Evidence of the Impact of EVA on the Indian Automotive Industry

Bigyan P. Verma [1]

Abstract

This research paper examined evidence of economic value added (EVA) and its impact on and relevance in the Indian automobile industry. For that, the economic data of six NSE-listed automobile companies from 2016–17 to 2020–21 were utilized. In the analysis, the dependent variable is the log number of stock prices, and the independent variables are a log of EVA, Tobin's *Q*, and return on assets (ROA). In addition, an OLS regression econometric model was used to determine whether or not the independent variables explained the dependent variable in a statistically significant manner. The analysis showed a very high statistical significance at both levels ; the overall regression model and individual coefficient levels, as seen from their *p*-values. This outcome cemented the view that EVA is not to be discounted in the Indian automotive sector and that it positively affected the stock price. With multiple challenges of the 21st century, disruptive technologies, and structural issues of supply and demand transformations, automotive companies would do well if they operated with EVA as their key performance measure. Moreover, new sustainable products, such as launching electric vehicles (EVs), might become a game-changer for many automotive firms in the coming years. This may benefit the growing value-sensitive market sentiments by bolstering sustainable practices of players in this sector.

Keywords : **EVA, NOPAT, ratios, Tobin's *Q*, Indian automotive industry, value of firm, capital, WACC**

JEL Classification Codes : G30, G31, G32, G34

Paper Submission Date : December 20, 2021 ; Paper sent back for Revision : April 21, 2022 ; Paper Acceptance Date : September 20, 2022 ; Paper Published Online : November 15, 2022

For a very long time, profit was viewed as a traditional measure of performance of a business that had multiple forms like earnings before interest and tax (EBIT); earnings before interest, tax, depreciation, and amortization (EBITDA); or net operating income (Stewart, 2019). As a result, managers began trusting the traditional measure—a measure used by accountants—in their search for an objective measure to gauge the performance of their corporations (Stern et al., 2007). But, as per Stern et al. (2007) and Stewart (2019), measures like net income and other forms like earnings per share (EPS) and price-to-earnings multiple (P/E multiple) are nothing but fallacious. As a young graduate, Joel Stern received—as he claimed—a simple lesson from the owner of a mom-and-pop grocery store, who pointed at a cigar box behind the counter and said, "If the lid was rising during the day, we were doing just fine" (Stern et al., 2007). This statement implied that cash is king and value comes with it. This incident was an eye-opener to him (and Bennet Stewart) as they propounded the concept of value-added through economic value added (EVA).

EVA offers a promising proposition of an effective business performance measure: the point at which a business adds value is when they ascertain that its income, referred to as net operating profit after tax (NOPAT), exceeds its cost of capital (Stern et al., 2007; Stewart, 2019). Proponents of EVA argue that NOPAT, under the EVA

[1] *Director & Professor of Finance,* Institute of Management Technology (IMT), Nagpur, 35 Km Milestone, Katol Road Nagpur - 441 502, Maharashtra. (Email : bigyanv@imtnag.ac.in ; bigyanverma@hotmail.com)
ORCID iD : https://orcid.org/0000-0002-1974-0370

DOI : https://doi.org/10.17010/ijf/2022/v16i11/172461

convention, cannot be manipulated because the rules are set in adjustments, which consider replacing some items with others. The section on research methodology details EVA and its components.

Climate change poses a considerable challenge to the auto industry, forcing it to accept alternative technologies to drive into the future. As a result, some significant technological transformations to carry into the future are developing (Miglani, 2019). First, it is critical to achieve zero-emission standards, which requires the industry to accept more carbon-neutral or negative technologies (Miglani, 2019). Third, electric or hydrogen-fuel-driven vehicles have posed a different set of challenges. Finally, the pandemic has altered the dynamics of the automobile industry, forcing players to remodel their business practice and strategies to counter those challenges.

As with the Indian auto industry, presently, it stands at the fourth place in terms of the automobile market size. Also, it accounts for 7.1% of India's GDP, generating employment for over 29 million people. The automotive and component industry put together is close to USD 100 billion, which has grown to be a key industry in India (Miglani, 2019).

Research Problems and Questions

The dynamics of the auto industry globally and in India make this study more appropriate amidst this mega-industrial metamorphosis to gauge whether EVA offers any signal to auto companies to shift their gears toward value-addition. The Indian automotive companies are no strangers to stringent environmental and pollution standards set by the Indian government, which has been tightening them for at least the last decade. Albeit, do they and the investor community concern themselves with issues, such as environment, carbon emissions, or compulsions of sustainability? Do those regulations impact their operations and profitability? Despite the burden of such criteria, have auto companies added value, nonetheless?

Research Objective — Stock of Value

This paper attempts to examine whether EVA as a performance measure has any relevance on the stocks of the Indian automotive industry relative to Tobin's *Q* and return on assets (ROA). Whether or not its significance is signaled in stock prices, a prominent market indicator of an underlying stock. Stock prices are prone to the vagaries of a multitude of factors. In this environment, does collective opinion reflect the view of value addition through price? Does the Indian automobile industry view EVA as relevant from a stock market perspective? Economic value-addition is not alien to the Indian stock market, though. Value, in any form, is a measure of certainty, but in the business context, this could mean a credible residual return. When repeatedly created over its hurdle rates or cost of capital, that value is termed economic value added (Stewart, 2019; Subedi & Farazmand, 2020). This research paper proposes to find answers to these relevant questions and issues by using linear regression and examining the statistical significance of this explanatory power of EVA over stock price alongside Tobin's *Q* and ROA—two other comparative performance measures.

Identification of Research Gaps

Most studies, as will be seen in the literature review, examined EVA as a standalone tool and measured its effectiveness against select financial performance measures to gauge its explanatory power over a dependent variable, which in most cases were either stock returns or market value. Very few conducted studies on the Indian automotive sector subjecting it to the assessment of economic value added or linked it with working capital or financial ratios. In fact, very few linked EVA to stock prices for domination of EVA.

Research Scope

The study here examines evidence on the statistically significant impact of EVA, Tobin's *Q*, and ROA in explaining the log-stock price of Indian auto companies for 2016–17 to 2020–21.

Review of Literature

This section examines papers specific to EVA in general and specific to the automotive industry and includes studies from Indian and global markets. The purpose was to examine EVA or its presence and relevance to the Indian automobile sector from a stock market perspective.

Stewart (2019) examined the Russell 3,000 firms to compare EVA with EBITDA. He averred that most private equity (PE) firms examined only EBITDA as a measure to evaluate and better the performance of the companies they had invested in. In this study, Stewart showed that EVA could be a better tool because it could explain 20% more than EBITDA of the changes in the value of the underlying firms. Thus, he suggested that EVA could be a better tool that could provide more clarity on the performance drivers of their business and determine their intrinsic value. Choudhary and Sharma (2010) used EVA as a performance tool and found that it could not only be used as a performance but also as a decision tool. EVA-enabled organizational change empowered those working for the organization by instituting a "culture of performance," incentive compensation, and a financial management system. Essentially, they equated EVA to a tool that empowered decision-makers effectively.

Altaf (2016) studied EVA in the Indian context and stated that EVA's effect on stock information was present but limited. He pointed at the complex adjustments and the non-availability of EVA-specific data as the key drawbacks; the study also took note of the association of EVA with market value added (MVA) as pertinent. Verma et al. (2013) studied EVA in the context of mergers of Indian banking companies (selected ones) in a decadal study (2000–10); compared the value-added and destroyed in both the periods: the pre-merger and post-merger. They concluded that the merger of the public sector banks (PSU) did not result in positive EVA. However, a few banks found that the value was positive. Sakthivel and Arjunan (2009) studied value-based management in the context of the Indian paper industry. They related it with two key concepts in value-based management, shareholder value-added and EVA. They highlighted that aspects of shareholder value have been increasingly found in Indian companies and are gradually becoming very prominent. As a result, more and more firms have begun adopting one of the two key measures. They also argued that shareholder value is measured on returns on investments, which, in turn, can be either dividends or capital appreciation. While capital appreciation depends on the market value of shares, dividends depend on multiple macroeconomic, industry-specific, and firm-specific factors.

Jagannathan and Suresh (2017) examined the trade-off theory and pecking order theory of capital structure in the context of the Indian services sector. They covered a range of enterprises from the 2011–15 period. Their study concluded that when it comes to estimating the possibility of debt portion in the capital, that was possible by examining the debt-to-equity ratio of the previous year, which was statistically significant. However, the trade-off theory or pecking order theory and its plausibility of employment in the capital structure returned weak results at the overall model level in the OLS model. However, they were statistically significant not to reject the hypothesis of the presence of pecking order theory or the absence of trade-off theory. Santhosh Kumar and Bindu (2018) studied the capital structure in the passenger car segment of the automotive industry. The debt-to-capital ratio was chosen as the dependent variable; profitability, firm size, tangibility, growth in assets, and non-debt tax shield were selected as independent variables. Specific to the passenger car segment, these independent variables did not have any explanatory power over the dependent variable, and thus the null could not be rejected. However, the *F*-statistics displayed a statistically significant model—at an overall model level, which meant that the specific

model had more explanatory and predictability power than the intercept-only model to estimate the dependent variable with the aid of the independent variables.

Rabha and Singh (2022) studied the relevance of the capital asset pricing model (CAPM) in present times and the context of Indian capital markets. The study used the rolling regression model to observe the capital market index of NSE 50 for 10 years (2011–21). They used the conventional and constrained model developed based on the proposed model of Bajpai and Sharma (2015) and found that the conventional model using the beta was far more effective and statistically significant than the constrained model. This outcome made CAPM the best and most relevant model in present times to estimate the cost of equity in the Indian capital market context. Sriram (2018) studied the importance of return on equity (ROE) and ROA in the context of the Indian stock market. The study was carried out on BSE-listed companies; 22 firms were used. It was discovered in their panel regression model that ROE and ROA contributed most to the shareholders as returns in the period of study. It also suggested that most of the firms used debt to finance their ROE and ROA, which was reflected in the equity multiplier in those firms. The study also concluded that ROA significantly influences ROE. This impact of ROA on ROE makes the ROA a significant financial performance ratio in the Indian stock market context. It is one of the reasons for choosing this variable in our model. Similarly, Pinto and Rastogi (2019) and Reddy and Rath (2005) also used ROE to measure profitability.

Ahmad et al. (2019) studied Hindustan Petroleum Corp. Ltd. They examined the explanatory power of gross and net profit margins, liquidity ratios, current ratios, debt-equity, and interest rate coverage ratios on EVA and MVA. They discovered that all the ratios, except liquidity, significantly explained the EVA component but were not significant in the case of MVA. Subedi and Farazmand (2020) studied the adoption of EVA in public administration in China. Their study compared pre- and post-adoption of EVA and its impact on their services. Unfortunately, the study period was only for two years: 2009 and 2010, with 2010 as the year of the adoption of EVA. Nevertheless, the results were favorable. When they adopted EVA as the performance metric, it resulted in efficient service delivery, prudent investment, and operational decisions on the part of public administrators.

Al-Awawdeh and Kareem Al-Sakini (2018) studied Jordanian banks from 2010–16. They found that EVA and ROA had a significant explanatory power of shareholder value relative to other financial measures like MVA, ROE, or EPS. The authors argued that while traditional measures were important for assessing shareholder value, its modern equivalent, like EVA, could give a better result. Jalali Naini et al. (2011) studied the automobile industry in the context of the Iranian auto sector, particularly the supply-chain aspect, emphasizing game theory and a balanced scorecard. In this study, they briefly attributed the relevance of EVA and its establishment, although the context was Iranian component manufacturing for the auto industry. They concluded that more than regulatory or cost-saving pressures, societal or public pressures led the Iranian auto supplier component company—the largest in Iran—to change its course of performance. They were forced to adopt more environment-friendly supply chain practices, including reusing or recycling parts.

Gopalakrishnan (2014) presented a study that constituted an EVA assessment of the Indian auto companies and chose a host of them, six in all, including firms like Hero Honda, Tata Motors Ltd., Mahindra & Mahindra, and other global players. The study was limited to the computation of EVA and establishing the factual data of firms that created value against those which destroyed value. His study indicated that firms with EVA values displayed value-added with a positive value and value destroyed with a negative value. Pavelková et al. (2018) researched value addition using EVA as a performance measurement in the Czech auto sector. They discovered value-added variables as the key driver with the highest positive impact and personal costs as the negative impact on EVA. For key performance indicators (KPIs), they used stochastic frontier analysis and univariate sensitivity analysis. Furthermore, they compared the performance of the auto sector of the Czech economy through business cycles for three periods: pre-crisis, crisis, and post-crisis periods to observe their performance, such as EVA/sales, cost of debt, and cost of equity, and gauge their performance. As a result, there was a greater relevance of EVA in this

study, and it was reported that the in-crisis performance of most firms was uniform relative to those during either pre-crisis or post-crisis periods.

Jankalová and Kurotová (2020) conducted this study of sustainability assessment using EVA to assess the sustainable value of their sample of companies in the Slovakian auto sector. The task of computing EVA was not easy. Nevertheless, they concluded that EVA did offer a reasonable measure of value, especially in the case of creating sustainable value, since that could be established only if the assessment was using the concept of opportunity cost, which EVA seemed to have addressed, that value was positive only if the operations returned an income more significant than the cost of capital; those that did not were relegated as having destroyed value.

The overall impressions gathered from the review of the literature are as follows:

- EVA has been relevant and significant as a measure of performance for any organization.
- The use of EVA was not confined to any specific industry.
- The review examined various industries globally, from public service companies to banks to manufacturing firms.
- EVA did not impede most auto companies, whether in India or even in the case of Iran, Czech, or Slovakian firms.
- Most research on EVA in automotive studies evaluated herein indicated the presence of EVA as statistically significant.
- Some compared it with other financial performance tools for testing the efficacy of EVA as a reliable value-added measure.

Research Methodology

This research paper proposes to examine EVA and its effectiveness in explaining stock price compared to Tobin's *Q* and ROA. This paper employs the linear regression tool OLS for this study on automotive companies listed on the National Stock Exchange (NSE-India) for the period between 2016–2021.

- ***Source of Data*** : The data for the auto industry were culled from PROWESS IQ, a corporate database system owned by CMIE India Pvt. Ltd.
- ***Period*** : This study was conducted from 2016–17 to 2020–21.
- ***Sample of Firms*** : These are firms listed on NSE, as shown in Table 1. The choice of NSE was for the following reasons: NSE boasts of a deep financial market, with its depth in equities, debt, and other financial derivatives segments as well, with ample liquidity, having all the characteristics of a vibrant stock exchange. In addition, stock prices were also captured by CMIE's Prowess IQ from the NIFTY platform.

Firstly, the data were gathered for specific parameters: EVA, stock price, and various financial performance measures like ROCE, return on invested capital (ROIC), Tobin's *Q*, ROE, ROA, operating margin, and net margin (net profit margin). The stock price was considered the dependent variable because the stock price is the signal that captures the market's opinion of a stock based on select performance measures, the usual earnings numbers, and other ratios.

The financial ratios or performance measures were considered based on two conditions: (a) they should be available for the select sample universe of firms; (b) they should be available for the entire study period without

Table 1. ***Sample Firms for this Study***

1	Ashok Leyland Ltd.
2	Bajaj Auto Ltd.
3	Hero Moto Corp. Ltd.
4	Maruti Suzuki India Ltd.
5	Tata Motors Ltd.
6	TVS Motor Co. Ltd.

any gaps – as obtained from the Prowess IQ database. Wherever data was missing, those financial performance measures were dropped so that the econometric model did not give spurious results. Thus, six were identified as large automobile companies in India from a total sample of nine firms. It is to be noted here that this study included firms producing passenger, light commercial, and heavy-duty commercial vehicles, including two-wheelers, three-wheelers, and four or more wheeled vehicles, as shown in Table 1. The econometric model will be discussed in the results and discussion section.

Implements of EVA

Here, EVA and its components are discussed in some detail. Before arriving at the net operating profit after tax (NOPAT), the revenue must be adjusted. There are 160 "patented" adjustments to be made to purify earnings before their value assessment. Similar adjustments are required for calculating the cost of capital and invested capital. However, to estimate EVA, the most common adjustments frequently followed by most researchers were employed in computing net operating profit after tax (NOPAT) and invested capital (IC). The cost of capital was considered the weighted average cost of capital (WACC), and in computing it, the CAPM was chosen (Rabha & Singh, 2022; Santhosh Kumar & Bindu, 2018).

EVA has two parts: an income and a cost; when that cost is deducted from that income, the residual is called economic value added (EVA) (Stewart, 2019). The different parts that make-up EVA is elaborated in some detail hereunder:

$$EVA = NOPAT - ₹\,\text{Cost of Capital} \quad (1)$$

Here, expanding the ₹ cost of capital leads to this equation:

$$₹\,\text{Cost of Capital} = \{(\%\,\text{Cost of Capital}/100)/\text{Capital}\} \quad (2)$$

The percentage of the cost of capital is further broken into different parts to know what it consists of :

$$\%\,\text{Cost of Capital} = \{(\text{Debt weight} \times \%\,\text{After-tax Cost of Debt}) + (\text{Equity weight} \times \%\,\text{Cost of Equity})\} \quad (3)$$

Now, it is time to examine NOPAT, which is defined as:

$$NOPAT = EBIT \times (1-t)$$
$$= S - COGS - SG\&A - D \times (1-t) \quad (4)$$

The merger of Eq.1 with Eq.4 leads to the following:

$$EVA = NOPAT - ₹\ COC$$
$$= EBIT \times (1-t) - COC \times C$$
$$= S - COGS - SG\&A - D \times (1-t) - COC \times C \quad (5)$$

where,
EBIT = Earnings before income and tax;
t = tax rate;
S = Net revenue/sales;
COGS = Cost of goods sold;
SG&A = Selling, general, and administrative expenses;
D = Depreciation expenses; and
C = Capital.

Under normal conditions, EVA considers equity alone. The firm in question, it is assumed, has zero debt or is unlevered. Therefore, while considering firms with debt, that cost must be accounted for when computing the cost of capital. Thus, the (normal) NOPAT is now reconsidered as LNOPAT (levered net operating profit after tax); and the formula is re-written as *LNOPAT* = *NOPAT* + taxes × interest (Stern et al., 2007).

EVA can be built with any of the two conventions: accounting or financing. The first one takes an internal view, while the latter takes an external view of EVA. Thus, the formula for accounting convention is:

$$EVA = NOPAT - ₹\ \text{Cost of Capital} \quad (6)$$

With an external view of finance convention, the EVA formula is re-written as:

$$MVA = \text{Firm Value} - ₹\ \text{Total Capital} \quad (7)$$

NOPAT can be calculated using one of these two approaches. One uses a top-down approach, which begins with sales and proceeds to net operating profit after taxes (NOPAT) after adjusting expenditures. The other one is the bottom-up approach. This starts at the bottom, EBITDA (earnings before interest, taxes, depreciation, and amortization). Then, based on the standard adjustments, it is filtered to obtain NOPAT. As per the EVA computation, there are adjustments—160 odd patented ones—which refine the net income of impurities; then, the cost of capital is calculated after making certain adjustments to the constitution of capital. Finally, EVA is only considered when the NOPAT is more than the cost of capital.

Calculation of Ratios

The ratios were chosen to check for the efficacy of EVA in explaining the stock price, with statistical significance. For this purpose, those ratios were selected from a range of literature where researchers had used a few sets of them to compare their performance in explaining stock price—in some cases stock market returns—to gauge the effectiveness of EVA over its other financial counterparts. In this paper, the chosen ratios are Tobin's *Q*—which was never used in the Indian automotive industry—and ROA (Sriram, 2018; Subedi & Farazmand, 2020). So here, EVA competes with two different ratios: one is Tobin's *Q,* and the other is ROA in explaining the stock price. The formula of those ratios is mentioned in this section below:

For Tobin's *Q*, the computation is done by first calculating the market capitalization of equity and the book value of debt, which is then divided by the book value of equity and debt. For ROA, the computation is PAT (earnings or profits after taxes)/Total assets.

The dependent variable here is the stock price obtained from the Prowess IQ database as recorded. The stock price considered here is the log number variable. The rationale for it is discussed in the appropriate section.

The weighted average cost of capital (WACC) is the percentage cost of compensation for the equity component and debt component in the overall capital structure, weighted by its constitution in the overall capital structure. It might also include other types of capital, such as the hybrid ones: preference capital. The cost of debt is perhaps easy to calculate as the interest rates of debt are priced mainly by the banks, and so are preference issues. But the equity is calculated with the aid of the CAPM, which is encapsulated in the following formula :

$$K_e = R_f + \beta\,(ER_m - R_f) \qquad (8)$$

Here, K_e stands for cost of equity; R_f for risk-free rate ; β is the beta or the volatility of the security relative to the market; ER_m , market return. In computing the cost of equity, the common equity was considered. The cost of debt was provided for in the database; the beta measure was taken from market data of sample firms; the market risk premium ($ER_m - R_f$) was also given (Batra & Munjal, 2018; Rabha & Singh, 2022). This information was included in the data obtained from the Prowess database.

There is growing criticism against CAPM. However, that has not limited its use in real-time in the Indian context. Therefore, this model is employed in the estimation of the cost of equity (Rabha & Singh, 2022; Santhosh Kumar & Bindu, 2018).

Research Hypotheses

The goal of this research paper is to examine the efficacy of EVA in explaining stock prices of Indian auto companies, with relative efficiency and statistical significance, compared to Tobin's *Q* and return on asset (ROA). Is there a possibility of EVA dominating ratios such as Tobin's *Q* and ROA? Is there any reason for this phenomenon, or is this a lack of awareness of EVA, on the part of the investor community, in assessing Indian auto stocks? This study is an attempt to seek answers to some of those questions. Therefore, the variables chosen in this study are

- **Dependent Variable** : log of stock price *(LnSTKP)*.
- **Independent Variables** : log of EVA *(LnEVA)*; Tobin's *Q,* and, return on assets (ROA).

Log Variables

Log variables are recommended when certain variables have large figures, and other comparable variables have values either in percentages or index type. This leads to spurious results or inconsistent ones, or worse, statistically insignificant results. It is recommended to make variables more compatible to ensure that the econometric model gives statistically significant results (Hsiao, 1985). Using log variables shows the magnitude of change—not just the change. Using log variables gives us results similar to demand elasticity, which are far more efficient.

Statements of Research Hypotheses

- **H_{01}** : There is no statistically significant explanatory power in EVA, Tobin's *Q,* and ROA in explaining the log of the stock price in the sample data for the period under study ; $\beta = 0$.
- **H_{a1}** : There is significant explanatory power in EVA, Tobin's *Q,* and ROA in explaining the log of the stock price in the sample data for the period under study ; $\beta \neq 0$.

The hypothesis statement seeks to establish the statistical significance of the log of EVA, Tobin's *Q,* and ROA in explaining the log of the stock price. Without prominently spelling, it seeks to examine the dominance of EVA over two other variables—Tobin's *Q* and ROA—although that is not an intended or direct purpose. The main objective is to gauge whether EVA explains the stock price of auto companies in India effectively and statistically significantly. The statistical test will be a two-tailed hypothesis; the hypothesis is examined using the standard confidence level of 95%; thus, the error margin is set at 5% alpha.

Analysis and Results

It is imperative to have an appropriate econometric model to carry out meaningful research. This research deals with panel data. As indicated by Hsiao (1985), Pinto and Rastogi (2022) sized the benefits of using the panel data technique rather than the common time-series or cross-sectional data. The natural choice thus was OLS (ordinary least squares). The entire analysis of this data was carried out in Stata version 11. Before the econometric model was chosen, it was essential to check whether the data or the variable qualified the conditions stipulated in the econometric model——here, ordinary least squares (OLS).

Conditions for OLS

Firstly, the data were subjected to a normal correlation test, and the choice of the test was Pearson's correlation. The results indicate a statistically significant correlation between the data variables under study. However, the correlation coefficient between none of the exogenous variables is more than 0.8; hence, there is no multicollinearity in the data. The results are shown in Table 2.

Ordinary least squares (OLS) require that the data meet at least a few conditions or properties. The data need

Table 2. ***Pearson Correlation of OLS Variables***

Pearson Correlation	Model A			
	LnStkp	***LnEVA***	***TobQ***	***ROA***
Log Stock Price	1			
Log EVA	0.4434*	1		
	0.0068			
Tobin's *Q*	0.3547*	–0.1454	1	
	0.0338	0.3976		
ROA	0.6476*	0.2277	0.3262	1
	0.0000	0.1816	0.0522	

Note. * Denotes high significance.

Table 3. ***Skewness – Kurtosis Test (of Normal Distribution)***

Skewness/Kurtosis Test for Normality					
				-------- joint	------
Variable	**Obs**	**Pr(Skewness)**	**Pr(Kurtosis)**	**adj Chi^2**	**Prob > Chi^2**
Resid	36	0.9192	0.1985	6.78	0.078

Table 4. ***Test of Heteroscedasticity***

Breusch – Pagan/Cook – Weisberg Test for Heteroskedasticity	
H0 : Constant variance.	
Variables: Fitted values of *LnStkp.*	
$Chi^2(1)$	0.150
Prob > Chi^2	0.70330
N0 = Not Rejected	Residuals are homoscedastic

Table 5. ***Test of Omitted Variable Bias***

Ramsey RESET Test using Powers of the Fitted Values of *LnStkp*	
H0 : Model has no omitted variables.	
F(3, 29)	**0.78**
Prob > *F*	**0.5170**

Need for more variable NOT detected ; Null cannot be rejected here.

Table 6. ***Test of Auto Correlation/Serial Correlation***

Wooldridge Test for Autocorrelation in Panel Data	
H0 :	No first-order autocorrelation
F(1, 5)	0.549
Prob > *F*	**0.4922**

Null Hypothesis : Not Rejected.

Data shows no incidence of serial or autocorrelation.

not meet all the 10 conditions; if it meets the critical ones, which will be detailed here in this section, that should suffice (Hsiao, 1985; Pinto & Rastogi, 2022). The most critical condition is the normal distribution of data (statistically, it is referred to as individually and independently distributed (IID)). In this research, the data variables are found to be normally distributed. In Stata-11, the regression command was run using the OLS model with the dependent variable as LnSTKP; independent variables as LnEVA, TOBQ, and ROA. After the residuals were generated, the histogram command checked the normal distribution. Finally, a skewness-kurtosis test was run, and the results indicate that the data in question is normally distributed. The results are included in Table 3.

The Breusch – Pagan/Cook – Weisberg test was employed to examine the presence of homoscedasticity — the constant variance of error terms followed. The null hypothesis (H_{01}) is not rejected, which suggests that the data did not contain any case of heteroscedasticity, implying that the error terms are homoscedastic. The results are depicted in Table 4.

Given the multiple variables, it is necessary to know whether the model contained issues of omitted variable biases. This is to verify whether the model included relevant variables or issues of irrelevant ones. The Ramsey RESET test was employed to confirm the null hypothesis that there is no case of omitted variables. The results show high Prob > Chi^2 ; thus, the null hypothesis (H_{01}) is rejected. It implies that the sample did contain omitted variable bias and that the need for more variables is not detected. The results are presented in Table 5.

Table 7. *Test of Multicollinearity*

Variance Inflation Factor | Multicollinearity		
Variable	**VIF**	**1/VIF**
ROA	1.23	0.816251
Tobin's *Q*	1.19	0.842699
Log EVA	1.12	0.894154
Mean VIF	**1.18**	

A test to check for autocorrelation or serial correlation was run. The tool used was the Woolridge test autocorrelation. The results suggest that there is no case of auto/serial correlation. The results are presented in Table 6. The multicollinearity test was conducted using the variation inflation factor (VIF). The multicollinearity is not detected since all variables are within the range and less than the peak value of 10. The results are included in Table 7.

Thus, it is established that OLS is the most appropriate method to run this econometric model. This means, in statistical parlance, that the test and its results would conform to BLUE (best linear unbiased efficient estimate) (Hsiao, 1985; Pinto & Rastogi, 2022). The model OLS equation is provided below as the econometric tool used in this research. The OLS econometric equation, with a simple linear equation with two variables, is:

$$Y_t = \beta_1 X_{it} + \beta_2 X_{it} + \mu_{it} \quad (9)$$

The proposed model is the final econometric regression model for testing the hypothesis retained after the above-mentioned filtering processes.

$$LnSTKP_{it} = \alpha_i + \beta_1 \times LnEVA_{it} + \beta_2 \times TobQ_{it} + \beta_3 \times ROA_{it} + \in_{it} \quad (10)$$

The details of the variables and their expansion is explained hereunder:
$LnSTKP_{it}$ = log stock price for *i* firms and for *t* periods.
α_i = is the constant for *i* firm.
$\beta_1, \beta_2, \beta_3$.... are the beta coefficients.
$LnEVA_{it}$ = log number of economic values added for *i* firms and *t* periods.
$TobQ_{it}$ = Tobin's *Q* for *i* firms and for *t* periods.
ROA_{it} = return on asset, for *i* firms and for *t* periods.
$\in_{it}$ = error terms (all other variables or effects which cannot be quantified), *i* firms, and for *t* periods.

Test of Hypothesis and Interpretation

The results of this OLS model were run on STATA-11. The results present a clear picture. Overall, the model fitment is statistically highly significant, as the Prob. > *F* is acceptable at 1% alpha (99% confidence level). The R^2 shows that this model could explain 60% of the variation in the stock price due to the model's variables. The adjusted R^2 shows that it could explain about 52% of the variation in the dependent variable as per the econometric model. The results are included in Table 8(a) and Table 8(b).

↳ The highest degree of statistical significance in explaining the stock price among the coefficients is ROA (return on assets). It means that for every 1% of the change in ROA, the stock price would positively react by 11 times, at an alpha of 5% (or 95% confidence) —that is statistically quite significant.

Table 8(a). ***Final OLS Econometric Regression Model and Results***

Source	**SS**	***Df***	**MS**		**# of Obs**	36
Model	47.93109	3	15.97703		***F*(3, 32)**	13.86
Residual	36.8878444	32	1.15274514		**Prob > *F***	**0.00000**
Total	84.8189344	35	2.42339813		***R*-Sqrd**	**0.56510**
					Adj *R*-Sqrd	0.52430
					Root MSE	1.07370
Log Stock Price	**Coef.**	**Std. Err.**	***t***	***P* > |*t*|**	**[95% Conf. Interval]**	
Log EVA	0.3849143	0.128109	3.00	0.0050	0.1239649	0.6458638
Tobin's *Q*	0.2526839	0.127548	1.98	0.0560	–0.007123	0.5124908
ROA	11.12977	2.984642	3.73	0.0010	5.050253	17.20929
_Cons	0.8465821	1.355613	0.62	0.5370	–1.914711	3.607875

Table 8(b). ***Final OLS Econometric Regression Model & Results***

	Linear Regression				**Number of Obs**	36
					***F*(3, 32)**	33.71
					Prob > *F*	**0.0000**
					***R*-squared**	**0.5651**
					Root MSE	1.0737
Log Stock Price	**Coef.**	**Robust Std. Err.**	***t***	***P* > |*t*|**	**[95% Conf. Interval]**	
Log EVA	0.384914	0.097507	3.95	0.00000	0.1863	0.5835
Tobin's *Q*	0.252684	0.135933	1.86	0.07200	–0.0242	0.5296
ROA	11.129770	2.057318	5.41	0.00000	6.9392	15.3204
_Cons	0.846582	0.968844	0.87	0.38900	–1.1269	2.8201

↳ ROA left EVA to a distant second spot. However, EVA displays a high statistical significance. Its coefficient shows that for a 1% variation, the stock price would positively react by 40% at an alpha of 5% (or 95% confidence).

↳ Tobin's *Q* came in at the third position—not too far in terms of effect from EVA. Its effect is statistically significant at an alpha of 10% (90% confidence) with a coefficient that points out that with a change in 1% of Tobin's *Q,* the stock price would change positively by 25%.

↳ The null hypothesis is rejected, clearly stating that there is a significant relationship between EVA, Tobin's *Q*, and ROA in explaining the dependent variable stock price, and that this relationship or explanatory power is statistically significant.

In the context of Indian auto companies' stock performance, the following are the key highlights:

↳ EVA does explain, with statistical significance, the stock price. Therefore, its role cannot be discounted here, as displayed by the results of this econometric model. At the overall model and the individual levels, coefficients and

p-value to EVA reveal a very significant explanation of the dependent variable: stock price (Log Stock Price: LnSTKP).

↳ The statistical significance of other variables, ROA, and Tobin's *Q*, too, are not to be discounted. They have also displayed a statistically significant relationship with the stock price at an overall OLS regression econometric model level as well as the individual coefficient, as shown by the *p*-values with an alpha of 1% and 10%, respectively.

↳ EVA comes only second to ROA but greater than Tobin's *Q*, which points to greater relevance of "value-addition" and its importance, relevance, and significance in the context of Indian automobile companies. It points to one thing: Indian auto companies would do well if their strategic and operational decisions are considered with due weights assigned to value-addition, specifically EVA. At least, this econometric model suggests some relevant relationships, which cannot and should not be ignored.

Conclusion

The Indian automobile sector, like its global counterparts, has been experiencing significant shifts in disruptive technologies. Compulsions of climate change are forcing them to change their engine and fuel technology to make them more carbon-neutral and environmentally friendly. The need for sustainability is forcing them to change their manufacturing practices. The rapid changes on the demand side due to increasing demand for online taxis lead to dwindling demand for ownership. The auto industry is clearly at the cusp of a significant transformation. This pandemic induced the thought necessary to examine whether the Indian automobile companies are gravitating to a value-added model to measure their business performance. Are investors giving the Indian auto companies a signal, through EVA or other value-added measures? These questions were inquired about and explored herein.

The research is conducted on six automobile companies from India listed on the Indian stock market—NSE. This research does not limit the study to only one auto market segment; it considers the entire auto market, which includes two-wheeler companies, passenger vehicle manufacturers, and light-commercial and heavy-duty commercial vehicles. The data was culled from Prowess IQ for the period beginning from 2016–17 till 2020–21. The study period did not include the COVID-19 pandemic times, as that was not the focus of this study. Therefore, the pandemic-induced pressures were not gauged.

The research presents fascinating results. In the case of EVA, it displayed some statistically significant relationships and pipped Tobin's *Q* on the scale of practical demand side planetary power towards the stock price. However, EVA came in at a distant second to ROA—a traditional performance measurement tool—in explanatory power to stock price. That the entire OLS regression econometric model has a very high statistical significance is displayed in the relatively high R^2 and a significant *p*-value (Prob. > *F*) at an alpha of 1% (or importance of 99%). The results point to one thing: EVA is not a measure to be discounted in the Indian automobile sector. Moreover, there seems to be a statistically significant relationship between EVA and the stock price.

As automobile companies realize that disruptive technologies, climatic and sustainability practices, demand-side and transformational supply-side changes notwithstanding – if they, like bankers, operate their business to earn incomes more significant than the cost of capital they borrowed to fund their operations, they will be in a comfortable position – like the grocer who examined the growing cash levels to check if he was fine, the auto firms would be adding good economic value, to their business.

Theoretical and Managerial Implications

The research article on EVA aims to assess whether, in the context of the Indian automotive industry, EVA has any relevance relative to other key financial ratios in terms of its measure and significance. The model's statistical significance quite appropriately points toward the inclusion of EVA as one of the critical financial ratio measures, which cannot be discounted. Therein lies the theoretical implications clearly from a value-addition perspective. The emphasis on EVA is a clear and present requirement because it informs the users that a specific business, through its engagement and financial effects, has either added value or destroyed it. Therefore, the academic community may take note of EVA and include it in their academic perusals so that future business leaders may employ them in their business models.

Besides theoretical implications, the managerial implications too cannot be ignored here. Businesses, in general, and automotive industry managers, in particular, may use EVA to gauge whether their business or revenue models are producing value at the end of a specific period. The overall linear regression models and the results put EVA as a statistically significant measure. That clearly states that EVA as a variable is as relevant as any comparable financial performance measure. It is not only the ROA or Tobin's Q but also EVA that can clarify whether a specific business has added value or has destroyed it. This finding will alert the business managers to ensure that their business activities are continuously checked based on value-addition. At times, it might seem that certain business activities, such as marketing, sales, operations, or strategy, are making a reasonable return on investments. But is that enough? Value addition encourages evaluating the possibility of the returns being more significant than the hurdle rate or cost of capital. It is then that the business generates more value for not only shareholders but also for all other stakeholders—because that business, then, rewards the shareholders and the society at large by generating dividends that are adequate for it to make sustainable growth—and in epochs such as these, the idea of sustainable growth is possible only when any business generates long-term value – and that is the essence of economic value added or EVA!

Limitations of the Study and the Way Forward

This study examines Indian auto companies listed only on the NSE. The sample size is retained at six auto companies (Table 1), and the period is only for five years, from 2016–17 to 2020–21. The econometric model is OLS (ordinary least squares) after filtering the data for necessary qualifications. This study focuses only on the value addition in the context of disruptive technologies and pressures of sustainable business practices in the Indian automotive industry and its value relevance for the said period. However, this study did not cover disruptive technologies and their impact on value addition. Perhaps, a study based on a structural equation modeling can detail the specific relationships between multiple variables, using factor or multivariate analysis to explain the finite relationship among many variables, EVA, and its components, as well as its effect on other dependent variables, such as stock price or market returns. These are promising areas for future research.

Author's Contribution

Dr. Bigyan P. Verma conceived the idea and developed qualitative and quantitative designs to undertake the empirical study. He is the sole author and worked on the analysis and writing of the paper.

Conflict of Interest

The author certifies that he has no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Funding Acknowledgement

The author received no financial support for the research, authorship, and/or publication of this article.

References

Ahmad, I., Alam, S., & Yameen, M. (2019). A study of economic value added (EVA) & market value added (MVA) of Hindustan petroleum corporation limited. *Global Journal of Economics and Business, 6*(1), 225–237. https://doi.org/10.31559/GJEB2019.6.1.14

Al-Awawdeh, H. A., & Kareem Al-Sakini, S. A. (2018). The impact of economic value added, market value added and traditional accounting measures on shareholders' value: Evidence from Jordanian commercial banks. *International Journal of Economics and Finance, 10*(10), 40–51. https://doi.org/10.5539/ijef.v10n10p40

Altaf, N. (2016). Economic value added or earnings: What explains market value in Indian firms? *Future Business Journal, 2*(2), 152–166. https://doi.org/10.1016/j.fbj.2016.11.001

Batra, G., & Munjal, A. (2018). An analytical study on determinants of capital structure composition during the post liberalization period in India. *Indian Journal of Finance, 12*(4), 20–36. https://doi.org/10.17010/ijf/2018/v12i4/122792

Choudhary, H., & Sharma, V. (2010). EVA discipline getting hotter at HARSCO corporation. *Indian Journal of Finance, 4*(6), 12–20. http://www.indianjournaloffinance.co.in/index.php/IJF/article/view/72594

Gopalakrishnan, C. (2014). Economic value added analysis of selected Indian automobile sector. *Indian Journal of Applied Research, 4*(3), 227–229. https://doi.org/10.36106/ijar

Hsiao, C. (1985). Benefits and limitations of panel data. *Econometric Reviews, 4*(1), 121–174. https://doi.org/10.1080/07474938508800078

Jagannathan, U. K., & Suresh, N. (2017). The nature and determinants of capital structure in Indian service firms. *Indian Journal of Finance, 11*(11), 30–43. https://doi.org/10.17010/ijf/2017/v11i11/119340

Jalali Naini, S. G., Aliahmadi, A. R., & Jafari-Eskandari, M. (2011). Designing a mixed performance measurement system for environmental supply chain management using evolutionary game theory and balanced scorecard: A case study of an auto industry supply chain. *Resources, Conservation and Recycling, 55*(6), 593–603. https://doi.org/10.1016/j.resconrec.2010.10.008

Jankalová, M., & Kurotová, J. (2020). Sustainability assessment using economic value added. *Sustainability, 12*(1), 318. https://doi.org/10.3390/su12010318

Miglani, S. (2019). The growth of the Indian automobile industry: Analysis of the roles of government policy and other enabling factors. In, K. C. Liu, & U. Racherla (eds.), Innovation, economic development, and intellectual property in India and China. *ARCIALA series on intellectual assets and law in Asia* (pp. 439–463). Springer. https://doi.org/10.1007/978-981-13-8102-7_19

Pavelková, D., Homolka, L., Knápková, A., Kolman, K., & Pham, H. (2018). EVA and key performance indicators: The case of automotive sector in pre-crisis, crisis and post-crisis periods. *Economics and Sociology, 11*(3), 78–95. https://doi.org/10.14254/2071-789X.2018/11-3/5

Pinto, G., & Rastogi, S. (2019). Sectoral analysis of factors influencing dividend policy: Case of an emerging financial market. *Journal of Risk and Financial Management, 12*(3), 110–127. https://doi.org/10.3390/jrfm12030110

Pinto, G., & Rastogi, S. (2022). Corporate governance impact on dividend policy of NIFTY-500 indexed Indian pharmaceutical companies (2014–2019). *Corporate Governance, 22*(7), 1547–1566. https://doi.org/10.1108/CG-08-2021-0309

Rabha, D., & Singh, R. G. (2022). Is CAPM still valid in today's market scenario? *Indian Journal of Finance, 16*(5), 57–68. https://doi.org/10.17010/Ijf/2022/V16i5/169518

Reddy, Y. S., & Rath, S. (2005). Disappearing dividends in emerging markets? : Evidence from India. *Emerging Markets Finance and Trade, 41*(6), 58–82. https://doi.org/10.1080/1540496X.2005.11052626

Sakthivel, N., & Arjunan, C. (2009). Value creation in Indian paper industry: An analysis. *Indian Journal of Finance, 3*(12), 46–54. http://www.indianjournaloffinance.co.in/index.php/IJF/article/view/71554

Santhosh Kumar, S., & Bindu, C. (2018). Determinants of capital structure: An exclusive study of passenger car companies in India. *Indian Journal of Finance, 12*(5), 43–53. https://doi.org/10.17010/ijf/2018/v12i5/123695

Sriram, M. (2018). Determinants of RoE of S&P BSE Sensex companies: A panel data analysis. *Indian Journal of Finance, 12*(9), 56–65. https://doi.org/10.17010/ijf/2018/v12i9/131564

Stern, J. M., Shiely, J. S., & Ross, I. (2007). The EVA challenge. Implementing value added change in an organisation. In, C. Boersch, & R. Elschen (eds.), *Das summa summarum des management.* Gabler. https://doi.org/10.1007/978-3-8349-9320-5_27

Stewart, B. (2019). EVA, not EBITDA: A new financial paradigm for private equity firms. *Journal of Applied Corporate Finance, 31*(3), 103–115. https://doi.org/10.1111/jacf.12365

Subedi, M., & Farazmand, A. (2020). Economic value added (EVA) for performance evaluation of public organizations. *Public Organization Review, 20*, 613–630. https://doi.org/10.1007/s11115-020-00493-2

Verma, B. P., Maji, P., & Nair, S. (2013). Mergers & acquisitions and their impact on corporate – values : Pre and post-merger analysis of Indian banks. *Indian Journal of Finance, 7*(2), 5–16. http://www.indianjournaloffinance.co.in/index.php/IJF/article/view/72143

About the Author

Dr. Bigyan P. Verma taught Finance at XLRI; Carleton University, Canada; & IIM Kozhikode. He has written *International Finance :* Theory and Practice (2002) and *Managing Work in the Digital Economy* (2022) and is the Director of IMT, Nagpur.