EVA-BASED FINANCIAL PERFORMANCE MEASUREMENT: AN EVIDENTIAL STUDY OF SELECTED EMERGING COUNTRY COMPANIES

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Abstract

This paper aims at examining the claims that economic value added (EVA) is a superior performance indicator than the traditional performance indicators like ROCE, NOPAT, EPS, OCF, and RONW. This study investigates the relative explanatory power of EVA measure of non-financial Indian companies with respect to two measures, market value added and stock returns used as a proxy for shareholder value. The analysis is performed for a sample of 46 Indian companies for the period of 2009-2019. The panel data regression models are employed to test the relative and incremental information content of EVA and other audited accounting-based measures. Relative information content tests reveal that NOPAT and OCF appear to be more value-relevant than EVA in explaining the market value of Indian companies. It was also found that ROA is more closely associated with stock market returns than EVA. Additionally, incremental information content tests suggest that EVA underperforms in comparison with NOPAT and OCF in analysing market value added. It was also found that EVA does not add any incremental information content to that provided by ROA and ROE accounting measures in explaining stock returns. Overall, the findings do not support the purported superiority of EVA to established accounting variables in association with market value or stock market returns of the firm. It is concluded that non-financial variables such as research and development, customer satisfaction, internal business process efficiency, innovation, employee satisfaction, CSR, product quality apart from financial variables drive market value and should be considered by investors in developing their investment strategies.

Keywords: EVA, Panel Data, Relative Explanatory Power, Market Value Added

Authors' individual contribution: Conceptualization – K.G.; Methodology – S.O.; Formal Analysis – K.G.; Resources – S.O.; Writing – Original Draft – S.O.; Writing – Review & Editing – K.G.; Funding Acquisition – S.O. and K.G.

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1. INTRODUCTION

The objective of wealth maximisation is a well-accepted concept in business. Wealth for an organisation means shareholder's wealth. A shareholder's wealth in an organisation is the product of the number of shares with the share price. Share market price is the performance

indicator of the progress of a company. Wealth maximisation seeks to serve the interests of its suppliers, employees, management, customers, and society at large.

With the aim of analyzing the financial and economic health of a company, many performance matrices in finance are employed. The same could be the measures of accounting or value-based measures that contribute to the wealth of shareholders. The returns on investment by the investors indicate the wealth created for them. The return received by an investor can be like in the format of appreciation of capital or dividends or sometimes all. Therefore, a company having better accounting performance measures will drive the stock returns, resulting in an increase in shareholder's wealth. Usually, the measures that are more closely correlated with the equity returns are considered better indicators.

Chen and Dodd (2001), Mcgrattan, Rogerson, and Wright (1997), and some other researchers reported that a single accounting measure could not explain the variability in shareholders' wealth. The traditional audited accounting metrics like earnings for each share (EPS), equity return, and assets return would not take into account the cost of capital for their calculations. Other measures like NOPAT, OCF, and ROCE also do not consider cost of capital so cannot be used to predict the firm value and thereby may not be a good measure for corporate performance. However, capital charges on the capital employed are incorporated in determining value-based measures.

In the early 1990s, several scholars suggested value-based performance measures which are unaudited, one of these measures is EVA (economic value added). EVA was advocated earlier and pioneered by Stern Stewart & Co., which was US-based and, therefore, is considered as a trade-marked variant of RI (residual income). It may be an intelligent argument that EVA should be employed rather than cash flow or earnings from the operations for construing as the best performance measure that is periodic. Other measures based on value are cash value-based addition, ROI (cash flow), discounted profits (economic), shareholders value added were also developed by consulting companies to measure the financial performance of the firm.

Stewart (2010) claimed that EVA's most accurate representation of the company's true profit. Many companies adopted EVA, as an internal control measure in the later years such as Sprint, Allied Holdings, Whirlpool, Coca-Cola, Toys "R" Us, and Georgia-Pacific. The unique selling point of EVA in comparison to residual income is that it takes into account economic profit and economic capital which have certain accounting adjustments. The number of adjustments has been debated in the academic literature and Stern Stewart & Co. has suggested 164 such adjustments.

A number of researchers have conducted empirical studies to investigate whether EVA, a value-based performance measure, is more reliable measure of financial performance for a company than the accounting-based measures. The results are mixed and controversial.

Biddle, Bowen, and Wallace (1997) analysed the earnings dominating residual income, which in effect dominates the economic addition of value for explaining equity returns. Chen and Dodd (2001) documented similar results. Bao and Bao (1998) proved that abnormal economic earnings (AEE) do not appear to be associated with a stock value or stock price in a significant manner. The study by O'Byrne in 1996 reported EVA to have explained greater than double the variance. O'Byrne also found that changes in EVA explained in a significant manner more variation in changes in market price. Lehn and Makhija (1996) found contrasting results that economic value added has a "slight edge as a performance measure" in comparison to multiple measures of accounting. Bacidore, Boquist, Milbourn, and Thakor (1997) used a new measure REVA – which is defined as refined economic value added. Ismail (2006) reported the earnings to be strongly associated along with equity returns compared to EVA and RI. The findings of Ismail's (2006) study failed to support the findings of EVA advocates about its superior indications over accounting measures for explaining variations in stock returns using variables in level and changes.

Some studies provide support to Stern Stewart hypothesis that EVA adds to the wealth of shareholders and drives the stock returns (Lefkowitz, 1999; Milunovich & Tsuei, 1996; Worthington & West, 2004; O'Byrne, 1996; Uyemura, Kantor, & Pettit, 1996; De Villiers & Auret, 1998; Turvey et al., 2000; Lehn & Makhija, 1997; Forker & Powell, 2004) greater in comparison to traditional measures of accounting. Few studies indicate that EVA is not associated to the equity returns and does not add to shareholder's wealth (Kyriazis & Anastassis, 2007; Peixoto, 2002; de Wet, 2005; Maditinos, Sevic, & Theriou, 2009; Biddle et al., 1997; Ismail, 2006).

The primary objective of the study is to examine the idea of proponents, the basic objective of this study is to examine the claim of proponents of EVA of its richness and superiority over the traditional measures of performance in the Indian context. Relative and incremental information content tests are conducted using panel data regression models. A sample of 46 companies is selected and tests are performed for the period 2009-2019. The study contributes to the existing literature by providing evidence from the Indian market on examining the superiority of value-based performance measure over conventional measures.

This study addresses the core research question: *"Which measure of performance out of EVA and traditional is a better measure for Indian markets?"*. The findings reflect that economic value-added in the Indian market does not have relative content which is better than traditional measures. The study also contends that a single financial metric does not drive the market price, and there are other non-financial factors that drive shareholder value and could be collectively considered as measures of performance.

The paper is divided into six sections, viz., Introduction, Review of literature, Methodology, Analysis, Discussion, and Conclusion. The context and relevance are discussed in the first section followed by the review of literature and methodology. The working is shown in the analysis section followed by the discussion of results and, finally, the conclusion.

2. LITERATURE REVIEW

2.1. Seminal works

Chen and Dodd (2001) analysed and examined the fitness and relevance of matrices that measure profitability. The study suggests that EVA has incremental information value than RI and OI measures, but the increase in R^2 is marginal from a practical point of view. So, the study concluded that the benefit of the EVA system is not so huge that it justifies the multiple costs in calculating adjustments to the audited statements. A less costly measure is RI. A measurement paradigm other than EVA could be taken to align organizational metrics with stock value. Overall, their findings failed to support the assertion.

Erasmus (2008) analysed the fitness of the measures based on value like RI, EVA, CVA (cash value added), and CFROI (cash flow return on investment) to explain adjusted share returns. The sample data is 316 firms on Johannesburg Securities Exchange during the 15 year period from 1991 to 2005. The initial part of the research is based on information that is relative to content tests on all performance measures. The first variable, which is dependent, is the market adjusted equity return which is the gap between the returns, compounded on a share and the ALSI index. The measures used for relative tests are CFO, EBEI, RI, EVA, CVA, as well as inflation-adjusted measures EVA-real, CVA-real, CFROI. One independent variable at time *t* and the same variable lagged by one time period divided by the share's market value are included in individual regressions. The data is removed from heteroscedasticity by the division. The results showed that EBEI outperformed the other measures with the highest *adjusted* R^2 value.

The second part of the study is based on the incremental information content tests to examine whether the addition of the value-based measures contributes significantly to the explanatory power. The components of the CFROI and lagged by one time period are taken and the results showed that *adjusted* R^2 for CFROI components is lower than that of EVA and CVA. It was proved that although the incremental information content of CFROI, CVA, and EVA components is statistically significant, however, the level of significance is low.

Maditinos et al. (2009) analysed how much is the explanatory power of EVA and SVA (shareholder value added) those are value-based measures of performance in comparison with three traditional accounting performance measures. Data from listed companies of the Athens Stock Exchange was collected over the period of 1992-2001 to execute the pooled OLS regression models. This study is conducted for companies in an emerging market. The relative information content tests were conducted using five regression models with level and change variables for EPS, ROI, ROE, EVA as independent variables. Change in SVA was not taken since it represents a change of shareholders' value added from one period to another. Annual compounded stock returns was used as the dependent variable. The results of relative information content tests showed that the EPS equation (with the highest R^2) provides more information than EVA in explaining stock returns. To conduct the incremental information content tests, a pairwise combination of one value-based measure and one traditional measure was taken.

Lin and Zhilin (2008) conducted a study using an integrated EVA performance measurement model to test the superiority of this model to traditional measures. The data was taken from China-listed companies for the period 2000-2001 and was analysed using BP neural network. The neural network was designed as an input layer, output layer, and a hidden layer. The input layer consisted of traditional and IEPM models with the variables. The output layer was developed based on market value per share. The hidden layer was created to show the input processing and internal structure of the problem. Mean square error was used to measure network performance. The IEPM model has less mean square error than the traditional model. It was proved that IEPM is a more effective tool in terms of prediction ability to measure the company's performance.

Worthington and West (2004) used pairwise regression to extend their own earlier research work (Worthington & West, 2001) by employing multiple alternative formulations that helped for pooling panel data which are random effects, fixed effects, and common effects. The analysis here was conducted for the Australian market. It was found that the fixed effect model is the most appropriate pooling technique for the models. The first phase of the study used a valuation model that takes net cash flow, earnings before extraordinary items, residual income, and economic value-added as explanatory variables and stock return as a dependent variable. Multicollinearity was not significant. The pairwise regressions showed that EVA best explains stock returns and the largest relative information content than the other accounting measures.

The second phase of the study used a component model with multiple adjustments that used various independent variables and EVA as the dependent variable. It was found that accounting adjustments contribute the most to variation in EVA and hence explains stock returns. The reasons cited for the divergence in results between this paper and earlier US studies could be the differences in GAAP between the US and Australia, different research design (fixed effects formulation, different explanatory variables).

Gupta and Sikarwar (2016) studied the relationship between four performance measures EPS, ROE, ROA, EVA/CE with stock returns. They used a sample size of 50 companies, mostly Indian from Nifty 50 for the period 2008-2011 for the analysis. Panel regression models are used to perform the incremental and relative information content tests. Hausman test was performed to find the suitability of fixed and random effects models. The findings indicated that the fixed effects model is more appropriate. The study finds evidence in support of EVA as a better measure than traditional accounting measures.

Fountaine, Jordan, and Phillips (2008) conducted the study to test if EVA can be used as a portfolio separation criteria. The study used 1000 listed US companies ranked by revenue as the buy list. EVA/CE (*eva2cap*) was calculated to select the top 100 and bottom 100 performers to create separate portfolios. Portfolios were also created

using 100 best and 100 worst performers in terms of the average of *eva2cap* for the past 3 years – *eva3yravg* and percentage change in *eva2cap* – *evadelta*. It was found that EVA has economic significance as a selection criteria for portfolio separation since the null hypothesis of no significant returns between the two portfolios was rejected. The study also concluded that these criteria can be used in bear markets 2000-2002 and bull markets.

De Wet and Hall (2005) analysed the results of 89 industrial companies listed on JSE Securities Exchange, South Africa, for the period 1995-2004 using market value divided by invested capital added as a proxy for shareholder value. The independent variables used for regression analysis were EVA/invested capital, cash flow from operations/invested capital, ROE, ROA, EPS, and DPS. Six regressions were taken with one independent variable at a time and standardised MVA as the dependent variable. The results suggested that operating cash flows has a stronger association with MVA than standardised EVA. The study has also reaffirmed the significance of cash flow management. The study also found that there is little explanatory power in EPS, DPS in explaining MVA, questioning the use of earnings or dividends in share valuations of South African listed companies. The findings did not support the claims of EVA proponents that EVA is a better measure than other accounting benchmarks and has a significant impact on the company's MVA.

Kyriazis and Anastassis (2007) tested the incremental and relative content explanatory power in the EVA model for stock returns in the context of a small European developing market, the Athens Stock Exchange. The Greek market has differentiated standards in accounting for the US and other major European countries. The period of study 1996-2003 was selected since the Greek stock market was in the transitory phase to more efficient and developed after the year 2000. 107 non-financial Greek firms, that were publicly traded, were used in this study giving 847 annual observations.

Bhasin (2017) studied the disclosures on the EVA from the annual reports that were a result of the 500 sample corporations from India. The study was majorly based on the secondary data sources for five years from 2007-2011. The study concluded that EVACE, ROCE, ROE, and EPS of sample companies differ significantly using ANOVA single factor test. Chi-square test is used to indicate that the difference between observed and expected values of EVACE is not statistically significant and the same is attributed to sampling fluctuations. Karl Pearson's Correlation Matrix shows the correlation between EVAE, ROE, ROCE, and EPS for Indian companies.

Kumar and Sharma (2011) examined and analysed the incremental information and relative content in economic value added and other conventional accounting measures of performance to explain market value added. They used a sample containing 97 non-financial companies over the study duration of 2000-2008 and obtained 873 firms-year observations. Ordinary least square regression was applied to test the claims about the superiority of EVA as a corporate financial performance measurement tool. Their results did not support the argument of the superior informational content of EVA with MVA as the dependent variable. The test to verify the relative information content showed that NOPAT and OCF are better measures than EVA and are more closely associated with the value of Indian firms.

The results of the incremental information content test suggest that EVA has a marginal contribution to information content beyond that provided by five popular traditional accounting measures such as EPS, NOPAT, OCF, ROCE, and ROE. It was also concluded that non-financial variables like the quality of the product, customer satisfaction, and employee retention need to be definitely considered to explain the market price variation of a company.

Ismail (2006) conducted research to test the assertion of EVA in comparison to other accounting measures. This paper used a sample of 2252 firm-year observations from the UK market. They applied panel data regressions to conduct relative information content. The dependent variable used is the annualized compounded annual rate of return to the shareholders to study information content of profit measures. The independent variables used are net income, net operating profit after tax, operating cash flow, residual income, and EVA. Accounting adjustments were carried for NOPAT and capital to calculate EVA. The correlation matrix showed that EVA has the lowest correlation with stock return. The panel data regression was carried out by conducting five separate regressions for each performance measure (EVA, RI, NI, NOPAT, and OCF) using variables in levels and in changes. The results showed that EVA does not outperform standard accounting measures NI and NOPAT in explaining the stock return. So, they concluded that the relative information content tests refute the claim of EVA proponents that EVA has been so far the best financial metric.

Gupta and Venkata Vijay Kumar (2013) studied the concept of value-based accounting with respect to Indian companies. Data of companies from BSE 100 for the year 2009 was taken as a sample. OLS regression analysis is conducted for the research paper. Three regressions are carried out with accounting profit, economic value added, market value added as the dependent variable for each regression. Cost variables – the cost of raw material, interest expenses, depreciation, employee expenses, and market value of debt and equity as independent variables. The second part of the study used the ANOVA test and concluded that negative EVA decreases MVA of the organization. It was found that most of the organizations have positive MVA (10) and 51 companies have negative EVA. The study concluded that continuance of negative EVA in the future would lead to negative MVA.

Masyiyan (2019) conducted a study and tested the superiority of EVA in comparison to other accounting measures. The paper uses regression amongst variables related to depreciation, cost, and expenses.

Shah, Haldar, and Nageswara Rao (2014) discussed the applicability of EVA as a powerful tool to introduce financial flexibility in the organization. The findings of this study reveal that EVA can be used as a tool to enable the company to differentiate between value-creating and value-destructing

activities and facilitating the managers in achieving strategic goals. This research emphasized the importance of EVA as a performance measure that measures the company's progress, guides investors, and leads to better decision making, thereby reflects the market's assessment of the company's value.

Ali (2018) talks about the analogy between economic value added and market value added in the agro context for Russian markets. The author uses panel data for the study. The findings provide a holistic overview of the areas where each measure can be used.

Ronen, Pliskin, and Pass (2018) along with his colleagues analysed the shortcomings of traditional accounting measures in their work *"The evils of traditional accounting"*. The paper compared the financial performance as reflected by the traditional measures vis-a-vis modern measures for selected companies.

2.2. Gap identification

The research works mentioned above focus majorly on the achievement of goal congruence of managerial and shareholder goals by tying compensation to EVA measure. The work done so far has a limited discussion on the opportunity cost of equity in-spite of being the most distinguished feature of EVA. This would results in better investment decision-making by managers as maximising returns after deducting the cost of equity. Corporates have introduced EVA linked flexible bonus systems which ensure managers and employees act like owners.

Also, no study examines the modalities and evidence about which measure between EVA and traditional performance measures for a firm's performance is more superior.

EVA brings in two aspects of flexibility – operational and financial. At the operational level, it can be used as a comparative performance assessment tool for activities, divisions, or businesses, it brings in the culture of ownership, and pushes managers to constantly evaluate investment decisions. At the financial level, EVA not just focuses on cutting costs but also on cutting excess capital from activities that have return on capital lower than the cost of capital. It is concluded that the adoption of EVA enhances flexibility in the organization in various dimensions, sends positive signals to the investors, and positions the organisation to rapidly adapt to the changes in the external environment bringing inherent stability.

3. RESEARCH METHODOLOGY

3.1. Sample selection

The sample is taken for a duration that spans across ten years, from FY 2010 to 2019. The sample for this study consists of 46 non- financial listed companies. Thus, a balanced panel set of 460 firm-year observations was obtained. 8 sectors have been taken for this – Automobile, Personal care, IT, Cement, Paints, Pharmaceuticals, Steel, and Tyres. Majorly, the data used in this study is extracted from Bloomberg. The companies that are considered for this study are mentioned in Table 9.

The following companies have been removed from the study for the below-given reasons.

Table 1. Companies dropped from the study (Part 1)

Sectors	*Companies*	*Reason for deselection*
Automobile	Eicher Motors Ltd (EIM IN)	Accounting cycle: Ends 12/31 for FY2010- FY2014. Ends 03/31 for FY2015-FY2019.
	Hero MotoCorp Ltd (HMCL IN)	Data for FY2010 - FY2012 not available.
Personal care	Nestle India Ltd (NEST IN)	Accounting cycle: Ends 12/31 for FY2010-FY2018. FY2019 data not available.
	Procter & Gamble Hygiene & Health Care Ltd (PG IN)	Accounting cycle: Ends 06/30 for FY2010-FY2019.
	Gillette India Ltd (GILL IN)	Accounting cycle: Ends 06/30 for FY2010-FY2019.
IT	Mphasis Ltd (MPHL IN)	Accounting cycle: Ends 10/31 for FY2010-FY2013. Ends 03/31 for FY2015-FY2019.
	HCL Technologies Ltd (HCLT IN)	Accounting cycle: Ends 06/30 for FY2010-FY2014. Ends 03/31 for FY2015-FY2019.
	Hexaware Technologies Ltd (HEXW IN)	Accounting cycle: Ends 12/31 for FY2010-FY2018. FY2019 data not available.
	Larsen & Toubro Infotech Ltd (LTI IN)	Data for FY2010-FY2011 not available.
Cement	ACC Ltd (ACC IN)	Accounting cycle: Ends 12/31 for FY2010-FY2018. FY2019 data not available.
	Ambuja Cements Ltd (ACEM IN)	Accounting cycle: Ends 12/31 for FY2010-FY2018. FY2019 data not available.
	Shree Cement Ltd (SRCM IN)	Accounting cycle: Ends 06/30 for FY2010-FY2014. Ends 03/31 for FY2015-FY2019.
	HeidelbergCement India Ltd (HEIM IN)	Accounting cycle: Ends 12/31 for FY2010-FY2014. Ends 03/31 for FY2015-FY2019.

Table 1. Companies dropped from the study (Part 2)

Sectors	*Companies*	*Reason for deselection*
Paints	Akzo Nobel India Ltd (AKZO IN)	Data for FY2010-FY2011 not available.
	Alembic Pharmaceuticals Ltd (ALPM IN)	Data for FY2010 not available. Company listed in 2011.
Pharmaceuticals	Abbott India Ltd (BOOT IN)	Accounting cycle: Ends 12/31 for FY2010-FY2013. Ends 03/31 for FY2014-FY2019.
	GlaxoSmithKline Pharmaceuticals Ltd (GLXO IN)	Accounting cycle: Ends 12/31 for FY2010-FY2014. Ends 03/31 for FY2015-FY2019.
Tyres	Goodyear India Ltd (GDYR IN)	Accounting cycle: Ends 12/31 for FY2010-FY2015. Ends 03/31 for FY2016-FY2019.
	MRF Ltd (MRF IN)	Accounting cycle: Ends 09/30 for FY2010-FY2014. Ends 03/31 for FY2015-FY2019.

3.2. Variables definition

The primary objective that has been considered for this study is to analyse and examine the content of relative information on traditional performance measures and *EVA*. With intent to achieve this, the study is conducted in two phases. In the first phase of the study, market value added (*MVA*) is used as the dependent variable. Economic value added (*EVA*), return on capital employed (*ROCE*), return on net worth (*RONW*), *EPS*, net operating profits after taxes (*NOPAT*), and cash flow from operations (*OCF*) are used as explanatory variables.

In the second phase of the study, the dependent variable is annual stock returns. The independent variables are *EPS, ROA, ROE*, and *EVA_CE*. The variable *EVA* has been scaled by the capital employed to find out *EVA_CE* for analysis to provide meaningful comparison.

ROE/RONW is another measure of profitability that focusses on the return on the shareholders' equity. *EVA* is defined as the surplus that is left after an appropriate charge is made for the capital that is employed in the firm. It is calculated as:

$$EVA = NOPAT - (WACC * CE) \quad (1)$$

where,

$NOPAT = EBIT - Taxes\ on\ EBIT$

$CE = Shareholders'\ funds + Long\ Term\ Debt + Short\ Term\ Debt + Preferred\ Equity$

$WACC = w_d * K_d * (1-t) + w_p * K_p + w_e * K_e$

K_e is calculated by the capital asset pricing model which is used for pricing risky securities and describes the relationship between systematic risk and expected return on assets. The formula used is given as:

$$K_e = R_f + \beta * (R_m - R_f) \quad (2)$$

where,

$R_f - Risk\ free\ rate$

$R_m - R_f - Market\ risk\ premium$

R_m, R_f values are directly taken from Bloomberg.

β – Beta of the stock. Raw beta values are taken from Bloomberg which uses BSE SENSEX as an index, 2 years, weekly data of stock, and index for regression of past stock returns on index returns.

K_d and K_p values are directly taken from Bloomberg.

3.3. Objective of the study

The foremost objective of this research is to examine the modalities and evidence that EVA is superior to traditional performance measures for a firm's performance. With this intent, the traditional measures of performance and EVA information content are analysed.

On the basis of this objective, the below hypotheses are developed.

First phase:

H1a: The relative information content of EVA is superior to traditional performance measures (NOPAT, ROE, ROCE, EPS, and OCF) in explaining the market value of Indian companies.

H2a: EVA adds more information content beyond the NOPAT, ROE, ROCE, EPS, and OCF in explaining the market value of firms.

Second phase:

H1b: EVA has more relevant information content than traditional accounting measures (ROE, ROA, and EPS) in explaining stock returns.

H2b: *EVA has more incremental information content than traditional accounting measures in explaining stock returns.*

3.4. The model specifications

The following analysis is conducted using *R* tool:

1) Pooled regression (OLS);

2) Least square dummy variables (LSDV);

3) Panel data regressions (fixed effects model, random effects model).

Hausman test for endogeneity is used to test to decide whether fixed or random effects model would be more appropriate.

The data is tested for pitfalls of regression, multicollinearity, and auto-correlation in the error term.

The below regression models are deployed in *the first phase* of the study.

Relative information content of each variable tested by univariate regression model:

Model 1a

$$MVA_{it} = \beta_0 + \beta_1 NOPAT_{it} + \varepsilon_{it} \quad (3)$$

Model 2a

$$MVA_{it} = \beta_0 + \beta_1 ROCE_{it} + \varepsilon_{it} \quad (4)$$

Model 3a

$$MVA_{it} = \beta_0 + \beta_1 RONW_{it} + \varepsilon_{it} \quad (5)$$

Model 4a

$$MVA_{it} = \beta_0 + \beta_1 EPS_{it} + \varepsilon_{it} \quad (6)$$

Model 5a

$$MVA_{it} = \beta_0 + \beta_1 OCF_{it} + \varepsilon_{it} \quad (7)$$

Model 6a

$$MVA_{it} = \beta_0 + \beta_1 EVA_{it} + \varepsilon_{it} \quad (8)$$

where,

MVA_{it} – MVA amount for the company *i* in period *t*;

EVA_{it} – EVA amount of company *i* in period *t*;

$NOPAT_{it}$ – net operating profits after taxes for the company *i* in period *t*;

$ROCE_{it}$ – the ratio of earnings before taxes by capital employed for the company *i* in period *t*;

$RONW_{it}$ – the ratio of net income after tax by net worth for company *i* in period *t*;

EPS_{it} – net income by the total number of shares outstanding for a company *i* in period *t*.

Further, for testing *H2a* with respect to incremental content for *EVA, NOPAT, ROCE, RONW, EPS,* and *OCF*, multiple linear regression models are used. The current study makes use of two separate models of multiple regression, one including all explanatory variables and another excluding of *EVA*:

Model 7a

$$MVA_{it} = \beta_0 + \beta_1 NOPAT_{it} + \beta_2 ROCE_{it} + \beta_3 RONW_{it} + \beta_4 EPS_{it} + \beta_5 OCF_{it} + \varepsilon_{it} \quad (9)$$

Model 8a

$$MVA_{it} = \beta_0 + \beta_1 NOPAT_{it} + \beta_2 ROCE_{it} + \beta_3 RONW_{it} + \beta_4 EPS_{it} + \beta_5 OCF_{it} + \beta_6 EVA_{it} + \varepsilon_{it} \quad (10)$$

The below regression models are deployed in *the second phase* of the study.

Univariate equations in regression used to test the information content (relative) of variables:

Model 1b

$$R_{it} = \beta_0 + \beta_1 ROA_{it} + \varepsilon_{it} \quad (11)$$

Model 2b

$$R_{it} = \beta_0 + \beta_1 ROE_{it} + \varepsilon_{it} \quad (12)$$

Model 3b

$$R_{it} = \beta_0 + \beta_1 EPS_{it} + \varepsilon_{it} \quad (13)$$

Model 4b

$$R_{it} = \beta_0 + \beta_1 EVA_{it}/CE_{it} + \varepsilon_{it} \quad (14)$$

Comparison of the coefficient of determination (R^2) of the regression analysis helps in determining as to which variable better explains the variation in the stock returns and therefore has the information content that is more relevant.

With the objective of testing the incremental information content of the accounting measures and EVA, the following multiple regression models are used:

Model 5b

$$R_{it} = \beta_0 + \beta_1 ROA_{it} + \beta_2 ROE_{it} + \beta_3 EPS_{it} + \varepsilon_{it} \quad (15)$$

Model 6b

$$R_{it} = \beta_0 + \beta_1 ROA_{it} + \beta_2 ROE_{it} + \beta_3 EPS_{it} + \beta_4 EVA_{it}/CE_{it} + \varepsilon_{it} \quad (16)$$

The differential in the value of R^2 from Regression models 5b and 6b indicate the incremental information content of EVA.

3.5. Theory on panel data

Cross-sectional time-series panel data is a dataset where the behaviour of the respective entities across time is observed. The entities can be counties/states, countries, firms, or even individuals. Balanced panel data has the even and same count of observations (time) with respect to each unit, cross-sectional. Observations that exhibit the same cross-sectional units across time periods or individual, constitute panel data regression models. As such, the panel data assists in controlling non-observable and non-measurable variables such as culture or the differences amongst multiple firm's business practices. that are factors that vary across entities but not over time like federal regulations, national policies, international agreements, etc. It factors in for the individual heterogeneity.

Mentioned below are the two tools that are used for analysing panel data:

1) random effects (RE);

2) fixed effects (FE).

Fixed effects – every individual entity exhibits individual characteristics that are specific to itself which are time-invariant. These account for individual heterogeneity, factors vary across entities but not over time. They cannot be measured or observed.

For countries, it could be their trade practices, political system, or regulatory environment. For companies, it could be their leadership style, culture.

Culture – a soft concept that comprises long-standing, majorly implicit values that are shared, assumptions, and beliefs that influence attitudes, behavior, and meaning in a firm.

Decision-making style – varied decision-making styles like autocratic, free reign can impact decision-making – both long term and short term, implementation of decisions, and the overall management of the firm.

Leadership style – leadership style has a major impact too – diffuse vs. clear, democratic vs. dictatorial leadership.

Ability to change – the firm's willingness to adopt change, willingness to take the risk, meeting goals, taking up risky projects.

How people work together – defining of goals, organization structure, defining of roles, formal vs. informal relationships amongst peers in the organization.

Beliefs about personal "success" – there are organizations that treat individuals like "stars" and thrive on teamwork or organizations where employees grow thanks to connections with superiors.

Growth stage of a company – established, more mature companies have control more structural in nature and properly framed and defined processes, and procedures that are signs of certain performance vs. start-ups that have less structured ways of conducting business.

Pooled ordinary least squares regression – ignores the fixed effects. The unobserved heterogeneity across entities is not taken care of in the model. The equation for the OLS model is represented by:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \varepsilon_{it} \quad (17)$$

In the fixed effects model, the regression model intercept is permitted to differ among individuals to show the features that are unique for individual entities.

Least squares dummy variable model (LSDV) – LSDV is in effect FE model using dummy variables. Dummy variables are used to capture the fixed effects. The equation for the LSDV model is represented by:

$$Y_{it} = \beta_0 + \beta_1 D_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 D_4 + \beta_m D_m + \beta_k X_{it} + \varepsilon_{it} \quad (18)$$

Fixed effects within group differentiator – it removes the fixed effects, so it is a less efficient model. As it was shown above that the intercepts have the fixed effects, the equation is represented by:

$$Y_{it} = \beta_{0i} + \beta_1 X_{1it} + \beta_2 X_{2it} + \varepsilon_{it} \quad (19)$$

Random effects model – the fixed effect models assume that the difference between 1 and 2 individuals is fixed. The random effects model assumes that this difference is random.

The composite error term w_{it} has two parts/components: u_i, that is the individual-specific error term or cross-section, and ε_{it}, which is the combination of cross-section error components and time series.

Rho is a time-wise correlation in error term w_{it}.

$$\rho = correl\,(w_{it}, w_{is}) \quad (20)$$

Time-wise covariance in error term w_{it}.

$$cov\,(w_{it}, w_{is}) = (sigma\_u)^2 \quad (21)$$

where,

$(sigma\_u)^2$ = variance of individual-specific random variable u_i;

$(sigma\_e)^2$ = variance of residuals (overall error term) ε_{it}.

Hausman test – RE model assumes no correlation between u_i and independent variables. Violation of the above assumption may lead to biased coefficient estimates. RE is efficient than FE as more degrees of freedom are there. But FE is unbiased. There is a trade-off bias versus efficiency. Hausman test can be used to choose RE or FE model.

The null hypothesis *(H_0): Cross-section errors (u_i) that are not correlated with any of the regressors (X_i).*

The preferred model is random effects. Individual characteristics (heterogeneity) are exogenous – independent with respect to regressors. RE model is reliable with this assumption.

The alternative hypothesis *(H_A): u_i and regressors (X_i) are correlated. The fixed effects model is more appropriate.*

A significant value of chi-square will reject the null hypothesis of no correlation of cross-section errors (u_i) with the regressors meaning the RE model is inappropriate.

Durbin Watson test – OLS regression has one of the assumptions – the covariance between ε_i, the random term for observation *i*, and ε_j, the random term for observation *j*, is zero.

$$Cov\,(\varepsilon_i, \varepsilon_j) = 0 \quad (22)$$

If this assumption doesn't hold true, the problem of autocorrelation exists. Durbin Watson test is used to detect serial autocorrelation in error term only under the assumption that the stated error term follows the first-order autoregressive (AR1) process.

Autoregressive process of order 1 (AR1) is represented by:

$$Y_t = \beta_1 + \beta_2 X_t + \varepsilon_t$$
$$\varepsilon_t = \rho\,\varepsilon_{t-1} + u_t \quad (23)$$

4. ANALYSIS AND RESULTS

4.1. Descriptive statistics

The table below provides a snapshot of the descriptive statistics in a summarized form for *MVA* which is the dependent variable and six other explanatory variables that are relevant for the first phase of the study. The statistics show that all the performance measures have a mean value that is positive. The mean value of *MVA* is INR 353450 million for Indian companies. The mean value of EVA is positive 34 million that goes to show that most of the firms in India are earning higher than the cost of capital. Table 2 also shows that the value of the median for all the performance measures is positive. Another thing to observe is the *MVA* (353450) has the highest median and mean (153736) that is followed by *EVA, OCF, NOPAT* in million terms. In percent terms, the mean *ROE* (23.72) is higher than the mean *ROCE* (19.36). *EVA* stands 4th in terms of ranking based on mean and median values.

The standard deviation is highest (685791) for *MVA* and lowest (30388) for *EVA* in million terms. In percent terms, *ROCE* (19.25) has a lower standard deviation than *ROE* (26.72). *EVA* (30388) has a lower standard deviation than *OCF* (48855), and *NOPAT* (35933) amongst the regressors. The range is highest (6869107) for *MVA* and lowest (395069) for *OCF* in

million terms. In percent terms, *ROE* (438.56) has a higher range than *ROCE* (209.13). *EVA* (376670) has a lower value for range than *OCF* (395069), a higher value than *NOPAT* (337456) amongst the regressors. *EVA* (-190214) has the lowest minimum value amongst the regressors.

Table 2. Descriptive statistics

Variable	*MVA*	*NOPAT*	*ROCE*	*ROE*	*EPS*	*OCF*	*EVA*
Mean	353450	21688	19.36	23.72	25.75	25653	34
Standard error	31975	1675	0.90	1.25	1.98	2278	1417
Median	153736	8539	15.49	21.96	16.24	8599	1305
Standard deviation	685791	35933	19.25	26.72	42.37	48855	30388
Sample variance	470309191631	1291172410	370.67	713.89	1795.49	2386830157	923436885
Kurtosis	26	15	13.61	25.31	20.18	15	14
Skewness	4	3	2.99	1.35	-0.75	4	0
Range	6869107	337456	209.13	438.56	587.45	395069	376670
Maximum	6590871	284387	153.44	243.31	216.76	329725	186457
Minimum	-278236	-53069	-55.68	-195.25	-370.69	-65344	-190214
Sum	162587098	9976556	8904.0	10910.71	11845.1	11800154	15700
Count	460	460	460	460	460	460	460

4.2. Descriptive statistics explanatory and dependent variables

The first set of variables

MVA, NOPAT, OCF, and *EVA* are in INR millions, *EPS* figures are in INR million per share. *ROE* and *ROCE* are in percentages.

The second set of variables

The statistics reflect that all performance measures having a mean value that is positive. The annual stock return has a mean value of 20.18 percent for Indian companies. Table 2 also reflects that the median value for all the performance measures is positive. In percent terms, *ROE* is the highest median and mean which is followed by stock return, *EVA_CE*, and *ROA*.

Another observation is that the standard deviation is highest (43.75) for annual stock return and lowest (9.46) for *ROA*. *EVA_CE* (15.62) stands 4th rank in terms of standard deviation. The range is highest (587.45) for *EPS* and lowest (100.27) for *ROA*. *EVA_CE* (114.21) has a lower value for range than the annual stock return (359.29) and *ROE* (438.56).

Shapiro-Wilk test – the test of normality of data.

The null hypothesis: *Data is normally distributed*.

This test is conducted for variables studied for the two regression equations.

1) The first set of variables:

p-value = $0 < .05 = \alpha$, and so, the null hypothesis is not supported. It is inferred at a 95% confidence that the data for the variables under study is not normally distributed.

2) The second set of variables:

p-value = $0 < .05 = \alpha$, and so, the null hypothesis is not supported. It is inferred at a 95% confidence that the data for the variables under study is not normally distributed.

Table 3. Shapiro-Wilk test of dependent and explanatory variables

	MVA	*NOPAT*	*ROCE*	*ROE*	*EPS*	*OCF*	*EVA*
W-stat.	0.5399	0.6016	0.7014	0.6891	0.7190	0.5895	0.6729
p-value	0	0	0	0	0	0	0
Alpha	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Normal	no	no	no	no	no	no	no

4.3. Correlation matrix

The pairwise correlations between independent and dependent variables are depicted.

1) The first set of variables.

It is observed that the mentioned variables are all positively correlated. *NOPAT* (0.804) has the highest correlation with *MVA* followed by *OCF* (0.679) and *EVA* (0.677). *ROCE, EPS,* and *ROE* have a positive but weak correlation with *MVA*. Largest correlation value was observed in between *NOPAT, OCF* (0.885) and *ROCE, ROE* (0.705). It is significant to make a note that *EVA* scores better than traditional accounting measures such as *NOPAT* and *OCF* which does not support the claim of advocates of *EVA* which states that *EVA* is closely associated with the *MVA*.

Table 4. Correlation matrix of dependent and explanatory variables.

	MVA	*NOPAT*	*ROCE*	*ROE*	*EPS*	*OCF*	*EVA*
MVA	1						
NOPAT	0.804	1					
ROCE	0.309	0.107	1				
ROE	0.199	0.075	0.705	1			
EPS	0.222	0.210	0.182	0.047	1		
OCF	0.679	0.885	0.061	0.031	0.199	1	
EVA	0.677	0.515	0.385	0.294	0.226	0.297	1

Notes: MVA – market value added; NOPAT – net operating profit after taxes; ROCE – return on capital employed; ROE – return on equity; EPS – earning per share; OCF – operating cash flows; EVA – economic value added.

2) The second set of variables.

A positive correlation amongst all variables is observed. *EVA/CE* has positive correlation with the stock return (0.142) but the small correlation in comparison to *ROA* (0.195) and the *ROE* (0.224). *EPS* (0.063) have a positive but a very weak correlation with stock return. Highest correlation value is observed between *ROA, EVA/CE* (0.809) and *ROE, EVA/CE* (0.685). The under-performance of *EVA* on traditional accounting measures (*ROA* and *ROE*) in terms of its correlation with stock return may be noted which rejects the claim of *EVA* advocates that *EVA* has high correlation with equity returns.

4.4. Relative information content test

4.4.1. Phase 1: The first set of variables

Below is shown the regression output for Model 1a with *NOPAT* as independent variable and *MVA* as dependent variable. The below 3 tests are conducted for Models 1a-6a for the first set of variables.

Oneway (individual) effect within the model

Balanced panel: $n = 46$, $T = 10$, $N = 460$

Residuals:

Min.	1st Qu.	Median	3rd Qu.	Max.
-1179919.2	-56341.7	-8076.4	54858.5	1716064.3

Coefficients:

	Estimate	Std. Error	t-value	Pr (> |t|)
NOPAT	12.05288	0.67736	17.794	<2.2E-16***

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Oneway (individual) effect random effect model (Swamy-Arora's transformation)

Balanced panel: n = 46, T = 10, N = 460

Effects:

	Var	Std. Dev.	Share
Idiosyncratic	6.581E+10	2.565E+05	0.395
Individual	1.007E+11	3.173E+05	0.605

Theta: 0.7523

Residuals:

Min.	1st Qu.	Median	3rd Qu.	Max.
-1438842	-62752	-28034	41297	1970391

Coefficients:

	Estimate	Std. Error	z-value	Pr (> |t|)
(Intercept)	7.6885E+04	5.0431E+04	1.5245	0.1274
NOPAT	12.752	6.2415E-01	20.4307	< 2E-16***

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

Hausman test

Data: MVA ~ NOPAT

Chisq = 7.0565, *df* = 1, *p-value* = 0.007898

Alternative hypothesis: *one model is inconsistent*

The relative information content test is reported for all independent variables. The assessment is based on the six regressions separate for all measures of performance like *ROCE, NOPAT, ROE, EPS, OCF*, and *EVA*.

4.5. Fixed effects model

Table 5 is extracted from the above regression output based on fixed effects model of panel data. This table shows the coefficient, R^2, *Adjusted* R^2 of each variable along with F-statistics.

It can be observed that all the regressions except *ROCE* (3.376) and *ROE* (0.174) are significant according to F-statistics at 0.1 percent significant level. The p-value results also talk about the six variables that are explanatory, all measures of performance are exhibit statistically significance except *ROCE* (0.067) and *ROE* (0.677) at 0.1 percent level of significance. The coefficients for all independent variables are positive except *ROCE* and *ROE* indicating an increase in *NOPAT, OCF, EPS,* and *EVA* are going to lead to higher market value added of companies in India.

Relative information content test may be measured by R^2 is also presented. The results of the test exhibit that *NOPAT* better explains the variation in market value added of firms in India with R^2 equal to 43.4%. Also, *OCF* shows a significantly higher R^2 (34.43%) that is followed by *EPS* and *EVA*. *ROCE* and *ROE* have very low R^2 value and negative value for *adjusted* R^2 indicating both the accounting measures contribute negatively to the explanatory power of *MVA*. The coefficient values for *ROCE* and *ROE* are also found to be negative which indicates that an increase in *ROE* or *ROCE* results in a decrease in market value added of Indian companies. The coefficients for *ROE* and *ROCE* are also not statistically significant at the 0.1 percent level. *ROCE*, *ROE,* and *EPS* have negative *adjusted* R^2 values.

It can be concluded that *EVA*, a measure of performance based on value, stands third in terms of *adjusted* R^2 suggesting that earnings have dominance in explaining the variation in market value added for Indian firms.

Table 5. Test results of the relative information content of NOPAT, ROCE, ROE, EPS, OCF, and EVA using fixed effects model

	NOPAT	*ROCE*	*ROE*	*EPS*	*OCF*	*EVA*
Coefficients	12.053***	-3360.6 '.'	-322.24	3538.97***	8.177***	8.928***
p-value	< 2.22e-16	0.067	0.677	1.06E-08	< 2.22E-16	< 2.22E-16
F-statistic	316.625	3.376	0.174	34.112	216.869	113.493
R^2 (percent)	43.40	0.81	0.04	7.63	34.43	21.56
Adj. R^2 (percent)	37.09	-10.24	-11.09	-2.66	27.13	12.82

*Note: '.', *, **, *** Significant at 10, 5, 1, and 0.1 percent levels, respectively.*

4.6. Random effects model

Table 5 is extracted from the above regression output based on the random effects model of panel data. This table shows the intercept, coefficient, R^2, *Adjusted* R^2 of each variable along with *Chisq*.

It can be observed that all the regressions except *ROCE* (0.399) and *ROE* (0.000) are significant according to *Chisq* at 0.1 percent significant level. The p-value results also exhibit and suggest a high statistical significance for all six explanatory variables in form of relative information content, except *ROCE* (0.527) and *ROE* (0.990) at a 0.1 percent level of significance. The coefficients for all independent variables are positive except *ROCE* and *ROE* indicating an increase in *NOPAT, OCF, EPS,* and *EVA* will eventually increase the market value added of companies in India.

The relative information content test as measured by R^2 is also presented. The results of the test recommend that *NOPAT* has the highest ability to elucidate the variation in market value added of companies in India with R^2 equal to 47.68 percent. Next, *OCF* has a significantly larger R^2 (36.14 percent) followed by *EVA* and *EPS*. *ROCE* and *ROE* have very low R^2 value and negative value for *adjusted* R^2 indicating both the accounting measures contribute negatively to the explanatory power of *MVA*. The coefficient values for *ROCE* and *ROE* is also found to be negative which indicates that an increase in *ROE* or *ROCE* results in a decrease in market value added of Indian firms.

It can be concluded that *EVA*, which is a performance measure that is value-based, stands third in terms of *adjusted* R^2 suggesting that corporate earnings dominate in explaining the variation in market value added for Indian firms.

4.7. Hausman test

It is conducted for the six Regression models 1a-6a to find out whether fixed effects or random effects model is more appropriate for each of the models. It is found that *NOPAT, EVA,* and *ROE* performance measures are better represented by the fixed effects model, whereas *ROCE, EPS,* and *OCF* regressions can be interpreted using the random effects model. It is observed from Table 5 and Table 6, that both the fixed and random effects models give similar interpretations for the six performance measures.

Table 6. Test results of Hausman test for fixed effects and random effects models for NOPAT, ROCE, ROE, EPS, OCF, and EVA performance measures

	NOPAT	*ROCE*	*ROE*	*EPS*	*OCF*	*EVA*
Chisq	7.057	3.420	15.648	0.001	1.199	17.124
p-value	0.008	0.064	0.000	0.978	0.274	0.000
Decision	Fixed	Random	Fixed	Random	Random	Fixed

So, it can be concluded from the first phase of this study, using the first set of independent variables, that *EVA* underperforms in comparison with *NOPAT* and *OCF*. This makes one reject the null hypothesis that traditional methods have less relevant information content than *EVA*. Therefore, it is evident that the variation in market value added is better explained by traditional measures than *EVA*, a value-based measure.

4.7.1. Phase 2: The second set of variables

Below is shown the regression output for Model 1b with *ROA* as an independent variable and *stock return* as a dependent variable. The below 3 tests are conducted for Models 1b-4b for the second set of variables.

Oneway (individual) effect within the model

Call:

plm (formula = Return ~ ROA, data = myframe, model = "within", index = c ("Company", "Year"))

Balanced panel: $n = 46$, $T = 10$, $N = 460$

Residuals:

Min.	*1st Qu.*	*Median*	*3rd Qu.*	*Max.*
-188.112	-24.130	-4.285	16.170	139.134

Coefficients:

	Estimate	*Std. Error*	*t-value*	*Pr (> |t|)*
ROA	2.41862	0.44019	5.4944	6.868E-08***

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Oneway (individual) effect random effect model (Swamy-Arora's transformation)

Total sum of squares: 878540
Residual sum of squares: 845240
R^2: 0.037903
Adj. R^2: 0.035802
Chisq: 18.0434 on 1 DF
p-value: 2.1592E-05

Hausman test

Data: Return ~ ROA
Chisq = 15.49, df = 1, p-value = 8.296E-05.

Alternative hypothesis: *one model is inconsistent*

Durbin-Watson test for serial correlation in panel models

Data: Return ~ ROA
DW = 2.3224, p-value = 0.9998

Alternative hypothesis: *serial correlation in idiosyncratic errors.*

Every independent variable's relative information content test is reported. The assessment is based on the 4 separate regressions measures for each measure of performance, i.e., *ROA, ROE, EPS, EVA_CE.*

4.8. Fixed effects model

Table 7 is extracted from the above regression output based on the fixed effects model of panel data. This table shows the coefficient, R^2, *Adjusted* R^2 and Durbin Watson *p-value* of each variable along with F-statistics.

It can be observed that except of *EPS* (0.669), all the regressions are statistically significant as per the F-statistics at 0.1%. These *p-value* results also recommend that in forms of the relative information content of all four explanatory variables, all measures of performance are statistically significant except for *EPS* (0.414) at a 0.1 percent level of significance. The coefficients for all independent variables are positive, indicating an increase in *ROA*, *ROE, EPS,* and *EVA_CE* will lead to an increase in stock returns of companies in India. One unit increase in *ROA* will lead to 2.419 units increase in stock returns which is the highest. A unit increase in *EVA_CE* will lead to 1.662 units increase in stock returns which is lower than *ROA* but higher than *ROE* (0.516) and *EPS* (0.067).

The relative information content test as measured by R^2 is also presented. The test results suggest that *ROA* has the greatest ability to explain the variation in equity return of companies in India with R^2 equal to 6.81 percent followed by *EVA_CE* (6.36) and *ROE* (6.33). It is depicted that *ROA, EVA_CE,* and *ROE* have almost similar R^2 values indicating that these performance measures have a similar impact on the explanatory power of stock returns.

EPS (0.16) with the lowest value for R^2 and the highest negative value for adjusted R^2 (-10.96) indicates that *EPS* is statistically insignificant in explaining the variation in stock returns.

The beta coefficient indicates that *ROA* provides a better explanation of variation in equity returns than *EVA_CE*. It can be concluded that an accounting measure is better and has more relevant information content than value-based measure.

4.9. Durbin Watson test

The results show that the *p-value* greater than 5 percent, which means the null hypothesis is accepted. There is no first-order serial autocorrelation in the error term of the four Models 1b-4b.

Table 7. Test results of the relative information content of ROA, ROE, EPS, and EVA_CE using the fixed effects model

	ROA	***ROE***	***EPS***	***EVA_CE***
Coefficient	2.419***	0.516***	0.067	1.662***
p-value	0.000	0.000	0.414	0.000
F-statistic	30.189	27.917	0.669	28.066
R^2 (percent)	6.81	6.33	0.16	6.36
Adj. R^2 (percent)	-3.57	-4.10	-10.96	-4.07
Durbin Watson p-value	0.9998	1.00	0.9998	0.9995

*Note: *, **, *** significant at 10, 5, 1 and 0.1 percent levels, respectively.*

4.10. Random effects model

Table 7 is extracted from the above regression output based on the random effects model of panel data. This table shows the intercept, coefficient, R^2, *Adjusted* R^2 of each variable along with *Chisq*.

It can be observed, in effect, all the regressions measures except *EPS* (1.824) are statistically significant as per *Chisq* at 0.1%. The *p-value* results also recommend that in forms of the relative information content of all four explanatory variables, all measures of performance are statistically significant except *EPS* (0.177) at a 0.1% level of significance. The coefficients for all independent variables are positive, indicating an increase in *ROA, ROE, EPS,* and *EVA_CE* will lead to an increase in stock returns of companies in India. One unit increase in *ROA* will lead to 0.9 units

increase in stock returns which is the highest. A unit increase in *EVA_CE* will cause 0.399 units to increase in stock returns which is lower than *ROA* but higher than *ROE* (0.367) and *EPS* (0.065).

The test results suggest that *ROE* holds the greatest explanation power for the stock returns variation for companies in India with R^2 equal to 5.02 percent followed by *ROA* (3.79) and *EVA_CE* (2.03). The *adjusted* R^2 value is highest for *ROE* followed by *ROA, EVA_CE. EVA_CE* stands third in terms of R^2 and *Adjusted* R^2 values indicating that accounting performance measures have a greater impact on the explanatory power of stock returns. It can be concluded that the accounting measures have more relevant information content than value-based measure.

Hausman test

It is conducted for the four Regression models 1b-4b to find out whether fixed effects or random effects model is more apt for each of the models. It is found that *ROA, ROE,* and *EVA_CE* performance measures are better represented by the fixed effects model, whereas EPS regression can be interpreted using the random effects model.

So, it can be concluded from the second phase of this study, using the second set of independent variables, that *EVA* underperforms in comparison with *ROA*. This causes the rejection of the null hypothesis, that *EVA* has more relevant information content than traditional measures. Hence, the variation in equity returns is better explained by traditional measures than *EVA*, a value-based measure.

4.11. Incremental information content test

This test is conducted to validate whether one variable provides more information content than another.

4.11.1. Phase 1: The first set of variables

In order to determine the incremental information content test of *EVA*, two regression models 7a-8a (equations (9) and (10)) are conducted. One model has only the traditional accounting measures as independent variables and the second model has *EVA* added as another independent variable. The dependent variable is the market value added.

VIF – test for multicollinearity

To detect the presence of multicollinearity amongst the regressors, variance inflation factor (VIF) values are analysed. A general rule is that VIF of 8-10 indicates the existence of collinearity of that variable with other independent variables. VIF values of all independent variables are in range 1-7 and the largest value of 6.932 for *NOPAT* thus indicating a low degree of multicollinearity amongst the explanatory variables.

Pooled ordinary least square regression

Table 8 shows the incremental information content test of all six explanatory variables based on the pooled ordinary least square regression. The model results on a whole suggest that the two models are statistically significant as F-statistic values (211.92 and 235.05) are greater than the F-critical value at a 0.1 percent significance level. Results related to coefficients reveal that *NOPAT*, *ROCE,* and *EVA* have a statistically significant relation at 0.1%. The coefficient of *OCF* indicates that it is statistically significant at a 5% significance level. *OCF* with *MVA* has an association that is negative, however, *NOPAT, ROCE,* and *EVA* have a positive correlation with *MVA*. It is observed that R^2 increases from 70.01 to 75.69 percent if *EVA* is included in the model. Further, the *adjusted* R^2 increased from 69.68 to 75.37 percent between the first model with only accounting measures and the second model which includes *EVA*. We can conclude that the increase of 5.68 percent in R^2 is a small value but it is having statistical significance indicating that *EVA* contributes to describing the variation in market value added of Indian firms. However, the pooled OLS regression model executed for panel data ignores the fixed effects, which means that it does not take care of unobserved heterogeneity across entities.

Table 8. Test results of the incremental information content of EVA, NOPAT, ROCE, ROE, EPS, OCF, based on pooled OLS regression

	Model 7a – Equation (9)	***Model 8a – Equation (10)***
Intercept	-122030***	24317.75
NOPAT	16.82***	10.04***
ROCE	8700***	5563.96***
ROE	-944.32	-1313.61
EPS	282.48	-181.26
OCF	-1.66*	1.53*
EVA	-	7.48***
F-statistic	211.92	235.05
p-value	< 2.22E-16	< 2.22E-16
R^2 (percent)	70.01	75.69
Adjusted R^2 (percent)	69.68	75.37

*Note: *, **, *** significant at 10, 5, 1, and 0.1 percent levels, respectively.*

Lagrange multiplier test – (Breusch-Pagan) is conducted to test whether there is a panel effect in the data. The null hypothesis is rejected indicating panel regressions are better than OLS regressions.

Lagrange multiplier test – (Breusch-Pagan) for balanced panels:

Data: *MVA ~ NOPAT + ROCE + ROE + EPS + OCF + + EVA;*

Chisq = 122.98, *df* = 1, *p-value* < 2.2E-16.

Alternative hypothesis: *significant effects.*

The results of the F-test show that individual and time effects are present in the panel data.

Table 9. Individual fixed effects for the companies which are the intercepts in the regression equation

	Companies and its' intercept			
Company	Apollo Tyres	Ashok Leyland	Godrej Consumer Products	Hindustan Unilever
Value	-15638.5	80677.4	317779.1	1656058.7
Company	Asian Paints	Aurobindo Pharma	India Cements	Infosys
Value	633259.9	69129.2	-21826.9	671611.6
Company	Bajaj Auto	Balkrishna Industries	Jindal Stainless	Jindal Steel & Power
Value	250811.8	50749.8	4153.6	-145140.3
Company	Berger Paints	Cadila Healthcare	JK Cement	JK Tyre & Industries
Value	185762.1	170532.7	3620.3	4666.3
Company	Ceat	Cipla	JSW Steel	Kansai Nerolac Paints
Value	-26967.7	178283.0	-318985.5	173309.3
Company	Colgate-Palmolive	Dabur India	Lupin	Mahindra & Mahindra
Value	598842.7	383170.6	233761.5	175197.3
Company	Divi's Laboratories	Dr. Reddy's Laboratories	Marico	Maruti Suzuki
Value	176654.1	77201.1	290567.5	279309.7
Company	Emami	Glenmark Pharmaceuticals	Mindtree	Natco Pharma
Value	238660.9	82872.9	112289.1	94761.5
Company	Oracle Financial Services Software	Ramco Cements	Tata Steel BSL	Tech Mahindra
Value	18588.3	36048.8	57496.6	92829.5
Company	SML ISUZU	SAIL	Torrent Pharmaceuticals	TVS Motor
Value	33177.6	-151649.7	101851.0	128976.6
Company	Sun Pharmaceuticals	TCS	UltraTech Cement	Wipro
Value	511818.5	1668226.4	204189.2	225622.0
Company	Tata Motors	Tata Steel		
Value	-764518.8	-604496.4		

Least square dummy variable regression

Table 8 shows the results of the least square dummy variable regression.

The least square dummy variables regression model is executed for the Model 8a of equation (10) which uses 45 dummy variables for the 46 companies to capture fixed effects in the companies.

The overall model results suggest that the model is statistically significant as F-statistic 61.05 is greater than the F-critical value at 0.1 percent significance level. Results related to coefficients exhibit that *NOPAT, ROCE*, and *OCF* are statistically significant at a 0.1 percent level of significance. *ROCE* has a negative association, whereas *NOPAT* and *OCF* are positively correlated with *MVA*. *EVA* independent variable is statistically insignificant based on LSDV regression. The coefficient of *EPS* indicates that it is statistically significant at 5 percent level of significance. It is observed that R^2 value (88.81) and *adjusted* R^2 (86.97) percent is greater than the R^2 (75.69) and *Adjusted* R^2 (75.37) for pooled OLS regression for Model 8a – equation (10). We can conclude that this model is an improvement on pooled OLS regression since it captures the fixed effects of individual companies, however, the addition of 45 dummy variables which results in the estimation of a high number of parameters reduces the degree of freedom, thereby decreasing the power of regression.

Table 10. Least square dummy variable regression for NOPAT, ROCE, ROE, EPS, OCF, and EVA as independent variables

Model 8a – Equation (10)	
Intercept	15640
NOPAT	7.758***
ROCE	-5779***
ROE	232.40
EPS	1289*
OCF	3.101***
EVA	1.15
factor(Company)Ashok Leyland	96320
factor(Company)Asian Paints	648900
factor(Company)Aurobindo Pharma	84770
F-statistic	61.05
p-value	< 2.2E-16
R^2 (percent)	88.41
Adjusted R^2(percent)	86.97

*Note: *, **, *** significant at 10, 5, 1, and 0.1 percent levels, respectively.*

5. RESULT DISCUSSION

5.1. Fixed effects model

The fixed effects model is conducted to find out the incremental information content of *EVA*, on two regression models 7a-8a (equations (9) and (10)), with all variables and another regression model except *EVA*.

Table 10 is extracted from the above regression output based on the fixed effects model of panel data. This table shows the coefficient, R^2, *Adjusted* R^2 of each variable along with F-statistics.

The overall results of the model suggest that both the models are statistically significant as

F-statistic values (74.82 and 62.55) are greater than the F-critical value at a 0.1 percent significance level. Results about coefficients reveal that *NOPAT*, *ROCE*, and *OCF* are statistically significant at a 0.1 percent level of significance. The coefficient of *EPS* indicates that it is statistically significant at 5 percent level of significance. *ROCE* has a negative association whereas *NOPAT* and *OCF* are positively correlated with *MVA*. It is observed that R^2 increases slightly by 0.14 percent points if *EVA* is included in the model. Further, the *adjusted* R^2 shows similar values between the two models. *EVA* is statistically insignificant as depicted by its coefficient implying that its impact on market value added is insignificant. We can conclude that the slight increase in R^2 and *EVA* being statistically insignificant means that *EVA* does not add any incremental information content to that provided by accounting measures in explaining the *MVA* of Indian companies.

5.2. Random effects model

Table 10 is extracted from the above regression output based on the random effects model of panel data. This table shows the intercept, coefficient, R^2, *adjusted* R^2 of each variable along with *Chisq*.

The overall model results suggest that both the models are statistically significant as *Chisq* values (487.41 and 624.19) are greater than the respective critical values at 0.1 percent significance level. Results about coefficients reveal that *NOPAT*, *OCF*, and *EVA* are statistically significant at a 0.1 percent level of significance. The coefficient of *OCF* indicates that it is statistically significant at 1 percent level of significance for equation (9). *NOPAT, OCF,* and *EVA* are positively correlated with *MVA*.

It is observed that R^2 increases from 51.78 to 57.95 percent if *EVA* is included in the model. Further, the *adjusted* R^2 increased from 51.24 to 57.39 percent between the first model with only accounting measures and the second model which includes *EVA*. We can conclude that the increase of 6.17 percent in R^2 is a low value but it is statistically significant, indicating that *EVA* contributes to explaining the variation in market value added of Indian companies.

5.3. Hausman test

It is conducted for the Model 8a – equation (10), which has six independent variables to find out whether fixed effects or random effects model is more appropriate. It is found that the null hypothesis is rejected, which means the fixed effects model is a preferred model.

So, it can be concluded from the first phase of this study, based on the interpretation from the fixed effects model, using the first set of independent variables, that *EVA* underperforms in comparison with *NOPAT* and *OCF*. This leads to the rejection of the null hypothesis, that *EVA* has more incremental information content than traditional measures. Therefore, it is evident that the variation in market value added is better explained by traditional measures than *EVA*, a value-based measure.

Variables are in range 1-4 and the highest value of 3.874 for *ROA* and *EVA_CE* indicating a low degree of multicollinearity amongst the explanatory variables.

The overall model results suggest that both the models are statistically significant as F-statistic values (9.08 and 7.81) are greater than the F-critical value at 0.1 percent and 1 percent significance level. Results about coefficients for Model 5b – equation (15) reveals that *ROE* is statistically significant at 1 percent level of significance. Results about coefficients for Model 6b – equation (16) reveals that *ROE* is statistically significant at 0.1 percent level of significance and *ROA* at a 5 percent significance level. The coefficient of *EPS* and *EVA_CE* indicate that both statistically insignificant. *EVA_CE* has a negative association with *Stock Return* whereas *ROE* and *ROA* are positively correlated with *Stock Return*. An increase in *ROE* by 1 unit (in percentage terms) will increase stock returns of the company by 0.361 units (in percentage terms). An increase in *EVA_CE* by 1 unit (in percentage terms) will decrease stock returns of the company by 0.488 units (in percentage terms).

It is observed that R^2 increases from 5.64 to 6.42 percent if *EVA_CE* is included in the model. Further, the *adjusted* R^2 increased from 5.02 to 5.6 percent between the first model with only accounting measures and the second model which includes *EVA*. We can conclude that the slight increase (0.78 percent) in R^2 value and *EVA_CE* being statistically insignificant means that *EVA_CE* does not add any incremental information content to that provided by accounting measures in explaining the variation in stock return of Indian companies. However, the pooled OLS regression model executed for panel data ignores the fixed effects which means that it does not take care of unobserved heterogeneity across entities.

5.4. Lagrange multiplier test – (Breusch-Pagan)

It is conducted to test whether there is a panel effect in the data. The null hypothesis is accepted indicating pooled OLS regressions are better than panel regressions.

Lagrange multiplier test – (Breusch-Pagan) for balanced panels:

Data: *Return ~ ROA + ROE + EPS + EVA_CE;*
Chisq = 2.9942, *df* = 1, *p-value* = 0.08356.
Alternative hypothesis: *significant effects.*

So, it can be concluded from the second phase of this study, based on the interpretation from the pooled OLS model, using the second set of independent variables, that *EVA_CE* underperforms in comparison with *ROE* and *ROA*. This leads to the rejection of the null hypothesis that *EVA_CE* has more incremental information content than traditional measures. Therefore, it is evident that the variation in stock returns is better explained by traditional measures than *EVA*, a value-based measure.

6. CONCLUSION

A review of research has provided mixed results on the dominance of *EVA* as a financial measure of performance over the traditional earnings-based measures. It is suggested that sometimes traditional measures outperform the value-based measures and another claim in the literature is based on the

value-based measures being superior and provide additional information in explaining the market value variations or shareholder value of Indian firms.

Addressing this question of superiority of *EVA* over accounting measures is the primary objective of this study. In the first phase of this study, the prime objective is to examine empirical evidence about the association of *EVA* in comparison with the traditional accounting performance measures (*NOPAT, RONW, ROCE, EPS,* and *OCF*) with market value added of companies in India. In the second phase in this research, the purpose is to test the claims of *EVA* advocates and observe the impact of *ROA, ROE,* and *EPS* relative to *EVA_CE*, a value-based measure.

To achieve this, a dataset of 46 Indian companies for the period of 10 years from 2010 to 2019 was taken to conduct relative and incremental information content of explanatory variables. The first set of independent variables are *NOPAT, RONW, ROCE, EPS, OCF*, and *EVA,* and *MVA* is the dependent variable. The second set of independent variables are *ROE, EPS, ROA,* and *EVA_CE,* and *Stock Returns* is the dependent variable.

Pooled ordinary least squares regression, least squares dummy variables, and panel data regressions (fixed and random effects models) tests are performed. It is proved that panel data regressions are better than pooled OLS and LSDV models since the power of regression is reduced due to ignoring fixed effects and using dummy variables to capture fixed effects respectively.

Using the dataset of 460 firm-year observations, the incremental and relative information content tests are conducted. The empirical results do not support the hypothesis that *EVA* is a superior performance indicator than conventional audited performance measures to explain the market value added of companies in India.

The relative information content test with the first set of variables reveals that *NOPAT* and *OCF* outperform *EVA* in its association with *MVA*, thereby not supporting the hypothesis that *EVA* has better explanatory power than other variables. The observations and findings of this research are similar to many international studies that reject the claim of *EVA* advocates about its superiority as a value-based corporate performance measure. The results of the incremental information content test reveal that *EVA* is a statistically insignificant variable, does not add incremental information to that provided by *NOPAT* and *OCF* in explaining the *MVA* of companies in India. Also, it was found that one variable *EVA* model is able to capture only 21.56% of the variations in *MVA*. It implies that if firms aim to align the organisation metrics with market value, a measurement paradigm other than *EVA* has to be considered. It is implied that there are other parameters that influence the market value of a company and should be factored in for financial performance.

The relative information content test with the second set of variables reveals that accounting measures outperform *EVA* in its association with stock returns. The results of the incremental information content test reveal that *ROA* and *ROE* outperform *EVA,* and *EVA* is a statistically insignificant variable, does not add incremental information to that provided by *ROA* and *ROE* in explaining the stock returns of Indian companies.

The findings that demonstrate the relatively low explanatory power of all measures of performance under analysis is largely consistent with the findings of many international studies (Chen & Dodd, 1997, 2001; Biddle et al., 1998; Maditinos et al., 2009). The results with the second set of variables also prove the findings of many scholars that more non-financial and financial determinants must be deployed to assess the stock return performance of the companies.

The results are consistent with the prior study conducted by Chen and Dodd (2001), which suggested that non-financial variables customer satisfaction, CSR, employees, product quality, research, and development have an impact on the market value of the firms. As suggested by Mishra and Suar (2010) in the paper *"Does corporate social responsibility influence firm performance of Indian companies?"*, financial performance measures along with non-financial performance measures, are indicators employed to assess a firm holistic performance.

The study has a few limitations. Variables like *EPS,* being market dependent, need to be considered with equity returns volatility and that might change the calculations. The data exhibits signs of distortion of measurement error but this is usual for panel data. The companies that are dropped for reasons, mentioned previously, may lead to selectivity bias. The equity returns needs to be factored in for the gap between the returns, compounded for a share, and on the ALSI index.

In conclusion, our findings do not support the claim of *EVA* advocates, that *EVA* is the best measure for performance measurement systems. It is evident that traditional measures are better performance indicators for financial performance for selected companies in the Indian stock market than EVA.

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