VALUE BASED FINANCIAL PERFORMANCE MEASURES: AN EVALUATION OF RELATIVE AND INCREMENTAL INFORMATION CONTENT

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Abstract

Value-based (VB) financial performance measures are often advanced as improvements over traditional measures. It is argued that the inclusion of a firm's cost of capital in the calculation of these measures facilitates the evaluation of value creation. Furthermore they attempt to remove some accounting distortions resulting from the limitations of conventional accounting information. This paper investigates the ability of four VB measures to explain market-adjusted share returns and compare it to that of some traditional measures. Empirical results indicate that the relative information contents of the VB measures are not greater than that of earnings. The incremental information content tests indicate that their components add significantly to the information content of earnings, but that the level of significance is relatively low.

Keywords: financial performance, cost of capital, accounting information

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1. Introduction

Firms focused on the maximisation of shareholder value need to ensure that all activities yield positive net present values. A number of value-based financial performance measures have been developed in an attempt to guide management actions towards achieving this objective. These value-based measures, such as Economic Value Added (EVA) and Cash Value Added (CVA), attempt to include a firm's cost of capital and to adjust financial statement information in order to remove some of the accounting distortions contained in traditional financial performance measures. Performance exceeding the cost of capital yields value, while the failure to achieve this results in the destruction of shareholder value.

Value-based financial performance measures (VBM) are presented by their proponents as a major improvement over the traditional performance measures. Most importantly, by including a firm's cost of capital in their calculation they could be applied in order to evaluate the value creating potential of a firm (Young and O'Byrne, 2001: 431; Lehn and Makhija, 1996: 35). If the returns generated on a firm's projects are in excess of the cost of capital, these projects would yield positive net present values and consequently shareholder value is increased (Grant, 2003: 81; Stewart, 1991: 174). These VBM also attempt to overcome some of the problems associated with the traditional measures by removing the accounting distortions contained in the financial statements (Ehrbar, 1998: 80; Peterson and Peterson, 1996: 10; Stewart, 1991: 66).

Perhaps one of the best known value-based performance measures is Economic Value Added (EVA). EVA is an estimate of the economic profit generated by a firm (Stewart, 1994: 73) and is calculated by comparing a firm's net operating profit after tax (NOPAT) to the total cost of all its forms of capital (debt, as well as equity) (Grant, 2003: 2). Maximising a firm's EVA should result in an increase in shareholder value created (Stewart, 1991: 174). Proponents of the measure report high levels of correlation with share returns (Worthington and West, 2004: 201; O'Byrne, 1999: 95; Bacidore, Boquist, Milbourne and Thakor, 1997: 17; O'Byrne, 1996: 117; Grant, 1996: 44; Lehn and Makhija, 1996: 36; Peterson and Peterson, 1996: 45; Stewart, 1994: 75, 136; Stewart, 1991: 66).

The measure Cash Value Added (CVA) is considered as another form of residual income (Young and O'Byrne, 2001: 428). This measure calculates the difference between a firm's operating cash flow and a capital charge based on the gross amount of invested capital (Young and O'Byrne, 2001: 440). One of the major differences between CVA and EVA is that depreciation and accruals are added back to NOPAT when calculating the operating cash flow values included in CVA (Martin and Petty, 2000: 128). Furthermore, accumulated depreciation is included with the invested capital amount when the gross invested capital is determined (Martin and Petty, 2000: 141). According to Young and O'Byrne (2001: 429), the calculation of CVA is less complex than the calculation of EVA since no accounting adjustments are required. They also argue that since depreciation is added back during the calculation of CVA the measure is not influenced by a firm's depreciation policy (Young and O'Byrne, 2001: 440). They perceive this characteristic of CVA as an advantage over EVA where different depreciation policies can result in large variations in the value of the measure.

A number of limitations with regard to CVA, however, are also highlighted. According to Young and O'Byrne (2001: 461), EVA is a better financial measure than CVA. They argue that the problem of different depreciation policies in the case of EVA can be solved by including an accounting adjustment. Furthermore, they indicate that by removing accruals and depreciation from the calculation of CVA the measure may loose important information required by the market when evaluating an enterprise. The process of removing the effects of accounting accruals in the calculation of CVA could also be relatively complex. They also warn that the incorporation of CVA values into valuation models should be considered carefully since CVA is based on historical accounting figures that do not represent the expected future cash flow generated by the enterprise (Young and O'Byrne, 2001: 442).

Another problem experienced with CVA occurs when uneven cash flow values are considered (Martin and Petty, 2000: 149). The resulting CVA values may provide conflicting signals with regard to the value creation of the projects under consideration. From the existing literature it is not clear whether CVA is able to outperform other financial performance measures.

The measure Cash Flow Return on Investment (CFROI) has been presented as an improvement over some of the other traditional and value-based measures by its proponents (Dzamba, 2003: 10). It is calculated by considering the inflation-adjusted investment in assets, the inflation-adjusted cash flow generated by employing these assets in the firm, and determines the yield generated over the estimated lifetime of the assets.

Madden (1999: 110) considers the calculation of CFROI to be based on basic DCF principles. The four inputs required to calculate the measure are as follows:

- The average life of the depreciating assets.
- The total amount of assets (includes both depreciating, as well as non-depreciating assets) adjusted for inflation.
- The inflation-adjusted cash flows generated by the assets over their lifetime.
- The final inflation-adjusted residual value of the non-depreciating assets at the end of the asset lifetime.

The calculations of the CFROI inputs are discussed in greater detail in Reviewers' Appendix 1. These four inputs are represented in the cash flow diagram provided in Figure 1:

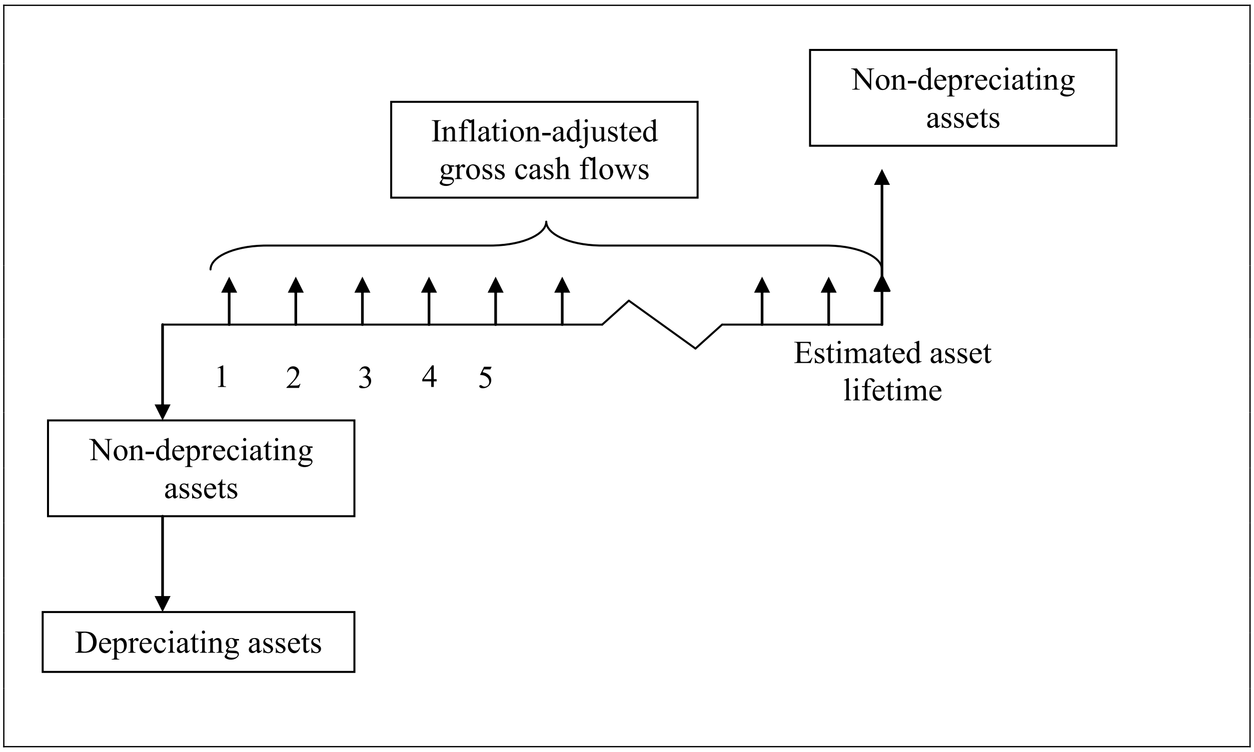

Figure 1. Cash flow diagram representing the four CFROI components

Based on these inputs the firm's CFROI value is calculated as the discount rate that would ensure that the present value of all the future cash flows (the equal annual inflation-adjusted gross cash flows, as well as the terminal non-depreciating assets amount) is equal to the initial investment (total non-depreciating and depreciating assets). As such, the CFROI may be viewed as a return on investment (ROI). However, it is not calculated for individual projects, but rather for the firm as a whole.

This CFROI figure is compared to the firm's inflation-adjusted (real) cost of capital. If a firm is able to generate CFROI values in excess of its inflation-adjusted cost of capital it should increase its shareholders' value while CFROI values below the real cost of capital will result in the destruction of shareholders' value. One of the characteristics of this measure is that is focuses on the return offered to all the capital providers of the firm and not only the shareholders (Madden, 1999: 101). Relatively little empirical research, however, have been conducted on the performance of CFROI relative to other financial performance measures.

In this paper the ability of the value-based measures residual income (RI), EVA, CVA and CFROI to explain market-adjusted share returns is investigated for a sample of firms listed in the Industrial Sector of the Johannesburg Securities Exchange (JSE) and compared to that of the traditional financial performance measures earnings before extraordinary items (EBEI) and operating cash flow (CFO). In the first part of the study the relative information contents of the value-based measures relative to the traditional measures are evaluated. The second part of the study investigates the incremental information content of the components of the value-based measures, and test whether the inclusion of these components contributes significantly to the information content of the other measures.

The empirical results indicate that the relative information contents of the value-based measures are not greater than that of earnings. The incremental information content tests indicate that the components of some of the value-based measures do add significantly to the information content of earnings. The level of significance, however, is relatively low.

The remainder of the paper consists of six sections. The first section focuses on the breakdown of the measures into their contributing components that is required for the information content tests. The second section describes the research method. The third section contains the descriptive statistics of the measures and components included in the relative and incremental information content tests. The fourth section provides the results from the relative information content tests, while the fifth section reports on the incremental information content tests. The final section contains the summary and the conclusions.

2 Components of the Value-Based Measures

This paper investigates the relative and incremental information content of the measures cash flow return on investment (CFROI), nominal and inflation-adjusted cash value added (CVA_{nom} and CVA_{real}), nominal and inflation-adjusted economic value added (EVA_{nom} and EVA_{real}), operating cash flow (CFO), earnings before extraordinary items (EBEI) and residual income (RI). To do so, these measures are partitioned into their contributing components using an approach applied by Biddle, Bowen and Wallace (1997: 305).

The following section provides a break-down of the components included in the calculation of the nominal versions of the measures included in the study. Thereafter, the inflation adjustments proposed by International Accounting Standard 15 (IAS15) are highlighted. Finally, the components of the inflation-adjusted measures EVA_{real}, CVA_{real} and CFROI are considered.

2.1 Nominal Measures

To explore the relationships between the various measures, one should commence by defining EBEI, and then discuss all the additional components required to calculate the measures. According to Biddle *et al*. (1997: 305) a firm's EBEI could be defined as follows:

$EBEI_t = CFO_t + Accrual_t$,

where:

$EBEI_t$ = The earnings before extraordinary items and tax for period *t*.

CFO_t = The net cash from operating activities.

$Accrual_t$ = The total operating accruals of the firm.

The difference between EBEI and the net operating profit after tax (NOPAT) is that NOPAT does not take the after-tax interest expense into account, while EBEI does. Therefore:

$NOPAT_t - ATInt_t = EBEI_t$

where:

$ATInt_t$ = Interest expense after provision for tax

While EBEI makes provision for the cost of debt by subtracting the interest expense, RI is calculated by deducting the cost of the total (i.e. debt and equity) capital.

$RI_t = NOPAT_t - (c^* \times IC_{t-1})$

where:

c^* = The firm's estimated weighted average cost of capital (WACC) after tax

IC_{t-1} = The amount of capital invested in the firm at the beginning of the period

Firms that achieve positive RI values are able to generate profits in excess of their total cost of capital, and consequently shareholder value should be created. Negative RI values are an indication that insufficient profits are generated, and as a result, shareholder value could be destroyed.

EVA is calculated in a similar way as RI. The major difference between the two measures relates to a number of adjustments to NOPAT and IC included in the calculation of EVA. These adjustments are included with a view to removing some of the accounting distortions identified by Stewart (1991: 28).

EVA_t=($NOPAT_t$ + $AcctAdj_{op;\ t}$) – [c^* x (IC_{t-1}+ $AcctAdj_{c;t}$)]

where:

$AcctAdj_{op;\ t}$=Adjustments to remove the accounting distortions from operating profit

$AcctAdj_{c;\ t}$=Adjustments to remove the accounting distortions from invested capital

Since EVA values are not published by Stern Stewart for South African firms, the EVA values are obtained from the McGregor BFA database (2005). Although these EVA values do not include all the adjustments recommended by Stern Stewart, the standardisation process applied to the financial statements contained in the database already makes provision for a number of the adjustments.

A firm's CVA is calculated by considering the operating cash flow rather than operating profit (as was the case for EVA), and subtracting the gross capital charge. To convert NOPAT into the operating cash flow, depreciation and amortisation are added back (Martin & Petty, 2000: 128). Changes in other long-term liabilities, such as provisions and deferred taxes, are also added to NOPAT to convert it into a cash flow figure (Young & O'Byrne, 2001: 441). The capital charge is based on the gross value of the invested capital and not on the net figure (Martin & Petty, 2000: 141). Accumulated depreciation is, therefore, added back to the invested capital.

CVA_t=Operating cash flow –gross capital charge

=($NOPAT_t$ + $CVAAdj_{op;\ t}$) – [c^* x (IC_{t-1}+ $AccDepr_{t-1}$)]

where:

$CVAAdj_{op;\ t}$=Depreciation, amortisation and changes in other long-term liabilities

$AccDepr_{t-1}$=Accumulated depreciation

Based on these definitions CVA can be presented as follows:

CVA=CFO + Accrual + ATInt – CapChg + AcctAdj + CVAAdj where:

CapChg =c^* x IC_{t-1}

AcctAdj =$AcctAdj_{op;\ t}$ – (c^* x $AcctAdj_{c;\ t}$)

CVAAdj=$CVAAdj_{op;\ t}$ – $AcctAdj_{op;\ t}$ + [c^* x ($AcctAdj_{c;\ t}$ + $AccDepr_{t-1}$)]

2.2 Inflation-Adjusted Measures

In addition to the nominal measures, this study also investigates the information content of the inflation-adjusted versions of EVA and CVA, as well as the measure CFROI. In order to calculate the inflation-adjusted versions of these measures, inflation adjustments are calculated according to the guidelines contained in IAS15. These guidelines recommend adjustments to the cost of sales, the depreciation, the level of gearing, and the property, plant and equipment (PPE). The calculations of these adjustments are described in more detail in Reviewers' Appendix 2.

After calculating the IAS15 inflation adjustments, the inflation-adjusted version of the measure EVA is calculated as follows:

$EVA_{real;t}$=$NOPAT_{real;t}$ – ($IC_{real;t-1}$ x $c^*_{real;t}$) = ($NOPAT_{nom;t}$ - $COSAdj_t$ – $DeprAdj_t$ ± $GearAdj_t$) – [($IC_{nom;t-1}$ + $PPEAdj_t$) x $c^*_{real;t}$]

where:

$EVA_{real;t}$=EVA in real terms, calculated after the inflation adjustments to NOPAT and IC, are included

$NOPAT_{real;t}$=NOPAT after including the cost of sales, depreciation and gearing adjustments

$c^*_{real;t}$ =the inflation-adjusted cost of capital

$IC_{real;t-1}$ =the invested capital after including the PPE inflation adjustment

The real CVA is then calculated as follows:

$CVA_{real;\ t}$= ($NOPAT_{nom;\ t}$ + $CVAAdj_{op;\ t}$ - $COSAdj_t$ – $DeprAdj_t$ ± $GearAdj_t$) – [c^*_{real} x ($IC_{nom;\ t-1}$ + $PPEAdj_t$ + $AccDepr_{t-1}$)]

where:

$CVA_{real;\ t}$ = CVA in real terms, calculated after the inflation adjustments to NOPAT and capital, are included

$CVAAdj_{op;\ t}$ = Depreciation, amortisation and changes in other long-term liabilities

$AccDepr_{t-1}$ = Accumulated depreciation

The measure cash flow return on investment (CFROI) compares the inflation-adjusted cash flow generated by a firm with the inflation-adjusted cash investment required to achieve it (Young & O'Byrne, 2001: 382). By including the estimated lifetime of the firm's depreciable assets and the expected residual value of its non-depreciable assets an internal rate of return is calculated. This CFROI figure is then compared to the firm's inflation-adjusted (real) cost of capital.

In order to investigate the relative and incremental information content of the measure and to compare it with the other measures included in this study the CFROI margin is defined as the difference between a firm's CFROI and its real cost of capital:

$CFROI_{Margin}$ =CFROI - c^*_{real}

The CFROI margin can be presented as follows:

$CFROI_{Margin}$ = CFO + Accrual + ATInt – CapChg + AcctAdj + InflAdj + $CVAAdj_{real}$ + CFROIAdj

where:

Accrual = The total operating accruals of the firm

ATInt = Interest expense after provision for tax

CapChg = The capital charge based on the cost of capital and the invested capital at the beginning of the financial year

AcctAdj = The accounting adjustments to NOPAT and IC_{t-1} to calculate EVA_{nom}

InflAdj = The IAS15 inflation adjustments included to calculate EVA_{real}

CVAAdjreal = The adjustments made to EVA_{real} to calculate CVA_{real}
CFROIAdj = The difference between CVA_{real} and the firm's $CFROI_{Margin}$

The relationship between the $CFROI_{Margin}$ components is summarised in Figure 2 (Biddle *et al*., 1997: 307):

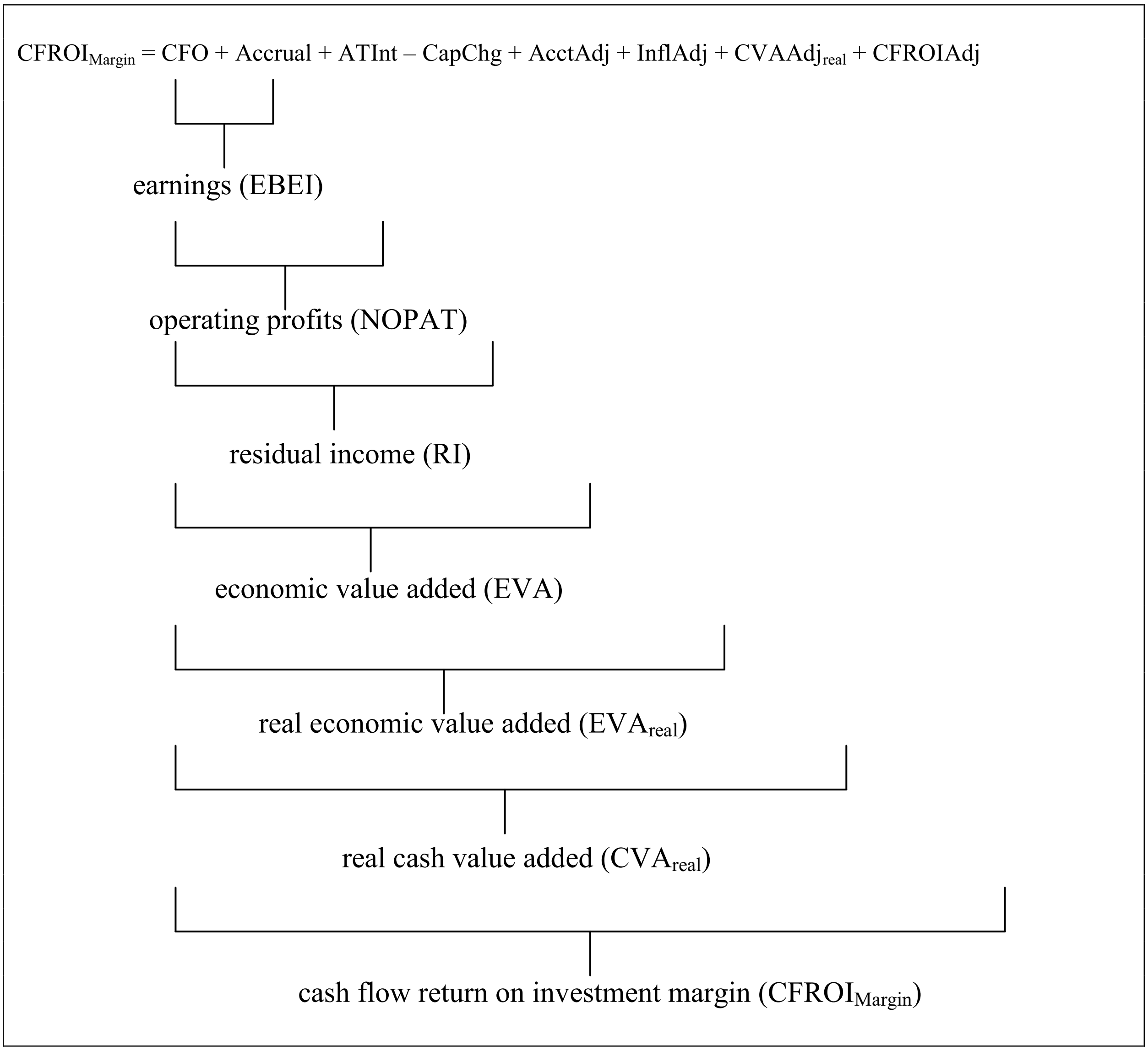

Figure 2. Components of the cash flow return on investment margin ($CFROI_{Margin}$)

3 Research Method

3.1 Hypotheses

The information content of a financial measure refers to the additional information that the market deduces from its publication and incorporates into the expected future financial performance of the firm. In order to evaluate the relative and incremental information content of the traditional and the value based measures included in this study, an approach developed by Biddle *et al*. (1997: 307) is applied. According to this approach, relative information content comparisons should be used to compare different measures, or when a choice between the measures is required. Incremental information content is used to determine whether one component of a measure provides additional information over and above that provided by another component.

To investigate the relative information content of the measures, the following null hypothesis is formulated (Biddle *et al*., 1997: 308):

H_{REL}: The information content of measure X_1 is equal to that of X_2

where X_1 and X_2 are pairwise combinations of the measures under investigation. Rejection of the null hypothesis indicates a statistically significant difference in the information content of the two measures.

In order to investigate the incremental information content of the components of measure X_i, it is necessary to decompose it into its contributing components:

$X_i = Y_1 + Y_2 + Y_3 + \ldots + Y_n$

The following null hypothesis is then formulated (Biddle *et al*., 1997: 308):

H_{INC}: Component Y_1 does not provide information content beyond that provided by the remaining components Y_2-Y_n

where Y_1-Y_n are the various components of the measure X_i investigated. Pairwise comparisons of the components are conducted to evaluate the incremental information content. Rejection of the null hypothesis indicates that the inclusion of the component under investigation will contribute significant additional information content.

3.2 Statistical Techniques

In order to evaluate the information content of the measures, the relationships between the measures and market adjusted share returns are investigated. For this purpose, regression analyses with the share return as dependent variable and the various measures as the independent variables are conducted. The statistical technique employed in this study focuses on the forecast errors of the various measures (calculated as the difference between the actual and expected values), which are standardised to size.

When assessing the information content of a measure, the statistical significance of the slope coefficient b_1 from the following ordinary-least squares regression is examined (Biddle *et al*., 1997: 308):

$$D_t = b_0 + b_1\, FE_{Xt} / \mathrm{MVE}_{t-1} + e_t \qquad (1)$$

where D_t (the dependent variable) is a measure of return for time period t;

FE_{Xt} / MVE_{t-1} is the unexpected realisation (or forecast error) of the measure X (FE_{Xt}), divided by the market value of the firm's equity at the beginning of the financial year (MVE_{t-1}); while e_t is a random disturbance term.

The unexpected realisation of the measure X for time period t is defined as the difference between the observed value of the measure (X_t) and the market's expected value of the measure ($\mathrm{E}(X_t)$):

$$FE_{Xt} = X_t - \mathrm{E}(X_t) \qquad (2)$$

Assuming that the market's expected value is formed according to a discrete linear stochastic process in autoregressive form, $\mathrm{E}(X_t)$ may be defined as:

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

where δ is a constant and the ϕ's are the autoregressive parameters. Substituting Equations (2) and (3) into Equation (1) yields:

$$D = b_0 + b_1 [X_t - (\delta + \phi_1 X_{t-1} + \phi_2 X_{t-2} + \phi_3 X_{t-3} + \ldots)] / \mathrm{MVE}_{t-1} + e_t = b_0' + b_1' X_t / \mathrm{MVE}_{t-1} + b_2' X_{t-1} / \mathrm{MVE}_{t-1} + b_3' X_{t-2} / \mathrm{MVE}_{t-1} + b_4' X_{t-3} / \mathrm{MVE}_{t-1} + \ldots + e_t \qquad (4)$$

where $\mathrm{E}(b_0') = b_0 - b_1\,\delta$, $\mathrm{E}(b_1') = b_1$, and $\mathrm{E}(b_i') = -b_i\,\phi_{i-1}$ for $i > 1$. Equation (4) provides the relationship between abnormal returns (D_t), and the lagged measures of accounting performance (X) scaled by MVE. For the purpose of this study, Equation (5) is limited to one lag:

$$D_t = b_0' + b_1' X_t / \mathrm{MVE}_{t-1} + b_2' X_{t-1} / \mathrm{MVE}_{t-1} + e_t \qquad (5)$$

3.2.1 Tests for Relative Information Content

The relative information contents of the measures are assessed by means of a statistical test developed by Biddle, Seow and Siegel (1995: 9). The independent variables are included in individual regressions against the dependent variable based on the following equation:

$$D_t = b_0' + b_1' X_t / \mathrm{MVE}_{t-1} + b_2' X_{t-1} / \mathrm{MVE}_{t-1} + e_t \qquad (6)$$

where D_t is the market-adjusted return on a firm's shares for time period t, X is one of the measures investigated, and MVE is the market value of the firm's equity. According to the test, pairwise comparisons of the adjusted R^2 values from the individual regressions are conducted. Statistically significant differences between two adjusted R^2 values result in the rejection of the null hypothesis H_{REL}. This indicates a statistically significant difference in the ability of the two measures under investigation to explain the variation in the dependent variable (Biddle *et al*., 1997: 310).

3.2.2 Tests for Incremental Information Content

In order to evaluate the incremental information content of the components of the measures investigated in this study, the following regression is conducted (Biddle *et al*., 1997: 311):

$$D_t = d_0 + d_1\, Y_{1;t} / \mathrm{MVE}_{t-1} + d_2\, Y_{1;t-1} / \mathrm{MVE}_{t-1} + d_3\, Y_{2;t} / \mathrm{MVE}_{t-1} + d_4\, Y_{2;t-1} / \mathrm{MVE}_{t-1} + e_t \qquad (7)$$

where Y_1 and Y_2 are two different components of the measure under investigation. The individual regression coefficients are assessed by means of t-tests to investigate the contribution of the specific component. F-tests are used to assess the following joint null hypotheses:

$$\mathrm{H}_{0Y_1}: \quad d_1 = d_2 = 0$$

$$\mathrm{H}_{0Y_2}: \quad d_3 = d_4 = 0$$

Rejection of the null hypotheses indicates that the inclusion of a component provides significant incremental information.

3.3 Measures

3.3.1 Dependent Variable

The relative and incremental information content tests applied in this study focus on the relationship between the independent variables and the unexpected return generated on a firm's shares. In order to estimate the unexpected return, the market adjusted return is calculated (Biddle *et al*., 1997: 312). This value indicates whether a firm over- or under performed relative to the overall market.

MktAdjRet The market adjusted return is calculated as the difference between the 12-month compounded return on a share and the 12-month compounded return on the ALSI index. These returns are calculated for a period ending three months after the end of a firm's financial year-end to ensure that the information contained in the financial statements is reflected in the share prices.

The 12-month compounded share returns, as well as the return on the ALSI index, are obtained from the McGregor BFA database (2005).

3.3.2 Independent Variables

The primary objective of this study is to investigate the relative and the incremental information content of a number of traditional and value based financial performance measures. The measures included in the relative information content test are CFO, EBEI, RI, EVA, and CVA, as well as the inflation-adjusted measures EVA_{real}, CVA_{real} and CFROI. The measures are calculated based on information obtained from the standardised financial statement data contained in the McGregor BFA database (2005).

Stern Stewart does not publish EVA values for South African firms. The McGregor BFA database (2005), however, contains EVA values that are calculated based on the standardised financial statements included in the database. Through the standardisation process applied by the database the majority of the EVA accounting adjustments are addressed. The equity adjustments proposed by Stern Stewart, however, are not included in the EVA values reported in the database.

In the case of firms listed at the end of the research period, values for EVA, cost of capital and invested capital are obtained from the McGregor BFA database (2005). Since these values are not available for those firms that delisted during the period under review, they are estimated using the same method as the one employed in the database. In order to evaluate the effect of inflation on the measures, the inflation adjustments proposed by IAS15 are quantified and included in the calculation of EVA_{real} and CVA_{real}. CFROI values are not available from the McGregor BFA database (2005). Consequently, these values are estimated by using the approach described by Madden (1999).

In order to evaluate the incremental information content of the components of the measures EVA, EVA_{real}, CVA, CVA_{real} and CFROI, the components indicated in Figure 2 are required. These components are quantified by information obtained from the McGregor BFA database (2005).

To reduce heteroscedasticity in the data, all the independent variables are divided by the market value of equity as measured three months after the beginning of the firm's financial year (MVE_{t-1}) (Biddle *et al*., 1997: 313). This period is chosen to correspond with the period over which the dependent variable is calculated.

3.4 Data

The measures CFO, EBEI, RI, EVA_{nom}, EVA_{real}, CVA_{real} and CFROI, as well as their contributing components, are calculated for all firms listed in the industrial sector of the JSE during the 15-year period from 1991 to 2005. Those firms listed at the end of this period are considered for the initial sample. Focusing only on these firms, however, would expose the study to a survivorship bias. Consequently, all delisted firms that were listed during the period under investigation are also included in the sample. A total of 198 listed firms and 188 delisted firms are identified.

Following Biddle *et al*. (1997: 311), those observations in excess of eight standard deviations from the median are classified as extreme outliers, and consequently 41 observations were removed from the sample. The number of observations classified as extreme outliers relative to the overall sample is relatively small. A closer investigation of those firms classified as extreme outliers also reveals that the majority of these values are observed for firms at the end of their lifecycle, where financial performance is diminishing, and share prices have already collapsed. Other examples include the first financial year of firms that listed for the first time, or firms that underwent financial reorganisation. Both the dependent and independent variables are also winsorised to ± four standard deviations from the median. The final sample investigated in the information content tests consists of 316 firms with 2 837 complete observations.

4 Descriptive Statistics of the Measures and Components Included in the Information Content Tests

4.1 Measures Included in the Relative Information Content Tests

The descriptive statistics of the winsorised values of *MktAdjRet*, EBEI, CFO, RI, EVA_{nom}, EVA_{real}, CVA_{real} and $CFROI_{Margin}$ included in the relative information content tests pooled across time are provided in Table 1.

Table 1. Descriptive statistics on the dependent and independent variables in the relative information content tests of $CFROI_{Margin}$

	Descriptive statistics							
	Dependent Variable	Independent Variables						
	MktAdjRet	EBEI	CFO	RI	EVA_{nom}	EVA_{real}	CVA_{real}	$CFROI_{Margin}$
Mean	0.141	0.202	0.297	-0.089	-0.142	-0.135	-0.039	-0.007
Median	0.018	0.125	0.151	0.003	-0.019	-0.007	0.022	-0.002
Std. Dev.	0.761	0.508	0.647	0.495	0.532	0.687	0.698	0.155
	Correlations							
	Dependent Variable	Independent Variables						
	MktAdjRet	EBEI	CFO	RI	EVA_{nom}	EVA_{real}	CVA_{real}	$CFROI_{Margin}$
MktAdjRet	1.000							
EBEI	0.297	1.000						
CFO	0.165	0.491	1.000					
RI	0.161	0.374	0.018	1.000				
EVA_{nom}	0.118	0.261	-0.037	0.909	1.000			
EVA_{real}	0.095	0.229	-0.065	0.747	0.833	1.000		
CVA_{real}	0.121	0.314	0.069	0.687	0.748	0.954	1.000	
$CFROI_{Margin}$	0.186	0.280	0.056	0.418	0.342	0.323	0.317	1.000

Notes:
All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are size-adjusted by divided them by the market value of the equity as measured three months after the beginning of the financial year. All correlations are significant at the 1% level, except between CFO, and RI and EVA_{nom}.

The measures EBEI and CFO exhibit the highest mean and median values, while the value based measures display small mean and median values, which are all close to zero. The lowest mean and median values are observed for the measure $CFROI_{Margin}$.

If the correlations are considered, all are found to be statistically significant at the 1% level, except the correlations between CFO, and RI and EVA_{nom}. The highest correlation between the dependent variable and an independent variable is observed between *MktAdjRet* and EBEI. In the case of $CFROI_{Margin}$, the highest correlation is between the measure and RI (correlation coefficient of 0.418). It is also interesting to note that the correlation between *MktAdjRet* and $CFROI_{Margin}$ is the highest for all the value based measures.

4.2 Components Included in the Incremental Information Content Tests

The descriptive data of the winsorised $CFROI_{Margin}$ components included in the incremental information content tests pooled across time are provided in Table 2.

The correlations between the majority of the $CFROI_{Margin}$ components are statistically significant at the 1% level. The correlation between AccAdj and InflAdj is significant at the 5% level, while the correlation between CapChg and Accruals is significant at the 10% level. Only the correlations between *MktAdjRet* and InflAdj, AccAdj and Accruals, and CFROIAdj and ATInt are not significant.

5 Relative Information Content Tests of $CFROI_{margin}$

The relative information content of the measures included in this chapter is evaluated by comparing the adjusted R^2 values obtained from seven separate regressions based on the following equation:

$$D_t = b_0 + b_1 X_t / MVE_{t-1} + b_2 X_{t-1} / MVE_{t-1} + e_t. \quad (8)$$

where:
D_t = the market-adjusted return for period t.
X = one of the seven measures CFO, EBEI, RI, EVA_{nom}, EVA_{real}, CVA_{real} and $CFROI_{Margin}$.

MVE_{t-1} = the market value of the equity three months after the beginning of the financial year.

The results from the relative information content tests are provided in Table 3:

Table 2. Descriptive statistics on the dependent and independent variables in the incremental information content tests of the $CFROI_{Margin}$ components

	Descriptive statistics								
	Dependent Variable	Independent Variables							
	MktAdjRet	CFO	Accruals	ATInt	CapChg	AccAdj	InflAdj	$CVAAdj_{real}$	CFROIAdj
Mean	0.141	0.297	-0.069	0.086	0.378	-0.053	0.009	0.096	0.031
Median	0.018	0.151	-0.022	0.029	0.169	-0.017	0.008	0.038	-0.017
Std. Dev.	0.761	0.647	0.589	0.175	0.650	0.215	0.346	0.195	0.667
	Correlations								
	Dependent Variable	Independent Variables							
	MktAdjRet	CFO	Accruals	ATInt	CapChg	AccAdj	InflAdj	$CVAAdj_{real}$	CFROIAdj
MktAdjRet	1.000								
CFO	0.165^{***}	1.000							
Accruals	0.054^{***}	-0.505^{***}	1.000						
ATInt	0.094^{***}	0.224^{***}	-0.088^{***}	1.000					
CapChg	0.139^{***}	0.441^{***}	-0.035^{*}	0.622^{***}	1.000				
AccAdj	-0.068^{***}	-0.117^{***}	-0.008	-0.263^{***}	-0.228^{***}	1.000			
InflAdj	0.004	-0.078^{***}	0.052^{***}	0.208^{***}	0.051^{***}	0.040^{**}	1.000		
$CVAAdj_{real}$	0.112^{***}	0.446^{***}	-0.089^{***}	0.561^{***}	0.518^{***}	-0.181^{***}	0.264^{***}	1.000	
CFROIAdj	-0.082^{***}	-0.058^{***}	-0.165^{***}	0.012	0.282^{***}	-0.337^{***}	-0.617^{***}	-0.259^{***}	1.000

Notes:

All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are deflated by the market value of the equity as measured three months after the beginning of the financial year.

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

Panel A of Table 3 contains the adjusted R^2 values calculated for the seven separate regressions. The measures are arranged in decreasing order based on their adjusted R^2 values. EBEI has a significantly higher adjusted R^2 value (0.0773) than the other measures. The regression analysis based on the $CFROI_{Margin}$ values yields the second largest adjusted R^2 value (0.0438). It is followed by RI (0.0375), CFO (0.0319), EVA_{nom} (0.0305), EVA_{real} (0.0139) and CVA_{real} (0.0138) correspondingly. In terms of relative information content, EBEI appears to outperform the other measures. In terms of the value based financial measures, $CFROI_{Margin}$ yields the best results.

According to Hayn (1995: 127), Burgstahler and Dichev (1997: 192) and Collins, Pincus and Xie (1997) profitable firms exhibit larger earnings responses than loss-making firms. O'Byrne (1997: 51) also recommends a distinction between positive and negative EVA values. The tests for relative information content are repeated after allowing different coefficients for the positive and negative values of the different measures. The results from these regressions are provided in Panel B of Table 3. All the measures exhibit higher adjusted R^2 values. The measure RI experienced the largest increase in its adjusted R^2 value (0.0375 to 0.1126), and it exhibits the highest adjusted R^2 value overall when compared to the other measures. It is followed by EBEI (0.0886), EVA_{nom} (0.0855), EVA_{real} (0.0635), CVA_{real} (0.0597) and CFO (0.0472) respectively.

Table 3. Tests of the relative information content of $CFROI_{Margin}$, CVA_{real}, EVA_{real}, EVA_{nom}, residual income, earnings and operating cash flow

Relative information content														
Rank order of R^2	Observations	(1)		(2)		(3)		(4)		(5)		(6)		(7)
Panel A: Coefficient of the positive and negative values of each performance measure constrained to be equal [a]														
All firms	2450	EBEI	>	$CFROI_{Margin}$	>	RI	>	CFO	>	EVA_{nom}	>	EVA_{real}	>	CVA_{real}
Adj. R^2		0.0773		0.0430		0.0375		0.0319		0.0305		0.0139		0.0138
Panel B: Coefficient of positive and negative values of each performance measure allowed to differ [b]														
All firms	2450	RI	>	EBEI	>	EVA_{nom}	>	EVA_{real}	>	CVA_{real}	>	CFO	>	$CFROI_{Margin}$
Adj. R^2		0.1126		0.0886		0.0855		0.0635		0.0597		0.0472		0.0429

Notes:

[a] In Panel A, the regression based on Equation (8) is conducted, where: $D_t = b_0 + b_1 X_t / MVE_{t-1} + b_2 X_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the seven measures CFO, EBEI, RI, EVA_{nom}, EVA_{real}, CVA_{real} and $CFROI_{Margin}$, and MVE is the market value of the equity three months after the beginning of the financial year.

[b] In Panel B, the regression used in Panel A is adjusted to allow different coefficients for positive and negative values of the independent variable: The regression based on the following equation is conducted, where: $D_t = c_0 + c_1 X_{t;pos} / MVE_{t-1} + c_2 X_{t;neg} / MVE_{t-1} + c_3 X_{t-1;pos} / MVE_{t-1} + c_4 X_{t-1;neg} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the seven measures CFO, EBEI, RI, EVA_{nom}, EVA_{real}, CVA_{real} and $CFROI_{Margin}$, and MVE is the market value of the equity three months after the beginning of the financial year.

In the case of $CFROI_{Margin}$, however, the measure dropped from the second to the last position overall in terms of the ranking of the adjusted R^2 values. It is also the only measure where the adjusted R^2 value decreased when the distinction between positive and negative values is allowed. A possible reason for this decrease could be the variable nature of the CFROI values. The cash flows included in the calculation of a firm's CFROI values are estimated based on the firm's profit figures. Relatively small changes in the profit figures, however, could result in CFROI values switching from a positive to a negative value (and vice versa). These changes are not the result of a pronounced difference in the firm's financial performance, but rather the way in which CFROI values (and IRR measures in general) are calculated. Distinguishing between the positive and negative values of the measure therefore reduces the adjusted R^2 value of the regression analysis.

6 Incremental Information Content Tests Of The $CFROI_{margin}$ Components

In order to evaluate the incremental information contents of the $CFROI_{Margin}$ components, the following regression analysis is conducted:

$$MktAdjRet_t = d_0 + d_1\, CFO_t / MVE_{t-1} + d_2\, CFO_{t-1} / MVE_{t-1} + d_3\, Accrual_t / MVE_{t-1} + d_4\, Accrual_{t-1} / MVE_{t-1} + d_5\, ATInt_t / MVE_{t-1} + d_6\, ATInt_{t-1} / MVE_{t-1} + d_7\, CapChg_t / MVE_{t-1} + d_8\, CapChg_{t-1} / MVE_{t-1} + d_9\, AcctAdj_t / MVE_{t-1} + d_{10}\, AcctAdj_{t-1} / MVE_{t-1} + d_{11}\, InflAdj_t / MVE_{t-1} + d_{12}\, InflAdj_{t-1} / MVE_{t-1} + d_{13}\, CVAAdj_{real;\,t} / MVE_{t-1} + d_{14}\, CVAAdj_{real;\,t-1} / MVE_{t-1} + d_{15}\, CFROIAdj_t / MVE_{t-1} + d_{16}\, CFROIAdj_{t-1} / MVE_{t-1} + \quad (9)$$

The results of the incremental information content tests of the $CFROI_{Margin}$ components are provided in Table 4.

If the results from the incremental information content tests are considered, it is observed that the regression coefficients of all the current year's $CFROI_{Margin}$ components except InflAdj are highly significant. If the previous year's variables are considered, only the correlation coefficient of $ATInt_{t-1}$ is significant. The F-statistic for the component InflAdj is not statistically significant, indicating that it does not contribute significant information content. The other F-statistics, however, are all significant, indicating that the remaining CFROI components contain statistically significant incremental information content.

The adjusted R^2 value for the multiple regression analysis conducted to evaluate the incremental information content of the $CFROI_{Margin}$ components in this study, however, is much lower than the values obtained in previous studies investigating the measures EVA_{real}, CVA_{nom} and CVA_{real}. An adjusted R^2 value of 0.0628 is observed in the case of the $CFROI_{Margin}$ components, compared to values of 0.1861, 0.1880 and 0.1995 (respectively) when the components of the other measures are investigated (Erasmus, 2008). Although the incremental information content of the $CFROI_{Margin}$

components are statistically significant, it explains less of the variation in the market adjusted share returns.

Table 4. Tests of incremental information content of $CFROI_{Margin}$ components: CFO, operating accruals, after-tax interest, capital charge, accounting adjustments, inflation adjustments, real cash value added adjustments and CFROI adjustments

	All firms [a]	*t*-stat	*F*-stat	*p*-value [b]
Observations	2450			
Constant	0.060	3.35***		
CFO_t	0.218	5.12***	13.36	<0.0001
CFO_{t-1}	-0.029	-0.62		
$Accrual_t$	0.134	3.46***	5.97	0.0026
$Accrual_{t-1}$	-0.048	-1.14		
$ATInt_t$	-0.442	-2.43**	7.26	0.0007
$ATInt_{t-1}$	0.700	3.79***		
$CapChg_t$	0.186	2.68***	3.63	0.0265
$CapChg_{t-1}$	-0.101	-1.49		
$AccAdj_t$	-0.302	-3.25***	5.51	0.0041
$AccAdj_{t-1}$	0.011	0.12		
$InflAdj_t$	-0.154	-1.94*	1.99	0.1364
$InflAdj_{t-1}$	0.030	0.37		
$CVAAdj_t$	-0.471	-3.02***	4.82	0.0082
$CVAAdj_{t-1}$	0.253	1.55		
$CFROIAdj_t$	-0.208	-3.81***	7.39	0.0006
$CFROIAdj_{t-1}$	0.042	0.72		

Notes:

[a] The regression based on the following equation is conducted: $MktAdjRet_t = d_0 + d_1\ CFO_t / MVE_{t-1} + d_2\ CFO_{t-1} / MVE_{t-1} + d_3\ Accrual_t / MVE_{t-1} + d_4\ Accrual_{t-1} / MVE_{t-1} + d_5\ ATInt_t / MVE_{t-1} + d_6\ ATInt_{t-1} / MVE_{t-1} + d_7\ CapChg_t / MVE_{t-1} + d_8\ CapChg_{t-1} / MVE_{t-1} + d_9\ AcctAdj_t / MVE_{t-1} + d_{10}\ AcctAdj_{t-1} / MVE_{t-1} + d_{11}\ InflAdj_t / MVE_{t-1} + d_{12}\ InflAdj_{t-1} / MVE_{t-1} + d_{13}\ CVAAdj_t / MVE_{t-1} + d_{14}\ CVAAdj_{t-1} / MVE_{t-1} + d_{15}\ CFROIAdj_t / MVE_{t-1} + d_{16}\ CFROIAdj_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, while the independent variables are the $CFROI_{Margin}$ components (CFO, accruals, after-tax finance cost, capital charge, accounting adjustments, inflation adjustments and cash value added adjustments). MVE is the market value of equity three months after the start of the financial year.

[b] *p*-values in parentheses represent non-directional *F*-test of the null hypothesis of no incremental information content (Hypothesis H_{INC})

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

7 Summary

The value-based financial performance measures economic value added (EVA), cash value added (CVA) and cash flow return on investment (CFROI) are proposed by certain research studies as improvements over the traditional financial measures. The objective of this paper was to evaluate the relative and incremental information content of these value-based measures compared to that of the traditional measures earnings and cash from operations. When the relative information contents of the different value-based financial performance measures are investigated, the results indicate that they are not able to outperform earnings (EBEI) in explaining market adjusted share returns. The results from the incremental information content tests indicate that the adjustments required in order to calculate the various value-based measures do contribute statistically significant incremental information content. If the adjusted R^2 values of the multiple regression analyses conducted to evaluate the incremental information content of the value-based measures are compared to the adjusted R^2 values obtained for the traditional measures, however, a much lower value is observed. The components of the value-based measures therefore explain significantly less of the variation in market adjusted share returns than the components of the other measures. Although the contributions of these components are statistically significant, they are not economically significant when combined into the various measures. Based on the results reported in this study it appears as if the value based measures are not able to outperform the relatively simple traditional financial performance measure earnings (EBEI) in explaining the variation in market adjusted share returns. The incremental information content tests conducted to evaluate the contribution of the components of the value-based measures also yield much lower results than for similar tests conducted for the traditional measures.

References

1. Bacidore, J.M., Boquist, J.A., Milbourn, T.T., & Thakor, A.V. (1997). The search for the best performance measure. *Financial Analysts Journal*, *53*(3), 11-20.
2. Biddle, G.C., Bowen, R.M., & Wallace, J.S. (1999). Evidence on EVA. *Journal of Applied Corporate Finance*, *12*(2), 69-79.
3. Biddle, G.C., Seow, G.S., & Siegel, A.F. (1995). Relative versus incremental information content. *Contemporary Accounting Research*, *12*(1), 1-23.
4. Burgstahler, D., & Dichev, I. (1997). Earnings, adaptation and equity value. *The Accounting Review*, *72*(2), 187-215.
5. Collins, D., Pincus, M., & Xie, H. (1997). Equity valuation and negative earnings: The role of book value of equity. Unpublished paper, University of Iowa, Iowa City, IA.
6. Dzamba, A. (2003). Focus on CFROI analysis to boost your firm's growth in 2004. *IOMA's Report On Financial Analysis, Planning & Reporting*, *3*(11), 10-12.
7. Ehrbar, A. (1998). *EVA: The real key to creating wealth*. New York: John Wiley & Sons.
8. Erasmus, P.D. (2008). The relative and incremental information content of the value based financial performance measure cash value added (CVA). *Management Dynamics*, 17(2), (Forthcoming).
9. Fabozzi, F.J., & Grant, J.L. (ed.). (2000). *Value-based metrics: Foundations and practice*. New Hope: Frank J. Fabozzi Associates.
10. Grant, J.L. (2003). *Foundations of economic value added* (2nd ed.). Hoboken, New Jersey: John Wiley and Sons.
11. Grant, J.L. (1996). Foundations of EVA™ for investment managers. *Journal of Portfolio Management*, *23*(1), 41-48.
12. Hayn, C. (1995). The information content of losses. *Journal of Accounting and Economics*, *20*(2), 125-153.
13. Lehn, K.L., & Makhija, A.K. (1996). EVA and MVA as performance measures and signals for strategic change. *Strategy and Leadership*, *24*(3), 34-40.
14. McGregor BFA (Pty.) Ltd. (2005). McGregor BFA Version 04.211.
15. Madden, B.J. (1998). The CFROI valuation model. *Journal of Investing*, *17*(1), 31-43.
16. Madden, B.J. (1999). *CFROI valuation: A total system approach to valuing the firm*. Boston: Butterworth-Heinemann.
17. Martin, J.D., & Petty, J.W. (2000). *Value based management: The corporate response to the shareholder revolution*. Boston: Harvard Business School Press.
18. O'Byrne, S.F. (1999). EVA and its critics. *Journal of Applied Corporate Finance*, *12*(2), 92-96.
19. O'Byrne, S.F. (1996). EVA® and market value. *Journal of Applied Corporate Finance*, *9*(1), 116-125.
20. Peterson, P.P., & Peterson, D.R. (1996). *Company performance and measures of value added*. Charlottesville: The Research Foundation of The Institute of Chartered Financial Analysts.
21. Stewart, G.B. (1994). EVA™: Fact and fantasy. *Journal of Applied Corporate Finance*, *7*(2), 71-84.
22. Stewart, G.B. (1991). *The Quest for value: The EVA™ management guide*. New York: HarperBusiness.
23. Worthington, A.C., & West, T. (2004). Australian evidence considering the information content of economic value added. *Australian Journal of Management*, *29*(2), 201-223.
24. Young, S.D., & O'Byrne, S.F. (2001). *EVA and value-based management: A practical guide to implementation*. New York: McGraw Hill.