RAY: International Journal of Multidisciplinary Studies, E-ISSN: 2456-3064
Volume V, No. 1, April, 2020, pp. 9-18.

Impact of Research and Development Investment on Firms' Profitability: A Study on Selected Automobile Companies in India

Puja Mondal
Research Scholar,
Department of Commerce,
University of Kalyani,
Kalyani, West Bengal, India.
pujamondal.haldar@gmail.com

Subhas Chandra Sarkar
Professor,
Department of Commerce,
University of Kalyani,
Kalyani, West Bengal, India.
subhasch2004@rediffmail.com

Structured Abstract:

Purpose: This paper investigates the impact of overall research and development (R&D) investment on the profitability of Indian automobile industry.

Design / Methodology / Approach: This study is based on secondary data. Data have been collected from published annual reports of the selected companies. The period of study is 10 years, 2008-2009 to 2017-2018. In order to examine the impact of R&D investment on profitability, R&D investment to net sales ratio has been used as independent variable while NPR, ROA, ROE and EPS have been used as dependent variables. To accomplish the result of the present study, descriptive statistics, correlation, regression, hypothesis testing, etc. have been used. Data have been processed through SPSS version 20.

Findings: The study reveals that there exists a negative correlation between dependent variables R&D investment, whereas a positive correlation exists between EPS and R&D investment. The result shows significant impact of R&D investment on net profit, return on asset, return on equity, earnings per share.

Originality / Value: There is no dearth of study on R&D and firms' performance but a study on the impact of R&D investment on profitability of Indian companies is hardly available.

Limitation: This research work has been confined to a single industry and the results obtained may not be applicable to all the industries.

Keywords: Research and Development Investment, Automobile Companies, Profitability Indicators.

Paper Type: Research Paper.

Introduction

Research and Development (R&D) investment is essentially the amount of money that a company spends to develop new product / s and services usually each year. For example, if a firm hires research scientists to develop new drugs, the salaries of these researchers will be treated as R&D expenditure.

In a seminal work, Peter Ducker (2005) wrote in his work that "business enterprise has two important basic functions: marketing and innovation". R&D investment is a long-term investment which does not give immediate gain but influence the company's growth, competitiveness and viabilities in future earning periods (Morbey, 1988). So R&D investment is an important issue that every company should follow to achieve success in this competitive and tough business environment.

Automobile industry is one of the largest industries not only in India but also globally. We know that innovation or research and development are fuel for automobile industry. According to one analysis (EU Commission 2016, EU and R&D scoreboard) there are 25 Indian companies in the list of the top 2,500 global R&D spenders compared to 327 Chinese companies. Out of these 25 companies, 20 companies belong to 3 industries. They are pharmaceuticals, automobiles and software. India has only one company, i.e., Tata Motors belonging to automobile industry, is in the top ten in R&D activities.

In this backdrop, the relationship between R&D expenditures and firms' performance as well as impact of R&D investment on firm performance has been discussed and carefully studied for many years. A large number of researches have been carried out to judge whether this relationship exists or not. Some researchers advocate that there is no relationship between R&D expenditure and firm performance; others suggest the existence of negative or positive relationship. In that respect, the main aim of this research is to find out the relationship between R&D investment and firms' profitability of automobile industry which are listed in NSE.

Literature Review

The objective of literature review is to find out the research gap. With a view to identifying the research gap, a review of literature has been made for the purpose of the study, which is furnished below.

Erickson et al. (1992): The focus of their paper was to analyze the extent to which R&D expenditure produce a comparative advantage towards supernormal profit. This study found that research and development plays an important role to earn victory over present and potential competitors. R&D expenditure also helps to earn normal or above average profit by preventing imitation.

Cui et al. (2002): In their study, the major objectives were to know the relationship between managerial ownership and R&D intensity of high R&D firm as well as to know impact of R&D intensity on the performance of the firm. This study found that there is negative correlation between return on asset and R&D intensity of the firm but revenue of the firm increases with the increase in R&D intensity.

Cooper et al. (2008): They worked on different dimensions of research and development asset and stock return. They disclosed on the basis of their study that in accounting, a positive relation exists between research and development investment and firms' performance but finance predicts that negative relation exists between them.

Bhagwat et al. (2011): They studied on impact of R&D and advertising expenses on profitability of pharmaceutical companies. Both R&D and advertising expenses played an important role to generate desired sales growth. They experienced that there is positive impact of R&D investment on earnings per share.

Gaffar et al. (2014): They conducted this study to know the impact of R&D budget on the firms' financial performance. They found that there is significant relationship of R&D expenditure with return on asset, return on equity, earnings per share on the financial performance of pharmaceutical companies in Pakistan. This study revealed that if R&D expenditure increases, return on asset, return on equity and earnings per share also increase.

Bouaziz (2016): The main objective of his paper was to reveal the effects of R&D expenditure on the financial performance of information technology companies. This paper revealed that there is no impact of R&D investment on firm performances.

Mishra (2018): This study examined relationship between R&D cost and profitability of Indian pharmaceutical companies. This paper focused on different dimensions of R&D activity that help to sustain the company to earn profit. Empirically it found that there exists significant impact of R &D cost on firms' profitability.

Research Gap

From the Literature Review, it is clear that there is no dearth of study on R&D and firms' performance but study on impact of R&D investment on profitability of Indian company is hardly available

Thus, this area has been identified as research gap.

Research Question

For the purpose of the achieving the objectives of the present study following research question has been made:

1. Is there any impact of R&D investment on profitability of the firm?

Objective of the Study

The main objective of the present study is to examine the impact of R&D investment on companies' profitability during the period of study. To realize the main objective, the following secondary objectives have been formed:

1. To study the impact of R&D investment on firms' NPR and its significance.
2. To study the impact of R&D investment on firms' ROA and its significance.
3. To study the impact of R&D investment on firms' ROE and its significance.
4. To study the impact of R&D investment on firms' EPS and its significance.

Limitation of the Study

The study has been conducted on a single industry. Therefore the outcome of the present study may not be applicable to the all industries.

Research Methodology

Sample Size: In the present study, Seven automobile companies have been selected for the purpose of study viz. Ashok Leyland Ltd., Bajaj Auto Ltd., Eicher Motors Ltd., Hero MotoCorps Ltd., Mahindra & Mahindra Ltd., Maruti Suzuki India Ltd., Tata Motors Ltd. All these companies are listed in National Stock Exchange.

Data Collection: This study is based on the secondary data. The data have been obtained from the annual reports of the selected automobile companies.

Period of Research: The present study has been made for a period of 10 years starting from 2008-2009 and ending on 2017-2018.

Tools Used: Both accounting and statistical tools have been used. In statistical tools, descriptive statistics, correlation, regression, hypothesis testing, etc. have been adopted for the present study. Accounting ratio is adopted as accounting tool.

Variables Ratio Used For Analysis:

1) Independent Variable

a) R&D Intensity Ratio = Total R&D Investment / Net Sales

2) Dependent Variables

a) Net Profit Ratio (NPR) = Net Profit / Net Sales
b) Return on Asset (ROA) = Net Income / Total Assets
c) Return on Equity (ROE) = Net Income / Shareholders' Fund
d) Earnings Per Share (EPS) = Income Available to Equity Shareholder / Number of Shares Outstanding

It is clear from the Table 1 that there is much greater degree of variability in the standard deviation of the dependent variables and independent variable. It suggests that there are different degrees of association between the dependent variables and independent variable.

Therefore, we formulate the followings hypotheses:

1 H_0: There exists no significant impact of R&D investment on NPR

H_1: There exists significant impact of R&D investment on NPR

2 H_0: There exists s no significant impact of R&D investment on ROA

H_1: There exists significant impact of R&D investment on ROA

3 H_0: There exists no significant impact of R&D investment on ROE

H_1: There exists significant impact of R&D investment on ROE

4 H_0 : There exists no significant impact of R&D investment on EPS

H_1: There exists significant impact of R&D investment on EPS

Analysis and Findings

Table 2 shows that nature of relationship of selected dependent variables with independent variable during the period of study. Table 2 discloses a negative correlation between NPR, ROA, and ROE with R&D intensity which has been found to be statistically significant. Table 2 also shows that there is positive correlation between EPS and R&D intensity. Theoretically, significant correlation of NPR, ROA, ROE and EPS indicates proper utilization of company's fund.

Table 3 reveals the impact of R&D intensity on NPR. T-test and F-test have been used to know whether liner regression is significant or otherwise. Table 3 shows a negative significant impact of R&D intensity on the net profit during the period of the study. Therefore, we accept alternative hypothesis 1: H_1. For increase in one unit R&D intensity, the NPR of the selected companies during the period of study stepped down by 0.509 unit. Multiple correlations imply that NPR is strongly responded by R&D intensity. Table 3 also reveals that the coefficient of determination, R^2 for the present study implies that 42.3 per cent of variations in NPR have been contributed by R&D investment. The adjusted R^2 of 41.30 per cent indicates that there are other additional factors' that have valuable impact on NPR. Table 3 also shows that F statistic (22.576) with p-value (0.01) indicates that the regression model is perfectly fitted.

Table 4 explains the impact of R&D intensity on ROA. T-test and F-test have been used to know whether liner regression is significant or otherwise. Table 4 shows a negative significant impact of R&D intensity of the selected companies on the return on asset. Therefore, we accept alternative hypothesis 2: H_1. For increase in one unit of R&D intensity, the ROA of the selected companies during the period of study stepped down by 0.383 unit. Multiple correlations imply that ROA is strongly responded by R&D intensity. Table 4 also reveals that the coefficient of determination R^2 for the present study implies that 51.90 per cent of variations in ROA have been contributed by R&D investment. The adjusted R^2 of 45.9 per cent indicates that there are other additional factors that have valuable impact on

ROA. Table also shows that F statistic (8.640) with p-value (0.01) indicates that the regression model is perfectly fitted.

Table 5 reveals the impact of R&D intensity on ROE. T-test and F-test have been used to know whether liner regression is significant or otherwise. Table 5 shows a negative significant impact of R&D intensity of the selected companies on the return on equity. Therefore, we accept alternative hypothesis 3: H_1. For increase in one unit of R&D intensity, the ROE of the selected companies during the period of study stepped down by 0.397 unit. Multiple correlations (0.833) imply that ROA is strongly depending on R&D intensity. Table 5 also reveals that 69.5 per cent of variations in ROE have been contributed by R&D investment. The adjusted R^2 of 65.60 per cent indicates minor additional factors' impact on explanatory variables. Table also shows that F statistic (18.640) with p-value (0.003) indicates that the regression model is perfectly fitted.

Table 6 reveals that the impact of R&D intensity on EPS. T-test and F-test have been used to know whether liner regression is significant or otherwise. Table 6 shows a positive significant impact of R&D intensity of the selected companies on the earnings per share. Therefore, we accept alternative hypothesis 4: H_1. For increase in one unit of R&D intensity, the EPS of the selected companies during the period of study increased by 0.594 unit. Multiple correlations (0.821) imply that EPS is strongly depending on R&D intensity. Table 6 also reveals that the coefficient of determination R^2 for the present study implies that 67.4 per cent of variations in EPS have been contributed by R&D investment. The adjusted R^2 of 56.7 per cent indicates that additional factors' impact on explanatory variables. Table also shows that F statistic (38.640) with p-value (0.04) indicates that the regression model is perfectly fitted.

Conclusion

The present study investigates whether R&D investment has significant impact on profitability of automobile industry in India. After analyzing the data, we can conclude in the matter of answer of the research question of the present study that R&D investment has significant negative correlation with the net profit ratio, return of asset, return of equity but R&D investment has significant positive correlation with earning per share in subsequent periods. R&D investment has statistically significant impact on firms' net profit, return on asset, return of equity and earnings per share in the short run.

Recommendation

It is recommended that more and more attention is required in relation to the R&D investment and its efficient utilization.

References

Bhagwat, Y., & Debruine, M. (2011). R&D and advertising efficiencies in the pharmaceutical industry. *International Journal of Applied Economics*, *8*(1), 55-65.

Bouaziz, Z. (2016).The impact of R&D expenses on firm performance: Empirical witness from the Bist Technology Index. *Journal of Business Theory and Practice, 4*(1), *51-60.*

Cooper, M. J., Gulen, H., & Schill, M. J. (2008). Asset growth and the cross-section of stock returns. *The journal of finance*, *63*(4), 1609-1649.

Cui, H., & Mak, Y. (2002). The relationship between managerial ownership and firm performance in high R&D firms. *Journal of Corporate Finance*, *8*(4), 313-336.

Drucker, P. (2005). *The purpose of a business*. New Zealand Management.

Erickson G., & Jacobson, R. (1992). Gaining comparative advantage through discretionary expenditures: The returns to R&D and advertising. *Management Science*, *38*(9), 1264-1279.

Geoffrey, A. V. (2015). Impact of R&D expenses and corporate financial performance, *Journal of Accounting and Finance, 15*(7) 135-149.

Ghaffar, A., & Khan. A. (2014). Impact of research and development on firm performance. *International Journal of Accounting and Financial Reportin*, *4*(1), 356-367.

Hsu, C. C., & Boggs, D. J. (2003). Internationalization and performance: Traditional measures and their decomposition. *Multinational Business Review*, *11*(3), 23-50.

Mishra R. (2018). Influence of Research and Development (R&D) cost on profitability: A study of Indian pharmaceutical sector. *Journal of Economics and Finance*, *9*(2), 63-68.

Titus, V., House, J. M., & Covin, J. G. (2017) The influence of exploration on external corporate venturing activity. *Journal of Management*, *43*, 1609–1630.

Zhang, A., Zhang, Y., & Zhao, R. (2003). A study of the R&D efficiency and productivity of Chinese firms. *Journal of Comparative Econometrics*, *31*(3), 444-464.

APPENDIX

Table 1: Descriptive Statistics

Variables	Minimum	Maximum	Mean	Standard Deviation	
Independent Variable					
R&D Intensity Ratio	0.19	5.43	1.56	1.20	0.769
Dependent Variable					
NPR	-11.19	19.04	7.66	6.01	0.784
EPS (Rs.)	30.57	178.55	89.37	52.54	0.584
ROE	-27.33	58.68	18.1435	13.89	0.765
ROA	-8.99	36.78	7.663	6.017	0.785

Source: Calculated by Authors.

Table 2: Pearson Correlation Test

	EPS	NPR	ROA	ROE
R&D Intensity Ratio	0.821* (0.04)	-0.651* (0.01)	0.721* (0.01)	-0.833* (0.003)

**Significant at 5 per cent level.

Source: Calculated by the Authors.

Table 3: Results of Linear Regression Analysis (Dependent Variable NPR)

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Constant	9.90	0.0266	- 0.651	9.422	0.00
R&D Intensity Ratio	-0.509	0.151		-2.939	0. 01
R = 0.651	R^2 = 0.423	Adjusted R^2 = 0.413	F- statistic = 22.576**		

**Significant at 5 per cent level.

Source: Compiled from published annual reports during the period of 2008-2009 to 2017-2018 and computed using SPSS 20.

Table 4: Results of Linear Regression Analysis (Dependent Variable ROA)

	Unstandardized Coefficients		**Standardized Coefficients**	**T**	**Sig.**
	B	Std. Error	Beta		
Constant	1.791	0.190	-0.721	9.422	0.00
R&D Intensity Ratio	-0.383	0.130		-2.939	0. 01
R = 0.721	R^2 = 0.519	Adjusted R^2 = 0.459	F- statistic = 8.640**		

**Significant at 5 .00 per cent level.

Source: Compiled from published annual reports during the period of 2008-2009 to 2017-2018 and computed using SPSS 20.

Table 5: Results of Linear Regression Analysis (Dependent Variable ROE)

	Unstandardized Coefficients		**Standardized Coefficients**	**T**	**Sig.**
	B	Std. Error	Beta		
Constant	0.936	0.136	-0.833	6.896	0.00
R&D Intensity Ratio	-0.397	0.093		-4.266	0. 003
R = 0.833	R^2 = 0.695	Adjusted R^2 = 0.656	F- statistic = 18.640**		

**Significant at 5 .00 per cent level

Source: Compiled from published annual reports during the period of 2008-09 to2017-2018 and computed using SPSS 20.

Table 6: Results of Linear Regression Analysis (Dependent variable EPS)

	Unstandardized Coefficients		**Standardized Coefficients**	**T**	**Sig.**
	B	Std. Error	Beta		
Constant	6.429	3.601	0.821	2.272	0.00
R&D Intensity Ratio	0.594	3.21		2.491	0. 04
R = 0.821	R^2 =0.674	Adjusted R^2 = 0.567	F- statistic = 38.640**		

**Significant at 5 per cent level

Source: Compiled from published annual reports during the period of 2008-09 to2017-2018 and computed using SPSS 20.