (referred to later in the paper) are registered trademarks of Stern Stewart.

2. Recent UK studies (e.g., Acker, Horton and Tonks, 2002; and Lin 2002) have also investigated the extent to which the changes in reporting financial performance introduced by FRS 3 (ASB, 1992) have improved the quality of earnings forecasts.

3. We acknowledge very helpful suggestions received from one of the reviewers on the structure of our valuation equations.

4. In unreported tests we substitute Accounting Value Added (AVA) for MVA for non EVA measures and find that the results with respect to the rankings of metrics are consistent with those reported in Section 4. AVA is defined as the market value of equity plus the book value of debt less the book value of net assets. We use the book value of debt because market values are not widely available. To test whether the use of book values for debt introduces additional errors in our analysis we test whether valuation errors differ across debt portfolios formed using quartiles sorted by leverage ratios, defined as long-term debt scaled by market value of equity plus long-term debt. We do not find any discernable pattern in average errors across debt portfolios.

5. Although US figures would be higher anyway due to currency differences between the pound and dollar, the figures for the US in terms of median firm size (MV and TAE) are still substantially larger. Note that while both samples represent only a sub-sample of the population of listed firms, they do, however represent the largest firms in each market and so reflect a large proportion of the market in terms of market value.

References

Accounting Standards Board. (1992) *Reporting Financial Performance*. (Financial Reporting Standard, 3).

Acker, D., Horton, J. and Tonks, I. (2002) Accounting Standards and Analysts' Forecasts: The Impact of FRS 3 on Analysts' Ability to Forecast EPS, *Journal of Accounting and Public Policy,* 21, pp. 193-217.

Anthony, R. (1975) *Accounting for the Cost of Interest.* (D C Heath & Co, Lexington, Mass).

Anthony, R. (1983) *Tell It Like It Was: A Conceptual Framework for Financial Accounting.* (Irwin).

Biddle, G., Bowen, R. and Wallace, J. (1997) Does EVA beat earnings? Evidence on associations with stock returns and firm values, *Journal of Accounting and Economics*, 24, pp. 301-336.

Bromwich, M. and Walker M. (1998) Residual income past and future, *Management Accounting Research*, 9, pp. 391-419.

Easton, P., Harris, T. and Ohlson, J. (1992) Aggregate accounting earnings can explain most of security returns, *Journal of Accounting and Economics*, June, pp. 119-142.

Edwards, E. (1977) The primacy of accounting income in decisions on expansion: an exercise in arithmetic, in: Cess van Dam, ed., *Trends in Managerial and Financial Accounting*. (Martinus Mijhoff, Amsterdam).

Edwards, E. (1980) The fundamental character of excess current income, *Accounting and Business Research*, Autumn.

Edwards, E., and Bell, P. (1961) *The Theory and Measurement of Business Income.* (Berkeley and Los Angeles University of California Press).

Francis, J., Olsson, P. and Oswald, D. (2000) Comparing the accuracy and explainability of dividend free cash flow and abnormal earnings equity value estimates, *Journal of Accounting Research,* 38, pp. 45-70.

Hicks, J. R., 1946. *Value and Capital,* 2nd Edition, Oxford, Clarendon Press.

International Accounting Standards Board. (2004) *Share-based payments, IFRS 2*.

International Accounting Standards Board. (2007a) Financial Statement Presentation, (http://www.iasb.org/Current+Projects/IASB+Projects/Financial+Statement+Presentation/Financial+Statement+Presentation.htm, last accessed 2 December 2007)

International Accounting Standards Board. (2007b) IAS 1 Presentation of Financial Statements (Revised), September.

Isidro, H., O'Hanlon J. and Young, S. (2006) Dirty surplus accounting flows and valuation errors, *Abacus*, 42, pp. 302-344.

Lee, C. M. C. (1996) Measuring wealth, *CA Magazine*, pp. 32-37.

Lee, C. M. C. Myers, J. and Swaminathan, B. (1999) What is the intrinsic value of the Dow?, *Journal of Finance,* 54(5), pp. 1693-1741.

Lin, S. (2002) The association between analysts' forecast revisions and earnings components: The evidence of FRS 3, *British Accounting Review*, 34, pp. 1-26.

Lindahl, N., 1939. *Studies in the Theory of Money and Capital*, Allen and Unwin.

O'Hanlon, J. and Peasnell, K. (1998) Wall Street's contribution to management accounting: the Stern Stewart EVA Financial Management System*, Management Accounting Research*, 9, pp. 421-444.

O'Hanlon, J. and Pope, P. (1999) The value relevance of UK dirty surplus accounting flows, *British Accounting Review*, 31, pp. 459-482.

Penman, S. H. and Sougiannis, T. (1998) A comparison of dividend, cash flow and earnings approaches to equity valuation, C*ontemporary Accounting Research,* 15(3), pp. 343-383.

Penman, S. H. (2003) The quality of financial statements: perspectives from the recent stock market bubble, *Accounting Horizons,* Supplement, 17, pp. 77-96.

Preinreich, G. (1938) Annual study of economic theory: The theory of depreciation, *Econometrica,* July, pp. 219-241.

Schipper K. and Vincent, L. (2003) Earnings quality, *Accounting Horizons,* Supplement, 17, pp. 97-110.

Shiller, R.J. (1981) Do stock prices move too much to be justified by subsequent changes in dividends, *American Economic Review*, 71, pp. 421-436.

Solomons, D. (1965) *Divisional performance: Measurement and control.* (Homewood ILL. Irwin).

Stark, A. and Thomas, H. (1998) On the empirical relationship between market value and residual income in the UK, *Management Accounting Research*, 9, pp. 445-460.

Stewart, G. (1991) *The Quest for Value.* (New York, Harper Business).

Stewart, G. (2002) Accounting is broken here's how to fix it: A radical manifesto, *EVAluation*, 7, September.

Table 1. Definitions of alternative metrics

The table describes the different performance measures employed including definitions extracted from Datastream (UK) and Compustat (US). EVA is economic value added and NOPAT(SS) is net operating profit after tax. Both measures are provided by Stern Stewart & Co. RI(SS) is residual income, which is measured as NOPAT(SS) – ($Capital_{,t-1}$* WACC). RI(1) and RI(2) are defined as RI(SS), but substituting NOPAT(1) and NOPAT(2) for NOPAT(SS). NOPAT(1) is defined as profit after tax but before interest expense and exceptional/extraordinary items. NOPAT(2) is defined as earnings before interest expense. TAE is total assets employed. OCF is operating cash flow. PBIT(1) is profit before interest and tax and exceptional/extraordinary items. PBIT(2) is profit before interest and tax but after exceptional/extraordinary items. OPCO(1) is operating profit for continuing operations and OPCO(2) is operating profit for continuing and acquired operations. CSUR is clean surplus income and STRGL is total recognised gains and losses. EFO is earned for ordinary and EBEI is earnings before exceptional and extraordinary items.

Label	*Capital Base*	*UK Definition*	*US Definition*
PANEL A: Residual income (RI) using Stern Stewart definition of capital			
EVA	Average capital	Stern Stewart	Stern Stewart
RI(SS)	Ending operating capital	NOPAT(SS)	NOPAT(SS)
RI(1)	Ending operating capital	NOPAT(1) Profit after tax, before extraordinary/exceptional (#182) plus net interest expense (#153-#143)	NOPAT(1) Income before extraordinary items (#237) plus special items and discontinued operations (#17+#66) and net interest expense (#15-#62)
RI(2)	Ending operating capital	NOPAT(2) Earnings (#625) plus net interest expense (#153-#143)	NOPAT(2) Net income (#172) plus net interest expense (#15-#62)
PANEL B: Residual income (RI) using a conventional accounting definition of capital			
RI(SS-TAE)	UK: Assets employed (#391) US: Total assets (#6) less current liabilities (#5)	NOPAT(SS)	NOPAT(SS)
RI(1-TAE)	UK: Assets employed (#391) US: Total assets (#6) less current liabilities (#5)	NOPAT(1) Profit after tax, before extraordinary/exceptional items (#182) plus net interest expense (#153-#143)	NOPAT(1) Income before extraordinary items (#237) plus special items and discontinued operations (#17+#66) and net interest expense (#15-#62)
RI(2-TAE)	UK: Assets employed (#391) US: Total assets (#6) less current liabilities (#5)	NOPAT(2) Earnings (#625) plus net interest expense (#153-#143)	NOPAT(2) Net income (#172) plus net interest expense (#15-#62)
RI(OCF-SS)	Ending operating capital	OCF Cash flow from operating activities (#1015)	OCF Net cash flow from operations (#308)
RI(OCF-TAE)	UK: Assets employed (#391) US: Total assets (#6) less current liabilities (#5)	OCF Cash flow from operating activities (#1015)	OCF Net cash flow from operations (#308)

Table 1. (Continued)

PANEL C: No capital charge (conventional reporting)			
Label	*Capital Base*	*UK Definition*	*US Definition*
NOPAT(SS)	n/a	NOPAT(SS)	NOPAT(SS)
PBIT(1)	n/a	Pre-tax profit before extraordinary/exceptional items (#157) plus net interest expense (#153-#143)	Pre-tax income before special items (#170+#17) plus net interest expense (#15-#62)
PBIT(2)	n/a	Pre-tax profit after extraordinary/exceptional items (#154) plus net interest expense (#153-#143)	Pre-tax income (#170) less extraordinary items and discontinued operations (#192+#66) plus net interest expense (#15-#62)
OCF	n/a	Cash flow from operating activities (#1015)	Net cash flow from operations (#308)
OPCO(1)	n/a	Profit from continuing operations (#1074) plus adjustments (#981) and profit from acquisitions (#1075)	n/a
OPCO(2)	n/a	Profit from continuing operations (#1074)	n/a
CSUR	n/a	Shareholders funds (#1105) plus ordinary dividends (#187) less capital issues (#1101)	n/a
STRGL	n/a	Earned for ordinary (#625) plus revaluation adjustment (#1099) plus currency translation difference (#1098) plus other recognised gains/losses (#1100)	n/a
EFO & EBEI	n/a	Earned for ordinary (#625)	Income before extraordinary items (#18)

Table 2. Descriptive statistics

The table reports descriptive statistics for each of the performance measures employed. For definitions of performance measures see Table 1. Additional variables are included: WACC is the weighed average cost of capital, provided by Stern Stewart & Co. TAE is GAAP-based total assets employed and EOC is Stern Stewart-based ending operating capital. The descriptive statistics are calculated using the cross-section of firms over the sample period, which is 1990 to 2001 for the UK and 1986 to 2001 for the US.

UK sample (Millions of Pounds)					US sample (Millions of Dollars)			
Performance Metric	*Mean*	*Median*	*Standard deviation*	*Firms-years*	*Mean*	*Median*	*Standard deviation*	*Firms-years*
EVA	23.19	3.21	268.97	3,771	-13.43	2.99	666.08	11,721
RI(SS)	13.36	2.67	264.12	3,311	14.18	8.83	685.57	11,552
RI(1)	-11.35	2.68	500.88	2,511	-30.50	2.59	1,894.45	10,776
RI(2)	-14.65	2.43	513.48	2,511	26.98	5.11	1,449.04	10,790
RI(SS-TAE)	15.92	2.54	413.68	2,708	-395.06	7.61	2,979.96	10,984
RI(1-TAE)	-7.18	2.45	558.23	2,706	-442.37	0.32	2,841.83	10,923
RI(2-TAE)	-10.89	2.13	560.20	2,706	-384.63	3.54	2,571.05	10,937
RI(OCF-SS)	102.67	20.80	380.39	2,220	175.85	33.41	1,301.72	9,486
RI(OCF-TAE)	78.92	17.02	449.95	2,356	-101.66	34.47	2,929.71	9,584
OCF	181.40	35.73	435.86	2,640	519.44	141.20	1,777.35	10,451
EFO & EBEI	71.62	9.56	339.43	4,306	234.23	70.05	991.13	12,418
NOPAT(SS)	125.26	22.23	412.69	3,788	367.71	109.79	1,022.76	12,412
NOPAT(1)	99.77	20.54	293.49	3,306	321.59	87.79	1,898.99	12,137
NOPAT(2)	96.02	18.66	311.41	3,305	375.77	99.39	1,618.68	12,151
PBIT(1)	151.98	30.65	410.54	3,306	473.98	131.60	2,192.53	12,124
PBIT(2)	143.04	27.56	415.58	3,306	529.90	143.79	1,969.85	12,136
OPCO(1)	248.48	57.47	637.84	2,526	n/a	n/a	n/a	n/a
OPCO(2)	127.81	28.77	315.86	2,525	n/a	n/a	n/a	n/a
CSUR	64.09	12.19	378.30	2,540	n/a	n/a	n/a	n/a
STRGL	80.02	16.20	299.13	2,475	n/a	n/a	n/a	n/a
MVA	1,117.81	127.04	5,522.70	3,779	4,173.45	776.53	17,673.80	11,820
MV	2,544.23	427.00	9,687.88	3,790	8,415.62	2,442.20	23,952.55	11,820
EOC	1,224.83	221.90	5,024.74	3,790	4,107.18	1,292.17	10,605.61	12,408
TAE	1,226.79	174.99	5,104.18	3,194	7,829.94	1,362.04	32,004.76	12,216
WACC	9.46%	9.00%	1.82%	3,790	10.55%	10.17%	2.57%	11,769

Table 3. Mean Errors for 3, 5 and 10 year windows

The table reports the average errors (*ex post – ex ante*) for different performance measures across windows of 3, 5, and 10-years for the US and UK. Definitions of performance measures are given in Table 1. The rankings range from 1 (smallest) to 16 (largest) for the US and 1 (smallest) to 20 (largest) for the UK. Rankings are calculated using the average errors across the 3 windows. Overall rank is the calculated by summing the ranks across the three windows and ranking smallest to largest.

PANEL A: US mean errors	*3 year*	*Rank*	*5 year*	*Rank*	*10 year*	*rank*	*Overall rank*
Residual income (RI) using Stern Stewart definition of capital							
EVA	367.9	5	916.76	5	1409.76	6	5
RI(SS)	416.88	6	984.38	7	1510.63	7	7
RI(1)	352.82	4	850.38	4	1135.18	3	4
RI(2)	427.75	8	953.86	6	1295	5	6
Residual income (RI) using a conventional accounting definition of capital							
RI(SS-TAE)	130.9	1	295.08	3	1143.41	4	3
RI(1-TAE)	**248.21**	**3**	**76.06**	**1**	**672.54**	**1**	**1**
RI(2-TAE)	169.45	2	194.59	2	858.56	2	2
RI(OCF-SS)	715.32	9	1416.23	9	2167.53	9	9
RI(OCF-TAE)	423.79	7	1084.48	8	2054.98	8	8
No capital charge (conventional reporting)							
NOPAT(SS)	1146.31	12	2107.69	13	3540.53	13	13
NOPAT(1)	1075.57	11	1959.55	11	3104.1	11	11
NOPAT(2)	1152.28	13	2070.47	12	3297.69	12	12
PBIT(1)	1402.93	14	2457.42	14	3967.67	14	14
PBIT(2)	1497.88	16	2623.61	16	4298.25	16	16
EBEI	906.31	10	1720.87	10	2748.45	10	10
OCF	1418.92	15	2502.28	15	4071.12	15	15
PANEL B: UK mean errors							
Residual income (RI) using Stern Stewart definition of capital							
EVA	73.7	7	158.61	6	69.14	8	7
RI(SS)	49.52	5	115.26	3	14.59	3	4
RI(1)	**22.41**	**2**	**105.12**	**2**	**14.15**	**2**	**1**
RI(2)	13.83	1	90.14	1	29.6	5	2
Residual income (RI) using a conventional accounting definition of capital							
RI(SS-TAE)	66.68	6	180	7	63.51	6	6
RI(1-TAE)	46.57	4	148.74	5	28.19	4	5
RI(2-TAE)	37.15	3	134.3	4	12.52	1	3
RI(OCF-SS)	224.99	12	317.77	10	1058.89	19	14
RI(OCF-TAE)	184.09	10	255.61	8	844.08	18	11
No capital charge (conventional reporting)							
NOPAT(SS)	268.13	16	472.02	15	607.89	14	16
NOPAT(1)	229.35	13	434.55	14	544.65	12	13
NOPAT(2)	220.98	11	422.29	13	525.59	11	10
PBIT(1)	328.91	18	595.67	18	797.84	17	18
PBIT(2)	311.83	17	570.03	17	754.27	16	17
EFO	230.07	14	411.82	12	518.4	10	12
OCF	485.26	19	763.27	19	2760.71	20	20
OPCO(1)	490.7	20	824.27	20	626.53	15	19
OPCO(2)	263.62	15	482.8	16	585.37	13	15
CSUR	163.57	9	331.14	11	326.28	9	9
STRGL	157.69	8	309.11	9	64.08	7	8

Table 4. Pair-wise comparisons for 3, 5 and 10 year windows

The table reports pair-wise absolute differences between performance metrics, calculated as the cross-sectional average of (ex-post - ex-ante, measure 1) - (ex-post - ex-ante, measure 2). A negative (positive) sign indicates that the first metric has a lower (higher) valuation error. Overall average is the average absolute differences across the three windows, 3, 5 and 10-years. ***, ** and * indicate significant differences (two tailed) at the 1%, 5% and 10% levels, respectively.

PANEL A: US pair-wise comparisons	*3-years*	*5-years*	*10-years*	*Overall average*
EVA V NOPAT(SS)	-536.49***	-1115.45***	-2130.77***	-1260.90***
EVA V NOPAT(1)	-497.71***	-967.31***	-1694.34***	-1053.12***
EVA V NOPAT(2)	-542.89***	-1078.23***	-1887.93***	-1169.68***
EVA V EBEI	-360.63***	-728.63***	-1338.69***	-809.32***
EVA V OCF	-733.98***	-1510.04***	-2661.36***	-1635.13***
EVA V RI(SS)	-29.50	-37.89	-100.87	-56.09
EVA V RI(1)	-19.35	27.19	274.58**	94.14
EVA V RI(2)	-65.89	-28.11	114.76	6.92
EVA V RI(1-TAE)	26.59	437.91***	341.59***	268.70***
EVA V RI(2-TAE)	32.46	386.22***	247.73*	222.14**
EVA V RI(OCF-SS)	-215.07***	-423.99***	-757.77***	-465.61***
RI(1) V RI(2)	-46.53	-55.31	-159.82	-87.22
RI(1-TAE) V RI(2-TAE)	5.87	-51.69	-93.86	-46.56
NOPAT(SS) V NOPAT(1)	38.78	148.13	436.43**	207.78*
NOPAT(1) V NOPAT(2)	-45.19	-110.92	-193.59	-116.57
PBIT(1) V PBIT(2)	-66.18	-166.19	-330.58	-187.65
PANEL B: UK pair-wise comparisons				
EVA V NOPAT(SS)	-143.83***	-304.10***	-505.48***	-317.80***
EVA V NOPAT(1)	-116.45***	-266.64***	-442.23***	-275.11***
EVA V NOPAT(2)	-108.45***	-254.37***	-423.18***	-262.00***
EVA V EFO	-118.47***	-243.90***	-415.99***	-259.45***
EVA V OCF	-327.73***	-595.35***	-2658.29***	-1193.79***
EVA V RI(SS)	8.91	20.97	-11.46	6.14
EVA V RI(1)	14.88	15.96	5.11	11.99
EVA V RI(2)	15.66	17.12	8.33	13.70
EVA V RI(1-TAE)	3.35	-8.98	29.88	8.08
EVA V RI(2-TAE)	3.53	-8.67	32.26	9.04
EVA V RI(OCF-SS)	-106.42***	-214.99***	-956.47***	-425.96***
RI(1) V RI(2)	0.78	1.16	3.22	1.72
RI(1-TAE) V RI(2-TAE)	0.18	0.31	2.39	0.96
NOPAT(SS) V NOPAT(1)	27.38	37.46	63.24	42.70
NOPAT(1) V NOPAT(2)	8.00	12.27	19.05	13.11
NOPAT(SS) V OPCO(1)	-127.10***	-234.50***	294.62	-22.33
NOPAT(1) V OPCO(1)	-154.49***	-271.96***	231.38	-65.02
NOPAT(2) V OPCO(1)	-162.48***	-284.23***	212.32	-78.13
NOPAT(1) V STRGL	62.82	125.44*	480.57	222.94
NOPAT(2) V STRGL	54.83	113.17*	461.52	209.84
PBIT(1) V PBIT(2)	14.11	25.64	43.57	27.77

Table 5. Variability of Errors for 3, 5 and 10 year windows

The table reports the standard deviation of errors (*ex post – ex ante*) for different performance measures across windows of 3, 5, and 10-years for the US and UK. Definitions of performance measures are given in Table 1. The rankings range from 1 (smallest) to 16 (largest) for the US and 1 (smallest) to 20 (largest) for the UK. Rankings are calculated using the average errors across the 3 windows. Overall rank is the calculated by summing the ranks across the three windows and ranking smallest to largest. The last four metrics in the table were only available in the UK from 1992, providing only one terminal year for a 10-year window.

PANEL A: US standard deviation of errors	*3 year*	*Rank*	*5 year*	*Rank*	*10 year*	*rank*	*Overall rank*
Residual income (RI) using Stern Stewart definition of capital							
EVA	**3846**	**1**	**4135**	**1**	**4847**	**1**	**1**
RI(SS)	3853	2	4162	2	4912	2	2
RI(1)	4359	5	4825	4	5582	4	4
RI(2)	4223	3	4660	3	5378	3	3
Residual income (RI) using a conventional accounting definition of capital							
RI(SS-TAE)	4915	14	5554	11	6227	9	12
RI(1-TAE)	4869	12	5407	9	6066	7	10
RI(2-TAE)	4772	10	5342	8	6024	6	8
RI(OCF-SS)	4405	6	5072	5	6206	8	5
RI(OCF-TAE)	4715	9	5249	7	5930	5	6
No capital charge (conventional reporting)							
NOPAT(SS)	4235	4	5143	6	6881	13	7
NOPAT(1)	4634	8	5557	12	6826	12	11
NOPAT(2)	4517	7	5438	10	6814	11	9
PBIT(1)	4952	15	6225	15	7958	14	15
PBIT(2)	4990	16	6346	16	8359	16	16
EBEI	4857	11	5671	13	6789	10	13
OCF	4897	13	6142	14	8070	15	14
PANEL B: UK standard deviation of errors							
Residual income (RI) using Stern Stewart definition of capital							
EVA	1183	8	1230	3	1217	8	3
RI(SS)	1189	9	1248	4	1264	9	7
RI(1)	**1095**	**1**	**1171**	**2**	**1144**	**1**	**1**
RI(2)	1102	2	1170	1	1158	2	2
Residual income (RI) using a conventional accounting definition of capital							
RI(SS-TAE)	1221	15	1353	9	1173	4	11
RI(1-TAE)	1203	10	1280	6	1178	6	8
RI(2-TAE)	1207	11	1277	5	1177	5	6
RI(OCF-SS)	1148	5	1391	12	1164	3	5
RI(OCF-TAE)	1173	7	1381	11	1179	7	10
No capital charge (conventional reporting)							
NOPAT(SS)	1285	17	1470	13	1507	12	12
NOPAT(1)	1144	3	1337	7	1376	10	4
NOPAT(2)	1144	4	1340	8	1418	11	9
PBIT(1)	1216	14	1564	16	1753	15	16
PBIT(2)	1210	12	1548	15	1773	16	14
EFO	1228	16	1491	14	1715	14	15
OCF	1214	13	1599	17	1695	13	13
OPCO(1)	1403	20	1849	20	n/a	n/a	n/a
OPCO(2)	1166	6	1374	10	n/a	n/a	n/a
CSUR	1304	18	1638	18	n/a	n/a	n/a
STRGL	1350	19	1713	19	n/a	n/a	n/a